Toward a National Plan for the Accelerated Commercialization of Solar Energy

The Role of State and Local Government

The MITRE Corporation

DISCLAIMER

The following pages are an exact representation of what is in the original document folder.

MTR--80W00043

DE83 017020

Toward a National Plan for the Accelerated Commercialization of Solar Energy: The Role of State and Local Government

Neville Gadsby

Prepared for
The Department of Energy
Conservation and Solar Applications

Contract No. EM-78-C-01-5174

AC01-78CS35147

May 1980

The MITRE Corporation
McLean, Virginia 22102
MTR-80W00043

THIS PAGE

WAS INTENTIONALLY

LEFT BLANK

ABSTRACT

This report characterizes solar technologies and related markets. It summarizes constraints and concerns that presently inhibit their accelerated commercialization and discusses the potential of subfederal units of government to remove, or at least alleviate, such barriers. It addresses the need for increased federal support if the potential for solar energy is to be realized.

ACKNOWLEDGEMENT

This report draws extensively on the work of Abbie Page as reported in Accelerating the Commercialization of Solar Energy: The Role of State and Local Governments, MTR-79W00189, August 1979.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

EXECUTIVE SUMMARY

State and local governments comprise the front line in any campaign to commercialize solar energy. Their potential in this regard is amply demonstrated by the early initiatives some of them have taken to this end, examples of which are cited in this paper. Virtually all branches of state and local government are involved in one way or another.

Commendable though many state and local activities are, they are presently pursued with varying levels of effort by different entities. Some are exploratory. Many focus on selected or limited applications. In contrast, the successful achievement of national goals for solar energy will demand the all-out effort of all state and other subfederal levels of government with respect to all appropriate solar applications.

Necessary levels of effort will require significantly increased federal support in the following areas:

- Funding: the direct and indirect provision of funds to enable subfederal governments and agencies to realize their potential.

- Information: the development and deployment of effective, adaptable networks to provide ready access to information, data, case history experience, etc.; preparation of sample legislation, codes, etc.; guidelines to program development, management, monitoring, and evaluation; workshop outlines, training syllabuses, and the like.

- Organization: development and maintenance of more streamlined, unambiguous channels of communication and referral.

- Motivation: positive leadership, definition of realistic goals and schedules, and demonstration by example of federal confidence in solar energy.

Above all, the attainment of national goals for solar energy will require significantly increased federal funding of all pertinent subfederal governments and agencies. Second to adequate financial support, effective information networks are a matter of high priority. The pace and energy of accelerated solar commercialization programs will result in the accumulation of information and experience at a rate wholly atypical of the normal market development of innovative technology. Information networks should focus on exploiting

successes, learning from mistakes, reducing delay, and minimizing duplicative efforts.

Many agencies and entities are involved in organizational interfaces between federal, regional, state and local governments. State and local participants frequently find present divisions of responsibilities and channels of referral unclear and confusing. They require review, clarification, and streamlining.

State and local governments are so crucial to the accelerated commercialization of solar applications that their role and related issues should be reviewed by the Standing Subcommittee on Solar Energy of the President's Energy Coordinating Committee.

SECTION I

INTRODUCTION

Many commercially available solar technologies and others close to commercialization are decentralized and site-specific. State and local governments are therefore in a position to play a critical role in accelerating the commercialization of solar energy. They address the problems of individuals, communities, institutions, and businesses at the local level and often on a personal basis. They are in close contact with the constituents, interest groups, and decision makers whose cooperation must be enlisted in any successful attempt to catalyze solar commercialization. Their information networks and understanding of the local political and institutional terrain are typically unequalled by higher government units. They are in a position to have considerable influence over many of the barriers that presently impede more rapid solar commercialization.

Many state and local governments have already taken considerable initiative in sponsoring solar and other energy-related programs. Several of these efforts have enjoyed some measure of federal support. Commendable though many such activities are, they are presently being pursued with varying levels of effort by different state and local entities. Some are exploratory. Many focus on selected or limited applications. In contrast, the successful achievement of national goals for solar energy will demand the all-out effort of all state and other subfederal levels of government with respect to all

appropriate solar applications, and high priority must be given to the increased federal support of activities at the state and local level.

No matter how good the war plan, the battle cannot be won from federal headquarters. Subordinate echelon and front line troops need the means, the technical assistance, and the logistics support with which to achieve local operational objectives.

SECTION II

SOLAR TECHNOLOGIES AND MARKET SECTORS

Solar technologies included in this report and their market sectors/applications are shown in Table I.* Smaller scale, dispersed technologies that are already commercially available or are nearing commercial availability such as active solar heating and cooling, passive solar design, dispersed biomass, low head hydro, dispersed wind, and industrial (including agricultural) process heat will be most responsive to near-term state and local commercialization efforts. This does not imply that the remaining technologies do not merit state and local attention. Some states are in a unique position to participate in mid- and long-term demonstration projects. Such opportunities should be used to gain hands-on experience, to provide indications of commercialization potential, and to identify barriers. Barrier removal efforts associated with near-term marketing goals can also have a positive impact on the commercialization of technologies not yet on the market. This must be borne in mind while coping with problems more immediately at hand.

Solar applications are projected to supply 22.0 quads (fossil fuel equivalent) of energy by the year 2000.** However, insolation

*The current commercialization status of solar technologies is summarized in Towards A National Plan for the Commercialization of Solar Energy: The Implications of a National Commitment, MTR-79W00004, The MITRE Corporation, October 1979.

**Assumes quadrupling the current level of solar utilization by the year 2000 (Option II), (op. cit.).

TABLE I

SOLAR TECHNOLOGIES AND RELATED MARKET SECTORS/APPLICATIONS

MARKET SECTOR APPLICATION / TECHNOLOGY	RESIDENTIAL				COMMERCIAL*				INDUSTRIAL				CENTRAL UTILITY					SYNTHETIC FUELS			
	Hot Water	Heating	Cooling	Electricity	Hot Water	Heating	Cooling	Electricity	Low Temp. (To 100°C)	Med. Temp. (100°-350°C)	High Temp. (Over 350°C)	Electricity	Base	Intermediate	Semi-peaking	Peaking	Fuel Savers	Methanol	Synthetic Crude Oil	Ammonia	Synthetic Natural Gas
Thermal	X	X	X		X	X	X		X	X	X										
Passive		X				X															
Wind				X				X				X	X	X			X				
Photovoltaics				X				X				X		X	X		X				
Solar Thermal Electric												X		X	X		X				
Biomass		X				X				X	X										
Solar Thermal Energy Systems									X												
Hydro Electric												X	X	X							
Ocean Thermal Energy Conversion													X								
Biomass Electric													X	X							
Wood Conversion																		X	X	X	X
Animal Waste																					X

*Includes multi-family dwellings and institutional buildings.

Source: Toward a National Plan for the Commercialization of Solar Energy: Guidelines for Regional Planning, The MITRE Corporation, MTR-79W00385, January 1980.

levels, wind characteristics, demand, economic environments, costs of conventional energy, and social and cultural environments vary between regions. Consequently, market projections vary from region to region with associated energy savings ranging from 0.6 quads in New England to over 3.4 quads in the Pacific Region (see Figure 1). Table II, which provides a state by state analysis of solar projections for the residential buildings market, further illustrates such regional disparities. Despite these variations, achievement of national goals will demand the intense involvement of all state and local governments in the easement, removal, and where possible reversal, of current and potential barriers and impediments to solar commercialization.

In addressing this challenge, state and local governments will be dealing primarily with markets, as opposed to technologies. Each solar application/market sector is characterized by an array of interacting participants referred to collectively as a Technology Delivery System (TDS). Among them are key decision makers who exercise the major influence in deciding whether or not to "go solar." Their concerns about solar energy and the causes of these concerns should be the focus of state and local efforts to promote solar commercialization. For example, the primary participants in the new one- and two-family homes" speculative market are listed in Table III. Their interactions (the market TDS) are shown in Figure 2. In this market sector, the home builder/developer is the ultimate

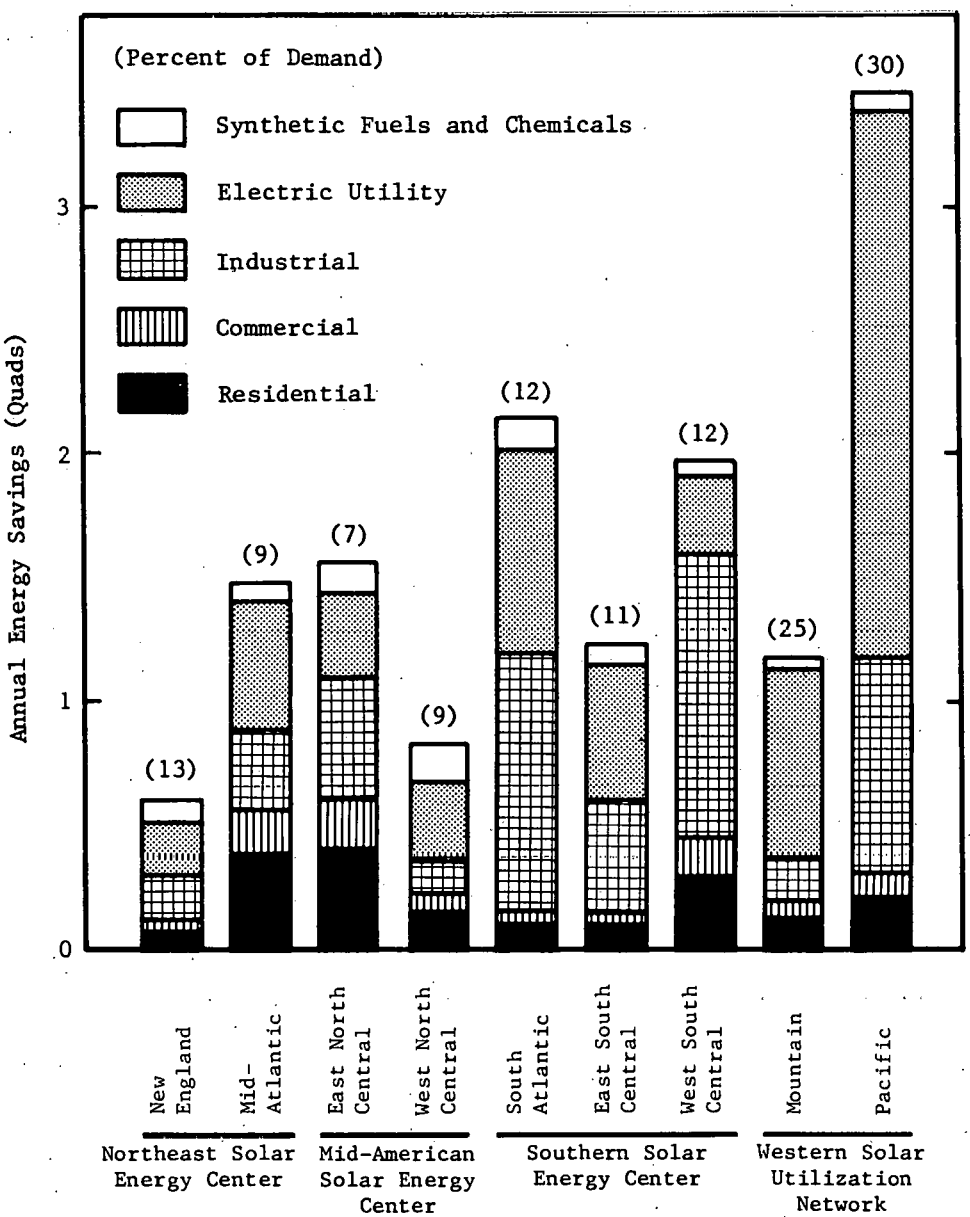


FIGURE 1
REGIONAL SOLAR MARKET PENETRATION IN THE YEAR 2000, REFERENCE CASE*

*See Toward a National Plan for the Accelerated Commercialization of Solar Energy: The Implications of a National Commitment, MTR-79W00004, The MITRE Corporation, October 1979, for a description of the Reference Case assumptions.

TABLE II

RESIDENTIAL BUILDINGS MARKET: PROJECTED CUMULATIVE NUMBER OF SOLAR SYSTEMS INSTALLED (THOUSANDS) AND ENERGY SAVINGS (MILLIQUADS), BY STATE, 1978-2000(*)

	1978		1985		1990		2000	
CENSUS REGION/STATE	NO. OF SYSTEMS	MILLIQUADS DISPLACED	NO. OF SYSTEMS	MILLIQUADS DISPLACED	NO. OF SYSTEMS	MILLIQUADS DISPLACED	NO. OF SYSTEMS	MILLIQUADS DISPLACED
New England								
Maine	0.733	0.015	30.584	0.812	73.345	2.060	169.277	5.750
New Hampshire	0.571	0.011	23.787	0.633	57.052	1.603	131.661	4.473
Vermont	0.328	0.006	14.023	0.361	32.601	0.915	75.233	2.555
Massachusetts	3.829	0.079	159.718	4.244	383.068	10.758	884.004	30.026
Rhode Island	0.651	0.014	27.187	0.723	65.203	1.837	150.470	5.111
Connecticut	2.036	0.042	84.956	2.257	203.759	5.723	470.213	15.972
Mid-Atlantic								
New York	43.034	0.811	931.096	24.673	2,149.647	59.019	4,937.952	155.708
Pennsylvania	17.932	0.338	387.957	10.280	895.687	24.592	2,057.480	64.878
New Jersey	28.690	0.541	620.731	16.449	1,433.098	39.347	3,291.968	103.805
South Atlantic								
Delaware	0.183	0.002	8.438	0.215	17.197	0.406	38.175	0.924
Maryland	1.010	0.016	46.350	1.188	94.580	2.233	209.958	5.081
Virginia	1.287	0.019	59.061	1.512	120.374	2.841	267.220	6.468
West Virginia	0.459	0.007	21.092	0.540	42.990	1.015	94.435	2.310
North Carolina	1.929	0.030	88.590	2.268	180.559	4.261	400.827	9.702
South Carolina	0.734	0.011	33.749	0.863	68.785	1.623	152.696	2.695
Georgia	1.287	0.019	59.061	1.512	120.369	2.841	267.220	6.468
Florida	2.113	0.033	97.027	2.484	197.757	4.667	439.003	10.624
East North Central								
Michigan	17.963	0.376	383.888	10.290	925.268	29.323	2,033.804	84.373
Wisconsin	8.982	0.187	191.946	5.145	462.634	14.661	1,016.901	42.187
Ohio	21.227	0.443	453.687	12.161	1,093.499	34.655	2,403.586	99.713
Illinois	22.044	0.461	471.136	12.628	1,135.556	35.988	2,496.031	103.549
Indiana	10.614	0.222	226.843	6.080	546.749	17.327	1,201.793	49.857

*Assumes accelerated commercialization incentives to achieve national goal of 22 quads displaced energy by year 2000 (Option II) and mid-priced conventional fuels.

TABLE II, Concluded

CENSUS REGION/STATE	1978		1985		1990		2000	
	NO. OF SYSTEMS	MILLIQUADS DISPLACED	NO. OF SYSTEMS	MILLIQUADS DISPLACED	NO. OF SYSTEMS	MILLIQUADS DISPLACED	NO. OF SYSTEMS	MILLIQUADS DISPLACED
East South Central								
Kentucky	2.403	0.051	103.544	2.726	239.386	6.271	635.855	20.055
Tennessee	2.980	0.063	128.318	3.380	296.838	7.775	788.460	24.866
Alabama	2.596	0.056	111.761	2.944	258.538	7.312	686.724	21.657
Mississippi	1.635	0.035	70.368	1.854	162.783	4.264	432.383	13.636
West North Central								
Minnesota	8.745	0.194	183.335	5.111	410.394	11.984	922.416	32.834
Iowa	6.359	0.140	133.335	3.718	298.468	8.716	670.847	23.880
Missouri	10.732	0.237	225.002	6.273	503.667	14.707	1,132.054	40.296
North Dakota	1.589	0.035	33.334	0.929	76.618	2.179	167.712	5.970
South Dakota	1.589	0.035	33.334	0.929	76.618	2.179	167.712	5.970
Nebraska	3.578	0.079	75.002	2.091	167.889	4.903	377.352	13.432
Kansas	7.156	0.158	150.000	4.182	335.777	9.804	754.703	26.862
West South Central								
Arkansas	7.205	0.115	153.886	5.933	352.060	13.365	767.670	38.303
Louisiana	12.248	0.197	261.606	10.087	598.502	22.719	1,305.039	65.114
Oklahoma	12.248	0.197	261.606	10.087	598.502	22.719	1,305.039	65.114
Texas	40.347	0.650	861.765	33.224	1,971.536	74.839	4,298.952	214.495
Mountain								
Montana	1.997	0.032	44.121	1.480	94.824	3.482	195.481	10.214
Wyoming	0.855	0.013	18.909	0.636	40.639	1.492	83.776	4.377
Colorado	7.132	0.115	157.575	5.290	338.655	12.438	598.145	36.476
New Mexico	3.995	0.065	88.242	2.962	189.647	6.966	390.963	20.426
Idaho	2.282	0.037	50.423	1.693	108.369	3.980	223.407	11.672
Utah	3.137	0.051	69.333	2.328	149.008	5.472	307.184	16.049
Arizona	7.704	0.124	170.181	5.713	365.388	13.432	753.996	39.395
Nevada	1.427	0.023	31.515	1.057	67.730	2.487	139.628	7.295
Pacific								
Washington	5.825	0.097	86.456	1.540	188.650	3.877	446.554	11.221
Oregon	5.825	0.097	86.456	1.540	188.650	3.877	446.554	11.221
California	71.566	1.191	1,062.176	18.918	2,324.894	47.637	5,486.243	137.853

TABLE III

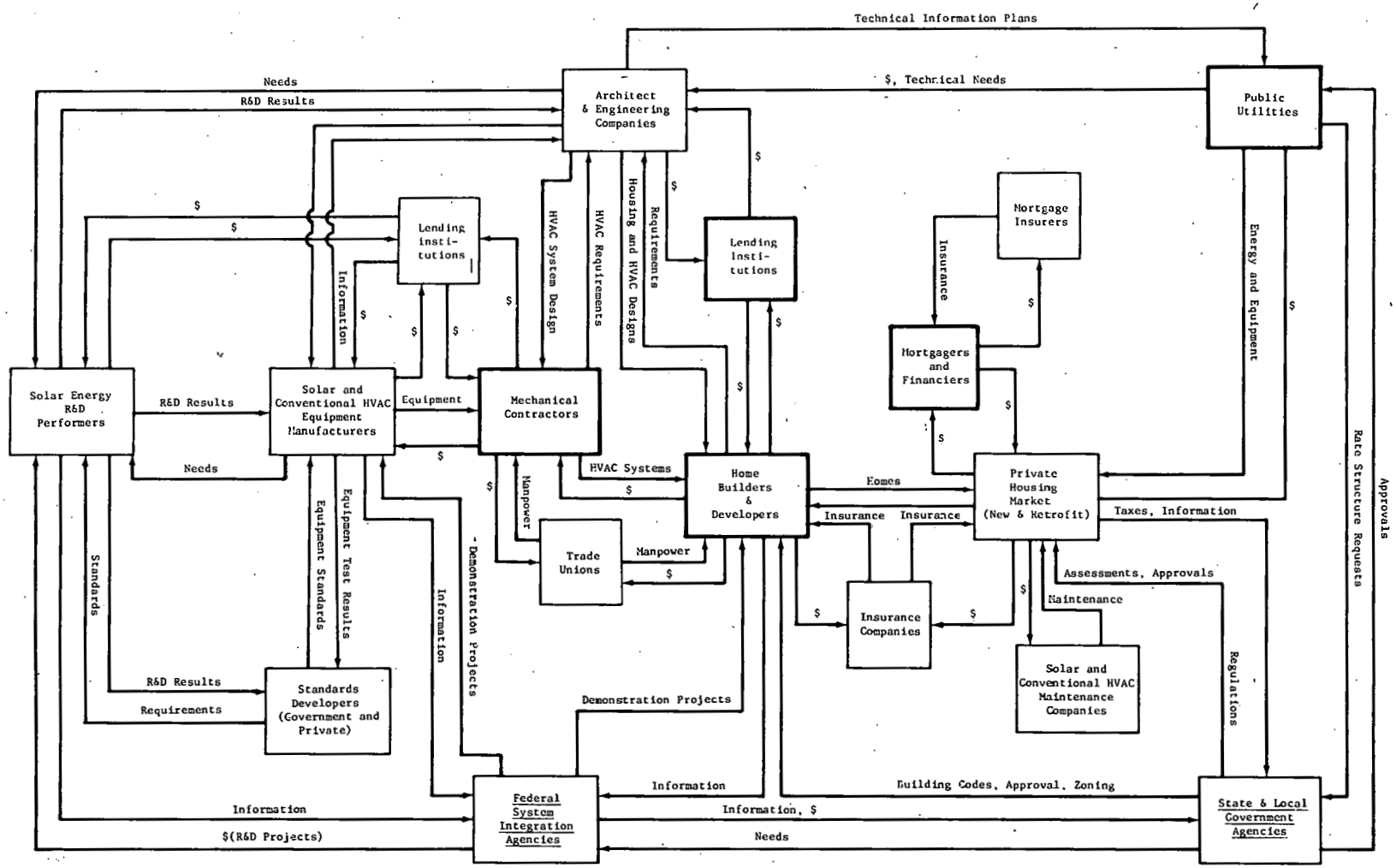
PARTICIPANTS IN THE RESIDENTIAL BUILDINGS MARKET,
ONE- AND TWO-FAMILY HOMES AND RETROFIT

Principal decision makers:

- Builders/Developers/General Contractors
- Mortgage Lenders
- Construction Financiers
- Mechanical (HVAC) Engineers
- Mechanical Contractors/Systems Installers

Others:

- HVAC Maintenance Firms
- Energy/Conservation Consultants
- Architects
- Standards Developers
- Federal Standards Agencies (e.g., NBS, DOE, HUD, VA)
- Other Federal Agencies (e.g. NOAA, NASA, SEA, FHLBB, NSF)
- State and Local Government
  - Taxation units
  - Regulatory units
  - Energy Extension Service
  - Standards/codes units/building inspectors
- Federal Systems Integration Agencies (e.g. DOE, HUD, VA)
- End-users
  - Homeowners
  - Federal, State and Local Governments
- Solar R&D Firms
- Solar Equipment Manufacturers/Distributors/Dealers
- Construction Trade Unions
- Insurance Companies
- Utilities
- Information Disseminators



Source: R. Hewett, Solar Buildings Markets: Participants and Concerns, The MITRE Corporation, WP-12488, November 1978.

FIGURE 2
PARTICIPANTS AND THEIR INTERACTIONS IN THE SOLAR TECHNOLOGY DELIVERY SYSTEM FOR SPACE AND WATER HEATING IN THE RESIDENTIAL MARKET: NEW (SPECULATIVE) CONSTRUCTION AND RETROFIT

decision maker. He or she is primarily influenced by the attitudes and advice of construction and mortgage financiers, HVAC engineers/contractors and, in some regions, by utility companies. All of these are affected by the actions of state and local, as well as the federal government. Figure 3 shows some typical interactions.

Each market and submarket has a different set of decision makers, some of whose solar concerns are applicable to more than one market. Other concerns are relatively unique to specific applications/markets, and some may vary in significance depending on local conditions. In general, barriers fall into three groups: economic, institutional, and environmental (including safety considerations).* Specific barriers are summarized in Tables IV, V, and VI. These tables also show those barriers amenable to state and local government action and those requiring the participation of the federal government and/or the private sector.

In light of these concerns, the thrust of state and local efforts must be to:

- develop a positive attitude throughout all branches of government toward the use of solar energy
- increase confidence in solar systems throughout the community by, for example, government purchase, use, and demonstration of solar applications
- reduce or reverse economic disincentives to solar use through, for example, preferential taxation, cheap financing, or utility rate structures

*A fourth category, technical barriers, also exists. Since it is not directly susceptible to state and local government initiatives, it is not considered in this discussion.

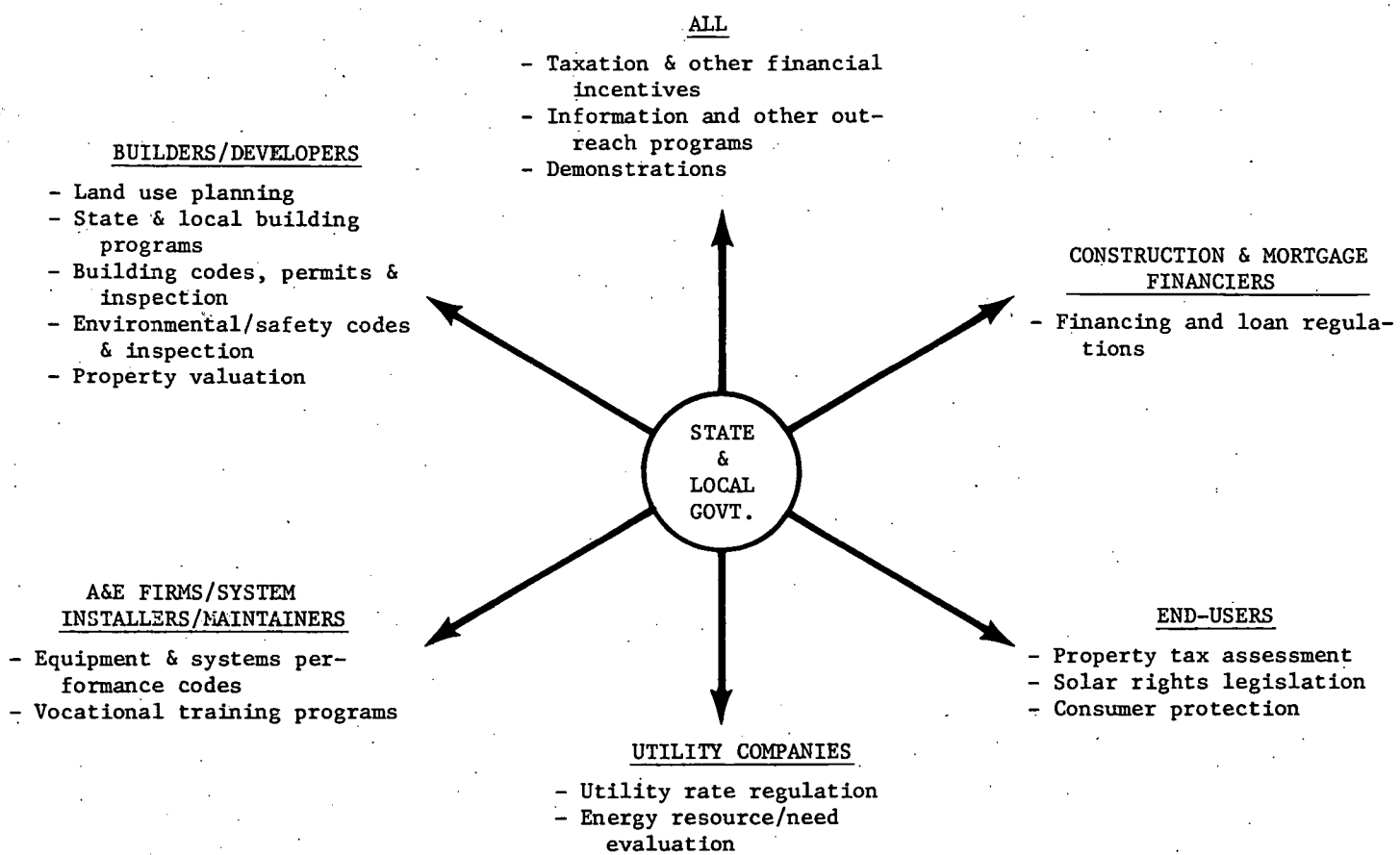


FIGURE 3
TYPICAL INTERACTIONS BETWEEN STATE AND LOCAL GOVERNMENTS AND PRINCIPAL DECISION MAKERS IN THE RESIDENTIAL BUILDINGS MARKET (NEW SPECULATIVE CONSTRUCTION)

TABLE IV

MAJOR ECONOMIC BARRIERS TO SOLAR COMMERCIALIZATION

ECONOMIC BARRIERS	TECHNOLOGIES										
	OTEC	Central Solar Elec.	Central Wind Elec.	Central Biomass	Dispersed Photovoltaic	Dispersed Wind	Dispersed Biomass	Solar IPH	Low Head Hydro	Active Solar H&C	Passive Solar Design
*High initial cost	•	•	•	•	•	•	•	•	•	•	•
Low relative cost of alternatives	•	•	•	•	•	•	•	•	•	•	•
Uncertain future cost of alternatives	•	•	•	•	•	•	•	•	•	•	•
*Uncertain future cost of the biomass resource				•			•				
High cost of transmission	•	•	•	•					•		
High cost of storage		•	•		•	•		•		•	
*High cost of land		•	•	•				•	•		
*High cost of site-specific feasibility studies		•	•	•				•	•		
*High cost of site-specific environmental studies		•	•	•				•	•		
**Lack of firm and advantageous utility rate structure policies		•	•	•	•	•			•		
Cash flow problems in early years									•		
*Difficulty in obtaining financing		•	•	•	•	•	•	•	•	•	•
*Difficulty in obtaining insurance		•	•	•	•	•	•	•	•	•	•
**Lack of uniform and advantageous property tax treatment					•	•	•			•	•
Disruption of work schedules during retrofit							•	•		•	
High cost of purchased biomass fuels							•				
*Lack of a generous definition of techniques and materials that should qualify for tax exemptions											•

*Susceptible to state and local government actions.

**Can be alleviated by state and local government actions: more complete removal requires federal action and/or private sector involvement.

Source: A. Page, Accelerating the Commercialization of Solar Energy: The Role of State & Local Governments, The MITRE Corporation, MTR-79W00182, May 1979.

TABLE V

MAJOR INSTITUTIONAL BARRIERS TO SOLAR COMMERCIALIZATION

INSTITUTIONAL BARRIERS	TECHNOLOGIES										
	OTEC	Central Solar Elec.	Central Wind Elec.	Central Biomass	Dispersed Photovoltaic	Dispersed Wind	Dispersed Biomass	Solar IPH	Low Head Hydro	Active Solar H&C	Passive Solar Design
**Lack of solar access protection		•			•			•		•	•
**Lack of wind access protection			•			•					
*Competition with other land/resource uses		•	•	•			•		•		
**Lengthy lead time for permits		•	•	•				•	•		
*Additional lead time for land acquisition		•	•	•				•	•		
**Lack of site banking		•	•	•							
*Public resistance to utility ownership		•	•	•	•	•			•		
*Lack of utility cooperation		•	•	•	•	•			•		
**Lack of attention by public utility commissions		•	•	•	•	•			•		
**Possible PUC jurisdiction over cooperatives					•	•		•	•		
**Zoning and building code limitations and conflicts		•	•	•	•	•	•	•		•	•
**Aesthetic/architectural controls					•	•				•	•
Lack of marketing, intallation and service personnel					•	•	•		•	•	•
Absence of industry-wide standards and performance criteria					•	•	•	•		•	•
*Absence of product testing and certification					•	•	•	•		•	•
**Lack of adequate consumer information					•		•			•	•
Lack of stable biomass supply				•				•			
Unavailability of conforming fuels							•				
Local citizen opposition									•		
Labor problems								•		•	
TV interference			•								
Lack of a field test or demonstration	•										
Unclear status of Law of the Sea	•										
Leasing requirements for offshore tracts	•										

*Susceptible to state and local government actions.

**Can be alleviated by state and local government actions: more complete removal requires federal action and/or private sector involvement.

Source: A. Page, Accelerating the Commercialization of Solar Energy: The Role of State & Local Governments, The MITRE Corporation, MTR-79W00182, May 1979.

TABLE VI

MAJOR ENVIRONMENTAL/SAFETY BARRIERS TO SOLAR COMMERCIALIZATION

POSSIBLE ENVIRONMENTAL BARRIERS	TECHNOLOGIES										
	OTEC	Central Solar Elec.	Central Wind Elec.	Central Biomass	Dispersed Photovoltaic	Dispersed Wind	Dispersed Biomass	Solar IPH	Low Head Hydro	Active Solar H&C	Passive Solar Design
Effects on marine biota	•		•								
Effects on terrestrial biota		•	•						•		
Climatological impacts	•	•	•								
Explosion hazards	•										
**Fire hazards							•				
**Health risks (toxic materials)		•			•					•	
*Other safety hazards (falling blades, breaking dams)			•			•			•	•	
*Noise			•			•					
**Air emissions				•			•				
**Water pollution (residues)				•							
*Thermal pollution				•							
*Erosion		•						•			
Seismic effects											
**Landclearing		•		•							
**Harvesting impacts				•		•					
*Increased pesticide and fertilizer use				•							
Increased demand for water				•							
**Aesthetic intrusions		•	•			•				•	

*Susceptible to state and local government actions.

**Can be alleviated by state and local government actions: more complete removal requires federal action and/or private sector involvement.

Source: A. Page, Accelerating the Commercialization of Solar Energy: The Role of State & Local Governments, The MITRE Corporation, MTR-79W00182, May 1979.

- develop outreach capabilities--information targeted at the specific concerns of specific decision makers, appropriately packaged, disseminated through leverage mechanisms that enjoy high credibility, and backed by advisory services

- ease regulations, codes, etc., that presently inhibit solar commercialization or are unduly burdensome to solar proponents; replace them with regulations that are conducive to solar use; and indoctrinate those that administer such regulations

- simplify and speed up permit application and award procedures

- assess the solar potential of their communities, set realistic solar goals, and draw up contingency and operational plans

- catalyze and support cooperative interfaces between TDS participants, decision makers, leverage points, government and other agencies in a broker-type role

- monitor markets and vigorously pursue solar opportunities

- coordinate community organizational and institutional resources and efforts

- provide consumer protection services

This list is illustrative and far from comprehensive, but it provides a context for the following more detailed discussion of the role of state and local governments in accelerating the commercialization of solar energy.

SECTION III

SOLAR COMMERCIALIZATION EFFORTS AT THE STATE LEVEL

Each of the three branches of state government (the executive, legislative and judiciary) has a role to play in the commercialization of solar energy. Although the role of the judiciary branch is indirect and requires statutory action to modify, quasi-judicial bodies such as regulatory boards and commissions can directly influence solar commercialization, favorably or otherwise. Furthermore, the latter are more amenable to guidance by state and local executives.

Within each of the main branches of government and their counterparts in substate, regional, county and municipal governments, there are many subunits serving specific functions that influence or can influence solar commercialization. Some of these listed in Table VII, which identifies their roles under the headings of policy makers, promoters, regulators, and end users. These are further described in following sections.

EXECUTIVE BRANCH

Governors and Their Staffs

Because of the prestige of the governor's office, direct gubernatorial leadership can be extremely influential in mobilizing the entire government and the private sector toward the increased use of solar energy. A governor can, for example:

TABLE VII

TYPICAL STATE AND LOCAL GOVERNMENT ORGANIZATIONAL ELEMENTS AND THEIR ROLES IN SOLAR COMMERCIALIZATION

ORGANIZATIONAL UNIT	ORGANIZATIONAL SUBUNIT	PRINCIPAL TYPES OF PARTICIPATION			
		POLICY	PROMOTIONAL	REGULATORY	END USER
State Government, Executive Branch	Governors and their staffs	X	X		X
	Multi-State Regional Commissions	X	X		
	Regional Solar Energy Centers	X	X		
	State Energy Departments	X	X		
	Energy Extension Services		X		
	Taxation Department	X	X		
	Consumer Protection Departments		X	X	
	Public Works/Building Services Departments				X
	Housing Development Agencies	X	X		X
	Transportation Departments	X			X
	Agriculture and Forestry Departments	X	X		
	Standards and Codes Departments			X	
	Education Departments		X		X
	State Level Economic Development Mechanisms		X		
State Government, Regulatory/Quasi-Judicial Org.	Public Utility Commissions			X	
	Environmental Regulation Departments/Boards			X	
	Energy Facility Siting Boards			X	
State Government, Legislative Branch	Specific Legislative Committees	X	X		
	Legislative Staff	X	X		
County or Substate Regional Agencies	Elected Officials and County Admin.	X	X		X
	Planning Agencies	X	X		
	Public Works/Building Services Departments				X
	Public Assistance/Information Agencies		X		
	Transportation Departments				X
	Environmental Protection Departments			X	
Local Agencies	Elected Officials, Town/City Managers	X	X		X
	School Boards		X		X
	Building/Plumbing/Fire Inspectors			X	
	Property Tax Assessors			X	
	Planning and Zoning Boards and Departments	X	X	X	
	Conservation/Natural Resource Departments	X	X	X	
	Historic District/Aesthetic Design Review Boards			X	
	Public Works/Building Services Departments				X
	Public Assistance/Information Agencies		X		
	Transportation Departments				X
	Community Development Corporation				X
	Local Housing Authorities	X	X		X

SOURCE: A. Page: Accelerating the Commercialization of Solar Energy: The Role of State & Local Governments, The MITRE Corporation, MTR-79W00182, May 1979.

- make solar energy a priority issue
- call for a study of solar energy potential within his/her state
- promote policies supportive of solar energy
- create commercialization offices or task forces (e.g., the SolarCal Council in California, Solar Alliance in Connecticut, Solar Action Office in Massachusetts) involving leaders from business/industry, labor, government, academia, community groups, special interest groups, and consumer agencies
- appoint officials who will promote solar energy within the agencies they lead
- encourage the use of solar applications in government operations

Multi-State Regional Commissions

Many states participate in Title V Regional Commissions that conduct energy programs under Section 515 of the Public Works and Economic Development Act of 1967 (as amended) with the support of funds from the U.S. Department of Commerce. Although they operate under presidentially appointed federal cochairpersons, policy and program decisions are made with the collective agreement of the executive branches of state governments within the region. To date, solar-related roles of regional commissions have included:

- formulation of regional policy supportive of solar energy in general and of regional solar commercialization centers in particular
- provision of funds, staff, and other support for the assessment of solar resources, technologies, and applications
- funding of solar demonstration and outreach projects

For example, the New England Commission has:

- funded a proposal that culminated in the establishment of the Northeast Solar Energy Center with which it maintains an advisory relationship
- contributed funds to six New England states in support of solar commercialization efforts (policy analysis, information development, dissemination, and demonstration projects)
- sponsored or assisted several programs and research projects relating to the industrial and domestic (including low income housing) use of wood as a fuel
- provided funds for the installation and operation of a small windmill on Mount Washington
- provided funds to retrofit a demonstration building with solar and wind equipment and to monitor and evaluate these systems
- supported research on the commercial-scale conversion of animal wastes to methane and on problems associated with feeding electricity from dispersed wind systems into commercial grids
- contributed to the development of simplified procedures for licensing low-head hydro
- sponsored a major conference (and subsequent implementation planning) with the Eastern Canadian Provinces to develop policies and projects for cooperation in the areas of direct solar, wood, wind and hydroelectric developments
- testified at public hearings on biomass developments; reviewed and commented upon the draft Domestic Policy Review of Solar Energy*

Other state and regional commissions have played similar roles in solar commercialization. The Department of Commerce's Development

*A. Page, Accelerating the Commercialization of Solar Energy: The Role of State and Local Governments, MTR-79W00182, The MITRE Corporation, May 1979.

Administration (EDA) has supported specific projects through their Regional EDA Commissions established through interstate compacts and congressional legislation. The Four Corners Commission (Colorado, New Mexico, Arizona, Utah, and Nevada) funded a project which identified high potential sites for anaerobic digestion of cattle manure into methane and demonstrated the conversion technology with a mobile unit which traveled throughout the member states. The Southwest Border Regional Commission (California, Arizona, New Mexico, and Texas) funded member states to study their potentials for renewable energy development. Currently there is no formal EDA policy to support solar energy development, but each regional commission has the discretion to fund proposals submitted or approved by member states.*

State Energy Units

Almost every state has an energy department, division, office or staff that serves as the focus of energy activities within the executive branch. Their status and influence vary widely subject to the policies and levels of interest of the governors. Some of their activities include:

- evaluating and projecting state energy usage, needs, and resources, and the potential for solar energy
- analyzing solar energy policy options

*SERI, Annual Review of Solar Energy, draft document, Chapter 27.

- drafting pertinent legislation
- designing the Energy Extension Service program, a federal program modeled after the Agricultural Extension Service to provide conservation and solar information and technical assistance to small energy users
- stimulating interest throughout the community and providing a solar information service
- organizing solar workshops, seminars, training programs, demonstrations, and other outreach activities
- initiating and coordinating solar commercialization efforts by other state agencies

The Minnesota Energy Agency has, for example:

- provided solar energy policy analysis to the executive and legislative branches
- written legislation on solar access, solar equipment standards, and solar property tax incentives
- designed the Minnesota energy extension service
- conducted the Minnesota Alternative Energy R&D Policy Formulation Project to determine the potential of the state's solar resources
- managed the Energy Center which provides both general information and technical advice on specific systems
- evaluated the performance of solar systems already installed
- managed a $400,000 alternative energy grant program to respond to unsolicited proposals
- conducted competitions with cash awards for the design of low-cost passive solar homes
- worked with vocational-technical schools to design training courses for solar equipment installers
- lobbied at the federal level for funds for solar demonstration projects arising in Minnesota
- advised the Mid-America Solar Energy Center

Energy Extension Service (EES) Units

The purpose of the DOE Energy Extension Service (EES) Program, authorized by Congress in 1977, is to offer practical energy saving information and advice to small energy users such as individuals, small businesses and agricultural operations, schools, hospitals, and state and local governments and to encourage the use of solar and other renewable resources. The program also addresses leverage and multiplier groups that influence energy use such as architect and engineering firms, builders, and bankers.

Ten pilot states* were competitively selected to receive grants of up to $1.1 million each to participate in a 19-month pilot program. The nonparticipating states were subsequently invited to submit applications for grants of up to $30,000 each to support state activities, observe pilot state programs, understand the lessons learned by pilot states, and use those lessons as a basis for planning participation in a nationwide Energy Extension Service.

The pilot states have generally grouped their extension programs and activities on the basis of client categories to be served. Much of the activity revolves around providing advice on energy conservation methods. However, in the course of this work, consumer questions about solar energy are frequent. The specific solar

*Alabama, Connecticut, Michigan, New Mexico, Pennsylvania, Tennessee, Texas, Washington, Wisconsin, Wyoming.

commercialization activities of pilot state Energy Extension Services have included:

- answering solar questions that come through the telephone "hot line" (Connecticut)
- providing information to farmers on solar grain drying (Alabama)
- conducting workshops on solar and wind power (New Mexico)
- holding seminars for small businesses and the housing industry (Tennessee)
- providing individualized technical advice about solar applications to local governments, the home building industry, small manufacturers, financial institutions, hospitals, and other consumers (Texas)
- providing information to all consumers on safe and efficient use of wood-heating appliances (Wisconsin)
- monitoring the availability of wind and solar resources at high schools throughout the state (Wyoming)

Many nonpilot states are active in similar projects but, pending the inception of a nationwide EES program, these are not, for the most part, supported with EES funds. Proposed legislation--the Energy Management Partnership Act (EMPA)--will consolidate DOE state grant programs and reflect the fact that, at the implementation level, such programs are already well integrated in most states.

Consumer Protection Units

Most states have offices or departments which deal with consumer complaints concerning fraud, truth-in-advertising, service issues, and pricing questions. These offices are closely linked with, or

sometimes part of, the office of the state Attorney General. These departments will become involved in solar commercialization by:

- issuing warnings about poor practices or equipment
- publishing consumer protection and solar buying guides
- lobbying for consumer protection legislation
- investigating complaints

Massachusetts established a unique "Solar Action Office" within its consumer affairs department. This office serves as the solar advocate within state government. It also provides technical information to a wide clientele. Specific activities this office has engaged in concerning the commercialization of active and passive solar space and water heating include:

- providing complaint referral services
- preparing and distributing solar consumer information such as the buyers' guide, "How to Make a Good Solar Purchase"
- preparing and distributing technical information to a wide audience: a catalog of the entire solar industry infrastructure within the state; a "loading table" for rooftop collectors for architects, builders and building code inspectors; a pamphlet on correct techniques for installation of water heaters
- holding technical conferences and seminars for the general public and specific groups such as plumbers, building code inspectors, contractors, electricians, homeowners, and architects
- writing model solar legislation
- writing model warranty standards for solar products
- keeping track of all available solar grant programs and informing all interested parties

- managing the HUD solar water heater initiative, and monitoring the performance of these installations
- taking periodic surveys of various components of the solar technology delivery system (such as consumers and installers), keeping track of their concerns
- providing technical services to state and local building officials
- investigating barriers to solar business and market development in the state
- working with labor and industry to develop a computerized model which will examine the regional economic and employment impacts of solar energy in residential housing. The information provided by this model may be useful to bolster arguments for increased financial incentives for solar energy.
- acting as the in-house solar design advisor to other departments within the state, particularly those responsible for building and maintaining state-owned buildings such as new housing for the elderly. Site evaluations and technical review services are offered
- serving as public speaker to a variety of organizations and provider of information to the news media.

While this may be an unusually active solar commercialization effort within a consumer affairs department, these projects are well within the general purview and responsibility of state government, and could be placed in an Energy Office, Governor's Office, or Special Task Force on state solar commercialization.

Public Works/Building Services and Housing Development Units

These units are responsible for the building and maintenance of state owned property and for financing or subsidy of new and renovated housing for elderly or low and moderate income tenants. They are, therefore, among the largest building developers in their states

and have considerable opportunity to stimulate solar commercialization by the purchase of solar equipment and by leadership. They also have considerable power to experiment with innovative building design and structure. These opportunities can be exploited by:

- the appointment of architects and engineers with successful solar experience
- evaluation of design/build options
- development of design and purchasing specifications
- review of pertinent codes and regulations to allevaite or remove those that presently tend to inhibit solar initiatives
- interfacing with other states that have initiated successful programs in these markets
- negotiating the appropriation of additional funds to offset the additional design and initial higher capital costs of solar construction
- sponsoring architectural competitions

Transportation Units

State transportation departments operate fleets of vehicles that can be used to test and demonstrate the use of biomass fuels. Since such fuels will be regionally produced and, at least initially, will probably find regional rather than national markets, state efforts in biofuel commercialization are appropriate. These could include:

- testing and demonstration programs
- evaluating transportation applications and providing policy analyses to state executive and legislative branches.

For example, Nebraska made 30 state vehicles available for a two million mile road test of gasohol conducted under the aegis of an

Agricultural Products Utilization Committee staffed by the state agricultural department. A bill is presently before the legislature to appropriate funds for matching grants to four development corporations to build facilities to produce gasohol.

Agricultural and Forestry Units

State agricultural units can contribute greatly to the use of agricultural and forestry resources in energy-related applications. While stimulating demand through demonstration projects and evaluations and increasing supply through agricultural and forestry development programs, they can also plan for the sustainment of timberlands against anticipated market demands. The cooperative interaction between traditional farming and forestry interests and those resulting from increased bioenergy applications will be a major concern of state agricultural and forestry units, whose solar commercialization roles will include:

- identifying and quantifying potential biomass energy resources
- providing policy analysis for the executive and legislative branches on the development of biomass resources for energy purposes
- testing and demonstrating biomass energy technologies
- providing technical assistance to the agricultural and forest products industries (including farms and wood lot owners) on the use of biomass fuels in their own operations and the production of biomass fuels for sale
- providing increased forest management services

Standards and Codes Units

State governments typically include departments that establish and enforce statewide standards for building, plumbing, and electrical safety, and for fire prevention. Most regulations predate solar applications and, if enforced in an unenlightened way by inadequately informed inspectors, can pose barriers to the accelerated commercialization of solar energy. On the other hand, several states are developing solar specific standards and reviewing existing regulations with regard to their relevance to solar systems. Florida has a state wide requirement that plumbing be designed to facilitate the installation of future solar hot water equipment. California permits local building departments to establish solar standards. Nevada makes solar design allowances a feature of the energy conserving building code. While some system performance codes may appear restrictive in the short term they can, in the long run, raise the quality of systems and components and help to create confident consumer demands.

In the above context the commercialization roles of state standards and codes units include:

- development and enforcement of pertinent solar specific regulations
- review of existing, nonsolar specific regulation and, where appropriate, recommendation of revisions
- training of inspectors in the application/interpretation of regulations with respect to solar applications

- collaboration with regional and federal agencies in the development of model codes and standards
- interface with architects, engineers, builders, etc., to resolve problems

Education Units

State education departments can contribute to solar energy commercialization through educational programs and their participation in pertinent building activities. Some state energy departments press for the inclusion of energy curricula in public schools to increase energy awareness and as a means of disseminating energy information into homes. Others go further. New Jersey, for example, has a Junior Energy Inspectors program directed towards helping homeowners find ways of conserving energy.

Since states typically reimburse towns, at least in part, for the purchase of school buildings and equipment and can specify conditions governing such reimbursements, they do have the potential to influence solar use. Under the National Energy Act, state education departments are also involved in the retrofitting of public schools.

At the higher educational level, states can be influential in initiating policies that will lead to the vocational training of solar equipment installers/maintainers, and to the development of capabilities for solar research and development, and commercialization of state colleges, universities and vocational/technical schools.

In summary, state departments of education can:

- develop energy-related curricula
- promote the use of solar energy in school building programs
- sponsor vocational training programs
- set up solar research, development, and commercialization programs in institutions of higher education

State Level Economic Development Units

A number of innovative institutions have arisen recently in several states with the basic aim either of assisting technologically-based companies or of providing answers to technological questions. Examples are the Connecticut Product Development Corporation, the Massachusetts Technology Development Corporation (both quasi-public corporations), and the Pennsylvania Technology Assistance Program (PENNTAP). These organizations function at the state level somewhat independently of the executive branch but maintain ties with the state's economic development department. They provide individualized business development assistance (funds and managerial expertise) to small technologically innovative companies, and they bring together willing buyers, financiers and sellers of solar technologies. For example, the Massachusetts Technology Development Corporation organized a wood gasification project for a large apartment complex. It brought together owners of the forest resource, gasification equipment makers, and private sector investors. Efforts of this nature have significant potential and serve as a model for state level activities.

REGULATORY AND QUASI-JUDICIAL UNITS

Public Utility Commissions (PUCs)

State public utility commissions (PUCs) can be expected to play a crucial role in the commercialization of those solar technologies which produce electricity or gaseous fuels for distribution or use electricity or gas as a back-up fuel. Their activities relating to solar commercialization include:

- regulating utility rate structures
- issuing certificates of need for new power plants
- regulating new business activities of the utilities
- deciding whether certain activities, such as wholesale power sales from cogenerators to utilities, should be regulated
- reviewing utility demand forecasts and supply plans

In most states, PUCs are now primarily concerned with cost and reliability of traditional utility service and have generally acted as an overseer rather than initiator of policy.* However, in a few states, such as California, PUCs have assumed a very active role in promoting solar development through the regulatory process. For example, the California Commission:

- ordered a staff investigation of low-interest, long-term financing of solar devices by utility companies
- urged development by the utilities of solar medallion building programs to promote solar construction
- concluded that solar energy should be designated as a preferred element of supply planning to meet California's future needs

---

*N.L. Dean and A.S. Miller, "Plugging Solar Power Into the Utility Grid," Environmental Law Reporter, July 1977.

- ordered utilities under its jurisdiction to collect and assess load survey and climate data relating to solar energy

Most states have not gone as far as California, but PUCs have the capability to develop and encourage new modes of utility planning. In the area of dispersed solar technologies (primarily solar water heating and solar space heating and cooling), PUCs can play an active regulatory and policy role. They can encourage utilities to provide solar customers with back-up service at reasonable and, in some cases, preferential rates (for example, where the service is controlled or interruptible, or where the solar system acts as a peak-shaving device for the utility). They can encourage utilities to use their substantial borrowing powers to make available low interest loans to solar customers.

In some states, PUCs are now involved in reviewing utility demand forecasting and supply proposals. This role is sometimes performed by Energy Facility Siting Boards, which are discussed later. Previewing supply plans offers PUCs a chance to support consideration of solar technologies in future energy and utility planning.

In the area of central solar electric and other centralized solar technologies, PUCs can address the complex economics and system-integration issues associated with the introduction of intermittent sources into the power grid.

In most cases, PUCs are not currently well prepared to deal with many of these issues, and yet their full participation is critical to the commercialization of pertinent solar technologies.

Environmental Regulatory Units

State environmental departments that are frequently associated with decision making, quasi-judicial boards typically relate to solar commercialization through:

- issuance (or denial) of permits for major facilities
- development and enforcement of environmental standards and statutory regulations
- their possible requirement for the evaluation of alternative development proposals that rely on conventional energy supplies.

Although such departmental activities can be expected in general to favor the use of environmentally benign, direct solar systems, they could tend to discourage the commercialization of less direct applications of solar energy such as large scale wood combustion, liquid and gaseous biofuel manufacture, and the like.

State environmental units are also heavily involved in a regulatory mode in the siting and construction of central solar facilities of all kinds.

State Facility Siting Boards

Some states have established specialized agencies to deal with the siting of large energy facilities. Activities of these units that could serve to catalyze solar commercialization include:

- assuming the role of lead agency that focuses all considerations related to facility siting
- developing site banks, including those for central biomass, solar thermal, photovoltaic and wind arrays*
- reviewing power needs and supply strategies

- streamlining procedures for, and the handling of, license applications

LEGISLATIVE BRANCH

Specific Legislative Committees

In some cases state legislatures have established special energy committees; in others, bills relating to energy are referred to other established committees. Even in state legislatures which have special energy committees, bills on taxation frequently are referred to financial committees. Thus, typically, there is no single point of access to the legislative process.

As Table VIII indicates, most solar-related state laws passed to date are concerned with financial incentives.

In the area of financial incentives, the states have passed 21 bills dealing with the income tax, 28 property tax bills, 7 sales and use tax bills, 4 bills providing low interest loans, and two states (Maine and Tennessee) have provided grants for demonstration.

In the area of solar access, 8 laws provide for voluntary easements, 3 allow solar considerations in planning, zoning or subdivision regulations, and one declares access to sunlight a transferable property right. All of these solar access laws are locally administered.

These limited examples illustrate the significant potential of state legislative units to remove or alleviate barriers to solar

TABLE VIII

SOLAR-RELATED STATE BILLS AS OF
JUNE 1978

TYPE OF LAW	TOTAL NUMBER PASSED, ALL STATES, AS OF JUNE 1978	NUMBER OF STATES HAVING LAWS OF THIS TYPE
Solar Financial Incentives	62	37
Solar Access	12	12
Standards for Solar Systems	5	5
Solar Building Code Provisions	3	3

SOURCE: Summaries of Pilot State Extension Services, U.S. Department of Energy, February 1978.

commercialization. Through legislative hearings they can also do much to publicize solar energy.

Legislative Staffs

Staff to legislative committees play a key role in the generation of ideas for new legislation, in the drafting of bills and, hence, in the type of solar incentive legislation that is eventually passed. They also play a key liasion role with the executive agencies and departments, and provide crucial investigative and back-up research services to legislators sponsoring solar bills.

Regional, County, and Local Government

The roles of chief executives, elected officers and functional units of county, regional, and local governments closely parallel those of their state analogues. To review them in detail would be unduly repetitious, yet they have tremendous potential to contribute to solar commercialization efforts. A number of local communities have developed, and begun to implement, comprehensive solar plans. The City of Davis, California, is frequently cited in this context.* Many others have embarked on more limited programs that, apart from the direct benefits that accrue, generate experience that is invaluable to other local communities.

---

*R. Brunner, Local Energy Policies, Summary of Testimony before Subcommittee on Energy and Power of the Committee on Interstate and Foreign Commerce, U.S. House of Representatives, Washington, D.C., May-June 1978.

SECTION IV

THE DOE ENERGY EXTENSION SERVICE AND THE REGIONAL SOLAR ENERGY CENTERS

Many federal departments and agencies have programs that aid state and local governments in support of energy conservation, the use of alternative fuels, and solar commercialization. Thirteen federal departments have reported 68 outreach programs related to conservation and the use of renewable energy resources.* They provide information or technical assistance. About $190 million in federal funds were devoted to these programs in 1979. More than half of them are managed by DOE.*

The Energy Extension Service and the Regional Solar Energy Centers are identified here because, in addition to their own specific programs, they function as facilitators (and in the case of EES, the coordinator) of all such federal programs.

THE DOE ENERGY EXTENSION SERVICE

The Energy Extension Service (EES) was authorized by Congress in 1977** to encourage energy conservation measures and the use of renewable resources by small energy users such as homeowners, small business and agricultural operations, schools, hospitals, and state and local governments. Small energy users account for about 40

*Comprehensive Program and Plan for Federal Energy Education, Extension and Information Activities, DOE/CS, January 1979.

**The Energy Research and Development Administration Authorization Act, PL 95-39, and the DOE Organization Act, PL 95-91.

percent of the nation's annual consumption of energy.* The EES also addresses leverage and multiplier groups, such as architectural and engineer firms, builders, and financiers that affect energy use. The pilot program works through the states, each of which was given the maximum latitude to design and manage its own programs and to test new approaches. The EES aims to provide personalized information and technical assistance to help small energy users to make informed energy-related decisions. States are responsible for delivering such services to users and DOE/EES for providing states with the necessary backup and technical assistance. It does this mainly by putting states in contact with existing technical resources,** facilitating information sharing, and meeting training needs.

The ten pilot states are presently conducting a total of 74 EES programs,† some operated entirely by the state, others operated by universities, and some jointly through state/university partnerships. Despite variations among target audiences, all programs include residential, commercial, and government public institution categories. While EES programs are not solar-specific, but relate to a wide range of energy conservation and alternative fuel use,†† most of them

*DOE Report HCP/U2671-01, The Energy Extension Service Evaluation, October 1978.

**See, for example, Energy-Related Technical Assistance Guide for State Grant Programs, MTR-7968, The MITRE Corporation, May 1979, which identifies pertinent federal and state programs, technical assistance resources, and points of contact.

†U.S. Department of Energy, "Evaluation of the Energy Extension Service Pilot Program," Report to Congress, DOE/CS-0074, Marcy 1979.

††A comprehensive summary of ongoing pilot state programs is given in DOE/CS-0074 (op. cit.).

include the use of solar energy. For example, the New Mexico EES, in cooperation with the New Mexico Energy Association, has a residential solar program that provides workshops and personalized technical assistance to homeowners on active and passive solar applications for both new and retrofit construction.

Based on 1975 Census figures, federal outreach funding of pilot states in FY 1978 was equivalent to $0.69 per capita, of which the EES component was $0.17.* Evaluation of its first 6 months of operation showed that, despite normal shake down problems, the EES program had proved cost effective in terms of program cost per unit of conventional fuel displaced. It presently appears to be most cost effective within the commercial/small business sector.**

THE REGIONAL SOLAR ENERGY CENTERS (RSECs)

In 1978, DOE established four Regional Solar Energy Centers (see Figure 4) as part of the national solar commercialization planning process coordinated under the National Plan to Accelerate the Commercialization of Solar Energy (NPAC). RSEC Boards of Directors typically include representatives of each member state, nominated by their governors (the Mayor in the case of the District of Columbia). Unlike the EES, which embraces all aspects of energy conservation and alternative fuel use, the RSECs are devoted solely to promoting the

---

*Some Perspectives on Energy Conservation Outreach Programs, DOE/IR-0034, October 1978.

**Evaluation of the Energy Extension Service Pilot Program: The First Year, DOE/CS-0100, August 1979. In the small business sector the cost of incremental saving of 1 BBL of oil equivalent = $6.85 - $8.95.

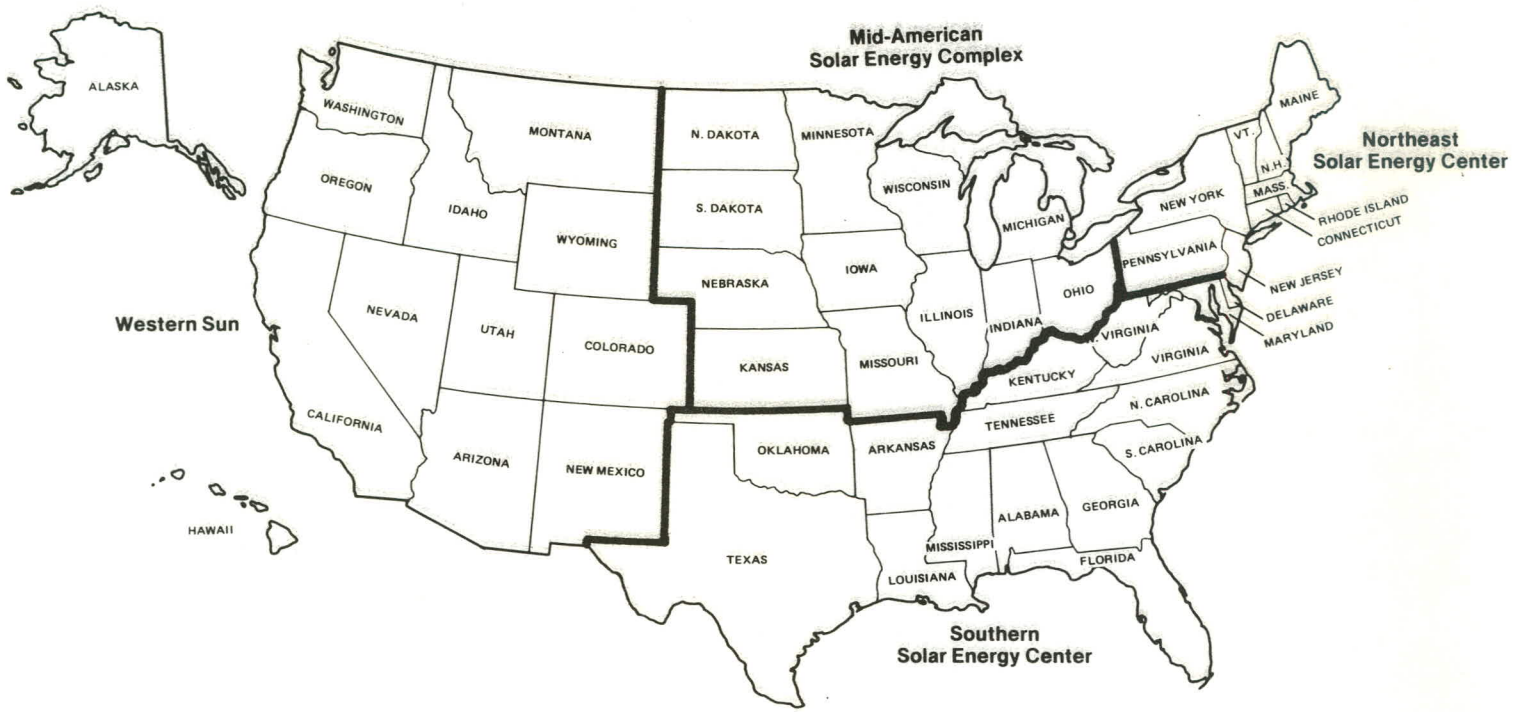


FIGURE 4
REGIONAL SOLAR ENERGY CENTERS

use of solar energy. They are the primary subfederal planning and coordinating agencies within NPAC. Their major goals are threefold:

- to develop and maintain regionally specific commercialization plans within polity guidelines established by the Domestic Policy Review (DPR)
- to initiate, monitor and evaluate regional programs in collaboration with member states
- as appropriate, to coordinate and support (both technically and with funds) state and local commercialization programs

The RSECs are supported on solar energy research and development matters by the Solar Energy Research Institute (SERI) in Golden, Colorado.

Patterns of current and projected energy needs and utilization, and the availability of energy-related resources vary widely between regions as do many of the economic, institutional, demographic, and other characteristics that influence the potential for solar commercialization. Taking such factors into account, the RSEC planning process entails:

- development of data bases
- identification of opportunities for solar use
- identification of key decision makers and leverage points within related markets, together with their ongoing, solar-related market concerns and barriers to commercialization
- formulation of commercialization strategies
- development of commercialization programs and mechanisms for their monitoring and evaluation

As with NPAC, the planning process is a continuous one. All the Regional Centers have completed the initial planning phase and three have begun operations. Target markets comprise two broad categories:

- those that represent significant opportunities for early market penetration of well established solar technologies, such as space and water heating for residential and commercial buildings that are major consumers of energy
- those that present early opportunities for the development of markets for commercially less well established technologies such as wind energy conversion, biomass, applications, photovoltaics, etc.

In the above context the interface between the Regional Centers and member states is broadly twofold. On the one hand, the states contribute to the overall regional planning process and to the implementation of regional program components within their communities. On the other hand, the RSECs assist state programs through:

- provision of regional information and data networks
- provision of assistance in program planning, monitoring, and evaluation
- provision of technical assistance
- direct funding of community programs most suited to state and local implementation
- as appropriate, and without usurping the autonomy of state and local jurisdictions, coordination of state and local solar commercialization activities and fulfillment of a broker role in interfacing between pertinent agencies and interest groups at a regional level, etc.

The Regional Solar Energy Centers are relatively new and, perhaps not surprisingly, their modes of operation with states tend to differ. Thus, the Northeast Solar Energy Center has developed a

centralized system with a relatively large headquarters staff that disburses federal funds for alternative energy programs and tends not only to coordinate and support state programs but to exercise a measure of control over them. In contrast, the other Regional Centers operate, or plan to operate, a more decentralized system involving smaller headquarters staffs. The emphasis is on regional planning, programming, and coordination roles and the provision of support for state and local commercialization initiatives. The RSECs have enormous potential for stimulating, coordinating, and supporting state and local government efforts across the board.

SECTION V

THE NEED FOR GREATER FEDERAL SUPPORT FOR STATE AND LOCAL GOVERNMENTS

Solar commercialization is ultimately a front line activity in which state and local governments have a crucial role to play. Attainment of national goals for solar energy requires that all state and local jurisdictions achieve their full potential with respect to accelerated commercialization with the minimum delay. They cannot do this without continuing and enhanced support from the federal government. Even those presently implementing the more ambitious programs are faced with barriers to accelerated commercialization that are beyond their power to remove. The major kinds of federal support required are in the areas of:

- Funding-the direct or indirect provision of funds adequate to enable subfederal governments and agencies to attain realistic goals
- Information-the development and maintenance of networks; the production of guidelines for program development, management, monitoring and evaluation; preparation of sample legislation, codes, workshop outlines, vocational/training syllabuses and materials, sponsorship of appropriate demonstrations, etc.
- Organization-the maintenance, and where necessary, the creation of simplified channels of communication/responsibility for the effective referral and resolution of state and local issues
- Motivation-strong, positive leadership, a clear definition of feasible goals, the formulation of national policies/programs for their attainment, and demonstration by example

FINANCIAL SUPPORT

The state and local commitment required to reach near- and mid-term national solar energy goals will not be achieved without a significantly increased federal financial commitment. Many sub-federal communities cannot afford to fund solar programs without seriously disrupting other priority policies and programs to which they are committed. Even the more affluent communities that accord high priority to solar energy have to pace their programs according to their resources. Some programs are presently of an exploratory nature and/or emphasize selected solar applications. In contrast, attainment of national goals will require fully operational efforts that address all opportunities to use solar energy. The potential of such funding is revealed by the recent evaluation of the Energy Extension Service Pilot State program. Although it would be unrealistic to extrapolate from the numbers cited, they support the view that such expenditure is cost effective when compared to the cost of imported oil.

INFORMATION

Effective dissemination of data and information is crucial to the accelerated commercialization of solar energy. Everyone involved in the process is operating on a time scale considerably more condensed than that which typifies the normal market evolution of innovative technologies. Information and experience is therefore accumulating at a faster than typical rate. At the same time, all participants must gain from the experience of others; speed up

decision processes, program planning, and implementation; and avoid redundancy of effort. To these ends, comprehensive, adaptive, and multi-faceted networks need to be established nationwide. Information required includes:

- systems engineering information
- performance data--both manufacturers' data and real life experience
- capital, operational, and maintenance cost characteristics
- case histories--successful and otherwise
- examples of state/local government initiatives and experience
- codes, standards
- legislation
- manufacturers, distributers, installers/maintainers
- availability of preferential financing

Several federally sponsored and a number of private sector information outreach capabilities already exist, such as:

- the National Energy Information Center (DOE)
- the National Solar Heating and Cooling Information Center (DOE)
- the Solar Energy Industry Director and Buyer's Guide (Solar Energy Industries Associations), etc.

Likewise, the Energy Extension Service has initiated an Energy Related Technical Assistance Guide (ERTAG) for State Grant Programs*

*C. Neves, et al., Energy-Related Technical Assistance Guide for State Grant Programs, (Revision 1), Volume I, MTR-7968, The MITRE Corporation, Federal Resources; Volume II, State Resources, May 1979.

that catalogs federal and state programs considered to be potentially useful in support of state and local efforts. The RSECs and some states have similarly developed or are developing regional or community oriented information and data bases. There is an urgent need to coordinate these and the many other information sources into a practicable network, designed to suit state, local and regional requirements and capabilities. Development of this facility could be an appropriate responsibility of the DOE Office of Conservation and Solar Applications Energy Extension Service in the context of its outreach responsibilities and its established interface with state agencies.

Despite the existence in certain state and local communities of extensive and successful solar commercialization programs, a much larger number are less advanced and some have hardly got off the mark. The latter two categories in particular have limited, if any, experience in the development of programs such as are required to stimulate solar utilization, or in their implementation, management, monitoring, and evaluation. Nor are they adequately experienced in the resolution of a number of solar-related institutional and quasi-judicial barriers. The potential for federal support in this context is significant through, for example, the provision of guidelines to program development, etc., model legislation, codes, regulations, the temporary assignment of technical experts, and so forth.* The RSECs

*DOE is preparing a handbook on program evaluation. Volume 1, Planning for Evaluation is in draft, DOE/CS/69071-1 (Draft), August 1979.

could be instrumental in negotiating and administering many of these and other natures of support, such as workshop outlines, educational and training syllabuses.

ORGANIZATION

A major criterion of organizational effectiveness is the extent to which it facilitates the attainment of functional objectives. In this context, many at the state and local level find present divisions of responsibility and channels of referral unclear and confusing. They should be reviewed, clarified and streamlined. Consider, for example, the goals and activities of the Energy Extension Service and the Regional Solar Energy Centers.

As previously stated, the function of the EES is to offer practical energy saving information, advice, and technical assistance to small energy users, and to encourage the use of solar and other renewable energy resources. The program is operated through the states in conjunction with DOE State Grant Programs. Although its terms of reference embrace all aspects of energy utilization pertinent to small energy users, its primary thrust has been in the area of energy conservation, including the use of renewable resources.

In contrast, the roles of the four RSECs are solar-specific and relate to all appropriate energy users, not merely small energy users. They contribute to NPAC through the regional planning process which involves close collaboration with the states, and they contribute to solar commercialization by evaluating regional energy

needs and resources, identifying solar market opportunities and leverage points, providing technical assistance, information networks and other outreach and support activities. As appropriate, they also coordinate and provide financial support to state and local programs. Occupying as they do a position between macro policy and national goals at one end of the scale and the person-to-person realities of the market place at the other, the RSECs are in a position to provide input upwards and guidance and support downwards. Despite their emphasis on opportunities for solar, they inevitably become involved in conservation technology because of the critial dependence of solar system performance on the incorporation of effective conservation methods. In this regard alone, there is potential for overlap and some redundancy between EES and RSEC activities, especially in the areas of outreach and technical advice. Although there are some advantages to having multiple sources of information and technical advice, present arrangements merit review to identify the most efficient deployment of functional responsibilities.

DISTRIBUTION LIST
MTR-79W00043

A-10
G. MacDonald
C. Zraket

D-12
H. Benington
J. Fearnsides
S.W. Gouse
C. Grandy
R. Greeley
A. Tachmindji

W-50
R. Ouellette
L. Thomas
W-50 Data Files (32)

W-51
A. Ghovanlou

W-53
T. Wright

W-54
E. Krajeski
S. Lubore

W-56
P. Clifford
B. Fuller

W-58
L. Duncan
G. Erskine

W-80
L. Cain
M. Ennis
R. Foreman
L. Gsellman
M. Neuworth
M. Scholl
E. Sharp
H. Wong

W-81
R. Kalagher
R. Lay

W-82
G. Bennington
F. Eldridge
N. Gadsby (10)
R. Manley
L. Newman
S. Pack
J. Rosenberg
P. Walker

W-83
E. Jamgochian
J. Stone

W-84
A. Autio
S. Lewis
A. Page (5)

W-85
D. Medville

W-86
N. Coates

Metrek Library (1)

Document Control (5)

Department of Energy (15)

Approved for Distribution:

Pamela Walker

MITRE Department
and Project Approval: Pamela Walker