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STATE GOVERNMENT WORKSHOP ON
BARRIERS AND INCENTIVES OF
GEOTHERMAL ENERGY RESOURCES

Quarterly Report
For Period May 1, 1978 - July 31, 1978

Rutherford C. Harris
Project Director

National Conference of State Legislatures
1405 Curtis Street
23rd Floor
Denver, Colorado 80202

August 1978

Prepared for the
U.S. Department of Energy
Division of Geothermal Energy
Under Contract ET-78-G-03-1795

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Reference to a company or product name does not imply approval or recommendation of the product by the National Conference of State Legislatures or the U.S. Department of Energy to the exclusion of others that may be suitable.

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I. INTRODUCTION

With funds from the United States Department of Energy, Division of Geothermal Energy, the National Conference of State Legislatures has undertaken a project to stimulate and assist the review of state policies that affect geothermal development.

The NCSL Geothermal Policy Project has the following work tasks:

- Prepare background material for state geothermal policy reviews;
- Develop specific geothermal profiles for target states;
- Stimulate state decisions to review geothermal policies;
- Assist states in their analysis of geothermal issues;
- Review state policy analyses and legislative actions; and
- Formally review the project's methods and results.

State assistance will be in the form of

A. Reference Materials

1. "Packet of Background Materials" -- a comprehensive gathering of information on the nature of geothermal resources and the various development opportunities available including important state legislation and research studies;
2. "Geothermal Pamphlet" -- an introduction to the nature of geothermal resources, their beneficial uses, the role of state policies and the NCSL Geothermal Policy Project;
3. "State Profile" -- a concise description of a state's leading policy concerns and potential benefits from geothermal development, including an outline of the location and character of the state's geothermal resources and their potential applications;
4. "Summary of State Actions" -- a summary of state study results and legislative actions taken during the year.

B. State Presentations and Technical Assistance

As part of the policy review process, the project will provide individual assistance at the request of the state. In the form of workshops or through more informal contacts, project staff will assist in such areas as analyzing policy alternatives, describing legislative action taken in other states, and identifying important studies, expert witnesses and concerned parties available for assistance.

C. Assistance from Experts

To insure that the policy reviews conducted are thorough and complete, the project is designed so that the states receive the expertise of all parties concerned with geothermal development. Participating in the multifaceted effort will be

- State legislators;
- State legislative staff;
- State and local officials;
- Geothermal developers, investors, utilities and other concerned private groups;
- Consultants from public and private research institutions; and
- Representatives of the Division of Geothermal Energy, U.S. Department of Energy.

This second quarterly report--covering the period of May 1 through July 31, 1978--includes a discussion of project activities in the areas of

- State activities,
- Publicity,
- Development of project materials,
- Liaison activities,
- Professional papers, and
- Conferences.

Potential problem areas also are identified and future plans are discussed including an assessment of prospects for future progress.

II. EXECUTIVE SUMMARY

In its second quarter of activity, the National Conference of State Legislatures' Geothermal Policy Project concentrated its efforts in two areas: 1) state activities and 2) development of project materials.

In the area of state activity, six states were selected to participate in the project during its first year: Delaware, Hawaii, New Mexico, Oregon, Utah and Virginia. Following this selection and acceptance of participation by the states, project activities were initiated through a series of formal and informal meetings with legislative committees or key individuals in the states. Legislative committees were addressed on three occasions--twice in New Mexico and once in Oregon--and meetings held with key contact persons in three states--Delaware, Hawaii and Utah. In other activity, general work plans were designed and negotiations begun on outlining responsibilities and setting time deadlines in project states; contacts were made with executive agency personnel having jurisdiction over geothermal activities in their states; and initial state workshops were planned in Hawaii on August 2 and Utah on August 30.

In the development of project materials, the project pamphlet, a final draft of the Issue Paper and the review of state statutes and regulations were completed. Also, work was begun on the state profiles with a preliminary profile completed for Hawaii.

In other activities, project staff worked with DOE/DGE regional personnel in developing regional plans, presented a paper "State Incentives for Geothermal Development" at the Geothermal Resources Council Special Short Course on "Geothermal Energy: A National Opportunity (the Federal Impact)"; and attended the Annual Meetings of the National Conference of State Legislatures and the Geothermal Resources Council.

III. ACTIVITIES

A. STATE ACTIVITIES

During the second quarter, efforts concentrated on initiating project activities in the states. There were seven major areas of activity:

- Selection of project states,
- Acceptance of project participation,
- Development of work plans,
- Executive agency contacts,
- State meetings,
- Workshop planning, and
- Summary of state activities.

1. Selection of Project States

Six states were selected to participate in the project during the second quarter of project activity. They are

- Delaware
- Hawaii
- New Mexico
- Oregon
- Utah
- Virginia

The selection process leading up to these choices consisted of three steps:

a. Consultation with U.S. Department of Energy, Division of Geothermal Energy

Regional managers of U.S. DOE/DGE were asked to prioritize the states in their region for project participation based on the following criteria:

- The presence of significant legal and institutional problems that need to be addressed; and
- The potential for development of geothermal resources.

Using the initial responses obtained from the states as a guide (see First Quarterly Report), the following states were recommended for project involvement by the regional managers:

Eastern

New Jersey
North Carolina
Virginia

Rocky Mountain Basin and Range

Idaho
New Mexico
Utah

Pacific

Hawaii
Oregon

b. Delineation of Legal and Institutional Problems

To obtain more information on legal and institutional problems in the states, executive agency personnel responsible for overseeing geothermal activities were contacted. Table I shows the areas identified for potential project involvement.

c. Presentations in Potential Project States

In three potential project states, project staff addressed legislative committees which have jurisdiction over project activities:

--Oregon Interim Task Force on Energy Conservation and Planning,
May 10, 1978,

--New Mexico Interim Committee on Natural Resources, May 31, 1978, and

--Georgia Legislative Services Committee, June 29, 1978,

The purpose of the presentations, which were made at the request of the states, was to inform the committees about the project, and to obtain a clearer indication of the interest of key committee members in working with the project.

TABLE I

A PRELIMINARY GUIDE TO
LEGAL AND INSTITUTIONAL PROBLEMS IN WESTERN AND GULF GEOTHERMAL STATES

ALASKA

1. Lack of incentives for geothermal
2. Uncertain water law interface

ARIZONA

1. Unsettled resource definition (mineral or sui generis)
2. Uncertain effect of geothermal exemption from state water laws (Conditioned on non-impairment of surface and groundwater sources--is this a rebuttable presumption?)
3. Uncertain impact of FICO litigation
4. Leasing rules undergoing revision

COLORADO

1. Uncertainty over practical application of statutes and regulations (first test well being drilled June, 1978)
2. Uncertainty over bonding requirements
3. Water law impact unclear (Geothermal developers can't appropriate any produced water without approval of surface owner; all water laws are applicable)
4. Lack of production incentives for geothermal

HAWAII

1. Full impact review (EIS) required for geothermal exploration
2. New (1978) statutes and regulations, practical application uncertain
3. Ownership of the resource

IDAHO

1. Impact of new lease regulations (all land in section must be leased, only one section per lease)
2. Power generation not recognized as a beneficial use of water (if consumptive water rights required)
3. Geothermal operators being asked to demonstrate that Raft River geothermal horizon is separate from critical groundwater aquifer
4. If space heating well is less than 1000', water rights required
5. No incentives for geothermal production

LOUISIANA

1. Uncertain legal status (mineral, sui generis). (Ownership analysis peculiar to LA due to civil law system)
2. No geothermal leasing regulations
3. Production regulations in process
4. No incentives
5. Will geopressured reservoirs be developed primarily for methane? (What will royalty structure be? taxes?)

MONTANA

1. Land Department emphasis on coal leasing
2. All bidding is competitive (exploration is thus discouraged without lease)
3. Geothermal fluid production requires water right

NEVADA

1. Leasing regulations in process
2. Tax study in process
3. Geothermal fluid production requires water right
4. Geothermal resources in surface estate (public domain) (What will impact of Union Oil be, especially since less than 1% of Nevada is state land, and 99% of KGRAs are on federal land?)

NEW MEXICO

1. Geothermal fluids must be appropriated (water rights)
2. No incentives for geothermal production

OREGON

1. Division of authority (less than 2000' and 250' under Department of Water Resources, otherwise under Department of Geology & Mineral Industries)
2. Statute declares geothermal resources to be surface estate (Impact of Union Oil)
3. Unclear definition (water, mineral, sui generis)
4. Department of Water Resources considers that all geothermal fluid should acquire water right
5. ReInjection may be required to preserve priority (waste disposal under task force consideration)
6. Any surface water appropriated for recharge will be junior to subsequent filings
7. Energy Facility Siting Council has no guidelines for permitting geothermal facilities

TEXAS

1. No specific geothermal leasing regulations (first test well drilled June, 1978)
2. Resource category and ownership unclear
3. Methane is defined as part of the resource; however, existing oil and gas leases probably include methane, and may include heat and pressure as well.
4. Water law interface unclear

UTAH

1. No geothermal statute
2. Geothermal fluids must be appropriated
3. No incentives
4. Environmental regulations under review

WASHINGTON

1. No geothermal leasing regulations
2. No geothermal production regulations
3. Ownership uncertain

WYOMING

1. No specific geothermal production regulations
2. Geothermal resource is water, must be appropriated
3. No incentives

*These problems were identified by executive agency personnel in the states. The information was obtained as part of a survey to update state statutes and regulations affecting geothermal development.

In Oregon, in addition to the presentation before the full committee, discussions were held with the chairman and vice-chairman of the Interim Task Force on Energy Conservation and Planning, the chairmen of the Senate and House Energy Committees, the staff director of the Energy Task Force and the Legislative Council's office. Contacts also were made with personnel from the Oregon Department of Energy and Department of Geology and Mineral Industries to obtain their views on current or potential problem areas for geothermal development that the project might address. As a result of these discussions, a tentative commitment was obtained from the key legislators to work with the project, negotiations were begun on a tentative work plan, and a list of persons was developed who should be contacted for involvement in the project.

In New Mexico, the project presentation followed a series of meetings with legislative staff and key members of the interim committee. Results of the meetings were (a) obtaining a unanimously adopted motion by the committee requesting that New Mexico be chosen as a project state, (b) beginning work on a tentative work plan, and (c) obtaining a time slot on the July meeting agenda to develop a specific work plan including areas in which the project will concentrate and a timetable for key actions.

In Georgia, a presentation was made to the Legislative Services Committee which approves legislative activities during the interim period. The committee unanimously approved Georgia's participation in the project beginning in 1979.

2. Acceptance of Project Participation

Following the selection of project states, letters of invitation were sent to the designated key contact persons in the states (see Appendix A).

The letter requested two actions on the part of the state legislature as initial steps toward beginning project activities in the state:

- a. Complete a work plan outlining work tasks, the organization that will assume the lead responsibility for each task and a timetable that schedules project efforts in conjunction with preparation for 1979 legislative sessions; and
- b. Obtain a letter from the legislative leadership indicating their acceptance of the project's offer to work with the state.

In negotiations between project staff and key contact persons, agreement was reached in all six states and a tentative work plan discussed for each state. A letter was received from the Senate President and Speaker of the Hawaii Legislature indicating their formal acceptance of the project.

3. Development of Work Plans

a. Outline

It was decided that there will be two work plans for each state:

- A general plan which outlines responsibilities of the NCSL project and the individual states plus a timetable outlining when major actions will take place, and
- A state specific plan that details the subject areas covered by the policy study, how the state will carry out its tasks and a timetable for actions.

A draft of the general work plan was developed. The plan indicates seven major work areas and designates the lead responsibility for each task. Also, the plan calls for a time deadline for completion of each work task (see Appendix B).

b. State Work Plans

General work plans were approved for New Mexico and Hawaii (see Appendices C & D). In addition, negotiations continued with the other

project states to set the deadlines called for in the work plan.

Meetings with key contact persons to develop work plans were held in Delaware, Hawaii and Utah.

4. Executive Agency Contacts

Table II shows the contacts made with executive agency personnel who have jurisdiction over geothermal activities in their state. This list of contacts, developed as part of the project's review of state statutes and regulations, will be utilized extensively as the project begins activities in project states.

5. State Meetings

a. New Mexico

Project activities were initiated in New Mexico with a presentation on July 13, 1978, before the Interim Committee on Natural Resources. Discussion centered on three areas:

- An overview of geothermal resources in the state (the resource, research and development programs, leasing and exploration status and commercialization potential);
- A tentative list of problem areas in geothermal development to be used in developing an agenda for the policy study (see Appendix E); and
- A proposed work plan for New Mexico's participation in the project.

b. Hawaii

Three meetings were held in Hawaii in preparation for the August 2 workshop:

- July 27 - met with Native Hawaiians to discuss their concerns over geothermal development and, in particular, their demands for input into the planning process at the local and state levels and for some type of indemnity when the resource reaches the development stage;

TABLE II

STATE EXECUTIVE AGENCY PERSONNEL OVERSEEING GEOTHERMAL ACTIVITIES

ALASKA

Bob Baker, Department of Fish & Game
 Ed Bouco, Division of Lands, Department of Natural Resources
 Hoyle Hamilton, Division of Oil & Gas, Department of Natural Resources
 Donald K. Markle, Division of Energy & Power Development
 Clarissa Quinlan, Energy Office
 Ross Schaff, Division of Geology and Geophysical Survey

ARIZONA

W. E. Allen, Oil & Gas Conservation Commission
 A. K. Doss, Land Department
 Bruce Scott, Division of Environment

CALIFORNIA

Nancy Aurich, Energy Commission
 Russell Dupree, Office of Noise Control
 Dick Forester, Department of Fish and Game
 Al Frank, Water Resource Control Board
 Bob Glucosie, Energy Commission
 Priscilla Grew, Department of Conservation
 D. L. Hoagland, State Lands Commission
 Mary Jadiker, Lake County Energy Council
 Neil Moyer, Air Resources Board
 Ron Nichols, Energy Commission
 Dennis Olmstead, Division of Oil & Gas
 Chuck Priddy, State Lands Division
 Kathryn Tobias, Office of Planning & Research
 Judy Warburg, Department of Water Resources
 Syd Willard, Energy Commission

COLORADO

Marie Gosh, Board of Land Commissioners, Department of Natural Resources
 Frank Piro, Oil & Gas Commission

HAWAII

James Deter, Department of Lands and Natural Resources
 Daniel Lum, Department of Lands & Natural Resources
 Al Nakaji, County of Hawaii
 Mike Shimabukuro, Department of Lands and Natural Resources
 Edwin Watson, Attorney General's office
 Walter Watson, Department of Lands and Natural Resources

LOUISIANA

Anne Bachman, Institute of Environmental Studies (LSU)
 Arnold Chauviere, Office of Conservation
 Tom Harrell, Professor of Law (LSU)
 T. C. Landrum, Research & Development, Department of Natural Resources
 William Schuler, Esq., Advisor to the Office of Conservation

MONTANA

Ray Breuninger, Department of Natural Resources & Conservation
 Keith Brown, Department of Natural Resources & Conservation
 Randall Moy, Energy Office
 Ellene Shore, Environmental Quality Council
 Lawrence Siroky, Water Rights Division

NEVADA

Kelly Jackson, Department of Energy
 Roland Westergard, State Water Engineer

IDAHO

Alan Dornfest, Tax Commission
 Ken Foyt, Water Rights Division, Department of Water Resources
 Dave McIsin, Energy Office
 Marty Montgomery, Energy Office
 John Mitchell, Department of Water Resources
 Mr. Zarold, Department of Lands

NEW MEXICO

Joan Diamond, State Land Office
 Dan Nudder, Oil Conservation Division
 George Scudella, Environmental Improvement Agency

OREGON

Kent Ashbaker, Department of Environmental Quality
 Pam Collins, Land Conservation & Development Commission
 Margie Harris, Department of Energy
 Larry Jehousek, Division of Water Resources
 Debra Justus, Department of Energy
 Vernon Newton, Department of Geology & Mineral Industries
 Leonard Wilkerson, Division of State Lands

TEXAS

Al Askew, Governor's Energy Office
 Myron Dorfman, Center for Energy Studies, University of Texas
 Jack Glibberson, Land Office
 A. W. Overbeck, Center for Energy Studies, University of Texas
 Mel Waxler, Division of Oil & Gas

UTAH

Marvin Maxwell, Water and Pollution Control, Bureau of Environmental Health
 Bob Morgan, Division of Water Rights
 Chauncey Powis, Environmental Coordinator, Governor's office
 Donald Prince, Division of Lands
 Lynn Thatcher, Environmental Health Service Branch
 Wayne Thomas, Water and Pollution Control, Bureau of Environmental Health

WASHINGTON

Gordon Bloomquist, Department of Natural Resources
 Steve Craig, State Energy Office
 Vaughn Livingston, Division of Geology and Earth Resources
 Eric Schuster, Department of Natural Resources

WYOMING

Bernie Dalley, Department of Environmental Quality
 Mrs. Hansen, State Board of Lands
 Richard Stockdale, State Engineer's Office

--July 27 - met with officials of the County of Hawaii to seek their input into the project and to learn more about their views on the repercussions of geothermal development on the Big Island; and

--August 1 - met with key legislative contact persons to brief them on the project goals and objectives, to review current and future federal geothermal programs affecting Hawaii and geothermal activities at the state level, and to draw up a general work plan for the Hawaii Legislature's participation in the project. Attending this meeting were the chairman of the Senate Energy and Natural Resources Committee, a state representative, the consultant to the Senate Energy and Natural Resources Committee, the director and staff assistant for energy of the Legislative Reference Bureau, the director of the Department of Planning and Economic Development, the Pacific Region manager of DOE/DGE, and the DOE Hawaii liaison officer.

6. Workshop Planning

In addition to the state meetings held during the second quarter, workshops for two states--Hawaii and Utah--were planned. This work consisted of:

- a. Developing an agenda,
- b. Recruiting resource persons,
- c. Developing state profiles and other workshop materials,
- d. Contacting attendees, and
- e. Overall meeting coordination.

7. Summary of State Activities

Table III summarizes the key state activities that took place during the second quarter with the goal of beginning project activities in the project states.

B. PUBLICITY

1. News Release

A news release announcing the selection of project states was sent to national news wire services, energy publications and statehouse news services. The news release was also sent to state contacts for their use in introducing the project in their respective states (see Appendix F).

TABLE III

SUMMARY OF KEY STATE ACTIVITIES

	<u>Introductory Presentation Before Legislative Committee</u>	<u>Meeting with Key State Contact Persons</u>	<u>Development of General Work Plan</u>	<u>Initial Workshop Planned</u>
Delaware		x (Jul 6)		x (Oct)
Georgia	x (Jun 29)			
Hawaii		x (Jul 31)	x	x (Aug 2)
Oregon	x (May 10)			x (Oct)
New Mexico	x (May 31) x (Jul 13)		x	x (Sep 15)
Utah		x (Jun 27)		x (Aug 30)
Virginia				x (Oct)

2. News Activity

In news activity, an article appeared in several Oregon newspapers concerning the participation of the Oregon Legislature in the NCSL Geothermal Policy Project. The article resulted from an interview with project staff during a previous visit to the State Capitol (see Appendix G).

3. Energy Report to the States

Project staff wrote the lead article, "Geothermal Resources Ease Energy Woes," for the July 7 edition of Energy Report to the States, the biweekly report of the Energy Policy Project of the National Conference of State Legislatures. The report, with a mailing list of 1,500 persons, is distributed primarily to state legislative and executive officials (see Appendix H).

C. DEVELOPMENT OF PROJECT MATERIALS

1. Pamphlet

The project pamphlet was completed and printed (see Appendix I).

2. Packet of Background Material

a. Issue Paper

A final draft of the Issue Paper was developed and distributed to a comprehensive list of persons involved in geothermal development requesting their comments or suggestions regarding the paper's format and substance (see Appendix J).

To complete the final draft, project staff devoted considerable time to analyzing the content and format of the paper to encourage utilization by its primary target audience of legislators and legislative staff. In terms of content, special attention was paid to tensions in the area of state/federal jurisdiction over utility regulatory issues such as access

to transmission systems and rate regulation. Contact was made with the following persons to clarify respective responsibilities:

- George Handley, DOE/FERC, San Francisco
- Bill Wheelock, DOE/FERC, Office of Electric Power Regulation, Washington, D.C.
- Wade Sewell, DOE/FERC, Office of Policy Development, Washington, D.C.
- Bernard Cromes and Dan O'Sullivan, DOE/FERC, Office of General Counsel, Washington, D.C.
- Don Steger, California Public Utilities Commission
- Joe Aidlin, Vice President & General Counsel, Magma Power Company
- Lawrence Kapiloff, California Assemblyman
- Coulter Stewart, Consultant, Assembly Subcommittee on Energy
- Jack McNamara, USC Law Center

In terms of format, graphic diagrams were designed to clarify the structure of the paper by highlighting the major subjects covered in each issue area. Also, work was begun on a decision flow-chart that will represent graphically the alternative paths that can be followed in considering geothermal legislation and the consequences that flow from making a particular decision.

b. Outline of Study Areas

The project proposal indicates that the basic document in the packet of background material, State Policies for Geothermal Development, will be supplemented by an expanded analysis of certain areas important to the project's goal of encouraging geothermal development in the states. It was decided that initial research efforts will be concentrated in five areas:

- Direct use applications,
- Environmental protection,
- Incentives,
- Utility regulations, and
- Water rights.

To guide the research, an outline of the major issue areas was developed (see Appendix K). Also, staff assignments were made for lead responsibility in collecting material, writing summaries, etc. Research in the areas was begun.

c. Review of State Statutes and Regulations

The review of state statutes and regulations was completed through the following activities:

- Completion of the telephone survey of executive officials,
- Compilation of information on state summary sheets,
- Incorporation of the material into state files, and
- Updating of charts and tables on state legislation and regulations in State Policies for Geothermal Development. (See "State Geothermal Laws and Regulations" in First Quarterly Report.)

d. Bibliography

In preparation for further research and as a first step in preparing a bibliography for the packet, project staff began developing a bibliography (annotated where necessary) of material currently available in project files. This bibliography will be used as a starting point in developing a comprehensive library of reference materials by identifying areas where more information is needed and by beginning to critique the studies and reports available.

3. State Profiles

Development of state profiles for project states was begun. Initial efforts concentrated on collecting existing reports from DOE/DGE-sponsored operations research and resource assessment studies.

A preliminary state profile for Hawaii was developed for use in the August workshop (see Appendix L) with major sections concerning

- a. Resource potential,
- b. Resource applications,
- c. State laws and regulations, and
- d. Policy concerns.

Also, draft profiles were developed for Utah and New Mexico.

4. Legal Research

a. Enabling Act Issue

An early decision in the FICO litigation in Arizona (FICO v. Pima Mining Co., 523 P.2d 487(1974)) held that a lease issued by the State Land Department for water production was invalid under the Arizona Enabling Act (Section 28) and Constitution. This provision requires that state lands granted at statehood must be sold at public auction through competitive bidding. This stricture also applies to "products of land" including water. Research was undertaken to determine the possible effect of this decision on geothermal development in other states such as New Mexico which operates under an identical stricture in its Enabling Act.

b. Reasonable Use Doctrine

The major decision in the FICO litigation (FICO v. Bettwy, 558 P.2d 14(1976)) affirmed the doctrine of "reasonable use" for groundwater withdrawals in Arizona. This rule allows unrestrained production so long as the groundwater is used to benefit the drilling parcel. It prohibits transport of groundwater off the drilling parcel if such activity injures other users of the common supply. Where geothermal fluids are designated as groundwater, this legal doctrine may have considerable impact on resource allocation and marketing.

c. Case Files

A card file is being maintained of pertinent judicial decisions. The case holdings were abstracted and shepherdized for later citations and revisions.

D. LIAISON ACTIVITIES

1. U.S. Department of Energy, Division of Geothermal Energy

Particular attention was paid during the second quarter to the development of regional plans of the U.S. Department of Energy, Division of Geothermal Energy. Project staff participated in four activities geared toward assuring that the activities of the NCSL Geothermal Policy Project are closely coordinated with the policy development components of the DOE/DGE regional plans:

- a. Attended the quarterly meeting of the Southwest Operations Research (New Mexico Energy Institute) Advisory Committee where the OR state team activities were reviewed (Las Cruces, NM - June 1, 1978);
- b. Participated in a planning session of the Pacific Region team and state OR contractors (Sacramento, CA - June 21, 1978);
- c. Monitored the presentation of the Rocky Mountain Basin and Range Region Plan to key regional public and private officials (Salt Lake City - June 28, 1978); and
- d. Participated in numerous formal and informal meetings during the Annual Meeting of the Geothermal Resources Council on development of regional plans for the Pacific and Rocky Mountain Basin and Range Regions (Hilo, HI - July 25-28, 1978).

2. United Indian Planners Association

Project staff met on several occasions with UIPA staff to discuss interaction between the NCSL and UIPA geothermal projects. Also, Kenneth Wonstolen, Research Associate, assumed lead responsibility for NCSL for coordinating activities between the two projects and for developing in-house expertise on Native American issues affecting geothermal development in the states.

E. PROFESSIONAL PAPERS

Project staff served as faculty for the Geothermal Resources Council Special Short Course No. 7 "Geothermal Energy: A National Opportunity (The Federal Impact),"

Washington, D.C. - May 17-18, 1978. The presentation--"State Incentives for Geothermal Development"--discussed the state role in geothermal development and highlighted recent policy initiatives taken by states to address problem areas (see Appendix M).

F. CONFERENCES

Project staff attended three conferences during the second quarter:

1. Annual Meeting of the National Conference of State Legislatures - Denver, Colorado - July 5-8, 1978;
2. Annual Meeting of the Geothermal Resources Council - Hilo, Hawaii - July 25-28, 1978; and
3. American Legal Institute/American Bar Association's Energy and the Law Symposium - Boulder, Colorado - July 10-14, 1978.

During these meetings, project staff made contact with key public and private officials to seek their assistance in project activities and attended numerous substantive sessions on issues relating to geothermal energy.

G. MISCELLANEOUS

Project staff reviewed many documents from the perspective of the state role in geothermal development. These included the Battelle Institute's report "Legal and Regulatory Aspects of Liquid Waste Disposal from Geothermal Installations;" the DOE/DGE Rocky Mountain Basin and Range Region's Work Breakdown Structure; and a paper on federal and state laws affecting geothermal development in the State of Alaska.

Also, a potential candidate for the position of project evaluator was contacted and preliminary discussions held concerning the evaluation requirements for the project.

Finally, a proposal was written and submitted to DOE/DGE to add personnel for additional work in the Eastern Region. The proposal addresses the need to begin policy development in all states of the Atlantic Coastal Plain as quickly as possible to insure the orderly and efficient development of geothermal resources in the region.

IV. VARIANCES OR PROBLEMS

One potential problem area has been identified: the effect the project's late start will have on achieving first year objectives. The project proposal, which calls for working with six primary target states, was designed around the assumption that the project would begin in October, 1977. The intended startup time allowed for a three-month preparatory period during which background materials were to be compiled and initial contacts made prior to the beginning of the legislative sessions. This approach would have allowed the project to begin actual work in the states during the crucial time when legislatures are in session (January to April).

The major effect of the project's late start in general terms is to reduce the scope of the policy review undertaken in project states. Although the project proposal calls for a comprehensive review of state policies affecting geothermal development, the limited amount of time in which the policy reviews can be undertaken in the project's first year has necessitated a prioritization of issues. Policy reviews will focus on only the most important areas of concern. It is anticipated that because of this limitation, policy reviews in current project states will have to be extended into the project's second year.

The specific effect of this problem in terms of exact areas to be included in policy reviews will be reported when specific work plans are developed for the six project states.

V. PLANS FOR FUTURE REPORTING PERIODS

During the next months, the project will concentrate on holding initial workshops in project states. These workshops will be designed to introduce the project to the appropriate legislative committees and to set agendas for the policy studies to be undertaken. Particular emphasis will be placed on determining the parameters of the study by delineating the exact areas that need to be addressed and by prioritizing these issue areas.

Following the workshops and development of study agendas, the project will turn its attention to the more substantive aspect of the project--the policy reviews that will be undertaken in each project state. Project staff will then work in close cooperation with the states to set forth for the legislative committees the alternatives they may consider in recommending state actions to encourage geothermal development.

VI. ASSESSMENT OF PROSPECTS FOR FUTURE PROGRESS

The prospects for future progress continue to look bright. The project, during its second quarter of activity, began actual involvement in the states; and the reception to the project by persons in both the legislative and executive branches of all project states was very positive. The level of cooperation and the interest of all members of the geothermal community in the states--both public and private officials--has been high.

APPENDIX A

**National
Conference
of State
Legislatures**

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Earl S. Mackey

S A M P L E

June 9, 1978

Senator T. C. Yim, Chairman
Committee on Energy and Natural Resources
State Capitol
Honolulu, Hawaii 96813

Dear Senator Yim:

I am pleased to inform you that Hawaii has been chosen as a project state in the National Conference of State Legislature's Geothermal Policy Project. This designation means that the Hawaii Legislature and NCSL will be working together over the next year in a comprehensive policy review of state laws and regulations affecting geothermal development in the state. The goal of this effort is to establish a legal and regulatory climate in Hawaii that encourages development of geothermal resources while at the same time protects the state's interest in its natural resources.

A first step toward reaching this goal is the development of a general work plan. Enclosed is a tentative plan that outlines work tasks, the organization that will assume the lead responsibility for each task and a timetable that should be used to make sure we schedule our efforts in preparation for Hawaii's 1979 legislative session.

We would appreciate you completing the work plan by assigning time deadlines to the various tasks. To help in this regard, I might point out that Task III includes the development of a state-specific work plan as part of an initial legislative workshop. At this time, we can outline in more definitive terms the exact steps that will be taken in Hawaii to develop legislative recommendations. Also, all project activities do not have to be completed by the beginning of the 1979 session if the legislature wishes to continue study and drafting after the session begins.

Finally, with submission of the work plan, we would like to have a letter from your leadership indicating the Hawaii Legislature's acceptance of our offer to work with you as a project state. This letter should indicate their support of the project's work with the Committee on Energy and Natural Resources during the upcoming months.

While awaiting these documents from you, we are beginning to develop your state profile and working on the background material that will be needed in the policy

Senator T. C. Yim

-2-

June 9, 1978

review process. Thank you again for your interest in the project, and we look forward to working with you.

Sincerely,

Rutherford C. Harris
Director
Geothermal Policy Project

RCH:gp
Enc.

cc: Senate President John T. Ushijima
Speaker James H. Wakatsuki
Representative Benjamin J. Cayetano

NATIONAL CONFERENCE OF STATE LEGISLATURES
GEOTHERMAL POLICY PROJECT

WORK PLAN: _____

<u>TASKS</u>	<u>LEAD RESPONSIBILITY</u>	<u>TIME DEADLINE</u>
I. "State Profile"		
<ul style="list-style-type: none"> • Provide information (state specific) on: <ul style="list-style-type: none"> --location and character of resource --potential applications and benefits --leading policy concerns 	NCSL	
II. "Packet of Background Information"		
<ul style="list-style-type: none"> • Provide information (general) on: <ul style="list-style-type: none"> --nature of geothermal resources --development opportunities --state laws and regulations --policy issues such as water laws --possible state incentives (utility regulations, marketing, tax policies, securities regulations, etc.) 	NCSL	
III. Initial Workshop		
<ul style="list-style-type: none"> • Introduce project • Outline possible study areas • Determine objectives and work plan (including committee hearings, staff study, etc.) 	NCSL NCSL State	
IV. Policy Review		
<ul style="list-style-type: none"> • Carry out work tasks as outlined at initial workshop • Provide technical assistance as requested (examples: analyzing policy alternatives, describing action taken in other states, identifying important studies & expert witnesses, holding additional workshops/ meetings, etc.) 	State NCSL	
V. Legislative Recommendations		
<ul style="list-style-type: none"> • Draft legislation • Introduce legislation 	State State	
VI. Consideration of legislation		
<ul style="list-style-type: none"> • Technical assistance as requested 	NCSL	
VII. Follow-up Assistance		
<ul style="list-style-type: none"> • Determine need for further assistance • Begin Step III again 	State NCSL	

VI. MISCELLANEOUS

- A. National Laboratories - establish on-going relationship between state programs and efforts of Sandia Laboratories and Los Alamos Scientific Laboratory (joint ventures for demonstration projects, etc.)
- B. Research and Development Funds - move existing state-supported programs from study efforts to more activist roles in developing geothermal energy; provide funding to make state eligible for federal matching fund programs.
- C. Indian Land - study appropriate relationship between Indian tribes and the state in terms of development of geothermal energy.

APPENDIX C
NATIONAL CONFERENCE OF STATE LEGISLATURES
GEOTHERMAL POLICY PROJECT

WORK PLAN: New Mexico

<u>TASKS</u>	<u>LEAD RESPONSIBILITY</u>	<u>TIME DEADLINE</u>
I. "State Profile"		Sept. 15, 1978
<ul style="list-style-type: none"> • Provide information (state specific) on: <ul style="list-style-type: none"> --location and character of resource --potential applications and benefits --leading policy concerns 	NCSL	
II. "Packet of Background Information"		Oct. 1, 1978
<ul style="list-style-type: none"> • Provide information (general) on: <ul style="list-style-type: none"> --nature of geothermal resources --development opportunities --state laws and regulations --policy issues such as water laws --possible state incentives (utility regulations, marketing, tax policies, securities regulations, etc.) 	NCSL	
III. Initial Workshop		Sept. 15, 1978
<ul style="list-style-type: none"> • Introduce project • Outline possible study areas • Determine objectives and work plan (including committee hearings, staff study, etc.) 	NCSL NCSL State	
IV. Policy Review		Nov. 1978
<ul style="list-style-type: none"> • Carry out work tasks as outlined at initial workshop • Provide technical assistance as requested (examples: analyzing policy alternatives, describing action taken in other states, identifying important studies & expert witnesses, holding additional workshops/meetings, etc.) 	State NCSL	
V. Legislative Recommendations		Dec. 1978
<ul style="list-style-type: none"> • Draft legislation • Introduce legislation 	State State	
VI. Consideration of legislation		
<ul style="list-style-type: none"> • Technical assistance as requested 	NCSL	Jan. - Apr. 1979
VII. Follow-up Assistance		
<ul style="list-style-type: none"> • Determine need for further assistance • Begin Step III again 	State NCSL	Apr. 1979

APPENDIX D
NATIONAL CONFERENCE OF STATE LEGISLATURES
GEOTHERMAL POLICY PROJECT

WORK PLAN: Hawaii

<u>TASKS</u>	<u>LEAD RESPONSIBILITY</u>	<u>TIME DEADLINE</u>
I. "State Profile"		8/2/78
<ul style="list-style-type: none"> • Provide information (state specific) on: <ul style="list-style-type: none"> --location and character of resource --potential applications and benefits --leading policy concerns 	NCSL	
II. "Packet of Background Information"		
<ul style="list-style-type: none"> • Provide information (general) on: <ul style="list-style-type: none"> --nature of geothermal resources --development opportunities --state laws and regulations --policy issues such as water laws --possible state incentives (utility regulations, marketing, tax policies, securities regulations, etc.) 	NCSL	
III. Initial Workshop		8/2/78
<ul style="list-style-type: none"> • Introduce project • Outline possible study areas • Determine objectives and work plan (including committee hearings, staff study, etc.) 	NCSL NCSL State	
IV. Policy Review		
<ul style="list-style-type: none"> • Carry out work tasks as outlined at initial workshop • Provide technical assistance as requested (examples: analyzing policy alternatives, describing action taken in other states, identifying important studies & expert witnesses, holding additional workshops/meetings, etc.) 	State NCSL	11/1/78 1/1/79
V. Legislative Recommendations		
<ul style="list-style-type: none"> • Draft legislation • Introduce legislation 	State State	1/1/79 1/15/79
VI. Consideration of legislation		
<ul style="list-style-type: none"> • Technical assistance as requested 	NCSL	1/15 to 4/15/79
VII. Follow-up Assistance		
<ul style="list-style-type: none"> • Determine need for further assistance • Begin Step III again 	State NCSL	4/15/79

NATIONAL CONFERENCE OF STATE LEGISLATURES
GEOTHERMAL POLICY PROJECT

Problem Areas in Geothermal Development

in New Mexico

Impediments to the development of New Mexico's geothermal resources occur in several areas of direct legislative concern. The following preliminary list has been compiled from suggestions by various public officials and representatives of the geothermal industry.

The list will be used to initiate project activities in New Mexico and to develop an agenda for policy study between the Interim Committee on Natural Resources and the NCSL Geothermal Policy Project.

I. RESOURCE CHARACTERIZATION

- A. Definition - clarify the legal status of geothermal in relationship to established resource categories.
- B. Ownership - clarify ownership rights.
- C. Water rights - clarify requirements of geothermal development vis-a-vis established water rights.

II. RESOURCE ACCESS

- A. Length of lease - determine appropriate length that balances public and private interests in geothermal resources development.
- B. Acreage limitations - determine minimum and maximum acreage limits to correspond to the needs of geothermal development.
- C. Delays - determine ways to overcome unnecessary delays in moving from lease application to energy production (standardized regulatory procedures, time limits on administrative actions, etc.)

III. ENVIRONMENTAL REVIEW

A. Obstacles - determine ways to overcome unnecessary obstacles to development while protecting legitimate environmental concerns (differentiating exploration and development phases, designating a lead agency to coordinate regulatory activities, etc.)

IV. DIRECT USE APPLICATIONS

A. State Support - encourage development of space heating and other non-electric uses of geothermal (demonstration projects, life-cycle analysis, tax exemptions, financial and planning assistance for community and small business projects, etc.)

B. Market Structure - decide on utility status of geothermal heat facilities (formation of heating districts, zoning for geothermal operations, etc.)

C. Regulatory Requirements - differentiate requirements and procedures suitable for high-temperature geothermal resources but unnecessary for development of lower temperature reservoirs.

V. INCENTIVES

A. Income Tax Treatment - equalize geothermal's position vis-a-vis other energy fuels (depletion allowance, deductions for current expenses, etc.)

B. Property Taxes - reduce burden (deferral from ad valorem assessment until commercial production begins, exemption on non-productive tracts, well-head production assessment in lieu of ad valorem, etc.)

C. Utility Confidence - increase attractiveness of geothermal investments (exemptions from utility regulation, transmission access, higher rate of return, etc.)

D. Retrofit Incentive - encourage retrofitting of existing buildings, equipment or processes to utilize geothermal energy.

News Release

National Conference of State Legislatures

FOR IMMEDIATE RELEASE
June 29, 1978

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STATES TO PARTICIPATE IN GEOTHERMAL PROJECT

Six states have been selected to participate in a unique project which will identify and help resolve legal and institutional problems hampering the production and use of geothermal energy, the National Conference of State Legislatures announced today.

The states--Delaware, Hawaii, New Mexico, Oregon, Utah and Virginia--were chosen as the initial participants in the multiyear project which will work eventually with all states that have the potential for geothermal development.

The project's goal is to assist states in establishing a legislative and regulatory climate that encourages efficient development of geothermal energy while protecting the state's interests in its natural resources.

A comprehensive policy review process will survey areas of state involvement in geothermal energy development. This is necessary because the geothermal industry is hindered by unsuitable provisions in state and federal leases, improper applications of state water laws, and ambiguous or discriminatory tax statutes. Some states, for example, have not enacted legislation to regulate the development of geothermal resources.

A number of policy issues must be examined if the benefits of geothermal energy are to be fully realized. These include prompt access and secure rights to the geothermal resource, efficient regulatory procedures, equitable tax treatment and investment opportunities, and an adequate market to recover the high costs of development.

-more-

Earl S. Mackey/Executive Director

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State legislatures, in addressing these issues, will be concerned with such questions as determination of ownership rights, geothermal resource distribution, regulation of field development and production, location of facilities, utility commission authority, taxation, and capital formation and market expansion.

The NCSL Geothermal Energy Project will provide state legislatures with information and assistance in dealing with these issues and policy questions. Individual assistance will be provided at the request of a particular state. Through workshops and informal contacts, state legislatures will be assisted in analyzing policy alternatives. Significant research studies, expert witnesses and concerned parties available for assistance will be identified.

To insure that policy reviews are thorough and complete, the project will engage expert consultants and other parties concerned with geothermal energy development. Participating in the multifaceted effort will be state legislators and legislative staff; state and local officials; geothermal developers, utilities and other interested parties; consultants from public and private research institutions; and representatives of the Division of Geothermal Energy, U.S. Department of Energy.

Vol. 4

July 7, 1978

No. 13

Geothermal resources ease energy woes

Searching for possible ways to reduce the nation's dependence of fossil fuels, several states are harnessing the natural heat of the earth for direct heating and cooling and for electric generation.

Geothermal energy, found in broad belts encircling the entire planet, now supplies about 1,500 megawatts (MW) of electric power globally from more than a dozen geothermal areas. Equally important is the growing worldwide use of these valuable natural resources for heating and cooling of buildings and for agricultural and industrial processing.

Oregon is encouraging this use of geothermal energy through a loan program for any veteran who installs a non-conventional heating or cooling system such as a geothermal space heater in his principal residence. And several states, including Colorado, Hawaii, Idaho, Montana, Nevada and Oregon, grant property tax exemptions or income tax credits or deductions for investments in geothermal systems.

As an incentive for district heating, which must be authorized as a utility supplier by the state, Oregon has given developers of geothermal heating districts the authority to contract for services, issue general obligation and revenue bonds, levy special assessment property taxes and exercise the power of eminent domain.

Idaho is demonstrating the new technology to consumers by "geoheating" the state capitol, and New Mexico is requiring a life-cycle cost analysis of alternative energy supply systems for new or renovated state buildings. This policy establishes a mechanism for discovering when geothermal heating is economically competitive.

At the local level, Boise, Idaho's, new system, to go into effect in 1979, will heat two million square feet of building space, or 18 city, state (including the state capitol), federal and private buildings, eight square blocks of an urban renewal area and the Boise State University campus.

(continued on p. 182)

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The National Conference of
State Legislatures

Earl S. Mackey, Executive Director

(continued from p. 181)

Oregon's Institute of Technology at Klamath Falls has been heated by geothermal hot water since 1964, and plans are underway to operate a geothermal space heating district in the central business area of that town covering 14 government office buildings. Also, Ore-Ida Foods of Ontario, Ore., is converting its plant's process heating to geothermal energy.

Electric generation

A major obstacle to widespread use of geothermal resources for electric generation is the fact that major utilities doubt the reliability of geothermal reservoirs. Hawaii attacked this problem by exempting private power producers from utility regulation if they consume the energy themselves or if they market it to regulated electric utilities.

California authorizes the state Public Utilities Commission to order utilities to interconnect with private producers whose electricity comes from non-conventional energy sources and transmit their power for personal consumption. The legislature is considering a bill to expand that authority where resale is intended as well. That state also allows a higher rate of return for utility investments in facilities which use non-conventional resources.

Another problem results from geothermal developers not being granted the tax benefits allowed other energy industries. Arizona is trying to overcome this hindrance by giving geothermal developers a percentage depletion allowance (as for gas and oil) and permitting current expensing of exploration and development expenditures.

Statewide development regulations control the geothermal industry's methods of drilling, resource production and waste disposal. Development activities are monitored to restrict environmental degradation and help ensure that geothermal resources are not wasted.

State laws and regulations affect every phase of geothermal development, from initial exploration and financing to final utilization and waste disposal. Exploration and private appropriation of the resource are governed by state permitting requirements and statutory definitions of geothermal resources; state lease provisions determine the security of a leasehold and influence its profitability; and statewide development regulations impinge on the economic value of resource discoveries. State securities regulations, taxation policies and utility regulations also have important consequences.

Development problems

The novelty of geothermal resources, their diverse character and the necessity of using the energy where it is produced pose major challenges for developers. These factors also create special concerns for state legislatures.

Resource characterization and determination of ownership rights, leasing and resource distribution, regulation of field development and production, facility siting and utility regulation, taxation, market expansion and public acceptance all are subject to legislative initiative. For geothermal resources to supply their full potential, these issues must be settled to provide secure rights and prompt access to the resource, efficient regulatory procedures, fair tax treatment and a market for the resource large enough to justify the high cost of development.

Many of these issues either have not been addressed or have been resolved by placing unnecessary barriers on development of the resource. Current policies largely derive from state water laws or petroleum statutes, and past experience with these resources often has been misleading when applied to geothermal development. As a result, established policies frequently present obstacles rather than encouragement to the geothermal industry.

Neglected policy areas also may impede development. For example, current state geothermal regulations are tailored principally to the production of electricity. Policymakers have given comparatively little attention to the legal and institutional foundations required for direct use of geothermal resources in agriculture, aquaculture, industrial processing and heating and cooling of buildings. Remedies for such policy vacuums should rank equally with revision of poorly drafted or misconceived regulations in order to encourage geothermal development.

The NCSL Geothermal Policy Project

The National Conference of State Legislatures has undertaken, through funding by the U.S. Department of Energy, a multiyear assistance program to make geothermal energy a viable resource for meeting the energy needs of the states. The goal of the Geothermal Policy Project is to help states establish a legislative and regulatory climate that encourages efficient development of geothermal energy while protecting the states' interests in their natural resources. Delaware, Hawaii, New Mexico, Oregon, Utah and Virginia have been selected as project participants. These states were chosen on the basis of potential for geothermal resource development, the need for policy review and the degree of interest expressed by the legislature.

How a geothermal field is developed

Magma, the molten rock found deep in the earth, is the heat source radiating heat energy (wavy dotted lines) through the rock above it. Water flows into the reservoirs rock from underground sources and surface runoff. The cool fluids are heated as they come in contact with the hot rock and rise to circulate within the reservoir. A drilling rig penetrates through the impermeable caprock to tap the reservoir. After drilling is completed, the geothermal energy is piped from the well to an electrical generating unit.

Union Oil Co.

U.S. potential

The energy potential of geothermal resources in the U.S. is hundreds of times greater than current use. The most well known manifestations of geothermal energy are volcanoes, hot springs and geysers, but the resources are more widespread than these dramatic displays.

Geothermal resources consist mainly of natural heat from the earth's interior, as well as fluids, dissolved minerals or gas and pressure. These diverse elements occur in a variety of geologic settings, including hydrothermal and geopressured reservoirs, hot dry rock and magma chambers.

High temperature resources have the greatest energy potential, but lower temperature reservoirs may be competitive economically as well. An important consideration in geothermal's economic outlook is the location of the resource, since heat energy cannot readily be stored or transported over long distances.

However, the U.S. Geological Survey found that the geothermal reserves in the western states can supply all new electric capacity in those states for the next two decades. This energy -- more than 100,000 MW -- can be generated from natural steam and high-temperature geothermal fluids at prices competitive with electricity from fossil and nuclear powerplants.

Likewise, a comparable potential for electric generation is expected from the geothermal-geopressured reservoirs of the Texas-Louisiana Gulf Coast. Geopressured reservoirs also contain large amounts of dissolved natural gas, and if proven economically competitive, this source will more than triple present domestic natural gas reserves.

U.S. potential for direct uses of the earth's heat to heat and cool buildings and for agricultural uses such as drying crops and heating greenhouses may exceed electric generation. Geothermal reservoirs suitable for direct heating are widespread in the eastern U.S. as well as the gulf and western states.

State geothermal policies

Laws regulating geothermal development have been established in each of the 15 gulf and western states and in Maryland. The states have characterized the resource, identified available lands and the methods for leasing, and provided for statewide regulation of field development and production activities. California and New Mexico enacted geothermal statutes in 1967, and other states followed in the '70's, often patterning their legislation after earlier state geothermal statutes or the federal Geothermal Steam Act of 1970.

In most states, administrative agencies have promulgated leasing and development regulations to implement the enacted legislation. Major concerns of state leasing regulations are:

- (1) characteristics of the resource
- (2) access for exploration
- (3) the manner of granting a lease
- (4) rentals and production royalties
- (5) lease terms and adjustments
- (6) efficient geothermal operations.

The project will address many areas of state involvement in geothermal development through a comprehensive policy review process. Those will include:

- (1) resource definition: describing the resource subject to geothermal policies and deciding if it belongs to the domains of water or mineral rights and whether it is a public or private resource
- (2) entry provisions: specifying the manner of granting access for resource exploration
- (3) leasing provisions: specifying the manner of leasing and lease obligations
- (4) development regulations: controlling well-drilling and production for purposes of safety and resource conservation
- (5) water appropriation: fixing the applicability of state water laws to geothermal development
- (6) environmental standards: regulating the permissible effects of geothermal development on the environment
- (7) taxation: setting property, severance, income and other special taxes that bear importantly on geothermal development
- (8) securities regulations: expanding or contracting the supply of capital available to geothermal developers by rulings of the state securities commissions and the federal Securities and Exchange Commission
- (9) utility regulations: governing utility investments, power transmission and rate regulation

Technical assistance

As part of the policy review process, the project will provide individual assistance at the request of the participating state. Through workshops or more informal contacts, project staff will help in analyzing policy alternatives, describing legislative action taken in other states and identifying important studies, expert witnesses and concerned parties available for assistance.

For more information, contact Rutherford Harris, project director, or Douglas Sacarto, associate director (303) 623-6600.

Federal support of geothermal energy

The goal of geothermal energy development at the federal level is to stimulate development of geothermal energy as an economic, reliable and environmentally acceptable energy source. Objectives of the federal effort are:

	<u>1985</u>	<u>2000</u>
Electric power capacity (GW)	3-4	20-40
Fossil fuel displaced (q/yr)	.2-.3	1.5-3.0
Direct Thermal Uses (q/yr)	.1-.2	.5-2.0
Geopressured (q/yr)	0-.02	2-4
Total Thermal Energy	.3-.5	4-9

Geothermal Energy Budget Estimates (in \$millions)

	<u>FY 78</u>	<u>FY 79</u>
(1) Engineering Research and Development	15.5	21.6
(2) Resource Exploration and Assessment	17.6	29.4
(3) Environmental Control and Institutional Studies	8.1	11.4
(4) Hydrothermal Technology Applications	28.1	27.2
(5) Advanced Technology Applications	22.5	29.6
(6) Utilization Experiments	12.0	7.5
TOTAL	91.8	126.7

Hydrothermal Power Plants in the Near Future

Roosevelt Hot Springs, Utah	1 MW	1978
East Mesa, Calif. (Magma)	10 MW	1978
Raft River, Idaho	5 MW	1979
Brawley, Calif. (Union Oil Co.)	10 MW	1979
Puna, Hawaii	3 MW	1980
Niland, Calif. (San Diego Gas & Electric)	10 MW	1980
Roosevelt Hot Springs, Utah (Rogers Engineering)	55 MW	1981
East Mesa, Calif. (Republic Oil Co.)	48 MW	1981
Advanced Raft River, Idaho	5 MW	1981
Federally-funded demonstration project	50 MW	1981
TOTAL	200 MW (approx.)	

State report...

Waste disposal

In the past few years, a growing number of states have expressed concern over the development of issues surrounding nuclear energy -- particularly its transportation and storage. (See ERS, Vol. 4, Numbers 6 and 11). The U.S. Nuclear Regulatory Commission is following state legislative activity in this area and issued a report earlier this month on recent enactments dealing with high-level radioactive waste disposal.

The following are brief descriptions of some of the most current laws.

Resolutions to Congress

Four states approved resolutions to Congress dealing with radioactive waste: Colorado (SM 3, 1977) asked that Congress, the President and ERDA exclude it from consideration as a potential site for a high-level waste repository. Delaware (HR 124, 1977) requested that the state's congressional delegation support a bill to give states veto power over waste repositories, and Louisiana (SCR 83, 1977) sought federal legislation "to require the proper federal agency to notify both the governor and the legislature of any state of the agency's intention to search for radioactive waste disposal sites within that state."

Hawaii's resolution (SR 68, 1976) asked the U.S. Environmental Protection Agency to halt any plans for undersea disposal of radioactive wastes until their safety is "proven beyond any shadow of doubt."

State prohibitions

Louisiana (H 14, 1977) prohibits the use of salt domes in the state as temporary or permanent disposal sites for radioactive waste. A Michigan enactment (S 144, 1978) bans the deposit or storage of radioactive waste in the state, while several other bills (S 153, S 688, S 689 and S 690, 1978) prohibit the state's consent to the acquisition of land or buildings to store, deposit or dump radioactive material by the federal government.

Oregon's enactment (S 272, 1977) forbids the operation of radioactive material waste disposal facilities within the state.

Requires state approval

Minnesota (H 1215, 1977) prevents the construction or operation of a "radioactive waste management facility" within the state unless authorized by the legislature. "Containment, disposal or deposit of high-level nuclear wastes, radioactive substances or radioactive contaminated materials or the processing of high-level nuclear wastes" within South Dakota are banned unless granted prior approval by the legislature under that state's enactment (H 822, 1977). The construction or establishment of a high-level radioactive waste repository is not allowed in Vermont under H 261, 1977, unless approved by the General Assembly.

Bans out-of-state waste

Montana (H 254, 1977) prohibits the disposal in that state of large quantities of radioactive materials produced in other states.

Minnesota (H 1215, 1977) bans the transportation of wastes into the state for temporary storage for up to 12 months

pending transportation out of the state."

Miscellaneous

Kentucky's resolution (HR 70, 1978) appoints a special advisory committee on behalf of the General Assembly to assume an oversight role on matters pertaining to nuclear waste during the next two years. The resolution continues a 1976 advisory committee which had completed its duties.

Under Texas bill H 1560, 1977, the Texas Water Quality Board is empowered to regulate the discharge of waste or pollutants into any water within the state. However, no permits shall be issued authorizing the discharge of "any radiological, chemical, or biological warfare agent or high-level radioactive waste."

For more information, contact Elizabeth McCarthy, NRC Office of State Programs, (301) 492-7794.

Federal report...

Planning energy impact aid

The Senate Environment and Public Works Committee approved its inland energy impact assistance bill June 27 by a 10-4 vote, but the bill may face stiff opposition on the Senate floor, where Proposition 13 has created an atmosphere increasingly hostile to new spending programs. If the bill fails in the Senate, it probably will be dead for the remainder of the 95th Congress, since the House does not plan to begin work until the Senate acts.

The bill (S 1493) would authorize \$150 million a year through FY 1983 for grants, loans, loan guarantees and interest subsidies for the public facility and service needs of areas

with rapidly expanding population due to proposed or existing "major energy development."

What constitutes "major" is not spelled out, but "development" would include exploration, extraction and related conversion or processing activities, transportation facilities such as pipelines, and federally funded projects specifically including uranium processing and nuclear waste disposal. The committee also expanded the bill to cover the continuing adverse effects of major generating facilities.

Each state would get an allocation of impact money according to a formula based 50 percent energy development-related population and employment increases, 30 percent on state efforts to internalize impact costs (probably to be based on the ratio of state per capita spending in impact areas vs. non-impact areas), and 20 percent on housing needs.

In areas designated by a governor as likely to suffer economic dislocation from substantial energy exports to other areas, the bill would set up impact assessment teams of federal, state and local officials and non-voting industry representatives. The teams would project the areas' employment and public facility and service needs over the period of anticipated impacts, and develop mitigation plans setting forth specific measures to meet these needs, as well as priorities for implementation.

The plans would have to identify committed and requested contributions toward impact costs from the owner or operator of the energy development, along with available federal funds under existing assistance programs, and state and local funds that can be made available.

The plans would have to be approved by the Economic Development

Administration in the Commerce Department, or one of the regional economic development commissions with authority to administer the programs.

Although the bill provides for the award of impact aid prior to the approval of a mitigation plan, no more than half the funds appropriated in FY 1979 could be so awarded, and no more than 20 percent each year thereafter.

One of the major issues before the committee during markup of the bill was the extent to which the assistance should be in grant as opposed to loan form. U.S. Sen. Robert Stafford (R-Vt.) argued that states suffering the side effects of energy development should not be afforded grants because they could repay loans from energy development revenues. He offered an amendment to convert the entire assistance program to 15-year loans at 8 percent interest.

The amendment was defeated, however, after the bill's co-sponsor U.S. Sen. Gary Hart (D-Colo.) and others pointed out that some communities may suffer impacts for which they could not raise mitigating revenues.

A town in Colorado, for instance, might get most of its new population from a coal mine in Wyoming, which could not be taxed. Another argument was that the affected states and communities may have difficulty surmounting statutory or constitutional limits on additional borrowing.

The bill already contains requirements for states to provide an annually escalating share of the costs of carrying out the mitigation plans, beginning with a 12.5 percent share in FY 1980, and increasing by the same amount yearly until it reached 50 percent in FY 1983. The state's share would be derived from taxes or other

revenues associated with the energy development.

In addition, states receiving grants would have to demonstrate an adequate strategy to recover "the substantial majority" of such funds within a reasonable time, or demonstrate an alternate strategy for assuring that the economic benefits of the energy development will be used to minimize its impacts.

The NCSL has argued that legislatures should be consulted early in the development of the state's plan because such cost-internalization requirements as the measures in the mitigation plans may require additional state authorizing legislation, and because the legislatures will have to appropriate the state's share of the mitigation.

West Virginia House Speaker Donald Kopp submitted a statement to the committee for the NCSL noting the requirements entailing state legislative action and emphasizing that the entire assistance program could suffer indefinite and unnecessary delays if legislators are not given a role.

Another issue in the committee markup that probably will be brought up again on the Senate floor is a federal cost-internalization requirement. Section 1107 of the bill would have enabled federal lease, license, permit, assistance, easement and other approvals needed by an energy development to be conditioned on reasonable contributions by the owner or operator toward the development's impacts. After converted industry opposition, the committee agreed to drop this provision without eliminating the possibility that the committee might offer an acceptable substitute on the floor.

For more information, contact Rob MacDougall, (202) 624-5420.

Update...

Energy project visits Minnesota

The range and variety of innovative legislation adopted by the states and the current configuration and status of the National Energy Plan were discussed by Jim Matthews, director of the NCSL Energy Policy Project, and Special Assistant Rob MacDougall at the meeting June 14 with the Minnesota House Select Committee on Energy.

At the invitation of the committee, MacDougall reviewed portions of the proposed National Energy Act agreed to by the Conference Committees, including rate reform, and the recent accord on natural gas.

Matthews explored the wide variety of approaches taken by the state legislatures in promoting the development of alternative and renewable energy resources.

The impact of alternative energy in Minnesota could be dramatic. A 1 percent shift to alternative technologies in that state could replace the use of nearly 95 million barrels of oil (using 1972 consumption figures), serving Minnesota consumers \$16 million per year.

The Minnesota House Select Committee on Energy, chaired by Rep. Ken Nelson, is meeting during the interim to examine approaches to a comprehensive legislative energy program.

Composed of three members from each standing committee, the committee has divided into three subcommittees to make in-depth investigations into:

1. Energy cost and pricing, particularly its impact on low-income persons.
Rep. Robert Vanasek, chairman.

2. Energy and economic development.
Rep. Pete Petrafeso, chairman.
3. Alternative energy systems.
Rep. Russell Stanton, chairman.

Samuel Rankin, legislative analyst and staff coordinator for the committee, identified possible future topics for consideration as:

- energy conservation as a method of providing a new energy supply for the state.
- lifeline rates.
- utility rate setting procedures.
- time-of-day metering.
- financial needs of energy suppliers.
- possible negative impact on conservation of energy cost subsidies.

The visitation by project staff to Minnesota is one example of the type of technical assistance available to state legislatures.

NRC seeks state agreements

The U.S. Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency (EPA) entered into agreement in 1975 for the implementation of certain responsibilities under the Federal Water Pollution Control Act (FWPCA).

The Environmental Protection Agency has delegated to 30 states its permitting authority under the National Pollutant Discharge Elimination System, section 402 of the water pollution control act, and the NRC has adopted a policy of entering into similar agreements with those states.

So far, the commission has made agreements with Virginia, New York and South Carolina, but would like to expand the number of agreement states.

The Federal Register (43 FR 19485, May 5, 1978) contains the full text of the three existing agreements.

For more information, contact Elizabeth McCarthy, Office of State Programs, NRC, Washington, D.C., 20555, (301) 492-7794.

Calendar

July 24-25	DOE's Solar Update
Boston, Mass.
Aug. 22-23	Energy Management in
Buildings, New York
University
Denver, Colo.
Aug. 29-30	Energy Management in
Buildings, New York
University
Atlanta, Ga.
Sept. 13-15	Second National Confer-
ence on Standards for
Solar Energy Use,
American Society for
Testing and Materials,
New York City

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APPENDIX I

Geothermal energy

Oregon may be a model

BY JOSEPH R. SAND
United Press International

SALEM - Oregon, known for its firsts in environmental areas, may become a model for the West in what can be done with geothermal energy.

Rutherford Harris, Denver, was in Salem recently seeking support for a new geothermal policy project being put together by the National Conference of State Legislatures, the official representative of the nation's 7,600 state legislators and their staffs.

He said the project is designed to help establish state laws and regulations that are consistent with the efficient development of geothermal resources. He said the group will try to encourage development of geothermal resources and yet protect the states.

Why Oregon first? "Oregon has already taken a lot of steps. We would like to work with Oregon to make it a positive

model as to what can be done in geothermal energy," Harris said.

"Klamath Falls is the shining example of the direct use of geothermal energy," he said.

Geothermal energy, which comes from the earth's natural internal heat, is found in significant amounts in Oregon, according to Walt Pollock, Department of Energy.

The Klamath Falls area is the best known. Pollock said the City of Klamath Falls has been using geothermal resources since the turn of the century and other communities are contemplating it. The resources is used by Oregon Institute of Technology and for agricultural operations in the area.

A geothermal belt runs from Klamath Falls up to the northeast corner of the state, he said, including the cities of Vale, Ontario, Baker, La Grande and others.

In Ontario, Ore-Ida Foods Inc. has plans to use geothermal for

plant heating and processing and has a grant to fund test drilling.

Pollock said, "Geothermal development is very real here (in Oregon)." In terms of non-electrical uses of geothermal energy "we're farther along than anyone."

Harris said he was well-received by legislators and government agencies and is hopeful he will bring other western states with geothermal potential into the project.

To develop available geo-

thermal resources, commercial investments must expand greatly beyond the present level, he said. Development is hindered, however, by numerous legal and institutional difficulties. Examples, Harris said, are unsuitable provisions in state and federal leases, obstructive applications of state water laws and ambiguous or discriminatory tax laws. In some states, he said, laws to regulate the development and use of geothermal resources have not been enacted at all.

ISSUES IN GEOTHERMAL LEGISLATION

GEOTHERMAL POLICY PROJECT
NATIONAL CONFERENCE OF STATE LEGISLATURES
1405 CURTIS STREET, SUITE 2300
DENVER, COLORADO 80202

JULY 1978

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ISSUES IN GEOTHERMAL LEGISLATION

INTRODUCTION

Geothermal resources have significant potential as an alternative energy source. High-temperature geothermal fields can be tapped for electrical generation, while lower-temperature reservoirs find their utility in various "direct use" applications: industrial process heat, space heating and cooling, greenhousing, crop drying, food processing, aquaculture, snow removal, balneology. The United States is the current leader in electrical generation but trails other countries in direct use of the resource. In both cases, only a small fraction of the geothermal potential is being realized.

Geothermal resources are especially attractive because development promises to be less environmentally damaging than exploitation of fossil and nuclear fuels. In addition, some geothermal fields may comprise "income" energy sources--that is, virtually inexhaustible or potentially renewable. These advantages, plus the extent of the resource, present a unique opportunity for future energy development. And, since geothermal exploitation is in preliminary or initial stages, the scope for policymaking remains great.

A clear understanding of the nature of geothermal development is the first requirement for effective legislation. Geothermal resources have distinctive characteristics which should be recognized in state laws and regulations. Regulatory experience with other resources is an important reference, but may be misleading

when applied to geothermal development. Indeed, current state and federal geothermal policies are often criticized for excessive reliance on oil and gas or water law precedents.

NATURE OF THE RESOURCE

Geothermal resources are a complex mix of elements. Natural heat from the earth's interior is the central energy component--but fluids, dissolved minerals and gases, and pressure also may be resource constituents. Geothermal systems occur in a variety of geologic settings, including hydrothermal and geopressured reservoirs, hot dry rock and magma chambers. Only hydrothermal systems (vapor or fluid dominated) are presently in production. Development of hot dry rock, magma chambers and geopressured reservoirs awaits further technological advances to insure economic viability.

The commercial value of geothermal systems is dependent on numerous factors. Most important are reservoir temperature, size and depth, fluid quality and quantity, associated resource constituents and access to geothermal markets.

The location of a geothermal reservoir is a vital factor affecting its commercial potential. Heat energy (enthalpy) cannot readily be stored or transported over long distances. The wide market enjoyed by fossil and nuclear fuel producers, therefore, is not available to geothermal suppliers. Geothermal operations are tied to local buyers who can utilize a specific resource (temperature, flow rate, salinity, etc.) near the producing field. Recovery of resource constituents ("by-products") may enhance the value of geothermal prospects.

STATE POLICIES

Geothermal resources are a novel energy source of diverse character.

Exploration, production, and marketing pose unique problems to a growing geothermal industry. State legislators also are faced with a major challenge. Resource characterization and determination of ownership rights, resource distribution, regulation of field development and production, facility siting and utility commission regulations, taxation, capital formation and market expansion all are subject to legislative initiative. For geothermal resources to supply their full potential, policies must be established in these areas providing prompt access and secure rights to the resource, efficient regulatory procedures, equitable tax treatment, investment incentives and a substantial market.

The remainder of this paper describes potential legislative actions to encourage the efficient development of geothermal resources. For each area, policy objectives and legislative options are outlined. The issues presented are generic in nature, and the range of options may not be suitable for every state.

RESOURCE CHARACTERIZATION

RESOURCE CHARACTERIZATION

Geothermal resources are similar in some respects to water, minerals and gas. As a result, considerable disagreement--including litigation--has arisen over the essential nature of the resource and corresponding ownership rights. This climate of uncertainty impedes geothermal development and makes resource characterization a major issue. As long as the nature of geothermal resources remains unclear, ownership also will be uncertain. As a result, geothermal entrepreneurs face the difficult task of negotiating with all possible lessors for access rights. Legislative concerns include the definition of resource elements, designation of ownership rights and the relationship of geothermal resources to other resource categories, especially water.

OBJECTIVE: IDENTIFICATION OF THE GEOTHERMAL RESOURCE AND ITS CONSTITUENTS

This is a matter of statutory definition. The definition identifies just what resource is subject to geothermal legislation and serves as an important reference for the courts in resolving disputes and as a model for private contracts.

Issue: Does the definition adequately identify geothermal systems and elements?

Options: A broad, general definition may be adopted. Alternatively, characteristics of the various resource forms (hydrothermal, geopressured, etc.) may be specified. Subsurface heat energy, a transfer medium and associated byproducts are essential elements of the geothermal resource. Pressure is another possible component. Minimum

temperature and depth levels may be employed for greater specificity. Byproducts may be described generally or listed--many states exclude hydrocarbons and helium.

OBJECTIVE: DETERMINATION OF THE LEGAL STATUS OF GEOTHERMAL RESOURCES

Determination of the legal relationship of geothermal resources to established resource categories and the corresponding application of existing law--including implications for ownership--often have been left to the judiciary. However, a legislative assignment has several advantages. Unlike courts, legislatures are not precedent bound, nor are they limited to the factual dispute at hand. Rather, they may examine a wide range of facts and make decisions on the basis of public policy.

Issue: How should geothermal resources be classified?

Options: Geothermal resources have generally been classified, if at all, as water, mineral or sui generis (unique). Constituents (heat, fluid or vapor, dissolved minerals and gases, pressure) may perhaps be classified individually.

Issue: What is the legal relationship between geothermal fluids and groundwater?

Options: Geothermal fluids may be considered groundwater and regulated accordingly. However, existing water allocation procedures--especially in the water short western states--may impose considerable constraints on development. To minimize the problem, requirements for water rights may be limited to consumptive use (fluid not reinjected, additional cooling water). Also, geothermal appropriations might be "perfectable" as "developed" water--not ordinarily part of the general supply.

Geothermal fluids may be distinguished from groundwater in at least two ways. A distinction may be drawn according to the depth and/or temperature of the producing horizon. Alternatively, a "use" definition may be adopted, whereby fluids withdrawn for their heat content are designated geothermal--not water--resources. A conflict between geothermal and water rights may arise under this approach, requiring a determination of their relative status. Superiority might be assigned according to temporal priority or to a scale of preferred ("beneficial") uses.

Finally, geothermal fluid production may be exempted from water laws unless interference with groundwater aquifers is indicated. Such an exemption can be designated a "rebuttable presumption" so that the initial burden of proof does not fall on geothermal developers. This would recognize that geothermal reservoirs are probably most often distinct from groundwater aquifers.

Issue: Has geothermal ownership been clarified?

Options: Classification of geothermal resources may determine ownership as well. Mineral rights are usually in subsurface estates, while water rights are usually in surface estates. In the western states, water rights, especially to groundwater, may be in the public domain. Legislative manipulation of these rights can produce various mixes of public and private ownership: as water (public domain) a state could claim all geothermal resources; as water (surface estate) a state would possess all geothermal resources underlying state lands; as mineral (subsurface estate) a state would own all geothermal resources where it possesses the mineral estate, including those under state lands and those under private lands where the state retains a mineral reservation. A sui generis designation could be assigned to any of these estates.

RESOURCE ACCESS

REGULATORY EFFICIENCY

LAND USE
PLANNING

DEVELOPMENT
RIGHTS

EXPLORATION
RIGHTS

RESOURCE ACCESS

Access for exploration and development is a fundamental requirement for geothermal legislation. The access system influences the rate of exploration and development, protects public and private interests and controls fragmentation and monopolization of the resource. Many regimes are possible, but it is vital that the process chosen be streamlined and efficient, with coordination of access procedures for state, federal and private lands. As a first step, it would be helpful to identify land available for geothermal development.

OBJECTIVE: LAND USE PLANNING FOR GEOTHERMAL DEVELOPMENT

Some lands may be deemed unsuitable for geothermal development due to environmental, social, economic, or other reasons. It is important to delineate available lands so that entrepreneurs can concentrate their exploration efforts in the appropriate areas. The planning mechanism for these decisions should not impose a barrier to development through excessive delay in review periods.

Issue: How should geothermal areas be delineated?

Options: Land use and zoning plans should address potential geothermal development. Local agencies can prepare a geothermal element to a general plan, and areas unsuitable for development may be withdrawn from entry. KGRA (Known Geothermal Resource Area) designations may be employed for land categorization, according to various criteria: presence of a producing well, geology, well data and competitive interest.

Issue: Does an adequate land use planning mechanism exist?

Options: Determination of the respective roles of state and local planning agencies is required. Local control over small facility siting, especially for direct use, may be desirable. On the statewide level, designation of a lead agency or creation of an inter-agency task force are streamlining options. Adequate funding and administrative expertise are necessary, and appropriations for resource assessment may be worthwhile.

OBJECTIVE: DISTRIBUTION OF ENTRY AND DEVELOPMENT RIGHTS

Distribution of exploration and development rights through permits, patents, leases or appropriation is the basic task in this area. In order to stimulate development, costly delays, burdensome requirements and overlapping jurisdictions must be minimized at all stages of the distribution process.

Issue: How should entry rights for resource exploration be granted?

Options: Entry rights should correspond to the ownership regime in effect and the type of land (state/private, KGRA/non-KGRA) in question. For geothermal "public domain" resources, access to both state and private lands would need to be addressed. For geothermal "surface" resources, access to state lands would be necessary. For geothermal "mineral" resources, access to state mineral estate (public) and mineral reservation (private) lands would be required.

Leases may be issued for exploration purposes, particularly when the lands are in a KGRA. Leasing provides security for discovery investments but may reduce ease of access due to review requirements. An alternative system might employ exploration permits, possible as an exclusive right.

Ease of access can be influenced by minimizing environmental and other agency review processes at the exploration phase. If permits are used, security for investments can be provided through conversion privileges (preferential rights to a lease) or by allowing exploration expenditures to be credited against lease bids. Permit duration, rentals, work commitments and surface use stipulations are additional concerns.

Issue: What mode of resource access should be adopted?

Options: Three models are familiar options for resource distribution on public lands: patents (hard rock minerals), appropriation (water) and leases (oil and gas, coal, common minerals). Patents commit surface and resource ownership to developers; leasing and appropriation provide for surface occupation and production rights while retaining surface and resource ownership in public hands.

Issue: How would a patent system work?

Options: After obtaining entry rights and locating a commercially viable geothermal resource, explorers would be entitled to apply for a patent. Some state constitutions or enabling acts may prohibit disposition of state lands at less than full market value. Environmental review might be appropriate before granting a patent.

Issue: How would an appropriation system work?

Options: After gaining entry, entrepreneurs would be authorized to divert (appropriate) a specific quantity of discovered geothermal resources, probably in conjunction with a surface occupation license. The quantity authorized would be related to the intended use of the resource. Environmental review would probably occur prior to actual production.

Issue: How would a leasing system work?

Options: Convertible exploration permits would lead to non-competitive leasing for the subject lands. A more flexible approach is possible with other types of entry rights. For instance, a "two-tier" leasing system could be employed, whereby lands with high geothermal potential (KGRA) are leased competitively (by bid) and other areas are leased non-competitively (by application). Possible bidding factors include cash bonuses, royalties or profit shares, rentals and work commitments. Environmental review might be required prior to lease issuance.

Lease terms should balance public and private interests in the resource. Public interests include fair return of resource value, efficient production and protection of surface lands. Private interests include security of tenure, flexibility in development and profitability. Relevant terms address lease duration, renewal, rentals, bonding, stipulations (work commitments, environmental conditions, covenants for surface restoration), royalties or profit shares and renegotiation.

Issue: Does the access regime address fragmentation and monopolization of the resource?

Options: Many states have adopted acreage limitations. Minimum acreages are set for individual parcels, while maximum acreages are applied to both individual and total holdings. Maximum number of parcels or number of townships occupied are other options for limiting total holdings.

Acreage limits should correspond to the needs of geothermal development. Minimum acreages that are too high may inhibit small-scale projects, while maximum acreages that are too low may impede exploration and prevent developers from securing their investments in a reservoir.

Issue: Is the access regime a streamlined process?

Options: This is an important area for policy initiatives and is essentially a cost-free method of stimulating development. Burdensome requirements should be minimized. For instance, environmental review should correspond to the level of activity in question. Overlapping jurisdictions can be dealt with by allowing single reviews, permits and bonds to satisfy multiple jurisdictions and by designating lead agencies. Costly delays can be reduced by specifying time periods for agency review processes.

FIELD DEVELOPMENT

REGULATORY EFFICIENCY

DRILLING
CONTROLS

ENVIRONMENTAL
REGULATION

RESERVOIR
MANAGEMENT

FACILITY
SITING

RESOURCE
ALLOCATION

REGULATION OF FIELD DEVELOPMENT

Regulation of field development can generally be achieved through existing regulatory mechanisms, with specific geothermal modifications as required. Drilling controls, reservoir management and allocation of production rights, facility siting and environmental regulation are areas of concern. Of prime importance is the institution of a streamlined regulatory effort. Coordination of state and federal efforts is an important avenue to be pursued.

OBJECTIVE: ADOPTION OF GEOTHERMAL DRILLING CONTROLS

Most states have relied on their oil and gas agencies to regulate geothermal drilling. Prevention of groundwater contamination (faulty drilling may establish pathways between previously isolated aquifers) is of central concern. Blowouts are a potential problem with high-temperature/pressure geothermal wells.

Issue: What drilling controls should be authorized?

Options: Information on geothermal drilling will assist in the institution of controls. Legislatures may mandate that well logs be maintained and made available to the appropriate agency. Information on temperature gradients and bottom-hole temperatures also will aid resource assessment.

States should authorize the responsible agency to require appropriate drilling practices. Special attention is usually paid to reinjection and well abandonment. Blowout prevention equipment (BOPE) and adequate well casing are other regulatory concerns. Stringent controls appropriate for deep, high-temperature wells may be unnecessary for shallow, low-temperature wells.

OBJECTIVE: RESERVOIR MANAGEMENT AND ALLOCATION OF PRODUCTION RIGHTS

Geothermal fluids are "migratory" or "fugitive" in nature, similar to oil and gas or groundwater. Withdrawal at one site may reduce production potential at other sites on the same reservoir. Therefore, when a reservoir is shared by competing developers, allocation of production rights may be required to avoid a wasteful race to produce the resource.

Various reservoir management techniques and allocative schemes have evolved to control overdrilling and inefficient withdrawal of petroleum and water. These also may be adapted to geothermal production; however, the unique aspects of geothermal development should be observed when promulgating such regulations.

Issue: What reservoir management techniques should be authorized?

Options: A well-spacing plan is the most common method of governing withdrawal rates on a reservoir. Pooling of tracts is usually employed as well to avoid inequities to small parcel owners who might otherwise be prevented from drilling. Other measures also may be necessary, such as production restrictions and unitized operations (voluntary or mandatory). Geothermal unit development, however, raises anti-trust questions, and the quantitative allocation of reservoir heat content is a difficult task.

Issue: How should production rights be apportioned among competitive interests?

Options: Existing models of resource allocation in petroleum and groundwater reservoirs include "rule of capture," "reasonable use," "correlative rights" and

"appropriation." Efficient resource management will be difficult where state, federal and private leases exist in the same reservoir, unless allocative methods are integrated.

The rule of capture is essentially non-allocative: whatever can be reduced to possession becomes the property of the producer. The resulting race to "capture" the resource can have detrimental effects (mining) on reservoir performance. Production restrictions or unit operations can mitigate this problem.

The doctrine of reasonable use, whereby production is unlimited for the benefit of the drilling parcel, also could result in mining of the resource. Reasonable use prohibits transportation of fluids off the drilling parcel if the common supply would suffer. This prohibition on transport could be a serious impediment to geothermal marketing. Unitization or production restrictions might again be necessary to avoid reservoir deterioration.

Correlative rights to a resource are assigned on a pro rata basis, while seeking to keep total withdrawal within reservoir capacity. This would require information on reservoir characteristics. The allocation of enthalpy would be of particular concern under this approach.

The appropriation doctrine would grant exclusive rights to a specific quantity of geothermal fluid, defined by "beneficial use" (volume marketed) and accorded a temporal priority. Subsequent operations would be licensed only if prior rights were unimpaired. Under existing laws, not all states would recognize energy production as a beneficial use of water (geothermal fluid).

OBJECTIVE: ESTABLISHMENT OF FACILITY SITING PROCEDURES

Facility siting is bound up with land use and environmental issues. Regulatory efficiency is again the prime concern. Long lead-times for permitting energy facilities will seriously delay return on geothermal investments.

Issue: Do appropriate facility siting procedures exist?

Options: States may incorporate geothermal facility siting under existing statewide procedures. Lead agency designation or creation of an inter-agency task force are streamlining options. Alternatively, since local utilization of geothermal energy is necessary, county or municipal level agencies may be best suited to perform the review functions.

These approaches may be mixed according to the type of facility in question. For instance, is the facility for electric generation or heat transmission? If electric, is its capacity over a certain megawattage? If direct use, are associated pipelines over a certain diameter and length? Under any approach, attention should be paid to eliminating redundant permitting and bonding requirements and to avoiding costly delays.

OBJECTIVE: INSTITUTION OF APPROPRIATE ENVIRONMENTAL REGULATION

While geothermal development promises to be comparatively harmless to the environment, certain specific hazards should be addressed. Construction and drilling entail surface disturbance which may create erosion problems, destroy habitat and impair aesthetic values. Air pollution, water pollution (surface and groundwater), noise pollution, solid waste disposal and subsidence/seismicity effects

also should be examined. Impact review prior to development and regulation of actual operations are two modes of environmental management. A streamlined process is imperative.

Issue: When is impact review applicable to geothermal development?

Options: Many states have enacted "little NEPA's" which require environmental impact review of proposed state actions (lease or permit issuance, facility siting license). Formal review prior to a commitment to commercial production may be a hindrance to development. The scope of review at this stage may be limited to exploration impacts. Acquisition of baseline data during the exploration phase, however, may expedite later full impact review and subsequent permitting for operation. Generally, a lead agency will prepare impact review documents, with participation from other involved agencies and private parties. Streamlining options include limits on agency review periods, public participation and judicial appeals.

Issue: How should geothermal operations be regulated?

Options: Licensing of equipment, environmental bonds and lease stipulations, monitoring requirements and waste discharge permits are various approaches to environmental regulation. Pollution standards (emission or ambient) may be required as part of a federally approved or managed system under the various national pollution statutes. ReInjection is generally seen as the answer to brine disposal, although groundwater protection must be addressed.

A lead agency approach would be particularly valuable to coordinate regulatory activities regarding air, water, noise, solid waste and subsidence/seismicity. Permits and bonds applicable to multiple jurisdictions would help make environmental regulation more simple and less time consuming.

MARKET REGULATION

MARKET REGULATION

The availability of geothermal markets will ultimately determine the pace of development. Many legislative initiatives are available to clarify the geothermal market situation. Of major importance are utility regulatory issues, such as access to transmission systems and rate regulation. Novel market structures for direct use of geothermal resources should be considered as well.

OBJECTIVE: CLARIFICATION OF THE GEOTHERMAL-UTILITY INTERFACE

Utilities, traditionally conservative institutions, may be reluctant to participate in geothermal development due to its novelty and inherent uncertainty. If geothermal developers themselves generate electricity, questions arise concerning access to existing transmission systems and rate regulation of electrical sales. Investor-owned utilities may be reluctant to interconnect with non-utility or publicly-owned geothermal projects--especially if the power is to be delivered (wheeled) to other than the utility's own customers. Private geothermal generation facilities may not offer an adequate return on investment if electrical sales are rate regulated by utility commissions.

Issue: How can geothermal transmission access be provided?

Options: States can mandate utilities to interconnect with and wheel geothermal electricity, as long as the geothermal developer is willing to bear the cost of extra facilities, and system reliability is preserved. Designation of transmission

systems as "common carriers" (available to all electrical producers at equitable prices) is another approach. The utility provisions of the National Energy Act (under Congressional consideration) may grant jurisdiction in this area to the Federal Energy Regulatory Commission (FERC).

Issue: Should geothermal electrical sales be rate regulated?

Options: State may exempt small power producers from utility-style rate regulation if electricity is merely marketed to existing utilities for resale or is used by industries at the production site. Negotiation with the FERC may be necessary since wholesale of electricity is subject to federal jurisdiction. (FERC has not, however, exercised its jurisdiction over cogeneration plants selling excess power to utilities in the Pacific Northwest.) The National Energy Act may authorize the FERC to exempt small power producers (especially from alternative energy sources) from utility regulation.

OBJECTIVE: CONSIDERATION OF DIRECT USE MARKET STRUCTURES

The utility status of geo-heat facilities should be decided, and transmission access is again an issue. Heating district formation is an avenue which should be examined. The scope for legislative innovation is great in this area due to the limited development of geothermal direct use to date.

Issue: Should geo-heat distribution be rate regulated?

Options: To encourage the development of alternative energy sources such as

geothermal, exemption from utility-style rate regulation may be a worthwhile option. This would allow geo-heat to find its natural competitive position with respect to other heating methods.

Issue: How can transmission access for geo-heat be provided?

Options: Electrical transmission corridors may be the logical choice for geo-heat distribution. Legislative easements for pipelines would guarantee access to such corridors. Eminent domain authority for geo-heat distributors also may be necessary in order to complete transmission systems.

Issue: What market structures will facilitate direct use of geo-heat?

Options: Zoning for geothermal operations (industrial parks, etc.) is a valuable tool for stimulating development. Heating district formation is another promising avenue. Existing special districts may have their charters expanded or special geothermal districts created. Easements, power of eminent domain, bond authority and power to levy special assessment taxes are relevant to district heating.

INCENTIVES

TAXATION

MARKET
EXPANSION

INVESTMENT

INCENTIVES

Resolution of the issues raised in the previous sections would constitute a potent incentive to geothermal development. There are, however, additional factors within the purview of state legislatures. Geothermal resources must compete in an artificially priced and subsidized energy market. Moreover, the uncertainty surrounding such a novel resource inhibits capital formation and market development. Policymakers should consider measures to equalize the competitive position of geothermal resources and stimulate market development.

OBJECTIVE: EQUALIZATION OF THE COMPETITIVE POSITION OF GEOTHERMAL RESOURCES

Producers of most energy fuels are accorded various tax benefits. The extension of comparable benefits to geothermal resources should be considered. Early institution of tax benefits will avoid the need for major adjustments in the flow of tax dollars at a later date.

Issue: How can equitable tax treatment of geothermal development be achieved?

Options: Deferral of ad valorem assessment until commercial production begins (or substitution of a well-head tax) is an important property tax option. Otherwise geothermal producers face a significant tax burden during the long years of field and market development. Exemption from property taxes (or a refund) on non-productive tracts may be another worthwhile option.

In the income tax area, depletion allowances and deductions for current (exploration/development) expenses can be extended to geothermal operations as with other energy fuels. Investment tax credits are a further possibility to encourage development.

Finally, various gross-receipts, excise, severance, conservation and franchise taxes may be applicable to geothermal development. To facilitate investment decisions, the application (or exemption) and levels of such taxes should be defined.

OBJECTIVE: STIMULATION OF GEOTHERMAL INVESTMENT AND MARKET DEVELOPMENT

Uncertainties and delays in development may make utilities and other investors reluctant to commit capital to the geothermal industry. Due to its novel character, public acceptance of geothermal energy may be slow to develop. Private investment in geothermal equipment may appear non-competitive with other energy systems unless life-cycle costing is performed, or tax benefits are available. Various policy options are available to ameliorate this situation.

Issue: How can investments for geothermal development be increased?

Options: A geothermal loan guarantee program has been established on the federal level. Securities Commission rulings that geothermal investment is "sound" or "prudent" could open the way for institutional participation. Public funding for exploration, resource assessment and demonstration projects may be considered.

Utility investments in geothermal development may be encouraged by allowing costs to be expensed (as for research and development costs), included in the rate base (even if the field or facility fails) or allowed a higher rate of return. States may require utilities to purchase geothermal power if the cost is reasonable.

Issue: How can the geothermal market be expanded?

Options: Public acceptance can be influenced through education, funding of demonstration projects (such as geo-heating state buildings) and offering tax benefits. Examples of the latter include property tax exemptions for geothermal improvements

and income tax credits or deductions for investments in geothermal equipment, whether retrofitted or original. The availability of risk insurance on field longevity and facility performance may influence potential customers. Life-cycle cost analysis for energy systems in new or renovated state buildings also may be mandated, so that geothermal heating or cooling is adopted whenever it proves economically competitive.

CONCLUSION

Geothermal reserves are a major new energy resource, representing a secure domestic supply with relatively minor environmental dangers. Innovative state legislation can provide a substantial impetus to geothermal development. While comprehensive policymaking would focus on all the outlined areas, a step-by-step approach would still be valuable. In any case, new policies should be monitored and revised as necessary to insure effectiveness in operation.

PACKET OF BACKGROUND MATERIAL

Purpose: a thorough discussion of the nature of geothermal resources and various development opportunities available (including nonelectric) and the different social, economic and resource values associated with them.

Highlights: (1) "State Policies for Geothermal Development"

- (2) Expanded analysis of state regulations as they affect:
 - geothermal utility markets
 - securities issues
 - environmental protection
- (3) Multiple, nonelectric applications
- (4) Issues regarding:
 - power of eminent domain and other utility franchise matters
 - facility siting
 - water appropriation
- (4) Important state legislation reported and analyzed
- (5) Reports from research efforts by:
 - USC Law Center
 - Indiana University
 - Virginia Polytechnic Institute
 - Batelle
- (6) Conclusions of Operation Research studies

Outline of Possible Study Areas

(1) WATER LAW ISSUES

(a) Resource Classification

- water
- mineral
- sui generis

(b) Applicability of state water laws to geothermal

- water law plus geothermal law
- water law only
- geothermal law only (if no interference)

(c) Technical assessment

- is geothermal water the same as ground water?
- define by use?

(d) Ownership implications

(e) Enabling act question

(2) DIRECT USE ISSUES

(a) Applications/development opportunities

- heating and cooling of buildings
- industrial processing
- agriculture/aquaculture

(b) District heating

- type and size necessary for geothermal
- necessary authorization
- appropriate powers(contract for services, issue bonds, levy property taxes and exercise power of eminent domain)
- utility interface
- land use zoning

(c) Self-supplied heating

- authorization

(d) Excess/supplemental energy (especially for industrial use)

- sale to utilities of excess
- supplemental needs from utilities

(e) Incentives/economics

(f) Capital formation

(g) Characterization/ownership of resource

- distinguishing shallow, low-temperature geothermal resources from ground water (by use?)

(3) UTILITY INTERFACE ISSUES

(a) Facility siting/zoning

- special procedures for geothermal plants
- state vs/ cpimtu/municipality

(b) Power transmission

- authority to order interconnections/wheeling
- federal jurisdiction/state authority

(c) Utility status

- exemption of private producer (marketing to utility, public or self-supplier)
- federal jurisdiction/state authority

(d) Rate base/allowable expenses

- expansion of base
- research and development expenses
- risk insurance for buyers

(e) Rate of return

- accelerated for geothermal investment

(4) ENVIRONMENTAL REGULATION ISSUES

(a) Application of existing statutes/regulations

- air
- water
- solid waste
- noise
- seismicity/subsidence
- land use

(b) Federal requirements vs. state discretion

- alternatives

(c) Need for baseline data/monitoring

(d) Regulatory efficiency/streamlining permitting process

- review periods
- public participation
- judicial appeals and limits
- number of separate permits
- number of development stages and which ones require permits
- degree of specificity required

(5) INCENTIVES ISSUES

(a) Securities regulation

- what type affect geothermal
- alternatives

(b) Tax policy (applicability/benefits)

- property (ad valorem exemption, well-head tax)
- income (credits and deductions, depletion, current expensing)
- gross receipts (applicability of sales, severance, excise, franchise, conservation taxes)

(c) Funding alternatives/capital formation

- bond authority
- public funding of demonstration projects
- loan guarantees
- higher rate of return on utility investments
- risk insurance

(d) Educational programs

(e) Market demonstration

- demonstration projects (geoheat state buildings, etc.)
- institute life-cycle cost analysis

INTRODUCTION

This preliminary state profile is a compilation of existing information on geothermal resources in Hawaii. Its purpose is to initiate a comprehensive policy review of state laws and regulations affecting geothermal development to be undertaken by the Hawaii Legislature in concert with the Geothermal Policy Project of the National Conference of State Legislatures. The goal of this review is to encourage the efficient development of Hawaii's geothermal resources. A more comprehensive state profile will be developed later.

The profile is divided into four major parts:

I. POTENTIAL RESOURCE

- A. Physical Characteristics
- B. Location

II. RESOURCE APPLICATIONS

- A. Existing Uses
- B. Potential Uses
- C. Energy and Economic Value

III. STATE LAWS AND REGULATIONS

- A. Legislation Prior to 1978
- B. 1978 Legislation
- C. Regulations

IV. POLICY CONCERNS

- A. Resource Characterization
- B. Resource Access
- C. Environmental Review
- D. Direct Use Applications
- E. Incentives
- F. Miscellaneous

I. POTENTIAL RESOURCE

A. Physical Characteristics

In Hawaii, there are a variety of geothermal resources. Subsurface heat anomalies may exist as:

1. molten magma,
2. hot dense rock,
3. hot porous rock,
4. steam, or
5. hot water.

Magma chambers are the characteristic rock system of the islands. To be utilized for geothermal energy production, they must lie sufficiently near the surface to be penetrated by drilling.

Hot dry rock results when magma chambers intrude close enough to the surface to heat the overlying rock to high temperature. To be utilized, the rock's heat must be brought to the surface by injecting water or some other heat transfer medium.

Steam and hot water are hydrothermal reservoirs found in hot volcanic or intrusive igneous rocks where water has been trapped by an impermeable layer of caprock. The hydrothermal systems are formed by volcanic intrusion to or near the surface and deep circulation of surface waters along crustal faults.

The Puna District on the Island of Hawaii is the only area in the state where extensive study--including a 6,400 foot research well--has been conducted to determine the physical characteristics of a geothermal reservoir. The Puna District, lying on the east rift of the Kilauea Volcano, is composed of lavas that are primarily basalts. The geothermal resource is liquid-dominated and slightly brackish, with high reservoir temperatures (350°C) and fluid pressure (2000 psi).

The research well has an electric generating potential of about 3.5 megawatts, and the reservoir capacity is estimated to be at least 500 megawatts. There also is evidence of potential geothermal sites in other parts of the Big Island.

B. Location

The assessment of geothermal resources in Hawaii is at a preliminary stage with no large-scale resource assessment yet undertaken. Exploratory drilling has been conducted only in the Puna District of Hawaii. The primary assessment program up to this point has been an analysis of groundwater wells. Using a high concentration of silica as a geothermal indicator, and including all wells at a temperature greater than or equal to 25°C, areas of possible geothermal potential have been identified on the islands of Hawaii, Maui and Molokai. Information for the Island of Oahu has not been compiled. Attachment A shows the geographic areas where concentration of wells with geothermal indicators have been located.

II. RESOURCE APPLICATIONS

A. Existing Uses

Geothermal energy is not presently utilized either for electrical generation or in any direct use (non-electric) applications in Hawaii.

B. Potential Uses

The Puna Reservoir test-well indicates a potential for electric generation on the Big Island. The high downhole temperatures and the ample flow of high quality steam indicate excellent potential for supporting an electric power-generating plant.

In direct use applications, potential areas where geothermal energy may be utilized include:

1. industrial processing,
2. agriculture and aquaculture,
3. hot water for residential and commercial establishments, and
4. tourist attractions.

A study of geothermal development in the Puna District indicates that the following specific uses could be made of geothermal energy on the Island of Hawaii:

1. processing tropical fruit,
2. wood processing and paper manufacturing,
3. heavy industry such as metal refining and processing manganese nodules,
4. development of tourist attractions around health spas, and
5. multiple applications in an industrial park where a combination of businesses could be supported by geothermal energy.

C. Energy and Economic Value

Geothermal energy, as an indigenous energy source, offers potential benefits to Hawaii, which, given the state's virtually complete dependence on imported

oil, are of importance to its economy. Although no exact figures are available, the benefits to the state from geothermal development can be generalized as follows:

1. Reducing the state's dependence on imported petroleum to fuel electricity generation would reduce cash outflow and lower the present uncertainty of continued reliance on oil from overseas suppliers.
2. With continuing increases in the price of oil, the price of electricity produced from geothermal energy should be lower.
3. Development of geothermal energy on the Island of Hawaii should stimulate many industrial applications, increase job opportunities and foster economic growth on the island. Similar activity should be expected on the other islands as geothermal development occurs.

III. STATE LAWS AND REGULATIONS

A. Legislation Prior to 1978

1. Ownership - A bill to define geothermal resources, to declare it to be a "mineral" and to provide for the administration and management of the resource in the public interest. (HB 2197 passed, Act 241-74, H.R.S. 182-1, amended HB 3033 (1978))
2. Property Tax Exemption - A bill to exempt from property taxes building improvements utilizing geothermal energy. (SB 2467 (1976) passed)
3. Utility Regulation - A bill to exempt nonfossil power generation from PUC regulation when the energy is used by the producer or sold directly to a public utility and also to authorize the PUC to require public utilities to purchase surplus power from such facilities. (SB 995 (1977) passed)

B. 1978 Legislation

1. Direct Use Applications - A bill to include funds for a study of non-electric uses of geothermal energy. (SB 1581/HB 3039 passed, Act 131-78)
2. Ownership - A bill to clarify state ownership of geothermal resources under privately owned land where no reservation of mineral rights was made. (No action)
3. Property Tax Deferral - A bill to defer payment of property taxes on property classified as geothermal well sites until energy is produced from the well and geothermal power is sold for commercial purposes. (No action)
4. Research & Development - A bill to appropriate \$1,090,000 for research and development, applications and demonstrations directed toward development

and utilization of geothermal resources (includes funds for a rift zone laboratory, resource assessment, state matching funds, and a study of non-electric uses). (SB 1581/HB 3039 passed, Act 131-78)

5. Resource Access - A bill to clarify the authority of the Board of Land & Natural Resources to promulgate certain rules and regulations for the exploration and development of geothermal resources including giving the Board (a) flexibility in setting lease bidding terms and payments other than royalties, and (b) authority to impose limits on numbers of leases or acres held by a lessee.

6. Utility Rate Setting - (a) A bill to give the Public Utilities Commission the authority to set rates for electricity generated by geothermal resources based on costs and a fair return on investment and risk, and to require that the PUC not consider the cost of generating an equivalent amount of energy from fossil fuel in establishing rates. (No action)

- (b) A bill to give the Public Utilities Commission the authority to set a just and reasonable rate for geothermal-produced steam or electricity without any provision as to what factors the PUC must consider. (SB 2165 passed, Act 132-78)

C. Regulations

The Department of Land & Natural Resources developed "Regulations on Leasing of Geothermal Resources and Drilling for Geothermal Resources in Hawaii" (Regulation No. 8)

The major provisions of the leasing regulations are:

A. Method - competitive bidding for all geothermal leases (mineral reserve lands may be leased non-competitively with two-thirds vote of the Board of Land & Natural Resources).

- B. Primary Term - ten years.
- C. Renewal - so long as geothermal resources or byproducts are produced in commercial quantities, up to 65 years; or 5 years with diligent drilling without production or with shut-in wells without market.
- D. Renewal of Rentals and Royalties - 15 year intervals, beginning 35 years after the lease date.
- E. Annual Rental - for the state as bid or set in the lease; or for the surface occupant as set by the Board of Land & Natural Resources.
- F. Royalties - primary = 10 to 20%; byproduct 5 to 10%.
- G. Acreage Limits - minimum lease: 100 acres; maximum lease: 5,000 acres or 2,560 acres if the length of the tract is more than 6 times the width; maximum state holding: 80,000 on developed acres.

In terms of drilling regulations, the major provisions of permits are:

- A. Length - 1 year with renewal of 180 days.
- B. Performance Bonds - \$50,000 per well.
- C. Well Spacing - wells must be located 100 feet from outer boundary or from a public road.
- D. Equipment Requirements - casing and cement; blowout prevention.
- E. Injection Wells - permit required.
- F. Well Abandonment - permit required.

IV. POLICY CONCERNS

Impediments to the development of Hawaii's geothermal resources occur in several areas of legislative concern. The following list is a preliminary guide for developing a study agenda for the policy review:

A. Resource Characterization

1. Ownership - clarify state ownership of geothermal resources on private land where conveyance does not include a mineral reservation.
2. Water Rights - clarify requirements of geothermal development vis-a-vis established water rights.

B. Resource Access

1. Delays - determine ways to overcome unnecessary delays in moving from lease application to energy production (standardized regulatory procedures, time limits on administrative actions, etc.).
2. Private Lands - decide on the role of the state in facilitating access to private lands.
3. Speculation - determine how to control unnecessary land speculation (setting time limits on development, etc.).
4. Land Use Planning - determine advisability of making geothermal development an allowed use in conservation and agricultural districts.

C. Environmental Review

1. Obstacles - determine ways to overcome unnecessary obstacles to development while protecting legitimate environmental concerns (differentiating exploration and development phases, designating a lead agency to coordinate regulatory activities, etc.).

D. Direct Use Applications

1. State Support - determine the best means for encouraging development of non-electric uses of geothermal (demonstration projects, life-cycle analysis, tax exemptions, financial and planning assistance for community and small business projects, etc.)
2. Market Structure - decide on utility status of geothermal heat facilities (formation of heating districts, zoning for geothermal operations, etc.)
3. Regulatory Requirements - differentiate requirements and procedures suitable for high-temperature geothermal resources but unnecessary for development of lower-temperature reservoirs.

E. Incentives - identify possible state incentives for development with some measure of their relative cost and efficiency. Several areas already have been identified.

1. Property Taxes - reduce burden (deferral from ad valorem assessment until commercial production begins, exemption on non-productive tracts, well-head production assessment in lieu of ad valorem, etc.).
2. Royalties - minimize, defer, or waive royalty payments on state-owned land.
3. Retrofit Incentive - encourage retrofitting of existing buildings, equipment or processes to utilize geothermal energy through income or property tax reductions.
4. Joint Venture - share costs of geothermal development.
5. Loans - lend funds or credit (loan guarantees) to geothermal developers.
6. Revenue Bonds - use state revenue bonds for geothermal development.

7. Utility Confidence - increase attractiveness of geothermal investments (exemptions from utility regulation, transmission access, higher rate of return, etc.).

8. Support Systems - provide roads, harbor facilities, water supplies and other needs of a geothermal area.

F. Miscellaneous

1. Research and Development - determine the need for and appropriate role of the state in research and development activities.

2. Power Interconnections - encourage the development of an energy linkage among the islands.

APPENDIX L

Preliminary
GEOTHERMAL PROFILE
STATE OF HAWAII

Geothermal Policy Project
National Conference of State Legislatures
1405 Curtis Street, Suite 2300
Denver, Colorado 80202
303/623-6600

August 1978

APPENDIX M

State Incentives for Geothermal Development

Presentation Outline for
GRC Short Course No. 7
May 17-18, 1978

Good morning. I've been asked today to talk about state geothermal laws and regulations. I'm honored to have been invited as a speaker, and I think it's especially important to be discussing state policies at a conference in Washington, D.C.

Federal as well as state policy-makers need to be aware that state laws and regulations have major consequences for the geothermal industry. State government may either expedite or obstruct efficient resource development, and the available alternatives should be understood.

In this regard, the Division of Geothermal Energy of DOE has funded special studies--like the water law analysis by Owen Olpin and Dan Tarlock. And the Division has an extensive operations research effort underway.

Results from these studies underscore the importance of state regulation. State jurisdiction touches every stage of geothermal development--from initial exploration and financing to final utilization and waste disposal.

To list some major areas:

State securities regulations, for instance, can expand or contract the amount of investment capital available to geothermal operators.

State statutory definitions affect a developer's ability to appropriate the resource. This is an area Owen Olpin discussed yesterday.

And of course, the effects of state development regulations on the costs and timing of development are often mentioned.

State lease provisions, utility regulations and taxation policies are other major areas of concern for geothermal development.

Ad valorem taxation, in particular, is comparable in magnitude to federal income taxes or a 10% federal royalty. This was pointed out yesterday by Dr. Rex. His figures for a 50 MW field in East Mesa over a 30-year operating lifetime were, I believe:

\$59.7 million -- ad valorem
 67.1 million -- federal income tax
 70.2 million -- 10% federal royalty
 (16.6 million -- state income tax)

I'm not going to attempt an overview of existing laws and regulations in all their detail and the various problems they may cause--except to include by reference the paper distributed for your study guides. It includes several charts and tables with numerous details about present state regulations.

Instead, I'm going to highlight some new areas for initiative and describe a program for comprehensive policy review that state legislatures are undertaking with the National Conference of State Legislatures--the organization I work for.

First let me mention what NCSL is. NCSL--the National Conference of State Legislatures--is the official representative of the 50 state legislatures. It serves legislators and staff much like a trade association. The organization is non-partisan, non-profit, funded by the states and governed by a 43-member Executive Committee. It's headquarters are in Denver, Colorado and it has an office of State-Federal Relations here in D.C.

Early this year, NCSL began a program to assist state legislatures with the development of geothermal policies. The Geothermal Policy Project has four staff and is funded by the DOE Division of Geothermal Energy. During the next two years, the project will work intensively with approximately twelve states in a systematic review of geothermal policies. We'll be providing background material to the participating legislatures, and we'll help design and staff legislative workshops as requested by the legislatures involved.

All concerned parties will be consulted in this effort. State legislators and legislative staff and executive officials will of course be intimately involved. Local officials, geothermal developers, investors, utilities, environmental organizations and the Department of Energy will be sought out, also, for their views.

Basic issues of resource ownership and definition and regulations for leasing and field development will be examined closely when problem areas are identified. In addition, a number of new policy areas will be studied, including state tax policies, securities regulations, bond authorization, direct appropriations and construction programs and utility regulatory policies.

The states have not given a great deal of attention to these areas, although in some cases important initiatives have been taken. A number of these are listed in Attachment One of this paper. In their review of state laws, legislators will be looking at these selected enactments as possible solutions to problems of geothermal development.

Direct Heat Applications

Direct use is an aspect of geothermal development which has generally been ignored, and I want to stress policy incentives in that area.

Problem: One of the major concerns for direct use is that the kinds of regulatory requirements and procedures suitable for petroleum development and deep drilling for high-temperature geothermal resources may be unnecessary and burdensome for developers of lower temperature reservoirs for direct applications.

Response: Possible solutions for that problem may reside in provisions of some state statutes. Idaho and Washington, for example, apply geothermal regulations only to electric production. Other uses fall under state water law. Oregon limits geothermal regulations to systems with temperatures greater than 250°F. Maryland similarly defines geothermal resources as having temperatures greater than 140°F.

Problem: A second problem is that conversion to geothermal space heating or cooling involves large initial investments and this deters potential users.

Response: Oregon has responded by establishing a loan program for veterans who install in their principal residence a non-conventional heating or cooling system (this includes geothermal). Several other states grant property tax exemptions or income tax credits or deductions for investments in geothermal systems. Those states include CO, HI, ID, MT, NV, and OR.

Problem: Also, district heating systems--if they're to be established--need state authorization to act as a utility supplier.

Response: Oregon, again, has responded by authorizing geothermal heating districts with authority to contract for services, issue general obligation and revenue bonds, levy property taxes and exercise the power of eminent domain. These are powers needed by a utility supplier.

Problem: The market for direct heat is another area for innovative state action. Geothermal needs an initial market to demonstrate the technology to consumers and to establish an economic base.

Response: Idaho is helping in this area by geoheating the state capitol. New Mexico requires a life-cycle cost analysis of alternative energy supply systems for new or renovated state buildings. This policy establishes a mechanism for discovering when geothermal heating is economically competitive and then adopting it. This is an important action, since widespread use of geothermal energy in state buildings could provide a substantial market and demonstration for the industry to develop around.

Problem: Another concern--which is actually common to all uses of geothermal energy--is that even if economically competitive and legally unimpeded, the resource may remain underutilized because it is poorly understood and because important institutional arrangements are missing. Who, for instance, will undertake the construction, operation and maintenance of a district heating system?

Response: Oregon responded to the institutional problem by authorizing a bond-supported program to encourage utilities and private individuals to use non-nuclear energy sources; emphasis was placed on geothermal and other little-used energy forms. (A bond authorization for the program was referred to voters and defeated. Reintroduction is expected in 1979.)

Electric Generation

Problem: Major utilities are not sufficiently confident in the reliability of geothermal reservoirs to commit themselves to large scale development.

Response: Hawaii exempts private power producers from utility regulation if they consume the energy themselves or market it to regulated electric utilities. California authorizes the state PUC to order utilities to transmit power produced by private producers of electricity from non-conventional energy sources. California allows a higher rate of return for utility investments in facilities which utilize non-conventional energy sources.

Problem: Long delays between discovery of a commercial geothermal field and the construction of a powerplant to utilize the resource make ad valorem assessment burdensome for developers. The imposition of large property taxes long before income can be realized also discourages developers from proving reservoir capacities prior to securing a market. This creates a chicken and egg problem.

Response: Arizona has a well-head production assessment, in lieu of ad valorem.

Problem: Geothermal development is at a disadvantage when tax benefits allowed to other energy industries are not granted to geothermal developers.

Response: Arizona provides geothermal developers a percentage depletion allowance (as for oil and gas) and permits current expensing of exploration and development expenditures.

These selected policy initiatives are preliminary steps that will help geothermal development reach its full potential, and examination of these innovative measures will be an important part of review programs for state geothermal policies.

ATTACHMENT ONE

State Financial Incentives Applicable
to Geothermal Resources

Arizona H.B. 2257 (1977)

Provides for property tax valuation on gross yield, in lieu of ad valorem assessment, for geothermal production facilities. Extends percentage depletion deduction to geothermal production. Allows deduction (or capitalization) for current exploration and development expenses.

California S.B. 77 (1976)

Empowers PUC to order public utilities to transmit electricity generated by private producers from non-conventional sources.

A.B. 4032 (1976)

Higher rate of return allowed for utility investments in renewable energy facilities.

Colorado H.B. 1519 (1977)

Commercial or residential investments for solar, wind and geothermal energy systems deductible for state income tax.

Hawaii S.B. 2467 (1976)

Property tax exemption for building improvements to use geothermal energy.

S.B. 995 (1977)

Exempts nonfossil power generation and transmission facilities from PUC regulation when energy used by producer or sold directly to public utility. Authorizes PUC to require public utilities to purchase surplus power from such facilities.

S.B. 1581/H.B. 3039
(1978)

Major funding provided for geothermal resource assessment; research and development of non-electric uses; and the rift zone laboratory.

H.B. 2165 (1978)

Makes rates paid by public utilities to geothermal developers for geothermal steam, or electricity from geothermal steam, subject to PUC regulation.

Hawaii	H.B. 3033 (1978)	Determines the applicability of excise taxes on geothermal gross proceeds. Provides for royalties in lieu of a severance tax. Clarifies utility access.
Idaho	H.B. 468 (1976)	Income tax deduction for investments in residential geothermal energy facilities.
Montana	S.B. 86 (1975)	Applies state coal tax fund to renewable energy projects.
	S.B. 167 (1977)	Tax credit for nonfossil energy systems (may apply to geothermal).
	H.B. 292 (1977)	Tax deduction for residential nonfossil energy generating systems (may apply to geothermal).
Nevada	S.B. 326 (1977)	State energy conservation standards for buildings must allow design and construction latitude to the extent that solar, geothermal, or other nondepletable energy sources are used.
	A.B. 277 (1977)	Property tax credit up to \$2,000 for residential geothermal facilities for heating and cooling.
New Mexico	S.B. 185 (1975)	Created permanent fund for energy research and development and appropriated funds.
	H.B. 395 (1975)	Life-cycle cost analysis of nonfossil energy systems required for new state buildings or major renovations.
	H.B. 2 (1978)	\$200,000 appropriation for establishing geothermal space heating demonstration projects. 100% matching funds required.
	H.B. 199 (1978)	\$2 million appropriation for energy research and development.

Oregon	S.B. 339 (1977)	Income tax credit up to \$1,000 for residential geothermal space heating.
	S.B. 477 (1977)	Loan program for veterans--up to \$3,000 for residential geothermal energy facilities.
	S.B. 572 (1977)	Energy Conservation and Production Fund financed by state bond issues established to assist utility companies and individuals in development of non-nuclear energy resources. Emphasis on geothermal and other resources not currently in widespread use. Oregon Department of Energy authorized to develop alternate energy projects, fix rates and sell energy.
	SJR 32 (1977)	Authorizes issuance of bonds for Energy Conservation and Production Fund (must be approved by voters).
	H.B. 3185 (1975)	Authorizes geothermal heating districts with contracting and bonding authority and power of eminent domain.
	H.B. 2159 (1977)	Authorizes waiver of state bonding requirements for well drilling if operation has bond with federal government.
Texas	HSR 24 (1977)	Requests all state agencies and universities to encourage feasibility studies and demonstration projects for alternate energy use in state buildings.
Utah	SJR 37 (1977)	Interim committee to develop legislation pursuant to Utah energy policy (SCR 1, 1977) for support of solar, geothermal, wind and hydroelectric energy development.

National Conference of State Legislatures

The National Conference of State Legislatures, the official representative of the nation's 7,600 state legislators and their staffs, works to help lawmakers meet the challenges of the complex federal system. Headquartered in Denver, Colorado, with an office of state-federal relations in Washington, D.C., the NCSL is a non-partisan organization funded by the states and governed by a 43-member Executive Committee.

To assist states with energy policy questions, the Conference has undertaken special study projects and published several reports. The Geothermal Policy Project is an important part of this effort.

National
Conference
of State
Legislatures

Geothermal Energy: A Program for Legislative Action

Geothermal Policy Project

The NCSL Geothermal Policy Project is designed to help states resolve problems that impede the production and use of geothermal resources. The project will provide individual assistance in the form of workshops, presentations and expert advice. Funding for this effort is provided by the Division of Geothermal Energy, U.S. Department of Energy.

The scope for state policy review is great. Unsuitable provisions in state and federal leases, improper applications of state water laws, obstructive permitting procedures and ambiguous or discriminatory tax statutes hobble the geothermal industry. In some states, laws to regulate the development of geothermal resources have not been enacted.

Other policy areas that need to be addressed include

ownership and appropriation of the resource, field development and pollution control, financing, power of eminent domain and utility franchise authorizations.

For the benefits of geothermal resources to be fully realized, state policies must be suited to the character of geothermal development. The Geothermal Policy Project will provide state legislatures with the information and assistance they need to achieve this objective.

State Selection

Selection of a state to participate in the project will be based on the state's potential for geothermal resource development, the need for policy review and the degree of interest expressed by the legislature. A workplan will be designed upon selection of a state outlining activities to be undertaken by the project in concert with the legislature.

Reference Materials

Information provided to each legislature participating in the project will include the following:

- **Packet of Background**

Materials—A comprehensive gathering of information on the nature of geothermal resources, opportunities for development, generic policy issues and important state legislation;

- **State Profile**—A concise description of the state's potential benefits from geothermal development and leading policy concerns, including an outline of the location and character of the state's geothermal resources and their potential applications;

- **Summary of State Actions**—A summary of state laws and regulations regarding geothermal development, highlighting legislative actions taken during the year.

Technical Assistance

As part of the policy review process, the project will provide individual assistance at the request of a participating state. Through workshops or more informal contacts, project staff will assist in analyzing policy

alternatives, describing legislative action taken in other states, and identifying important studies, expert witnesses and concerned parties available for assistance.

Comprehensive Analysis

To insure that the policy reviews conducted are thorough and complete, the project will engage expert consultants and other parties concerned with geothermal development. Participating in the multi-faceted effort will be

- State legislators and legislative staff;
- State and local officials;
- Geothermal developers, investors, utilities and other interested parties;
- Consultants from public and private research institutions; and
- Representatives of the Division of Geothermal Energy, U.S. Department of Energy.

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What Is Geothermal Energy?

Geothermal energy is the natural heat of the earth. Temperatures deep within the earth exceed 1000°C, and from this energy storehouse, heat flows steadily to the earth's surface. Volcanoes, hot springs and geysers are the most dramatic manifestations of the earth's internal heat energy.

But valuable geothermal resources are more widespread than these special displays. Subsurface reservoirs of concentrated heat are accessible over large areas of the globe for use in heating or electric generation. In the United States, zones with significant geothermal potential cover most of the western states, the Atlantic Seaboard and the Texas-Louisiana Gulf Coast.

Electricity Production

Geothermal resources worldwide presently supply some 1,500 megawatts of electrical power from more than a dozen geothermal areas.

The Geysers area north of San Francisco is now the largest producer. More than 500 megawatts of capacity have been installed—enough to satisfy a city of one-half million. By the year 2000, production at the Geysers is expected to reach 2,000 megawatts.

Direct Heating

The earth's heat is equally important globally for direct use in agriculture, industrial processing, and for heating and cooling of buildings. Geothermal heating has a long history in the United States at Boise, Idaho, and Klamath Falls, Oregon, and is being actively developed in many other states. The Soviet Union, Hungary, Iceland and New Zealand, however, far surpass other countries in direct application of geothermal energy.

Environmental Benefits

In addition to supplying valuable energy, geothermal development can help reduce environmental damage by supplementing other major energy sources. Uranium and coal stripmining, off-shore drilling and oil-tanker deliveries, coal-fired and nuclear powerplants and disposal of nuclear wastes have numerous undesirable side effects. They produce air and water pollution, disrupt the land surface and wildlife habitats, consume water resources and pose hazards to the public health. Moreover, these effects often are more serious and widespread than would result from geothermal projects supplying the same energy needs.

The Untapped Resource

Geothermal resources offer a secure, domestic

energy supply hundreds of times larger than is currently being realized. According to the U.S. Geological Survey, geothermal reserves in the western states are adequate to supply all new electrical capacity in those states for the next two decades. This energy potential—more than 100,000 megawatts—can be generated from natural steam and high temperature geothermal fluids at prices competitive with electricity from fossil and nuclear power plants.

A comparable potential for electric generation is expected as well from the geothermal-geopressured reservoirs of the Texas-Louisiana Gulf Coast.

Geopressured reservoirs also contain large amounts of dissolved natural gas, and if proven economically competitive, this source will more than triple present domestic natural gas reserves.

In the United States, the potential for direct use of the earth's natural heat is perhaps even greater than for electric generation. Geothermal reservoirs suitable for direct heating are the most widespread, occurring in eastern as well as gulf and western states. The demand for thermal energy also is

tremendous. Direct heat applications at less than 250°C account for 40% of the nation's total energy consumption. Natural gas, oil, coal and electric power presently supply this energy. These costly, high-grade fuels could instead be conserved through direct use of the earth's heat.