GEOTHERMAL POLICY PROJECT

QUARTERLY REPORT

For Period September 1, 1980 – November 30, 1980

January 1981

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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:

- Initiate state geothermal policy reviews
  --select target states
  --solicit legislative participation
  --arrange committee structure

- Provide technical assistance to state geothermal reviews
  --prepare background materials
  --conduct workshops/conferences
  --interact with executive agencies
  --publicize activities

- Liaison with geothermal community
  --assist other DOE geothermal contractors
  --interact with geothermal organizations/developers

- Project evaluation
  --monthly, quarterly and annual reports
  --summary of state actions

State assistance in the form of:

A. Reference Materials

1. General Reference Materials
   a. Geothermal Guidebook
   b. Geothermal Policies in Selected States
   c. District Heating: Legal & Institutional Parameters
   d. State Incentives for Geothermal Development
   e. State Policies for Geothermal Development
   f. Guidebook to Groundwater Heat Pumps

2. State-Specific Reference Materials
   a. State Addenda (to Geothermal Guidebook)
   b. Issues Profile
   c. Issue Briefs
   d. Legislative Options
   e. Legislative Proposals/Draft Legislation
   f. Workshop Summaries
B. **State Presentations and Technical Assistance**

As part of the policy review process, the project provides individual assistance at the request of the state. This assistance is directed toward making suggestions for legislative action and assisting the legislature in implementing those actions. The type of technical assistance provided in an individual state is determined by the unique requirements of a particular legislature. Types of assistance provided include presenting testimony to legislative committees, organizing workshops and conferences, identifying issues of concern, and developing legislative options and proposals. Investigating administrative responses to policy concerns is an additional aspect of project 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 are:

1. State legislators;
2. State legislative staff;
3. State and local officials;
4. Geothermal developers, investors, utilities and other concerned private groups;
5. Consultants from public and private research institutions; and
II. SUMMARY

During this quarterly reporting period, efforts continued to carry forward policy development in existing project states. Follow-up contacts were made with most project states, and state visits and meetings occurred in eight project states.

Several state-specific documents and one background document, Geothermal Policies in Selected States, were prepared during this reporting period.

In Yakima, Washington, the project cosponsored a geothermal symposium with the Washington State Energy Office, in addition to attending several other geothermal meetings and conferences.
III. PROJECT ACTIVITIES

A. State Activities

In the third quarter of the project's third year, efforts were continued to carry forward policy development in geothermal and water source heat pump project states.

1. Follow-up State Contacts

a. **Alaska**—Contact was made with Bob Speed, House staff, to review progress of a special project.

b. **Connecticut**—Contact was made with Ron Gingerich, Office of Legislative Research, who requested information on water source heat pumps.

c. **Maryland**—Contact was made with Myron Miller, Legislative Science Advisor, Department of Legislative Reference, regarding project activities in that state.

d. **Nevada**—Contact was made with Sam Hohmann and Laurie Barnett, Legislative Council Bureau, to review the geothermal legislative proposals.

e. **South Carolina**—Contact was made with Becky Martin and Joyce Marchand, Office of Legislative Research, regarding the September state visit.

f. **Texas**—Contact was made with Curtiss Brown, Chief of Staff, Senate Natural Resources Committee, regarding project activities in that state.

g. **Virginia**—Contact was made with Don Shull, Director of Research, Division of Legislative Services, regarding project activities in that state.

h. **Wisconsin**—Contact was made with Leslie Glusgreen and Jon Peacock, legislative staff, regarding water source heat pump activities in that state.
1. Wyoming--Contact was made with Gerald Fox, Senior Research Associate, Legislative Service Office, regarding project activities in that state.

2. State Visits and Meetings
   b. Maryland--Presentation of geothermal legislative options--September 30.
   c. Oregon--Field research--November 21.
   d. South Carolina--Field research and presentation of geothermal and water source heat pump issues and options--September 18; Committee meeting to discuss geothermal and water source heat pump legislative proposals--October 22.
   e. Virginia--Continuation of geothermal issues and options discussion initially presented in May 1980--September 9; Committee meeting to discuss geothermal legislative proposals--October 22.
   f. Washington--Field research and geothermal symposium (cosponsored with the Washington State Energy Office)--September 24 (see C.I.).
   g. Wisconsin--Meeting with Assembly Committee on Energy to present water source heat pump issues and options--November 12-13.
   h. Wyoming--Presentation of proposed geothermal allocation plan, per Committee request--September 26; meeting with state agency personnel and legislative staff on geothermal issues--October 31.

A compendium of project activities to date this project year is found in Appendix 1: "Geothermal Project State Activities: 3/80 - 11/80."
B. Project Materials

1. State-Specific Materials
   - Geothermal Policy Report: Legislative Options---State of Maryland (Appendix 2)
   - Memoranda to South Carolina Research Coordinator regarding geothermal and water source heat pump issues and options (Appendix 3)
   - Report to the Joint Energy Committee on Geothermal Energy and Groundwater Heat Pumps---State of South Carolina (Appendix 5)
   - Report to the Assembly Committee on Energy on Water Source Heat Pumps---State of Wisconsin (Appendix 6)

2. Background Materials
   - Geothermal Policies in Selected States (Appendix 7)

C. General Meetings and Conferences

1. Yakima, Washington, Geothermal Symposium---Project staff attended and presented a speech at this meeting cosponsored by the Washington State Energy Office and the NCSL Geothermal Project on September 24. Project staff spoke on "State Policy Concerns Related to Groundwater Heat Pumps." See attached agenda for other topics covered at the symposium (Appendix 8).

2. Fall Progress Meeting of the State Geothermal Commercialization Program, Rocky Mountain Basin and Range Region---Project staff attended this meeting held in West Glacier, Montana, September 24-25. The meeting included reports by the state commercialization teams of Montana, North Dakota, South Dakota, Utah, New Mexico, Colorado and Wyoming; presentations by Randall Stephens, Roy Mink, Mike Tucker and other U.S. DOE personnel; lectures by N.M.E.I., John Nimmons, Dick Meyer, Debbie Strunsacher and others; and the comments of the Industry Review Panel. The panel consisted of Dave Atkinson (Hydrothermal Energy Corp.), Art Lange (AMAX), George Vranesh (attorney) and NCSL project staff.
3. Geothermal Resources Council Rocky Mountain Region Luncheon—
Project staff attended and heard a representative of Phillips Petroleum
speak on geothermal development in Utah.

4. Geothermal Resources Council Annual Meeting—Project staff attended
and presented a speech at this meeting in Salt Lake City, Utah, September
9-11. The Project Manager spoke on basic legal parameters with regard to
geothermal energy.

5. Project staff attended the DOE Eastern Region Conference November
5-7 in West Virginia and presented a geothermal summary and prospectus.

D. Publicity

The September 1980 issue of the Geothermal Progress Monitor includes a
description of the Geothermal Project's technical assistance activities, as
well as a reference to the project's work with the Alaska Legislature in
preparing that state's recently enacted Comprehensive Geothermal Resources
Act (HB 779).

E. Liaison Activities

Liaison contacts were made as follows:

- Becky Beemer, Thermal Power, California
  -- discussion of Nevada and Hawaii activities and interests

- Gordon Bloomquist, Washington State Energy Office
  -- status of Washington activities

- John Nimmons, Earl Warren Legal Institute
  -- review of project activities

- Fletcher Paddison, Ned Tilman and Claude Leffel, Johns Hopkins
  University - Applied Physics Laboratory
  -- review of east coast geothermal activities and discussion of
  DOE Eastern Region Geothermal Conference

- Joel Renner, Gruy Federal, Inc.
  -- information on geothermal resource definition

- Lani Majysa, Arizona Bureau of Geology
  -- copy of State Policies for Geothermal Development

- Don Clements, U.S. DOE
  -- discussion of revision of groundwater heat pump guidebook
• Clay Parr, U.S. DOE
  -- review of progress towards UPL/Philips-AMAX agreement, prospects for legislation, and proposed language for the legislation

• Bonnie Heineman, U.S. Department of Commerce Energy Group
  -- information on water source heat pumps

• Fred Creswick, Oak Ridge National Laboratory
  -- information on geothermal and water source heat pump energy

• Dan Lim, U.S. DOE
  -- information on geothermal and water source heat pump energy

• Winnie Lehman, U.S. GAO
  -- material supporting the inclusion of water source heat pumps in the federal energy tax credit program

• Ron Thomas, Technical Research Analysis Co.
  -- information on geothermal taxation issues

• Syd Willard, California Energy Commission
  -- invitation to Project Manager to speak at a geothermal hearing on November 13

• Bill Toth, EG&G Idaho, Inc.
  -- changes in personnel

• Dick Meyer, Western Energy Planners, Inc.
  -- further liaison on geothermal taxes

• Dave Lombard, U.S. DOE
  -- copies of water source heat pump documents

IV. VARIANCE OR PROBLEMS

None.

V. PLANS FOR FUTURE REPORTING PERIODS

In the upcoming quarter activities in current project states will continue, including bill drafting and committee testimony, and new project states will be targeted and solicited.

A revision of the Guidebook to Groundwater Heat Pumps and development of a state geothermal problem matrix are also planned.
VI. APPENDICES

3. Memoranda to South Carolina Research Coordinator regarding geothermal and water source heat pump issues and options
5. South Carolina Report to the Joint Committee on Geothermal Energy and Groundwater Heat Pumps
6. Wisconsin Report to the Assembly Committee on Energy on Water Source Heat Pumps
7. Geothermal Policies in Selected States
8. Yakima Geothermal Symposium Agenda (9/24/80)
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*Document was included in monthly report appendices.*
Geothermal Policy Report

Legislative Options

Prepared for the Maryland Legislature

1980 Geothermal Policy Review

September 1980

Geothermal Project
Energy Program

National Conference of State Legislatures
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INTRODUCTION

Geothermal activity in Maryland is in initial stages. Thus, the state may establish a comprehensive legal foundation to guide the course of future development. For geothermal resources to supply their full potential, policies must be established providing prompt access and secure rights to the resource, efficient regulatory procedures, equitable financial treatment and a substantial market. Such legislative action would reduce uncertainty regarding rights to the resource, methods of development and obligations to competitors and the public interest.

The National Conference of State Legislatures Geothermal Project, in conjunction with the Maryland Joint Energy Committee, is engaged in a review of Maryland's geothermal policies in order to facilitate the development of this potentially significant indigenous energy resource. This report examines relevant issues regarding resource characterization, rights and access to the resource, regulatory procedures and finance and the options available to the state in those areas.
GEOTHERMAL POLICIES

This section presents a review of approaches to the geothermal resources taken by various states in the areas of characterization, access and allocation, regulation and finance. The information herein is not intended to be comprehensive, but is, rather, a brief overview of geothermal legislation in the following states:

ALASKA
CALIFORNIA
DELAWARE
HAWAII
MARYLAND
NEVADA
NEW MEXICO
OREGON
UTAH
VIRGINIA
WASHINGTON
WYOMING
Characterization

Definition.

Alaska defines geothermal resources as the natural heat of the earth at temperatures greater than 120°C, the energy, including pressure, the material medium and associated by-products.

Relationship to Water.

Geothermal development may not interfere with existing water rights unless the developer either purchases sufficient water rights to offset the interference or supplies an equivalent amount of replacement water of comparable quality. No appropriations of geothermal fluids may be made nor priorities established.

Ownership.

Geothermal property rights are included within state mineral ownership.

Access and Allocation

Permitting and Leasing.

Access to state-owned geothermal resources may be obtained via exclusive, convertible exploration permits or, in designated "Competitive Geothermal Areas," by leasing at public auction.

Resource Allocation.

The Alaska statute declares it is in the public interest to protect correlative rights, thus giving each owner in a geothermal system an equitable share of the resource in a geothermal system.

Pooling and Unitization.

The Department of Natural Resources may issue pooling orders, limits on production and must approve unitization agreements. If the lessees of at least two-thirds of a geothermal system ratify a unit agreement, the Department of Natural Resources may enforce the agreement amongst all leaseholders.
Regulation

The Department of Natural Resources has regulatory jurisdiction over all private, municipal, state and federal lands--and developers thereon.

Drilling Controls.

The Department of Natural Resources regulates the siting, spacing, drilling, casing, cementing and abandonment of geothermal wells; requires individual or blanket surety bonds; and may require a reinjection program.

Resource Protection.

The Department of Natural Resources requires approval of a plan of development and operation on each producing geothermal system. It may issue well-spacing orders, limits on production and reinjection requirements to prevent waste.

Streamlining.

Geothermal development and regulation are subject to Alaska's Environmental Procedures Coordination Act.

Financing and Marketing

Taxation.

Geothermal developers are subject to ad valorem property taxes and state income tax. Users will not have their property assessments raised due to geothermal installations.

Financing.

The Alaska Power Authority (APA) power project loan fund, capitalized by direct legislative appropriations, is available for small-scale power projects. APA also has various bonding and state-guarantee mechanisms available. The state may directly fund some projects.

Utility Markets.

A geothermal heating district, whether public or private, may be formed by boroughs or municipalities. Public Service Commission oversight would be directed at reliability of service matters.
The state is funding geothermal assessment activities as well as drilling at Pilgrim Hot Springs. It is creating an Energy Center to stimulate renewable energy development.
Characterization

Definition.

California laws define geothermal resources as the natural heat of the earth below the surface of the earth, which may be extracted, including all minerals in solution or other products obtained from the naturally heated fluids. Exceptions to the by-products include oil, hydrocarbon gas or other hydrocarbon substances. The definition does not include the material medium.

Relationship to Water.

Certificates of primary purpose may be obtained which provide a rebuttable presumption of ownership of the material medium (groundwater) to geothermal developers.

Ownership.

The Public Resources Code implies that the ownership belongs to the mineral estate owner. Three cases have considered this issue as well: Union Oil

U.S. mineral reserves v. private surface

Geothermal Kinetics

State mineral reserves v. private surface

Pariani

Private mineral reserves v. private surface

Access and Allocation

Prospecting permits may be issued to the first qualified applicant for lands not subject to competitive public bid. If the lands are selected for competitive bid before the prospect permit is granted, the applicant will be denied. The State Lands Division/Commission has the discretionary powers of changing permit terms. The prospecting permittee has the first right to the development if geothermal resources are discovered.

The State Land Division has jurisdiction over leasing. Leases are awarded on a competitive basis of a cash bonus, net profit, or other single biddable factor.
Regulation

Drilling Controls.

Rules and regulations pertaining to state lands are under the jurisdiction of the State Lands Commission. The drilling, operation, maintenance and abandonment are under the supervision of the Division of Oil and Gas. Proposed waste discharge reports must be filed with the Regional Water Quality Control Board. Operations must comply with applicable provisions of the law under the jurisdiction of the Department of Parks and Recreation, the Department of Fish and Game and the Division of Forestry.

Resource Protection.

The State Lands Division may determine the spacing of wells and the rate of development and production. No well shall be perforated, redrilled, plugged back or altered except with the approval of the State Lands Division.

Facility-siting must be made in accord with the Commission of Geothermal Power Plant Siting Process.

Streamlining.

Standard procedures for geothermal developers include a nine-month Notice of Intent (NOI) and a nine-month Application for Certification (AFC). To expedite the process, a developer may submit a documented proposal to seek a twelve-month, single-phase NOI/AFC.

Financing and Marketing

Taxation.

Taxes of every kind and nature shall be assessed or levied upon the geothermal operation and improvements thereupon. Tax credits are provided for joint geothermal installations.

Financing.

California has no public financing provisions.

Utility Markets.

The Public Utility Commission is empowered to order public utilities to transmit electricity generated by private producers.
from non-conventional sources. A higher rate of return is provided for utility investments in renewable energy facilities. Utilities are required to examine renewable resources before constructing new fossil/nuclear capacity.

Market Expansion.

California has no programs (other than above) which encourage market expansion of geothermal resources.
Characterization

Definition.

Delaware has no definitive definition of geothermal resources. "Groundwater" is defined as "any water naturally found under the surface of the earth." "Mineral" is defined as "any natural inorganic substance with definite chemical and physical properties which is present in, or at the bottom of a body of water, or anywhere within the earth's crust."

Relationship to Water.

At the present time in Delaware this issue has not been addressed.

Ownership.

At the present time this issue has not been addressed in Delaware.

Access and Allocation

Permitting and Leasing.

There are permitting and leasing provisions in Delaware for water and mineral resources, but these are not clearly applicable to geothermal resources.

Resource Allocation.

Delaware has not established adequate authorization for allocation of geothermal resources. Hydrothermal fluids could be allocated under the existing groundwater allocation system on the basis of "equitable apportionment" qua correlative rights.

Pooling and Unitization.

This area is not addressed under current Delaware law.


Regulation

Drilling Controls.

Although no geothermal activity has occurred, and no specific geothermal drilling controls have been developed, there appears to be adequate authority (by the Division of Environmental Control of the Department of Natural Resources) to regulate the drilling, producing, distributing and disposing of hydrothermal resources.

Resource Protection.

It appears that the Division of Environmental Control has authority for environmental controls and reinjection.

Streamlining.

This issue has not been addressed for geothermal resources.

Financing and Marketing

Taxation.

No geothermal taxation initiatives have been taken in Delaware.

Financing.

No public financing initiatives have been developed for geothermal resources.

Utility Markets.

Steam, Heat and Power Corporations may be organized to provide steam, heat, power and water ("by means of a pipeline")"service, system, plant or equipment, for public use." Such corporations would be under general Public Service Commission jurisdiction, including rate-making authority, and would be required to apply for a certificate of public convenience and necessity from the Public Service Commission in order to organize.

Market Expansion.

No programs have been developed to date that encourage market expansion of the geothermal resources.

Note: The 1980 Legislature passed a comprehensive Geothermal Resources Act, but it was vetoed by the Governor.

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HAWAII

Characterization

Definition.

Hawaii's definition of geothermal resources includes heat, energy, the material medium and by-products. The resource is declared to be a mineral.

Relationship to Water.

Hawaii water law is unique and the relationship of the geothermal resources to water is unclear. The state is presently engaged in a comprehensive review of the water resource in Hawaii.

Ownership.

Ownership of the resource is in the mineral estate. It appears that native Hawaiians may have a legal claim to state geothermal resources. This claim is not absolute but is politically potent.

Access and Allocation

Permitting and Leasing.

Exploration permits are required to conduct any exploration activity on state or reserved lands. Permits are issued by the Department of Land and Natural Resources. The board also issues geothermal mining leases which convey to the lessee the exclusive rights to drill, discover, develop, operate, utilize and sell geothermal resources on state and reserved lands.

Resource Allocation.

(see below)

Pooling and Unitization.

Developers may commingle geothermal leases pending certain conditions, and may apply to the Board of the Department of Land and Natural Resources to implement unitization agreements.
Regulation

Drilling Controls.

Geothermal drilling regulations have been issued by the Department of Land and Natural Resources. Applications must be filed for permits to reinject and such reinjection wells are subject to periodic surveillance.

Resource Protection.

The Department of Lands and Natural Resources is responsible for environmental protection. The Department has also promulgated regulations with regard to well-spacing.

Streamlining.

There are no specific streamlining provisions in Hawaii.

Financing and Marketing

Taxation.

Hawaii enacted legislation to provide property tax exemption for building improvements to use geothermal energy. Legislation was also enacted which determines applicability of excise taxes on geothermal gross proceeds, provides for royalties in lieu of a severance tax, and clarifies utility access.

Financing:

Hawaii has not created public financing programs.

Utility Markets.

State law exempts non-fossil power generation and transmission facilities from Public Utility Commission regulation when energy is used by the producer or sold directly to a public utility. Public Utility Commissions are authorized to require public utilities to purchase surplus power from such facilities. Rates paid by public utilities to geothermal developers for geothermal steam, or electricity from geothermal steam, are subject to Public Utility Commission regulation.

Market Expansion.

Counties are authorized (either individually or together with utilities) by Hawaii law to develop geothermal and other alternative energy resources.
Characterization

Definition.

Maryland defines geothermal resources as the natural heat of the earth, above 49°C, including the transfer medium and associated by-products. The definition is broad enough to incorporate both hydrothermal and hot dry rock systems.

Relationship to Water.

The Maryland definition incorporates a temperature threshold of 49°C to distinguish geothermal resources from groundwater. Separate geothermal permits are required to explore for and produce the resource, in lieu of standard groundwater permits; geothermal production effects on standard water supplies are taken into account in the permit process.

Ownership.

Ownership of the resource is unclear in Maryland. The Maryland Geothermal Act subjects geothermal production to state control and approval, thereby giving the resource a quasi-public nature.

Access and Allocation

Permitting and Leasing.

The legal right to the surface must be demonstrated in order to obtain a geothermal permit. The Maryland geothermal statute requires application to the Department of Natural Resources in order to obtain a permit before commencing any geothermal resource exploration or development.

Leasing procedures and terms are implicitly left to the discretion of the Board of Public Works.

Resource Allocation.

The Maryland geothermal statute institutes an "appropriation" system for the resource, but statutory guidance is lacking regarding the nature of the system.
Pooling and Unitization.

No provisions under current law.

Regulation

Drilling Controls.

The Department of Natural Resources is charged with the responsibility of coordinating, evaluating, organizing and promulgating all policies, plans, and programs concerning the state's natural resources. At present the state has no specific geothermal drilling controls.

Maryland has no statewide policy on reinjection.

Resource Protection.

The Department of Natural Resources has responsibility (see above) for environmental controls. An application by utilities to the Public Service Commission for a certificate of public convenience and necessity simultaneously serves as an application for the necessary water use and air quality permits. There is not currently such a system specifically for geothermal power plants.

Streamlining.

Under the Maryland Geothermal Resources Act a geothermal developer is required to advise the Department of Natural Resources regarding all permits. There are no streamlining procedures.

Financing and Marketing

Taxation.

Geothermal resources were not specifically considered when the tax statutes and regulations of the state were established; consequently, they are not explicitly dealt with in the tax codes.

Financing.

Maryland has no public finance programs under which geothermal resources could be included.
Utility Markets.

It is not clear whether geothermal district heating facilities would be authorized in Maryland, or whether they would be defined as public service companies.

Market Expansion.

There are at present no programs to encourage geothermal market expansion in Maryland.
Characterization

Definition.

Nevada has defined geothermal resources as heat, for regulatory purposes; while for tax purposes, geothermal resources are defined to include heat and associated energy; fluids and gases, whether naturally occurring or injected; and by-products, excluding hydrocarbons.

Relationship to Water.

Nevada applies the appropriation doctrine to all water, whether surface or subsurface, including the steam, water or brines associated with geothermal energy.

Ownership.

The federal government owns 56.7 percent of the land in Nevada, while the state owns only 0.2 percent.

Access and Allocation

Permitting and Leasing.

The federal leasing system will be dominant in Nevada, but the state has developed a leasing system under the authority of the Division of State Lands, for state-owned lands.

Resource Allocation.

It appears that Nevada presently applies the prior appropriation method with regard to the allocation process of the geothermal resources.

Pooling and Unitization.

Nevada geothermal regulations do not address pooling or unitization of geothermal resources.
Regulation

Drilling Controls.

The Division of Water Resources has promulgated general regulations which apply to geothermal wells. All well drillers must be licensed and must file a notice of intent to drill with the State Engineer.

Production of geothermal resources is regulated, as are other underground water supplies, and therefore the State Engineer has not promulgated regulations specific to geothermal production.

Resource Protection.

Nevada has statutes relating to water and air pollution which would be applicable to geothermal development. Geothermal development is subject to the land use/zoning powers of political subdivisions of the state.

Streamlining.

Specific streamlining provisions have not been developed in Nevada.

Financing and Marketing

Taxation.

Nevada allows a property tax credit of up to $2,000 for homeowners installing alternative energy equipment. Nevada also exempts non-producing geothermal leases from ad valorem taxation but, in general, taxing of producing leases is uncertain.

Financing.

Nevada authorizes counties to sell bonds backed by state credit for electrical generation projects.

Utility Markets.

Nevada authorizes general improvement districts to "develop natural sources of energy...for space heating."

Market Expansion.

Beyond the legislation mentioned above, Nevada has provided no incentives for geothermal market expansion.

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Characterization

Definition.

New Mexico statutes define geothermal resources as the "natural heat of the earth" and the energy which may be extracted therefrom, material medium and associated by-products, excluding hydrocarbons. New Mexico has a dual regime, differentiating between "low-temperature thermal reservoirs" (less than the boiling point of water at the altitude of occurrence) and high-temperature thermal reservoirs.

Relationship to Water.

New Mexico's lack of an explicit characterization of geothermal resources makes unclear their relationship to water. However, the dual regime approach permits separate consideration of deep, high-temperature resources and shallow, low-temperature ones. The State Engineer and Oil and Gas Commission have joint jurisdiction over geothermal fluids. The State Engineer will apparently require appropriation of only offset water rights in interference situations.

Ownership.

Due to the lack of explicit characterization, ownership of geothermal resources is also unclear. The state issues leases on the basis of mineral ownership.

Access and Allocation

Permitting and Leasing.

The state land commissioner may designate an area as a Known Geothermal Resource Field (KGRF) and thus be available for leasing only through written competitive bidding.

Resource Allocation.

The allocation method in New Mexico is by correlative rights. The Oil Conservation Division of the New Mexico Energy and Minerals Department is authorized to protect the correlative rights of all geothermal resource owners.
Pooling and Unitization.

The Oil Conservation Division may apportion production in a geothermal system with the consent of lease holders. Furthermore, the Division may grant approval for the combining of two or more contiguous leases into a unitized area for purposes of exploration for and production of geothermal resources.

Regulation

Drilling Controls.

The Oil Conservation Division has promulgated regulations relating to drilling for geothermal resources. These drilling regulations differ for exploration and development wells. Low-temperature thermal wells are not subject to the well-spacing requirements and face less strict bonding requirements.

Resource Protection.

The Geothermal Resources Conservation Act authorizes the Oil Conservation Division to regulate and conserve the resource.

Streamlining.

Nevada law has not addressed this area.

Financing and Marketing

New Mexico laws have not addressed issues with regard to taxation, public financing or utility markets. The state does maintain a direct use demonstration fund.
Characterization

Definition.

Oregon defines geothermal resources as the natural heat of the earth, the heat, all minerals in solution and all by-products.

Relationship to Water.

The Oregon definition excludes shallow (under 2,000 feet), low temperature (under 250°F) resources from the act. Treatment of high-temperature geothermal resources is unclear.

Ownership.

Ownership in Oregon is assigned to the surface estate.

Access and Allocation

Permitting and Leasing.

The Division of State Lands provides exploration permits and leasing procedures.

Resource Allocation.

No explicit provisions.

Pooling and Unitization.

Unitization and production restrictions come under the authority of the Department of Geology and Mineral Industries.

Regulation

Drilling Controls.

The Department of Geology and Mineral Industries has issued comprehensive rules and regulations "Relating to Exploration and Development of Geothermal Resources" in Oregon.
Resource Protection.

The regulations set forth by the Department of Geology and Mineral Industries provide environmental controls. The Oregon Energy Facility Siting Council has the responsibility for siting certain energy facilities in the state. Oregon requires land use plans under the Comprehensive Planning Coordination Act, and any use of the state's lands must fall within the parameters set by the plans. Fluid injection policies have been formulated by the Departments of Water Resources, Environmental Quality, Geology and Mineral Industries and Energy, but have not yet been implemented.

Streamlining.

This issue has not been addressed in Oregon.

Financing and Marketing

Taxation.

Oregon allows an income tax credit up to $1,000 for residential geothermal space heating.

Financing.

Oregon has established a loan program for veterans which allows up to $3,000 for residential geothermal energy facilities. An Energy Conservation and Production Fund, financed by state bond issues, has been established to assist utility companies and individuals in development of non-nuclear energy resources.

Utility Markets.

District heating is authorized under the comprehensive Geothermal Heating Districts Act.

Market Expansion.

No programs have been developed to date that encourage market expansion of geothermal resources.
Characterization

Definition.
Utah statutes do not define geothermal resources.

Relationship to Water.
Geothermal resources are included within the jurisdiction of the Division of Water Rights.

Ownership.
Ownership of the geothermal resources is unclear. The state may issue both leases and water rights to geothermal resources.

Access and Allocation

Permitting and Leasing.
Geothermal well permits are conditional on obtaining water rights. Leasing regulations are under the authority of the State Land Board. Newly offered lands are leased by cost bonus bidding; otherwise leases are granted by application.

Resource Allocation.
Prior appropriation.

Pooling and Unitization.
Unit agreements can be obtained on request of the developer or on initiative of the State Engineer.

Regulation

Drilling Controls.
Drilling regulations are issued by the Division of Water Rights. Main features include: permit required for injection wells; approval by State Engineer required for temperature gradient wells.
Resource Protection.

Areas of resource protection are covered under the drilling regulations. Features which specifically relate to resource protection include: plan of operation; well spacing; unit agreements; equipment; abandonment; and environmental protection, which protection is enforced through applicable federal, state and local standards.

Streamlining.

Streamlining procedures have not been developed at this time in Utah.

Finance and Marketing

Utah laws have not addressed issues with regard to taxation, public financing, utility markets, or market expansion.
Characterization

Definition.

Virginia has no statutes specifically relating to geothermal resources. The state's definition of water, which includes all surface and subsurface waters which affect the public welfare, is broad enough to include hydrothermal resources.

Relationship to Water.

Lacking a formal definition, geothermal resources in Virginia would probably be defined as groundwater and be subject to the provisions of the Virginia Groundwater Act.

Ownership.

If geothermal resources were defined as water, they would be a public resource, subject to state jurisdiction.

Access and Allocation

Permitting and Leasing.

There is no permitting or leasing procedure for geothermal resources in Virginia. Virginia does have a mineral leasing system, but geothermal resources would not be treatable under this system as geothermal resources are not included in the definition of "mineral."

Resource Allocation.

Virginia has no geothermal allocation system, although if geothermal resources are defined as groundwater they would generally fall under a system of "appropriation."

Pooling and Unitization.

This issue has not been addressed in Virginia.
Regulation

Drilling Controls.

This issue has not been addressed with regard to geothermal resources. Although, if geothermal resources are defined as groundwater, regulation would be the responsibility of the State Water Control Board under the Virginia Groundwater Act. Re-injection policies would also fall under the State Water Control Board.

Resource Protection.

Virginia has statutes which address air pollution, water pollution, wetlands, critical environmental areas and environmental quality. There are no statutes which specifically address geothermal resources.

Streamlining.

Virginia has instituted a "one-stop" permitting mechanism whereby a master application serves as a vehicle to obtain a wide range of required state permits.

Financing and Marketing

Taxation.

Virginia statutes allow provisions for the exemption of alternative energy property from property taxation. Virginia individual income tax is graduated and deductions are based on those allowed by federal income taxation. Federal guidelines for depletion allowance are followed and intangible drilling expenses are deductible.

Financing.

(see Utility Markets)

Utility Markets.

Counties, cities and towns may issue general obligation bonds or revenue bonds in order to finance "waterworks and other public utilities," but whether such an authorization is adequate to cover geothermal district heating is uncertain.

Virginia has statutes authorizing "Industrial Development Authorities" and "Area Development Authorities." Such utilities are not presently, but could be, directed to consider geothermal utilization.
Market Expansion.

Virginia has not addressed this issue with regard to geothermal development.
Characterization

Definition.

The Washington Geothermal Resources Act defines geothermal resources as those from which it is technologically practical to produce electricity commercially. Under the Act, geothermal resources are characterized as *sui generis*, neither mineral nor water resources.

Relationship to Water.

Under Washington law, geothermal resources are defined as separate from water (see above). However, no statutory guidance is given regarding interference situations.

Ownership.

The Geothermal Resources Rights Act assigns the ownership of high-temperature geothermal resources to the surface estate.

Access and Allocation

Permitting and Leasing.

The Department of Natural Resources has drafted leasing regulations which affect both electricity-generating and direct-use wells on state-owned lands.

Resource Allocation.

No explicit provisions.

Pooling and Unitization.

Washington has no explicit provisions with regard to pooling or unitization.
Regulation

Drilling Controls.

The Department of Natural Resources has developed drilling regulations which are applicable to all lands within the jurisdiction of the state.

Resource Protection.

In response to the Geothermal Resources Act, the Department of Natural Resources' geothermal drilling rules and regulations include provisions for site-specific well-spacing. Well-spacing regulations take into consideration topography, economic efficiency, multiple use of lands and protection of correlative rights. The Department's rules also incorporate provisions for environmental protection.

Streamlining.

Washington has not addressed this issue to date.

Financing and Marketing

Taxation.

No taxation incentives for geothermal resources have been developed.

Financing.

Washington has developed no public financing programs for geothermal resources.

Utility Markets.

Washington laws do not authorize geothermal district heating, but three existing entities could be expanded to include such authority: Public Utility Districts, Municipal Utilities and Metropolitan Municipal Corporations. Washington allows utility investments in geothermal resources to receive a 2 percent higher rate of return.

Market Expansion.

No programs have been established which encourage expansion of geothermal development.
Characterization

Definition.

Wyoming laws define hot water and geothermal steam as underground water.

Relationship to Water.

Geothermal resources in Wyoming appear to be defined as "water," and as water are under the control of the State Engineer.

Ownership.

All water in Wyoming is owned by the state, with usufructuary rights in the public.

Access and Allocation

Permitting and Leasing.

The Wyoming Board of Land Commissioners has established a comprehensive leasing system for geothermal resources on state-owned lands, although there is at present no statutory authority which empowers the Board to develop these regulations. On private lands, owners must apply for water-use permits from the State Engineer.

Wyoming claims the right to water resources on federal lands (absent federal reserved water rights); it is unclear whether this assertion extends to federal geothermal resources.

Resource Allocation.

By statutory definition of geothermal resources as groundwater, Wyoming applies the prior appropriation doctrine.

Pooling and Unitization.

Allocation techniques come under the jurisdiction of the leasing system of the Board of Land Commissioners, as subject to water law.
Regulation

Drilling Controls.

The Board of Land Commissioners has promulgated rules and regulations which set forth drilling controls on state-owned lands. The only drilling controls on private lands are regulations that require all water users to apply for water-use permits from the State Engineer.

Resource Protection.

It is unclear whether Wyoming statutes regarding water and air pollution actually include geothermal pollution control authority.

Public Service Commission authority does not specifically include geothermal resources, and public utilities isolated at one site are exempted from Public Service Commission regulation.

The Industrial Siting Commission regulates development of energy generating plants larger than 100 Mw.

Financing and Marketing

Wyoming laws have not addressed issues with regard to taxation, public finance, utility markets or market expansion.
CHARACTERIZATION AND OWNERSHIP

Characterization of the resource, especially with regard to definition and assignment of ownership, can clarify the legislative intent, and prevent future confusion and possible judicial determinations contrary to the original legislative intent. Such uncertainty as that which can be caused by inadequate characterization will generally inhibit development of the geothermal resource as developers will be hesitant to risk possible court challenges to their right to the resource.

**Issue:** Who owns the geothermal resources in Maryland?

The Maryland Geothermal Resources Act requires that the State (through regulation by the Department of Natural Resources) be responsible for management and regulation of the geothermal resources in the state. The resource becomes quasi-public in nature because it is under the jurisdiction of police powers of the state when production is subject to state approval and control.

**Option:** Declare State ownership of the geothermal resources in Maryland. Declaring State ownership would give the state proprietary jurisdiction, in addition to control over production. If the intent of the original legislation (S.B. 1154) was to claim State ownership of the resource, then declaring this option will serve to clarify the intent of the bill. State ownership will allow the state to enhance the resource and prevent disputes between private owners.

**Option:** Declare that the geothermal resource is subject to private ownership. Such an option will require a decision on what property rights to the resource should be recognized so it can be determined who in fact is an owner of the resource. Since the Act has made the State responsible for the management and regulation of the resource, a legislative decision will need to be made which will allow the private owner some control over his resources.

**Issue:** What is the relation to water of geothermal resources in Maryland?

The statutory definition includes "the natural or artificial medium containing the heat" as part of the geothermal resource. Because the natural medium will generally be a form of water, the definition, by inference, includes groundwater. Groundwater, as well as surface water, is subject to the permit system of water use and well drilling of the Department of Natural Resources. Groundwater at temperatures higher
than 120°F (49°C) will be defined as geothermal resources and subject to regulation as a geothermal resource, but will still be subject to regulation as groundwater.

Option: Clarify that although there exists a relationship between groundwater and geothermal resources, geothermal resources need not also be under groundwater regulations and laws.

Option: No change.
ACCESS AND ALLOCATION

Issue: How should a developer be allowed access to state lands?

The Geothermal Resources Act requires that the legal right to use the surface must be demonstrated in order to obtain a geothermal permit. The authority to lease or otherwise convey State Property is vested in the Board of Public Works. Covenant procedures are implicitly left to the discretion of the Board.

Option: Give the Board of Public Works specific authority to lease State lands for geothermal development, including leasing methods and terms.

Option: Give the Department of Natural Resources specific authority to lease State lands for geothermal development, including leasing methods and terms.

Issue: Does Maryland have the authority to lease geothermal resources?

Because the Geothermal Resources Act does not specify whether the geothermal resource is to be leased, the legislature may desire to address this issue.

Option: Prohibit the leasing of geothermal resources.

Option: Authorize or require the leasing of geothermal resources. Such authorization should include provisions for competitive versus non-competitive leasing; rates for royalty and/or rental; acreage limitations; and terms of leases.

Issue: How should the resource be allocated among competing producers?

The Geothermal Resources Act sets forth an appropriation system which requires that permits be obtained from the Department of Natural Resources. The statute, though, does not address allocation procedures.

Option: Adopt the rule of capture. Such a system could include well-spacing and pooling, or could be modified to set upper limits on production to protect reservoirs and be more compatible with development of geothermal resources.

Option: Adopt the doctrine of correlative rights. Correlative shares in a geothermal reservoir could be assigned by a state agency or implemented through cooperative development. Cooperative development, or unitization, usually requires a specified percentage of operators to agree to the unit operation.
Option: Utilize the appropriate doctrine. Appurtenant water rights are likely to affect standard water users with established priorities and is the most relevant doctrine for users of hot groundwater.

Option: Utilize the doctrine of reasonable use. This doctrine, the prevailing doctrine for allocating groundwater in Maryland, presents difficulties to thermal utilization of the geothermal resource. Transportation of groundwater off a particular surface parcel may be precluded under reasonable use if damage results to other users of the common supply. There is no recourse to priority. This limitation could operate as a severe limitation to small-scale projects involving production on one parcel and use on another.
REGULATORY PROCEDURES

Issue: Is the statutory authority granted the Department of Natural Resources adequate to cover geothermal drilling activities?

The Department of Natural Resources has been provided with the responsibility of coordinating, evaluating, organizing, and promulgating all policies, plans, and programs concerning the State's natural resources. In addition, the Geothermal Resources Act requires application to the Department in order to obtain a permit before commencing any geothermal resource exploration or development.

Option: Direct the Department of Natural Resources to promulgate comprehensive geothermal drilling regulations by statute or general directive.

Option: No change.

Issue: What is Maryland's position regarding reinjection?

The State should institute a policy with regard to reinjection. Without a policy of disposal many developers, both large and small, will hesitate to invest in resource development in Maryland.

Option: Make reinjection mandatory. Some agency personnel in the state, and other technical experts believe because of the nature of the geothermal resources in Maryland that extraction would eventually deplete the resource and/or possibly cause the hydrothermal resource temperature to decrease.

Option: Require reinjection in majority of cases, but make allowances for cascading and economics.

Option: Prohibit reinjection in majority of cases. This policy could include a requirement of production of by-product water and/or subject by-product water to appropriation.

Option: Prohibit reinjection in all cases.

Issue: Are local zoning plans and building codes compatible with geothermal development?

Zoning and planning powers of various political subdivisions constitute an overlay upon the regulatory procedures of the Department of Natural Resources and its advisory committees. Under these powers
geothermal operations would have to be approved by the local commission on a case-by-case basis.

Option: Direct local planning commissions to prepare geothermal zoning elements. Consideration should be given to well sites and drilling, distribution corridors, heating districts and surface facilities.

Option: Exempt geothermal development from local zoning control. Control could be given to the Public Service Commission.

Option: No change.

Issue: Are existing pollution control standards for geothermal resource development activities adequate to control geothermal impacts?

The Geothermal Resources Act gives the Department of Natural Resources the authority to require that an applicant demonstrate that development would meet compliance with all applicable State air, water and noise laws; would have no adverse effect upon the natural environment, or rare or irreplaceable resources; would not have an adverse effect upon the public health, safety, or welfare; and would not cause an unreasonable rate of resource exhaustion. In addition, the Department of Health and Mental Hygiene is instructed to provide technical assistance in order to effectuate state pollution control standards.

Option: Acquire additional experience with the geothermal resources in the State prior to review and possible revision of applicable pollution control standards.

Option: Take specific steps to insure the integrity of groundwater supplies. Such steps could include reinjection control standards and well withdrawal guidelines. Some agency personnel in the State have also suggested a need for establishing liability for subsidence.
FINANCE AND MARKETING:

Issue: How can tax provisions which affect geothermal resources be clarified, and should taxes be adjusted to encourage geothermal resource development?

The application of tax provisions to geothermal properties and development operations in Maryland is uncertain because of the complex and unique nature of the resource. Geothermal resources were not specifically considered when the tax statutes and regulations of the State were established; consequently, they are not explicitly dealt with in the tax codes. Clarification of State taxes with respect to geothermal development is necessary if accurate financial planning is to be achieved. The way taxes are applied to geothermal resources will have a major influence on development of the resource. The State may desire to take advantage of federal geothermal incentives or to develop similar state incentives.

Property tax is of major importance because of its potentially large size. It is unclear whether property taxation on geothermal resources is to be ad valorem or based on realized value.

Option: Tax geothermal leases on ad valorem basis. Because of the relatively high valuation of the resource and a relatively low income during exploration and early production, an ad valorem tax may be especially burdensome to the geothermal developer.

Option: Allow deferral of ad valorem tax payment until income is produced from the property.

Option: Tax geothermal property on realized value. Such an assessment would most logically be made at the wellhead.

Option: Allow geothermal properties to pay a tax in lieu of an ad valorem property tax.

Option: Exempt the added value of a home or business due to installation of geothermal equipment from property tax. This exemption is currently allowed on some local property taxes for solar energy equipment in Maryland, and could also include other alternate energy sources.

Income tax is of importance because it represents a potentially substantial reduction in the net earnings of the geothermal developer. The options following were included in the National Energy Tax Act of 1978 and may be adopted by Maryland.
Option: A depletion allowance on geothermal resources can be instituted. Depending upon its provisions, a depletion allowance can provide incentives to geothermal development.

Option: Allow expensing intangible drilling costs. This option would allow certain drilling investments to be deducted from taxable income.

Option: Allow a special income tax credit for geothermal investments. Under the National Energy Tax Act a federal alternative energy income tax is available, but many states have enacted supplemental legislation.

Issue: What other funding avenues are available?

Options for municipal funding are discussed below. These alternatives could be used for all types of energy development, especially "new" or alternative energy sources.

Option: Provide for direct funding in the form of grants or establish revolving loan fund for low-interest loans for exploration and drilling costs incurred by municipalities. Revenue bonding is inapplicable to discovery and drilling costs due to the inherent risk; and use of general obligation bonds for such purposes is subject to debt limits and political constraints.

Option: Provide for "double barrel" bonding (both project and general revenues) to secure bond issues. Given the risky nature of reliance on "new" energy sources such as geothermal, such authority may enhance the marketability of municipal geothermal bond issues.

Option: Provide for state bond guarantees or create a State Bond Bank. Using State funds to guarantee bonds rather than to directly fund project construction should allow the available dollars to go further. In addition, private capital markets would be the primary source of equity, rather than state revenues. Such involvement of the private sector should be encouraged; direct state funding would reduce such participation.

Option: Authorize joint enterprise authorities, anticipation notes, and encourage participation in the Department of Energy loan program which loans up to $5 million for front-end use.

Issue: Is the definition of a public service company sufficient to include geothermal district heating facilities?

In order to implement geothermal district heating, statutory authorization must be found. A "public service company" is defined in Maryland law to include "steam heating...[and] water" service. It is not clear whether the provision of geothermal fluids would be covered under this mandate.
Option: Specifically authorize, by statute, the inclusion of geothermal district heating facilities within the definition of public service companies.

Option: Authorize public entities which are authorized to supply "water" (such as counties, municipalities, water authorities and environmental service), and which have broad powers appropriate for district heating to provide district heating even if such services would duplicate the functions of existing utilities.

Option: Enact a comprehensive district heating statute.

Issue: Should district heating facilities be under Public Service Commission jurisdiction?

Public Utility Commission policies relating to the certification and regulation of heating districts can have a significant impact on the development of district heating.

Option: Require Public Service Company jurisdiction over district heating facilities. Such jurisdiction could provide protection of both distributors and consumers with regard to rates, distribution and reliability of service.

Option: Exempt geothermal heating districts from Public Service Commission rate regulation, completely or conditionally.

Option: Exempt geothermal heating districts from Public Service Company certification jurisdiction, completely or conditionally.

Option: Exempt geothermal heating districts from Public Service Company jurisdiction under all circumstances or based on size limitations.

Option: Allow Public Service Company to grant operating permits to heating districts, in lieu of a certificate of public convenience and necessity, if the district can meet certain criteria. Such criteria could require that the applicant: 1) have adequate resource and system; 2) be fiscally sound and able to post bond; 3) have an adequate sales contract for their customers, in lieu of rate regulation, and that the contract meet certain criteria. This type of operating permit could allow heating districts to enter existing franchise areas under certain conditions.

Issue: What other approaches can Maryland take to encourage the development of geothermal resources?

Options: Expansion of the geothermal market can be fostered in a number of ways:
1) Public education and technical assistance programs can be administered by a geothermal ombudsman or the State energy officer;

2) Political subdivisions could benefit from planning and impact assistance;

3) Building codes can be examined for compatibility with geothermal equipment;

4) Life-cycle costing of new or renovated public buildings can be performed, including feasibility analyses of geothermal energy systems;

5) State-funded demonstration projects can be developed to encourage geothermal acceptance;

6) All new construction could be required to use geothermal energy systems where feasible.
APPENDICES
State Laws and Regulations Regarding Geothermal Resources

ALASKA

Statutes: Geothermal Resources Act (1971) A.S. Stat. 38.05.131
Leasing: Div. of Lands - Regulations & Statutes Pertaining to Coal and Other Leasable Minerals (1974) 11 A.A.C. 84.700...
Drilling: Div. of Oil & Gas - 11 A.A.C. 94.730... (1974)

ARIZONA

Statutes: Geothermal Resources (1972); amend. HB 2257 (1979) A.R.S. 27-651...
Leasing: Land Dept. - Geothermal Resources (1972) T.12C.S.A.22 (under revision)

CALIFORNIA

Leasing: State Lands Comm. - Leases & Prospecting Permits for Geothermal Resources (1970) C.A.C. 2250...
Drilling: Div. of Oil & Gas - Statewide Geothermal Regulations (1976) C.A.C. 1900...

COLORADO

Statutes: Geothermal Resources Act (1974) C.R.S. 34-70-101...
Leasing: Board of Land Commissioner - Special Rules & Regulations Relating to Geothermal Resources: Leases (1972) 515-243-1
Drilling: Oil & Gas Conservation Comm. - Rules & Regulations for the Development & Production of Geothermal Resources (1976) 111.01...

HAWAII

Statutes: Government Mineral Rights (1974); amend. HB 3033 (1973) H.R.S. 132-1...
Leasing: Dept. of Land & Natural Resources - Regulations on Leasing & Drilling Geothermal Resources: (1978) Res. No. 3
Drilling: Res. No. 8

IDAHO

Statutes: Leasing - Geothermal Resources Leasing Act (1975) ID Code 47-1501... production - Geothermal Resources Act (1974, as amend.) ID Code 42-6001...
Drilling: Water Resource Board - Drilling for Geothermal Resources (1973)

LOUISIANA

Leasing: Mineral Board - none (oil & gas model Likely)

MARYLAND

Statutes: Geothermal Resources Act (1973) A.C.M. 3-3A-01
MONTANA

Statutes: Leasing - Lease of Geothermal Resources (1974) R.C.M. 81-2601...
Siting - Major Facilities Siting Act (1975, as amended) R.C.M. 70-301...
Filing bottom-hole temperatures - Act to Facilitate the Discovery of
Geothermal Energy Sources (1975) R.C.M. 50-217, 146.148

Drilling: Geological Survey - Conservation Division - Geothermal Investigation
Reports (1975) M.A.C. 36-2.5(14)

NEVADA

Statutes: Leasing - An Act Relating to State Lands (1975) N.R.S. 332.010...
Production - An Act Relating to Geothermal Resources (1975) N.R.S. 534A.01

Leasing: Div. of Lands - pending

Drilling: Div. of Water Resources - Regulations Pertaining to Exploration Drilling
(1973)

NEW MEXICO

Statutes: Geothermal Resources Act (1967) N.M.S.A. 7-15-1...
Geothermal Resources Conservation Act (1973) (Chap. 272)

Leasing: State Land Office - Rules & Regulations Relating to Geothermal Resources
Leases (1971)

Drilling: Oil Conservation Div. - Rules & Regulations for Geothermal Resources (1977)

OREGON

Statutes: Geothermal Resources (1975) O.R.S. 522.005...
Geothermal Heating Districts (1975) O.R.S. 523.010...

Leasing: Div. of State Lands - Geothermal Lease Regulations (1975) 75-010...

Drilling: Dept. of Geology & Mineral Industries - Rules, Regulations & Laws
Relating to Exploration & Development of Geothermal Resources (1977) 632-20-005...

TENNESSEE

Statutes: Geothermal Resources Act (1973) T.A.C.S. Art. 3421s

Leasing: Railroad Comm./Div. of Oil & Gas - none (oil & gas model likely)

Drilling: Railroad Comm./Div. of Oil & Gas - Rules Having General Application
to Oil, Gas, & Geothermal Resource Operations (1976) 051.02.02.000
School Land Board - Rules & Regulations Governing Drilling & Producing
on Permanent Free School Lands (1974) (general)

UTAH

Statutes: Water & Irrigation Laws (1973) U.C.A. 73-1-120

Leasing: Div. of Lands - Rules & Regulations Governing Issuance of Mineral
Leases (1973); Geothermal Steam Lease Agreement (1973)

Drilling: Div. of Water Rights - Rules & Regulations for Wells Used for the
Discovery & Production of Geothermal Energy (1978)

WASHINGTON


Leasing: Dept. of Natural Resources - Geothermal Leasing Policy (1973) DRAFT

Drilling: Dept. of Natural Resources - none

WYOMING

Statutes: Underground Water (1973) WY Stat. 61-121

Leasing: Board of Land Commissioner - Rules & Regulations Governing the Issuance
of Geothermal Resource Permits & Leases (1973)

Drilling: State Engineer's Office - Rules & Regulations
## STATE GEOTHERMAL LEASE PROVISIONS

<table>
<thead>
<tr>
<th>State</th>
<th>Not-Area Lands</th>
<th>Royalty Lands (Competitive Leasing)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Newly Offered</td>
<td>Subsequent Leasing</td>
</tr>
<tr>
<td></td>
<td>Bidding Factor</td>
<td>Criteria</td>
</tr>
</tbody>
</table>

- **Alaska**: Not applicable.
- **Arizona**: Competitive leasing, Competitive leasing.
- **California**: Cash bonus or other, Producing Test.
- **Colorado**: (A), (A), (A), (A).
- **Connecticut**: Competitive (3), Competitive (3), (A), All lands awarded competitively (3).
- **Delaware**: Public Drawing (30-day filing), By application, (A), Producing Test.
- **Louisiana**: (C), (C), (C), (C).
- **Massachusetts**: Competitive, Competitive, Cash bonus, All lands awarded competitively.
- **Tennessee**: (C), (C), (C), (C).
- **New Jersey**: Competitive (5-day filing), By application, Cash bonus, Decided by Commissioner of Lands.
- **Oregon**: Public Drawing (30-day filing), By application, Cash bonus (2), Geology & water producing well.
- **Texas**: (C), (C), (C), (C).
- **Utah**: Cash bonus (2), By application (3), (3).
- **Washington**: Competitive, Competitive, Cash bonus (3), All lands awarded competitively.

---

1. Specified by state land commissioners.
2. Mineral reserve lands may be leased non-competitively or competitively, with one-third vote by Board of Land and Natural Resources.
3. Regulations are final.
4. If no bids received, Division of State Lands may reclassify for non-competitive leasing.
5. Lands are offered competitively by order of application, except those that are newly offered. Newly offered lands are leased by cash bonus bidding.
6. Unless otherwise, if a state receives no bid, it is withdrawn.
<table>
<thead>
<tr>
<th>Annual Rental</th>
<th>Royalties</th>
<th>Activity Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>primary</td>
<td>byproduct</td>
</tr>
<tr>
<td></td>
<td>10-12%</td>
<td>2-10%</td>
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<td>at least 5%</td>
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<td>primary</td>
<td>byproduct</td>
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<td></td>
<td>10%</td>
<td>between 2% and 10%</td>
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<td>at least 5%</td>
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<td>at least 10%</td>
<td>at least 5%</td>
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<td></td>
<td>primary</td>
<td>byproduct</td>
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<td>primary</td>
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<td>at least 10%</td>
<td>at least 5%</td>
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</tbody>
</table>

-3-
## INCOME TAX

<table>
<thead>
<tr>
<th>State</th>
<th>Bill</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>H.B. 1019</td>
<td>1978</td>
<td>Commercial or residential investments for solar, wind and geothermal energy systems deductible for state income tax.</td>
</tr>
<tr>
<td>Idaho</td>
<td>E.B. 468</td>
<td>1976</td>
<td>Income tax deduction for investments in residential geothermal energy facilities.</td>
</tr>
<tr>
<td>Montana</td>
<td>E.B. 292</td>
<td>1977</td>
<td>Tax deduction for residential nonfossil energy generating system (may apply to geothermal).</td>
</tr>
<tr>
<td>Oregon</td>
<td>S.B. 399</td>
<td>1977</td>
<td>Tax credit for nonfossil energy systems (may apply to geothermal).</td>
</tr>
</tbody>
</table>

## PROPERTY TAX

<table>
<thead>
<tr>
<th>State</th>
<th>Bill</th>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorado</td>
<td>S.B. 316</td>
<td>1979</td>
<td>Exclude alternative energy devices from valuation of property for property tax assessment.</td>
</tr>
<tr>
<td>Hawaii</td>
<td>S.B. 2467</td>
<td>1976</td>
<td>Property tax exemption for building improvements to use geothermal energy.</td>
</tr>
<tr>
<td>Nevada</td>
<td>A.B. 144</td>
<td>1979</td>
<td>Exempt nonproducing geothermal leases from property tax.</td>
</tr>
<tr>
<td>South Dakota</td>
<td>H.B. 1354</td>
<td>1973</td>
<td>Property tax credit up to $2,000 for residential geothermal facilities for heating and cooling.</td>
</tr>
</tbody>
</table>

Residential and commercial property tax credit for geothermal and other renewable energy systems.
### Enacted Incentives for Geothermal Development

#### SALES TAX

<table>
<thead>
<tr>
<th>State</th>
<th>Bill</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hawaii</td>
<td>H.B. 3033</td>
<td>1973</td>
<td>Determines the applicability of excise taxes on geothermal gross proceeds. Provides for royalties in lieu of a severance tax. Clarifies utility access.</td>
</tr>
</tbody>
</table>

#### LOANS

<table>
<thead>
<tr>
<th>State</th>
<th>Bill</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska</td>
<td>H.B. 266 Ch. 29</td>
<td>1973</td>
<td>Establishes an alternative power resources revolving loan fund within the state Department of Commerce and Economic Development.</td>
</tr>
<tr>
<td>Oregon</td>
<td>S.B. 477</td>
<td>1977</td>
<td>Loan program for veterans—up to $3,000 for residential geothermal energy facilities.</td>
</tr>
<tr>
<td>Virginia</td>
<td>H.B. 100 Ch. 631</td>
<td>1978</td>
<td>Directs the Virginia Housing Development Authority to establish a loan program for financing the purchase and installation of insulation, storm windows and doors, and solar and other alternative energy sources that will reduce reliance on present sources of energy in residential, public and nonprofit buildings.</td>
</tr>
</tbody>
</table>

#### LEASING POLICY

<table>
<thead>
<tr>
<th>State</th>
<th>Bill</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>S.B. 1027</td>
<td>1978</td>
<td>Modifies leasing procedures giving State Lands Commission discretion in issuing exploration and development leases; revises rentals, royalties and renegotiation procedures; gives the commission discretion in issuing and setting the terms of direct use leases.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>H.B. 446</td>
<td>1979</td>
<td>Extend the acreage limitation on state geothermal leases from 25,000 to 51,200 acres and provide for a second 5-year lease term without production upon payment of increased rental.</td>
</tr>
</tbody>
</table>
DEVELOPMENT REGULATIONS

California  A.B. 2644 (1973)  Streamlines geothermal exploration and field development regulation and facility siting; authorizes the state energy commission to prohibit curtailment of geothermal power production or transmission.

Oregon  E.B. 2159 (1977)  Authorizes waiver of state bonding requirements for well drilling if operation has bond with federal government.

E.B. 2134 (1979)  Establish procedures for reinjecting geothermal fluids and permit DOGAMI to adopt regulations on reinjection and require DEQ water pollution control facilities permit for reinjecting contaminated fluid.

UTILITY REGULATIONS

California  S.B. 77 (1976)  Empowers PUC to order public utilities to transmit electricity generated by private producers from non-conventional sources.

A.B. 2644 (1973)  Streamlines geothermal exploration and field development regulation and facility siting; authorizes the state energy commission to prohibit curtailment of geothermal power production or transmission.


Hawaii  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.
Utility Regulations cont.

**Hawaii**

**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.

**H.B. 3033 (1973)**

Determines the applicability of excise taxes on geothermal gross proceeds. Provides for royalties in lieu of a severance tax. Clarifies utility access.

**Kansas**

**H.B. 2842 (1973)**

Allows utilities to receive a 1/2% to 1% higher rate of return on investments in systems which derive energy from solar, geothermal and other renewable energy sources.

**Development Authorizations**

**Hawaii**

**S.B. 1773 (1973)**

Authorizes counties individually or together with utilities and end users to develop geothermal and other alternative energy resources.

**Act 36**

**Oregon**

**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 (rejected by voters).

**H.B. 3135 (1975)**

Authorizes geothermal heating districts with contracting and bonding authority and power of eminent domain.
Enacted Incentives for Geothermal Development

Development Authorizations cont.

<table>
<thead>
<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oregon</td>
<td>S.B. 502</td>
<td>1979</td>
</tr>
</tbody>
</table>

Permit joint participation in geothermal activities of cities and people's utility districts in Oregon with cities, utility districts, electric cooperatives and privately owned electric utility companies in Nevada and California.

LIFE-CYCLE COSTING/BUILDING CODES

<table>
<thead>
<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maryland</td>
<td>E.B. 413</td>
<td>1978</td>
</tr>
</tbody>
</table>

Requires consideration of life-cycle costing and energy consumption analysis during the preliminary design of new buildings financed by the state or with state assistance.

<table>
<thead>
<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Mississippi</td>
<td>S.B. 2379</td>
<td>1978</td>
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</tbody>
</table>

Establishes life-cycle costing in the design of state buildings.

<table>
<thead>
<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Nevada</td>
<td>S.B. 326</td>
<td>1977</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
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<tbody>
<tr>
<td>New Jersey</td>
<td>A.B. 562</td>
<td>1978</td>
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</table>

Requires life-cycle cost analysis in the design phase of any construction or renovation of major facilities. The analysis must compare alternative energy systems.

<table>
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<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
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<tbody>
<tr>
<td>New Mexico</td>
<td>E.B. 395</td>
<td>1975</td>
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</tbody>
</table>

Life-cycle cost analysis of nonfossil energy systems required for new state buildings or major renovations.

<table>
<thead>
<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Ohio</td>
<td>E.B. 419</td>
<td>1978</td>
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</table>

Requires life-cycle cost analysis in state-owned, assisted or leased facilities.

<table>
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<tr>
<th>State</th>
<th>Act</th>
<th>Year</th>
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</thead>
<tbody>
<tr>
<td>Texas</td>
<td>ESZ 24</td>
<td>1977</td>
</tr>
</tbody>
</table>

Requests all state agencies and universities to encourage feasibility studies and demonstration projects for alternate energy use in state buildings.
**Enacted Incentives for Geothermal Development**

**OMBUDSMAN/TECHNICAL ASSISTANCE**

**Oregon**

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.

**RESEARCH AND DEVELOPMENT/DEMONSTRATIONS**

**Arizona**

H.B. 2078 (1979)

Expands activities of Arizona Solar Energy Research Commission to include other renewable energy sources, including geothermal.

**Hawaii**

S.B. 1581 (1978)

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

H.B. 3039

Establish the Energy Laboratory of Hawaii and make appropriations.

**Montana**

S.B. 86 (1975)

Applies state coal tax fund to renewable energy projects.

**New Mexico**

S.B. 185 (1975)

Created permanent fund for energy research and development and appropriated funds.

H.B. 199 (1978)

$2 million appropriation for energy research and development.

H.B. 2 (1978)

$200,000 appropriation for establishing geothermal space heating demonstration projects. 100% matching funds required.

**OWNERSHIP**

**Washington**

S.B. 2191 (1979)

Place ownership of geothermal resources with the surface owner (private).
1980 LEGISLATIVE SUMMARY
as of July 10, 1980

Arizona

1980 session ended--no related legislation

Special session commenced June 11 to deal with groundwater management.

Alaska

1980 session ended

--HB 779 Signed by Governor

Establishes and defines State geothermal policy.

Colorado

1980 session ended

--HB 1203 No action taken Johnson

Provides tax credit for installation of alternative energy systems.

--HB 1204 No action taken Johnson

Provides income tax credits for energy conservation.

--HB 1264 Signed by Governor Hilsmeier

Provides income tax incentives for energy conservation and alternative energy (final tax relief legislation)

Delaware

1980 session ended

--SB 469 Vetoed McDowell

Promotes the discovery, development, production and regulation of geothermal resources in the state.
1980 session ended

--HB 376 Died in House
Geothermal energy development (limiting speculation).

--HB 393 Died in House
Encouragement of geothermal energy development by waiving state royalty payments for the first five years of development.

--HB 394 Died in House
Establishment of the Hawaii Geothermal Applications Center to investigate rift-zone reservoirs and various applications of geothermal energy.

--HB 395 Died in House
Provision of property and excise tax deferral for geothermal energy development.

--HB 502 Died in House
Appropriations for geothermal energy projects.

--HB 396 Died in House
Reservation of all mineral rights to the State.

--HB 504 Died in House
Agricultural lands (exploratory geothermal work allowed).

--SB 111 Died in Senate
Same as HB 394.

--SB 116 Died in Senate
Same as HB 376.
Appropriations for research and development of geothermal fluids in combinations with biomass energy projects.

-SB 974 Died in Senate

Geothermal resources; inclusion in State leases of public lands allowed.

-SB 1766 Died in Senate

Mineral rights reserved for the State; geothermal resources on private land excluded.

Idaho

1980 session ended

-S 1415 Signed by Governor

Appropriates $23,000 to the State Office of Energy to be used with $85,000 of E.P.A. funds for the drilling of a geothermal test well on the Capitol Mall grounds.

-HB 430 Died in Senate

Allows water right owners to change the nature of the use of their water right without losing the priority of their right.

Maryland

1980 session ended--no related legislation

New Mexico

1980 session ended--no related legislation

Pennsylvania

In recess until September 18, 1980

-H 1454 Pending in House Conservation Committee

Requires minimum yield for certain water wells and water, will supply stems, confines certain powers and duties on Department of Environmental Resources and provides a penalty.
South Carolina

In recess until August 20, 1980 (all bills still in committee effectively have died and must be reintroduced to be reconsidered)

--H 2717
Referred to House Committee on Ways and Means Edwards et al.
Authorizes the Joint Legislative Committee on Energy to receive and expend federal funds and provide for reference of energy legislation by Standing Committees of the General Assembly to the Energy Committee.

--H 3400
Committed to House Committee on Ways and Means Edwards et al.
Provides for income tax deductions for energy conservation, renewable source expenditures, and solar energy systems.

--H 3501
Referred to House Committee on Ways and Means McEachin et al.
Adopts as a deduction a Federal Internal Revenue Code Section concerning energy conservation expenditures.

--S 0218
Referred to Senate Committee on Finance Stephen
Provides for an income tax credit for energy conservation expenditures and limitations on such credit.

--S 0707
Concurred in House Amendment and Adopted Carter
Concurrent Resolution to propose the establishment of a state government-sponsored research organization for energy, science and advanced technology and request a special joint sub-committee to study the structure and funding of such an organization and make recommendations.

--S 0809
Referred to Senate Committee on Finance Sanders et al.
Provides for income tax deductions for energy conservation and renewable source expenditures.

South Dakota

1980 session ended

--S 109
Tabled in committee Gregerson and Mortimer
Includes geothermal resources under the provisions of the severance tax on energy minerals.

--S 110
Tabled in committee Dunn and Mortimer
Provides for the appropriation of groundwater and the development of geothermal resources.
South Dakota (continued)

---SB 111  Tabled in committee  Dunn and Mortimer

Defines geothermal resources and geothermal wells, provides for drilling permits and bonding requirements and regulatory authority.

---SB 117  Signed by Governor  Dunn and Mortimer

Defines geothermal resources and provides for leasing of geothermal resources on state lands.

Utah

1980 session ended

---SB 48  Bill died in Senate  Finlison and Sowards

Geothermal Resource Conservation Act: Assigns regulatory to the Division of Water Rights, defines geothermal resources, authorizes and establishes procedures.

Virginia

1980 session ended--no related legislation

Washington

1980 session ended

---HM 25  Passed  Zimmerman et al.

Exhorts the President and Congress to enact comprehensive geothermal energy development legislation as soon as possible.

---HM 1597  Signed by Governor  Williams et al.

Allows school districts to borrow money and issue bonds for improving the energy efficiency of school district buildings and/or installing systems to utilize renewable and/or inexhaustible energy resources.

---HM 1462  Failed  Scott et al.

Authorizes development of heating systems by cities, towns and counties.
Washington (continued)

Signed by Governor

- SSI 719

Allows utilities a 2 percent higher rate of return for utility investment in renewables or conservation.

Wisconsin

1980 session ended

-Amendment to AB 1180 died in Committee

AB 1180 is a budget review bill. The amendment would have authorized the Department of Natural Resources to create a groundwater heat pump study.

Wyoming

Budget session only
MEMORANDUM

TO: Joyce P. Marchand, Research Coordinator
FROM: Ken Wonstolen, NCSL
DATE: September 15, 1980
RE: Groundwater Heat Pump Issues and Options

Following is a checklist of issues and options for possible consideration by the Joint Committee on Energy. Each underlined issue is followed by a number of options, which may or may not be exclusive.

I. Groundwater Use

Clarify the application of the following to gwhp's:
(1) the reasonable use doctrine
(2) capacity use area regulation

II. Groundwater Quality

The Department of Health and Environmental Control (DHEC) is engaged in developing comprehensive regulations on production and disposal well standards. The effort should include:
(1) production and disposal well casing requirements
(2) well spacing to prevent volumetric or thermal interference
(3) chemical quality standards for injection wells
(4) areas for required reinjection to minimize drawdowns, salt water intrusion, etc.

III. Licensing

(1) develop permit system for gwhps
(2) develop gwhp certification program
(3) set threshold (unit size) levels for regulatory trigger

IV. Taxation

(1) adopt income tax incentive for gwhp installation
(2) exempt added value due to gwhp installation from ad valorem assessment
(3) eliminate sales tax on gwhps
V. Marketing

(1) designate state agency as consumer information clearing-house
(2) provide for state agency technical assistance services to prospective users
(3) employ gwhps in public construction
(4) authorize public district heating services using gwhps
MEMORANDUM

TO: Joyce P. Marchand, Research Coordinator
FROM: Ken Wonstolen, NCSL
DATE: September 15, 1980
RE: Geothermal Issues and Options

Following is a checklist of issues and options for possible consideration by the Joint Committee on Energy. Each underlined issue is followed by a number of options, which may or may not be exclusive.

I. CHARACTERIZATION AND OWNERSHIP

A. Definition

Define geothermal
(1) as a unique thermal resource
(2) as groundwater
(3) as a mineral
(4) by a temperature threshold

B. Ownership

Clarify property rights (private surface/mineral; public) to
(1) deep hydrothermal systems
(2) hot dry rock
(3) shallow aquifers

II. ACCESS AND ALLOCATION

A. Access

(1) provide for access to state-owned geothermal

B. Allocation

Determine competing rights to geothermal through:
(1) rule of capture
(2) correlative rights
(3) reasonable use
(4) priority
III. REGULATION

A. Drilling standards

(1) include geothermal well standards in DHEC regulations
(2) distinguish between high-temperature and low-temperature wells

B. Permitting
Streamline permit procedures through:
(1) "one-stop" agency approach
(2) lead agency structure
(3) small-scale exemptions

C. Reservoir Management
(1) establish program under Water Resources Commission

IV. FINANCE AND MARKETING

A. Taxation
(1) exempt added geothermal value from ad valorem assessment
(2) provide income tax incentive for geothermal expenditures
(3) exempt geothermal equipment from sales tax

B. Public Development
(1) authorize geothermal heating districts (provide bond authority)
(2) include geothermal development in Industrial Development Revenue Bond program
(3) use geothermal in public buildings
(4) establish bond bank/revolving loan fund

C. Utility Initiatives
(1) reduce regulatory burden on heating districts
(2) provide higher rate-of-return on utility geothermal investments
(3) provide transmission access to geothermal heating districts
D. Public Assistance

(1) establish state clearinghouse agency
(2) provide for technical assistance to prospective users
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INTRODUCTION

The NCSL Geothermal Project, in conjunction with the Virginia Coal and Energy Commission's Geothermal Subcommittee, is engaged in a review of Virginia's geothermal policies in order to facilitate the development of this potentially significant indigenous energy resource.

The recommendations which follow are based upon discussions by the Subcommittee and State agency personnel at meetings in May, July and September 1980.
CHARACTERIZATION
ISSUE: HOW SHALL VIRGINIA DEFINE GEOTHERMAL RESOURCES

Recommendation: Enact legislation which defines the geothermal resource as heat and associated by-products.

The following definition was drafted at the request of the Subcommittee:

"Geothermal resources" shall mean the natural heat of the earth and the energy in whatever form, present in, resulting from, created by or which may be extracted from that natural heat, including pressure, and all entrained or dissolved minerals and gases or other products obtained from the material medium of any geothermal resource, excluding hydrocarbons.

Recommendation: Include language in the state statutes which allows the regulating agency to promulgate rules and regulations which define the geothermal resource by temperature and volumetric rate.

The language below was drafted at the request of the Subcommittee:

Application. (1) The provisions of this legislation regarding permitting, well regulations, reservoir management and allocation do not apply to geothermal resources at temperatures below the minimum temperature set forth in the rules and regulations pursuant to section ___ of this act.

(2) The provisions of this legislation regarding leasing requirements [royalties or severance taxes] do not apply to geothermal resource applications producing less than the volumetric rate set forth in the rules and regulations pursuant to section ___ of this act.
ISSUE: HOW SHALL OWNERSHIP OF GEOTHERMAL RESOURCES BE ESTABLISHED

Recommendation: Geothermal resource ownership should be with the surface property owner.

The following language was drafted at the request of the Subcommittee:

Ownership Rights. Ownership rights to geothermal resources shall be in the owner of the surface property underlain by the geothermal resources unless such rights have been otherwise reserved or conveyed.

ISSUE: HOW SHALL GEOTHERMAL RESOURCES BE RELATED TO WATER

Recommendation: Geothermal resources should be separate from groundwater, and removed from water law.

The following language added to a geothermal statute, along with the definition recommended above, will clearly separate geothermal resources from water resources.

Findings. Geothermal resources are hereby declared to be sui generis, being neither a mineral resource nor a water resource.
ACCESS and ALLOCATION
ISSUE: HOW MAY ACCESS TO GEOTHERMAL RESOURCES BE OBTAINED

Recommendation: Legislation should be enacted to give the Department of Labor and Industry the responsibility and authority to develop a comprehensive geothermal leasing and permitting system for the State, which would establish access to explore for and develop the geothermal resource.

ISSUE: HOW SHALL GEOTHERMAL RESOURCES BE ALLOCATED

Recommendation: The Department of Labor and Industry should be required to develop comprehensive rules and regulations relating to exploration and development of geothermal resources in Virginia.

The rules and regulations of the Department should be based upon a system of equitable apportionment (correlative rights).

"Correlative rights" means the rights of each geothermal owner in a geothermal system to produce without waste his just and equitable share of the geothermal resources in the geothermal system.
REGULATION
ISSUE: WHAT AGENCY SHOULD HAVE PRIMARY JURISDICTION OVER GEOTHERMAL DEVELOPMENT

Recommendation: The Department of Labor and Industry should be given primary responsibility to regulate geothermal resources.

ISSUE: WHAT DRILLING CONTROLS ARE NECESSARY

Recommendation: The Department of Labor and Industry should be required to promulgate comprehensive geothermal drilling regulations.

ISSUE: HOW SHOULD THE ENVIRONMENT BE PROTECTED

Recommendation: The Department of Labor and Industry should be required to develop a system of obtaining exploration permits and leases for geothermal development; and a cooperative agreement should be instituted between the Department and the Water Control Board, giving the Water Control Board enforcement powers.
FINANCING and MARKETING
ISSUE: WHAT FINANCIAL INCENTIVES SHOULD BE EXAMINED

Recommendation: Allow geothermal resources similar exemptions from property taxes as solar energy.

To provide similar property tax benefits and incentives to geothermal developers as are given to solar developers, Article X, Section 6(d) of the Virginia Constitution would need to be amended to include geothermal energy. Once the Constitution is amended the legislature could:

1) amend 58-16.4(A) to include geothermal equipment and thereby allow cities and counties the option of exempting such;

2) exempt or partially exempt geothermal directly; or

3) amend 58-774 to include geothermal lands and improvements and thereby allow cities and counties the option of levying a severance tax in lieu of the ad valorem property tax.

ISSUE: HOW MAY THE DIRECT USE OF THE GEOTHERMAL MARKET BE ESTABLISHED

Recommendation: Amend Virginia statutes to include geothermal resource utilization in the authority of "Industrial Development Authorities" (15.1-1373 et seq.) and "Area Development Authorities" (15.1-1400 et seq.).

Recommendation: Allow geothermal resources to be utilized under the authority of the statutes which allow the private sector to organize "Heat, Light, Power (and) Water Utilities" (56-232 et seq.).

Private utilities in Virginia are under the jurisdiction of the State Corporation Commission. The recommendation below outlines how Commission jurisdiction over geothermal heating districts can be modified to facilitate the creation of such without sacrificing protection of the user or supplier.

Recommendation: Allow the State Corporation Commission to grant operating permits to heating districts in lieu of a certificate of public convenience and necessity, if the district can meet certain criteria. Such criteria could require that the applicant:
1) have adequate resource and system;

2) be fiscally sound and able to post bond; and

3) have an adequate sales contract for their customers, in lieu of rate regulation, and that the contract meet certain criteria.

This type of operating permit could allow heating districts to enter existing franchise areas under certain conditions.
APPENDIX 5
SOUTH CAROLINA

Report to the Joint Energy Committee on
Geothermal Energy and Groundwater Heat Pumps

OCTOBER 1980

GEOTHERMAL PROJECT
ENERGY PROGRAM
NATIONAL CONFERENCE OF STATE LEGISLATURES
1125 SEVENTEENTH ST., SUITE 1500
DENVER, COLORADO 80202
ACKNOWLEDGEMENTS

The National Conference of State Legislatures' (NCSL) Geothermal (GEO) Project is funded by a grant from the Department of Energy (DE-FG03-78SF 01795) in order to provide technical assistance to state policy reviews of obstacles and incentives to geothermal development, including the use of groundwater heat pumps. The material and opinions herein are those of the author and not those of the United States or the Department of Energy.

AUTHOR
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ADDITIONAL RESEARCH
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Sherri Valentine

The GEO Project would like to express its appreciation for the assistance of Joyce Marchand, Robert Stein and Becky Martin of the South Carolina Legislative staff.

In addition, it would like to acknowledge the participation and contribution of the following persons:

- B.C. Spigner, Water Resources Commission (WRC)
- Donald Duncan, Department of Health and Environmental Control (DHEC)
- Norman Olson, Geological Survey (GS)
- Marty Lehder, Division of Energy Resources (DER)
- Larry Lefebvre, Division of Energy Resources (DER)
- R. Dow Bailey, Public Service Commission (PSC)
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I. SUMMARY OF LEGISLATIVE PROPOSALS

A. Taxation
   (1) Include gwhp's* within the scope of the income tax deduction for "renewable energy source property"
   (2) Exempt the added property value due to gwhp installation from ad valorem assessment
   (3) Exempt gwhp's from the sales tax

B. Licensing
   (1) Establish a regulatory mechanism for gwhp well construction

C. Groundwater Use
   (1) Subject groundwater withdrawals for heat pump use to capacity use area regulation

D. Groundwater Disposal
   (1) Express a preference for reinjection of gwhp effluent
   (2) Fund a reinjection monitoring program

E. Public Assistance
   (1) Provide funding for consumer information and technical assistance services

*gwhp = groundwater heat pump(s)
II. DISCUSSION

Geothermal Resources

It is the conclusion of the NCSL GEO Project, after considering written and oral comments from the participants in this policy review, that it would be premature to suggest geothermal resource legislation at this time. It is felt that further assessment of the nature and extent of the South Carolina's geothermal resources is required in order to guide the development of a legal framework. It is hoped that the federally-funded East Coast geothermal drilling program will provide additional information in this regard. Currently, that program is most active in the Delmarva region.

Additional guidance to the development of an appropriate legal framework may be obtained by assessing the operation of geothermal legal regimes established in several other East Coast states. Maryland adopted a geothermal statute in 1978; it is presently reviewing that legislation and endeavoring to establish implementing regulations. The Delaware Legislature passed a geothermal bill in 1980 which was vetoed by the Governor. Virginia also is considering possible geothermal legislation for 1981 introduction. The NCSL GEO Project is assisting in all these efforts and will be able to transfer the experience gained to South Carolina at a future date. This will allow a more informed consideration of various policy options, including the use of temperature thresholds, private versus public ownership and allocation methods. (See Appendix A for a more complete listing of policy areas).

Groundwater Heat Pumps

A. Taxation

The General Assembly may provide a stimulus to gwhp use through the use
of several tax incentives. (It may wish to extend such incentives to air-to-air and earth-coupled heat pump systems as well.) The use of tax incentives is a common method of encouraging a particular technology. Therefore, it is suggested that:

(I) The General Assembly memorialize the Tax Commission to include gwhp's within the scope of the income tax deduction for "renewable energy source property"

It is not clear from the statutory language that gwhp's would qualify for the deduction. Their inclusion would comport with the apparent legislative intent since such units utilize solar and/or geothermal energy stored in groundwater. Gwhp's will not qualify for the federal energy tax credit under a recent IRS interpretation (unless they tap a geothermal source of at least 60°F /140°F). Thus, a state tax incentive becomes even more important.

Additional tax incentives suggested include:

(2) Exempting the added property value due to gwhp installation from ad valorem assessment

(3) Exempting gwhp's from the sales tax

Please refer to Appendix C for a fiscal analysis of these proposals.

B. Licensing
There presently is no regulatory mechanism in South Carolina to track or control well construction for gwhp use. The widespread use of these units raises issues of groundwater management to insure adequate supplies
and protect aquifer quality. Therefore, it is suggested that the General Assembly:

(I) Establish a regulatory mechanism for gwph well construction

At a minimum, such a mechanism would require notification to an appropriate state agency (DHEC and/or WRC) prior to drilling a gwph well. Additional requirements might relate to submission and approval of a well construction plan (siting, depth, casing, etc.), well logging and submission of data, abandonment and the use of licensed drillers.

These suggestions, of course, are relevant to any well constructed in South Carolina for whatever purpose. Indeed, DHEC is presently engaged in developing a legislative package in this area for possible consideration by the General Assembly. The Committee may wish to review any such proposal with regard to gwph (and geothermal) well drilling.

C. Groundwater Use

The South Carolina Groundwater Use Act allows the WRC to designate "capacity use areas" and provides broad regulatory authority in such areas. Groundwater withdrawals in excess of 100,000 gallons per day for heat pump use would only be allowed by permit. Smaller, commercial uses would not require a permit but would have to comply with the procedures established to protect and manage the groundwater resources of the area. Individual domestic gwph users, however, would be exempt from either requirement. The General Assembly may wish to grant WRC the authority to bring such individual uses within its management program as their cumulative impact could be substantial. This could be accomplished by limiting the
individual domestic exemption to uses other than home heating/cooling. Therefore, it is suggested that the General Assembly:

(I) Amend the Groundwater Use Act to subject gwhp withdrawals to capacity use area regulation

It should be noted that this proposal would not automatically add a regulatory burden to all gwhp users in South Carolina. Only small portions of the state have been designated as capacity use areas. Even within such areas WRC might, in its discretion, continue to exempt individual domestic gwhp's from its management program depending on aquifer characteristics, density of gwhp use and types of units in use. Where necessary, however, to protect groundwater supplies and allocate withdrawals among numerous gwhp users, WRC would have the requisite authority.

D. Groundwater Disposal
The disposal of effluent from gwhp's is another area inadequately controlled. Such disposal raises concerns relating to both groundwater quality and maintenance of supply. In general, assuming no additives are introduced to the groundwater in its cycle through the heat pump, reinjection offers advantages in both regards. That is, the water can be returned to its original source unchanged in quality (except for temperature) and thereby maintain the supply of groundwater in the aquifer.

Studies to date indicate that thermal pollution is not a significant problem due to slow migration of thermal fronts. Further, year-round use of gwhp will tend to even out temperature changes in the aquifer.
since both warmer and cooler water is reinjected. On the other hand, surface disposal may result in erosion, bog formation and leaching of pollutants back to the aquifer, in addition to reducing aquifer supply. Sewage disposal can result in system overloads. Therefore, it is suggested that the General Assembly adopt a joint resolution:

(1) Expressing a general preference for disposal of gwhp effluent by reinjection

Although reinjection is generally the best option, there are potential problems which should be noted. Gradual warming of an aquifer may result in enhanced bacterial growth and/or increased dissolution of minerals into the aquifer. Gradual cooling may result in increased precipitation of minerals from solution with possible negative effects on aquifer permeability. It is expected that DHEC's groundwater protection package would allow it to prevent such occurrences. In order to enhance DHEC's ability in this regard, it is suggested that the General Assembly:

(2) Fund a groundwater monitoring program to assess the effects of reinjecting gwhp effluent to sensitive aquifers

The WRC might also participate in such a program where formation of solution cavities, rather than potential health effects, was the primary concern.

E. Public Assistance

Gwhp's are already in use in South Carolina, and the industry as a whole
is in rapid expansion. Potential users would benefit from the availability of information and technical assistance services regarding types of units, costs and benefits, tax incentives, regulatory requirements, adequacy of groundwater supplies, etc. Therefore, it is suggested that the General Assembly:

(1) Provide funding for consumer information and/or technical assistance services

Such services might logically be located in the WRC, with the DER an alternative candidate.
MEMORANDUM

TO: Joyce P. Marchand, Research Coordinator
FROM: Ken Wustalen, NCSL
DATE: September 15, 1980
RE: Geothermal Issues and Options

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I. CHARACTERIZATION AND OWNERSHIP

A. Definition

Define geothermal
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(2) as groundwater
(3) as a mineral
(4) by a temperature threshold

B. Ownership

Clarify property rights (private surface/mineral; public) to
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(2) hot dry rock
(3) shallow aquifers

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A. Access

(1) provide for access to state-owned geothermal

B. Allocation

Determine competing rights to geothermal through:
(1) rule of capture
(2) correlative rights
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(1) include geothermal well standards in DHEC regulations
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Streamline permit procedures through:
(1) "one-stop" agency approach
(2) lead agency structure
(3) small-scale exemptions

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(1) establish program under Water Resources Commission

IV. FINANCE AND MARKETING

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C. Utility Initiatives

(1) reduce regulatory burden on heating districts
(2) provide higher rate-of-return on utility geothermal investments
(3) provide transmission access to geothermal heating districts
D. Public Assistance

(1) establish state clearinghouse agency
(2) provide for technical assistance to prospective users
MEMORANDUM

TO: Joyce P. Marchand, Research Coordinator
FROM: Ken Wonstolen, NCSL
DATE: September 15, 1980
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Following is a checklist of issues and options for possible consideration by the Joint Committee on Energy. Each underlined issue is followed by a number of options, which may or may not be exclusive.

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- Clarify the application of the following to gwhp's:
  1. the reasonable use doctrine
  2. capacity use area regulation

II. Groundwater Quality

- The Department of Health and Environmental Control (DHEC) is engaged in developing comprehensive regulations on production and disposal well standards. The effort should include:
  1. production and disposal well casing requirements
  2. well spacing to prevent volumetric or thermal interference
  3. chemical quality standards for injection wells
  4. areas for required reinjection to minimize drawdowns, salt water intrusion, etc.

III. Licensing

1. develop permit system for gwhps
2. develop gwhp certification program
3. set threshold (unit size) levels for regulatory trigger

IV. Taxation

1. adopt income tax incentive for gwhp installation
2. exempt added value due to gwhp installation from ad valorem assessment
3. eliminate sales tax on gwhps
V. Marketing

(1) Designate state agency as consumer information clearing-house
(2) Provide for state agency technical assistance services to prospective users
(3) Employ gwhps in public construction
(4) Authorize public district heating services using gwhps
SUMMARY OF STATUS OF KNOWLEDGE OF
ALTERNATIVE ENERGY RESOURCES OFFERING POTENTIAL FOR
DEVELOPMENT IN SOUTH CAROLINA
(based on Technical Panel Hearing, December 13, 1979)
LOW LEVEL GEOTHERMAL (heat-generating rock): for agriculture, and home hot-water and space heating

An attitude of resource: located under the lower coastal plain region; buried granitic rock there generates heat in the range of 100-150°F (38-65°C).

Time scale of development:

Research/development needs:

1) investigation of factors controlling heat flow in granitic rock
2) full inventory of resource potential
3) extraction (utilization) technologies
4) treatment and return of spent waters

Legislative programs needed:

Agencies involved:

S.C. Research & Statistical Services (Geol. Survey)
Virginia Polytechnic Institute and State Univ.

Benefits:

a) more efficient than conventional air-source heat pumps
b) can reduce our dependence upon fossil fuels by 21%
LOW LEVEL GEOTHERMAL (ground-water): for water and space cooling/heating (Home)

MAGNITUDE OF RESOURCE: underground aquifers occur throughout the State; in Beaufort and Jasper counties, water temperatures range from 60-67°F; in Charleston, water temperatures range from 95-100°F.

TIME SCALE OF DEVELOPMENT:

RESEARCH/DEVELOPMENT NEEDS: 1) extraction (utilization) technologies
2) treatment and return of spent waters

LEGISLATIVE PROGRAMS NEEDED: 1) public education
2) certification and instruction of water-well contractors
3) State support of an inventory and research program

AGENCIES INVOLVED: S.C. Water Resources Commission
Virginia Polytechnic Institute and State Univ.
S.C. Research and Statistical Services (Geol. Survey)

BENEFITS: a) 50% more efficient than conventional air-source heat pumps.
   b) can reduce our dependence upon fossil fuels by 21%
October 9, 1980

The Honorable Allen R. Carter, Chairman
Post Office Box 142
Suite 305 Senate Gressette Building
Columbia, South Carolina  29202

Dear Senator Carter:

This is in response to your letter of September 23, 1980, concerning fiscal impact statements on various tax incentives for groundwater heat pumps and small-scale hydroelectric facilities in South Carolina.

1. If the groundwater heat pump was included as part of the income tax deduction that was enacted in the Supplemental Appropriations Bill in 1980, there would be a loss in revenue of approximately $75,000 per year. We checked with the Internal Revenue Service to determine whether or not the groundwater heat pump was eligible for the Federal credit. They advised us that it would not qualify. However, we understand that owners of groundwater heat pumps have been receiving the credit under the name of Geothermal Heat Recovery Systems.

2. If the added value due to the installation of a groundwater heat pump was exempt from the Property Tax, there would probably be some loss in revenue to the local governments; however, it would be practically impossible to determine the amount.

3. If the Sales Tax was eliminated on the sale of groundwater heat pumps there would be a loss in revenue of approximately $150,000 per year.

4. We have looked into the question of the development of small-scale hydroelectric power in South Carolina. At the present time there are no such facilities, also we have not been able to determine when any of these facilities will be developed.
small-scale hydroelectric facilities would be put into operation. The loss that the State and Counties would realize would be a reduction in the possible future revenue from these facilities.

If we can be of any further assistance, please contact us.

Very truly yours,

SOUTHERN CAROLINA TAX COMMISSION
RESEARCH AND STATISTICS DIVISION

A. T. Clarkson, Jr.
Tax Research Supervisor

GLT: caw

cc
REPORT ON GROUND-WATER CONDITIONS

IN THE

LOW COUNTRY AREA, SOUTH CAROLINA

A Capacity Use Investigation

by

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SOUTH CAROLINA

WATER RESOURCES COMMISSION
REPORT NUMBER 132

1979
1. Regulations to limit ground-water withdrawals in areas where the supply is limited or where it has been documented that the movement of poor quality water is degrading a fresh-water aquifer.

2. Regulations related to well spacing, construction, and abandonment; proper testing of aquifers during well-construction operations; and the proper reporting of all such data.

3. Ground-water monitoring program.


5. Water users should be required to use the water of lowest quality available that is, or can feasibly be made, suitable for a particular purpose.

6. Measures should be instituted that would provide for the best practical management of the ground-water system and cause the least interference with existing water users.

7. If a capacity use area is declared, we would recommend that no well, regardless of capacity or purpose, should be drilled without first obtaining a permit from the SCWRC under the provisions of Section 49-5-40(a)(2) of the Ground Water Use Act.

WISCONSIN

Report to the Assembly Committee on Energy
On Water Source Heat Pumps

November 1980

Energy Program
Geothermal Project

National Conference of State Legislatures
1125 Seventeenth St., Suite 1500
Denver, Colorado 80202
303/523-6600
ACKNOWLEDGEMENTS

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AUTHORS

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The Geothermal Project would like to express its appreciation for the assistance of the following persons:

- Leslie Glustrom, Science Analyst, Legislative Council Staff
- Jon Peacock, Research Clerk, Assembly Committee on Energy
- Ron Hennings, Wisconsin Geological and Natural History Survey (WGNHS)
- Carl Blabaum, Department of Natural Resources (DNR)
- Kevin Kestler, Department of Natural Resources (DNR)
- Paul Didier, Department of Natural Resources (DNR)
- Greg Krohm, Wisconsin Division of State Energy (WDSE)
INTRODUCTION

The NCSL Geothermal Project is providing technical assistance to the Wisconsin Assembly Committee on Energy in a policy review of obstacles and incentives to the development of water source heat pumps (wshp). This report should be considered in conjunction with previous project documents.

- Guidebook to Ground Water Heat Pumps;
- Wisconsin Addedendum to the Guidebook.

This report represents a refinement of the earlier documents. It is based on additional statutory analysis and takes into consideration comments and direction from legislators, legislative staff and agency officials.

Information has also been drawn from the results of a recent NCSL telephone survey of over 100 professionals involved in different aspects of the development of water source heat pumps. The report contains a series of legislative suggestions for consideration by the Committee, including a statement of justification and discussion of issues and options.

NCSL is prepared to develop bill drafts, or to assist Wisconsin legislative staff in so doing, to implement those proposals selected by the Committee for possible introduction in the 1981 session.
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1. **SUMMARY OF LEGISLATIVE PROPOSALS**

A. **Water Quality**
   (1) Support DNR's budget request for a monitoring program of water source heat pump reinjection wells.

B. **Water Use**
   (1) Empower DNR to promulgate rules for the management of water use.

C. **Consumer Information**
   (1) Provide funding for an information clearinghouse on water source heat pumps.
   (2) Provide funding for a technical assistance program which would assist consumers in matching a water source heat pump system to particular applications.

D. **Financial Incentives**

   **Taxation**
   (1) Exempt water source heat pumps for additional property tax assessments.
   (2) Exempt water source heat pumps from the sales tax.
   (3) Provide an income tax credit or deduction for the use of water source heat pumps.

   **Loan Programs**
   (4) Develop a loan program for water source heat pumps.
II. ISSUES AND OPTIONS

A. Water Quality

Objective
To develop a water quality management program that would regulate the development of water source heat pumps so that the quality of Wisconsin's water would be protected.

Proposals
(1) Preferred Option: Support DNR's budget request for a monitoring program of water source heat pump reinjection wells.

Other Options:
- authorize DNR to allow the reinjection of water source heat pump effluent under their management;
- continue to prohibit the reinjection of water source heat pump effluent.

Justification
Reinjection of water source heat pump effluent offers several advantages in terms of maintaining the quality and supply of groundwater. In fact, this method of disposal is preferred in several states, including Arizona, New York and Oregon. Assuming no additives are used, the water can be returned to its original source unchanged in quality (except for temperature) and thereby maintain the supply of groundwater in the aquifer.
Studies to date indicate that thermal pollution is not a significant problem due to slow migration of thermal fronts. Further, year-round use of groundwater heat pumps tends to even out temperature changes in the aquifer, since both warmer and cooler water is reinjected. Surface disposal may, however, result in erosion, bog formation, leaching of pollutants back to the aquifer and reduction of aquifer supply. Sewer disposal can result in system overloads.

Despite the benefits offered by the reinjection of water source heat pump effluent, water quality problems can occur when the specific characteristics of an aquifer are not taken into account or when the system is abused. A water source heat pump licensing and management program could address these potential problems while allowing Wisconsin residents to take advantage of this method of effluent disposal.

Discussion

The reinjection of water source heat pump effluent is prohibited in the state of Wisconsin. This prohibition is the result of an administrative determination that water source heat pump effluent is a pollutant, as defined in the Wisconsin statutes. The most direct statement prohibiting reinjection is found in the Wisconsin Administrative Code: "The use of any well for disposal of solid wastes, sewage or surface or wastewater drainage is prohibited" (Sec. NR172.20). The statutory authority relied upon is the statement that: "It is the goal of the State of Wisconsin to eliminate the
discharge of pollutants into the waters of the state by 1985" (Sec. 147.01).

Pollutants are defined to include:

"...oil, sewage, sludge, munitions, chemical wastes, biological materials, radioactive substance, heat ... and industrial, municipal, and agricultural waste discharged into water" (Sec. 147.015(3)) [emphasis added].

These laws, which are interpreted as defining water source heat pump effluent as a pollutant, were enacted before the use of water source heat pumps became well known. However, several research efforts indicate that the use of reinjection wells for water source heat pump effluent does not introduce any significant pollution into the groundwater.

The metal components that make up the water source heat pump system are no more prone to introduce pollutants than galvanized steel and copper pipes commonly found in domestic plumbing systems. The freon and vegetable oil used in the heat exchanger are non-toxic. Moreover, oil tends to float on the surface of the aquifer above well intakes and freon tends to evaporate and escape through well vents. Finally, most systems are designed to shut down if a leak develops in the heat exchanger, since this will cause the system to lose the pressure necessary for operation.

DNR is presently requesting funds for a monitoring program of sixty water source heat pump reinjection wells. They are proposing that this project last for three years and be funded for $60,000 a year. Specific areas that DNR plans to examine are well construction methods and the potential for thermal pollution. Eligible sites will be selected according to geographic areas, with no more than 5% of the experimental wells in one county.
This proposal could accomplish an informal permit and management program for sixty reinjection wells, in the next three years. Thus it is suggested that the legislature:

(1) Support DNR's budget request for a monitoring program of water source heat pump reinjection wells.

It is important to note that Wisconsin's well construction code (DR112) is considered to be one of the most comprehensive in the country and is used as a model in other states. The proposed three year study reflects DNR's effort to maintain the state's stringent water management policies. Presently consumer interest in water source heat pumps is not high. Therefore, this program may be sufficient to allow most near-term prospective users the option to use reinjection. The program should be accompanied by some form of consumer technical assistance (see Section D). Reinjection is a fairly expensive method of effluent disposal, and there are more than ten types of water source heat pump systems that do not require reinjection. Consumers should be made aware of which system is most cost effective and efficient for a particular application.

The legislature may also want to specify that applications be accepted during the full three year period until sixty wells have been permitted. In addition, the legislature could require DNR to submit an annual report to the legislature describing results of the previous year's progress, and statutory or administrative measures necessary for the development of a formal licensing and monitoring program.
Alternatively, the legislature may wish to provide funding for the development of a formal licensing and management program. The results of several research efforts and the experience of numerous state regulatory agencies suggests that the technology to prevent the potential environmental problems of water source heat pumps exists. Many of these problems relate to the abuse of the water source heat pump system, or the failure to match the system to a particular application and can be addressed most directly through a licensing and water quality management program.

The appendix contains a comprehensive list of the potential environmental problems that can occur with the use of water source heat pumps and the corresponding regulatory options for addressing these problems. In summary, the regulatory options are:

- Establish aquifer-specific well-spacing standards to minimize the effect of thermal pollution;
- Require that reinjection wells return the water to the source aquifer, in order to maintain supplies;
- Limit the use of chemical additives;
- Protect aquifers susceptible to specific environmental problems by, for example, aquifer-specific limits on pumping rates, limits on the use of reinjection wells, or aquifer-specific equipment standards;
- Establish well construction standards (spacing, depth, casing, pumping rates and abandonment techniques) for reinjection wells; and
- Implement spot inspections and fines.
Although reinjection is generally the best option, there are potential problems which should be noted. Increases in the temperature of an aquifer may result in accelerated bacterial growth or increased dissolution of minerals into the aquifer. Gradual cooling may result in increased precipitation of minerals from solution, with possible negative effects on aquifer permeability. DNR's groundwater protection package should allow it to prevent such occurrences. The proposed DNR monitoring program will be able to enhance their ability in this regard. Moreover, this project will allow DNR to develop a model comprehensive management program that will be consistent with the states stringent well construction standards for supply wells.

Finally, the legislature could continue to prohibit the reinjection of water source heat pump effluent. This option is not recommended in light of the previous discussion.

B. Water-Use

Objective
To prevent the occurrence of well interference and aquifer drawdown.

Proposal
(1) Empower DNR to promulgate rules for the management of water use.
Justification
Presently, no state agency has been empowered to address problems of inadequate water supply. Moreover, Wisconsin's water law established reasonable use as the criterion for settling water supply disputes (State vs. Michels Pipeline Construction; Inc. (63 Wis. 2d 278 (1974)). The determination of reasonable use does not provide standards for water supply planning and is subject to the uncertainty of case-by-case adjudications.

Generally, Wisconsin has an abundant and under-used supply of water. There are some local areas, however, where groundwater supply problems exist. If there is significant development of water source heat pumps, water use will increase substantially, and problems of aquifer drawdown and well interference may occur.

Discussion
DNR might be given authority to manage water supplies, particularly in aquifers where the potential for drawdown exists. Specifically, DNR should be able to place limits on water consumption and to enforce aquifer-specific well-spacing standards for the prevention of well interference. The ability to designate water management areas, and to require non-consumptive use, through reinjection or closed loop systems in areas with water supply problems might also be an aspect of such a program. Therefore, it is suggested that the legislature:

(1) Empower the DNR to promulgate rules for the management of water use. These additional water management powers would give police power jurisdiction
to D:\R in the interest of general welfare but would not constitute a change in existing property rights.

C. Consumer Information

Objective
To assist consumers and water source heat pump installers in matching the type of water source heat pump system to a specific application.

Proposals
(1) Provide funding for a consumer information clearinghouse on water source heat pumps.
(2) Provide funding for technical assistance.

Justification
Wisconsin is in an excellent position to realize energy savings through the use of water source heat pump systems. Water source heat pumps have been found to be most efficient and cost-effective in states like Wisconsin which have severe winter climates. Moreover, Wisconsin has an abundance of water that is under-used, and it is presently depending on expensive imported fossil fuels to meet heating and cooling needs.

Water source heat pump systems are relatively novel, so consumers are unfamiliar with the many types of systems and their relative advantages and
disadvantages. Consumers also know little about:

- the different components of the heat pump unit;
- state regulations;
- life cycle cost-effectiveness;
- reputable water source heat pump installers; and
- available financial incentive programs.

Discussion

A consumer information clearinghouse could provide some of this information by distributing general information pamphlets and referring the more difficult questions to the appropriate state agency or to professionals knowledgeable about water source heat pumps. Moreover, a clearinghouse can be funded at a relatively low cost, so it is suggested that the legislature:

(1) Provide funding for an information clearinghouse on water source heat pumps.

The state may also wish to have the capability to respond to specific information requests. This type of technical assistance is generally more expensive than general informational services, but it offers several advantages to states that wish to encourage the well-planned development of resources. Providing technical assistance can:

- assist consumers, construction companies, well drillers and pump installers in complying with state regulatory standards;
- help consumers select the most economical and environmentally safe systems;
- address potential efficiency problems in the design of a system such as scaling, corrosion, pipe clogging;
c promote water source heat pump development by helping consumers understand the feasibility of using these systems to meet their heating and cooling needs;

- assist local building inspectors in assessing the use of new water source heat pump components.

Thus, it is suggested that the legislature:

(2) Provide funding for a technical assistance program.

The state may wish to draw on the expertise of various state agencies to participate in this program.

D. Financial Incentives

Objective

To encourage the use of water source heat pumps through the use of financial incentives.

Proposals

Taxation

(1) Exempt water source heat pumps from additional property tax assessments.

(2) Exempt water source heat pumps from the sales tax.

(3) Provide an income tax credit or deduction for the use of water source heat pumps.
Loan Programs

(4) Develop a loan program for water source heat pumps.

Justification

The use of water source heat pump systems offers several benefits to society as a whole. Moreover, the individual consumer realizes long term energy savings. However, these systems pay back only after approximately eight years due to high initial costs. In order for the state to receive the "spin off" benefits of water source heat pump development, which include energy savings, decreased dependence on imported fossil fuels, utilization of an abundant and decentralized source of energy and increased employment, the state could provide financial incentives to water source heat pump consumers. Incentives can also create consumer demand for more efficient innovations. For example, most water source heat pump manufacturers design their equipment for optimal efficiency in the cooling mode. Additional consumer demand could cause manufacturers to incorporate existing design innovations for more efficient heating into their "off-the-shelf" heat pump models.

Discussion

The use of tax incentives to encourage water source heat pump development is a fairly simple and highly visible method of public subsidy. Since the subsidy takes the form of foregone revenues, it would not adversely affect the state's current revenues. Therefore, it is suggested that the legislature consider the relative costs/benefits of:
(1) exempting water source heat pumps from additional property tax assessment;
(2) exempting water source heat pumps from the state sales tax;
(3) providing an income tax credit/deduction for the use of water source heat pumps.
Sales tax and income tax exemptions/deductions are more direct methods of assisting the front end financing of these systems, while a property tax exemption represents a more passive approach, which affects pay-back periods.

These tax incentives could be made available to home owners as well as businesses.

State sponsored loan programs provide a more direct way to help the consumer afford the high initial costs of water source heat pumps and other types of alternative energy systems. Some of these programs allow the state to assist a large number of consumers at relatively low costs. For example, states can use their tax exempt status to obtain funds for loans by floating a bond at relatively low interest rates. They could then offer a loan for a small percentage above the bond rate in order to cover administrative costs. It should be noted that using such subsidized funding will negate certain federal tax benefits which might become available. Under a recent IRS ruling water source heat pump expenditures do not qualify for energy tax credits unless they use a heat source greater than fifty degrees centigrade.

Subsidized loans and loan guarantees offer two other ways to leverage state funds. Subsidized loans entail the states paying a commercial lending
institution the difference between a low-interest loan and the market rate. For example, a home owner would borrow $5,000 from a bank for a water source heat pump system at an interest rate below market levels. The state would pay the incremental interest. Thus, the state would not have to invest large sums of money. Loan guarantees work in a similar way to achieve leverage. The state agrees to pay the lender only if the borrower defaults on the loan.

All loan programs should include provisions to assure that the most cost-effective systems are developed. Funds could be available only for those systems found to have no more than a designated pay-back period.

The loans could be available to construction companies as well as homeowners. The high initial costs of water source heat pumps are particularly effective in discouraging construction companies from considering water source heat pumps in new buildings. The cost to install a domestic water source heat pump, with a supply and reinjection well averages $5,700 while the cost of installing an electric heating system is only about $1,300. The end result is that a building contractor can turn out a home $4,400 cheaper by going with electrical heating, leaving the home owner to pay higher monthly heating costs. An additional factor is that building contractors borrow an average of 90 percent of their operating costs at 2 or 3 percent above prime. Thus, they have a strong incentive to cut costs.

The installation of water source heat pumps is often most cost-effective in new homes, since the cost of retrofitting can be prohibitive, and much of the installation of water pipes and heating ducts complement normal building procedures.
Finally, this market is massive in its size. Approximately 22 million new family units will be required in the U.S. during the ‘80s. Low-interest loans to construction companies, for the installation of water source heat pump systems, and other alternative energies can help assure that these homes use energy supplies in an efficient, cost-effective manner. Thus it is suggested that the legislature:

(4) Develop a loan program for water source heat pumps.

E. Conclusion

Water source heat pumps offer significant energy saving potential to Wisconsin residents. Moreover, Wisconsin has an abundant and presently under-used supply of water. This resource can be used to assist Wisconsin in becoming more energy self-sufficient.

Many of the potential environmental problems of water source heat pumps relate to the abuse of the water source heat pump system, or to the failure to match a system to the specific application. These problems can be addressed through a licensing and water quality management program. The proposed ONR reinjection monitoring program would provide an informal licensing and management program for up to sixty reinjection wells. This program reflects the historical state policy to enforce stringent well construction codes. The results of this three year study could produce a model comprehensive licensing and management program.
Consumer information in the form of an information clearinghouse and technical assistance can enhance Wisconsin's ability to benefit from the use of this alternative energy system. This information can encourage the use of these systems in general as well as help consumers conform to state regulations and understand the tradeoffs between the efficiency and cost-effectiveness of different water source heat pump systems. Finally, financial incentive programs can help consumers abate the high initial costs of these systems. Increased use of these systems can save energy, provide additional employment and create a demand for more efficient/cost-effective systems.
November 5, 1980

Ms. Virginia Fahys Smith
National Conference for State Legislators
125 17th Street
Denver, CO 80202

Dear Ms. Smith:

In response to your recent request to Carl Blabaum for information on proposals for groundwater protection and a heat pump study, I am pleased to provide the following:

1. Summary of Proposed Rules for Groundwater Protection,

2. A flyer describing the groundwater protection proposal, and

3. The proposed Session Law relating to groundwater heat pump research.

The thrust of the heat pump study is to determine any impacts there may be on groundwater by evaluating a limited number of installations. Primary elements of the study are establishing construction criteria for discharge wells, testing of the discharge water to determine if chemicals are leached from system components, determining thermal impact on groundwater in the area of discharge wells, assessing long term efficiency of discharge wells (i.e. does plugging occur due to incrustation or bacterial growth?), evaluating the capability of soil adsorption fields and seepage pits to accept the quantity of water discharged from heat pumps and conducting literature review to assess the experience in other states. We feel that these elements need to be evaluated before there is a final policy established on the direct discharge to groundwater. Currently, there are a number of heat pump installations in Wisconsin which are discharging to the land surface or surface water. The success of these installations will no doubt have a large influence on future demand for this type of heating and cooling.

If you have any questions on the above, please feel free to contact me. I am looking forward to discussing these issues with you when you are in Madison next week.

Sincerely,

Robert A. Baumeister, P.E., Chief
Public Water Supply Section

Robert A. Baumeister, P.E., Chief
Public Water Supply Section

cc: Carl J. Blabaum - WW/2
Appendix B

Table 1: Potential Environmental Problems of Water Source Heat Pumps and Corresponding Regulatory Options
<table>
<thead>
<tr>
<th>Problems</th>
<th>Regulatory Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Water Quality</strong></td>
<td></td>
</tr>
<tr>
<td>a) The reinjection of heated or cooled heat pump effluent into an aquifer.</td>
<td>Generally not a problem due to the slow migration of thermal fronts. Carbonate aquifers with large solution cavities are expected to be most susceptible to this problem. However, standards on well spacing, well depth, the number of reinjection wells used, and the use of cooling towers can minimize the effects.</td>
</tr>
<tr>
<td>b) The reinjection of heated or cooled heat pump effluent into a surface stream.</td>
<td>Presently regulated by EPA and designated state agencies through the NPDES program (S. 402 of Federal Water Pollution Control Act of 1972). Additional state controls include: - enforcing more stringent allowable temperature variations; NPDES = +5 or -5; - spot inspections and fines to assure compliance.</td>
</tr>
<tr>
<td>c) The use of chemical additives, such as anti-corrosives.</td>
<td>- Require that wshp systems have self cleaning mechanisms or easy access for manual cleaning if installed in aquifers that have high concentrations of corrosive minerals. - Limit the use of chemical additives; - Spot inspections and fines.</td>
</tr>
<tr>
<td>d) Reinjection of pollutants due to wshp machinery.</td>
<td>Should not occur unless highly corrosive alloys are used in systems. Thus: - prohibit the use of highly corrosive alloys; - spot inspections and fines.</td>
</tr>
</tbody>
</table>
e) Abuse of reinjection for sewage disposal, or for the disposal of contaminated effluent.

Regulated by EPA and designated state agencies through the Underground Injection Control (UIC) Program (Safe Drinking Water Act 1978). Additional state controls include:
- allowing the reinjection of wastewater effluent only;
- spot inspections and fines.
- Require that wastewater reinjection wells discharge back to the supply aquifer.
- Limit "consumptive" wastewater systems in these aquifers;
- Require reinjection or the use of closed loop systems;
- Well spacing, depth and casing standards.

f) Changing the chemical balance of the aquifers.

- Aquifer specific well spacing standards;
- Limits on consumptive use of water in susceptible aquifers.

II. Water Quantity

a) Well interference - wells spaced too close together.

b) Aquifer draw down - water consumed exceeds aquifer recharge capacity.

III. Land Subsidence

a) Volumetric deformations caused by over pumping in aquifers that are susceptible to subsurface compaction.

b) Surface sinkholes caused by the dissolution of carbonate rocks. This process could be accelerated by changes in groundwater temperatures and increased flow.

- Limits on the consumptive use of water in susceptible aquifers.
- Limit the use of wastewater reinjection wells in susceptible aquifers;
- Monitor a wastewater heat pump reinjection well in a susceptible aquifer.
GEOTHERMAL POLICIES

In Selected States

September 1980

GEOTHERMAL PROJECT – ENERGY PROGRAM

National Conference of State Legislatures

1125 Seventeenth Street Suite 1500

Denver, Colorado 80202

303/623-6600
GEOTHERMAL POLICIES

This document presents a review of approaches to the geothermal resources taken by various states in the areas of characterization, access and allocation, regulation and finance. The information herein is not intended to be comprehensive, but is, rather, a brief overview of geothermal legislation in the following states:

ALASKA
CALIFORNIA
DELAWARE
HAWAII
MARYLAND
NEVADA
NEW MEXICO
OREGON
UTAH
VIRGINIA
WASHINGTON
WYOMING
ALASKA

Characterization

Definition.

Alaska defines geothermal resources as the natural heat of the earth at temperatures greater than 120°C, the energy, including pressure, the material medium and associated by-products.

Relationship to Water.

Geothermal development may not interfere with existing water rights unless the developer either purchases sufficient water rights to offset the interference or supplies an equivalent amount of replacement water of comparable quality. No appropriations of geothermal fluids may be made nor priorities established.

Ownership.

Geothermal property rights are included within state mineral ownership.

Access and Allocation

Permitting and Leasing.

Access to state-owned geothermal resources may be obtained via exclusive, convertible exploration permits or, in designated "Competitive Geothermal Areas," by leasing at public auction.

Resource Allocation.

The Alaska statute declares it is in the public interest to protect correlative rights, thus giving each owner in a geothermal system an equitable share of the resource in a geothermal system.

Pooling and Unitization.

The Department of Natural Resources may issue pooling orders, limits on production and must approve unitization agreements. If the lessees of at least two-thirds of a geothermal system ratify a unit agreement, the Department of Natural Resources may enforce the agreement amongst all leaseholders.
Regulation

The Department of Natural Resources has regulatory jurisdiction over all private, municipal, state and federal lands—and developers thereon.

Drilling Controls.

The Department of Natural Resources regulates the siting, spacing, drilling, casing, cementing and abandonment of geothermal wells; requires individual or blanket surety bonds; and may require a reinjection program.

Resource Protection.

The Department of Natural Resources requires approval of a plan of development and operation on each producing geothermal system. It may issue well-spacing orders, limits on production and reinjection requirements to prevent waste.

Streamlining.

Geothermal development and regulation are subject to Alaska's Environmental Procedures Coordination Act.

Financing and Marketing

Taxation.

Geothermal developers are subject to ad valorem property taxes and state income tax. Users will not have their property assessments raised due to geothermal installations.

Financing.

The Alaska Power Authority (APA) power project loan fund, capitalized by direct legislative appropriations, is available for small-scale power projects. APA also has various bonding and state-guarantee mechanisms available. The state may directly fund some projects.

Utility Markets.

A geothermal heating district, whether public or private, may be formed by boroughs or municipalities. Public Service Commission oversight would be directed at reliability of service matters.
Market Expansion.

The state is funding geothermal assessment activities as well as drilling at Pilgrim Hot Springs. It is creating an Energy Center to stimulate renewable energy development.
Characterization

Definition.

California laws define geothermal resources as the natural heat of the earth below the surface of the earth, which may be extracted, including all minerals in solution or other products obtained from the naturally heated fluids. Exceptions to the by-products include oil, hydrocarbon gas or other hydrocarbon substances. The definition does not include the material medium.

Relationship to Water.

Certificates of primary purpose may be obtained which provide a rebuttable presumption of ownership of the material medium (groundwater) to geothermal developers.

Ownership.

The Public Resources Code implies that the ownership belongs to the mineral estate owner. Three cases have considered this issue as well: Union Oil

U.S. mineral reserves v. private surface

Geothermal Kinetics

State mineral reserves v. private surface

Pariani

Private mineral reserves v. private surface

Access and Allocation

Prospecting permits may be issued to the first qualified applicant for lands not subject to competitive public bid. If the lands are selected for competitive bid before the prospect permit is granted, the applicant will be denied. The State Lands Division/Commission has the discretionary powers of changing permit terms. The prospecting permittee has the first right to the development if geothermal resources are discovered.

The State Land Division has jurisdiction over leasing. Leases are awarded on a competitive basis of a cash bonus, net profit, or other single biddable factor.
Regulation

Drilling Controls.

Rules and regulations pertaining to state lands are under the jurisdiction of the State Lands Commission. The drilling, operation, maintenance and abandonment are under the supervision of the Division of Oil and Gas. Proposed waste discharge reports must be filed with the Regional Water Quality Control Board. Operations must comply with applicable provisions of the law under the jurisdiction of the Department of Parks and Recreation, the Department of Fish and Game and the Division of Forestry.

Resource Protection.

The State Lands Division may determine the spacing of wells and the rate of development and production. No well shall be perforated, redrilled, plugged back or altered except with the approval of the State Lands Division.

Facility-siting must be made in accord with the Commission of Geothermal Power Plant Siting Process.

Streamlining.

Standard procedures for geothermal developers include a nine-month Notice of Intent (NOI) and a nine-month Application for Certification (AFC). To expedite the process, a developer may submit a documented proposal to seek a twelve-month, single-phase NOI/AFC.

Financing and Marketing

Taxation.

Taxes of every kind and nature shall be assessed or levied upon the geothermal operation and improvements thereupon. Tax credits are provided for joint geothermal installations.

Financing.

California has no public financing provisions.

Utility Markets.

The Public Utility Commission is empowered to order public utilities to transmit electricity generated by private producers
from non-conventional sources. A higher rate of return is provided for utility investments in renewable energy facilities. Utilities are required to examine renewable resources before constructing new fossil/nuclear capacity.

Market Expansion.

California has no programs (other than above) which encourage market expansion of geothermal resources.
Characterization

Definition.

Delaware has no definitive definition of geothermal resources. "Groundwater" is defined as "any water naturally found under the surface of the earth." "Mineral" is defined as "any natural inorganic substance with definite chemical and physical properties which is present in, or at the bottom of a body of water, or anywhere within the earth's crust."

Relationship to Water.

At the present time in Delaware this issue has not been addressed.

Ownership.

At the present time this issue has not been addressed in Delaware.

Access and Allocation

Permitting and Leasing.

There are permitting and leasing provisions in Delaware for water and mineral resources, but these are not clearly applicable to geothermal resources.

Resource Allocation.

Delaware has not established adequate authorization for allocation of geothermal resources. Hydrothermal fluids could be allocated under the existing groundwater allocation system on the basis of "equitable apportionment" qua correlative rights.

Pooling and Unitization.

This area is not addressed under current Delaware law.
Regulation

Drilling Controls.

Although no geothermal activity has occurred, and no specific geothermal drilling controls have been developed, there appears to be adequate authority (by the Division of Environmental Control of the Department of Natural Resources) to regulate the drilling, producing, distributing and disposing of hydrothermal resources.

Resource Protection.

It appears that the Division of Environmental Control has authority for environmental controls and reinjection.

Streamlining.

This issue has not been addressed for geothermal resources.

Financing and Marketing

Taxation.

No geothermal taxation initiatives have been taken in Delaware.

Financing.

No public financing initiatives have been developed for geothermal resources.

Utility Markets.

Steam, Heat and Power Corporations may be organized to provide steam, heat, power and water ("by means of a pipeline") service, system, plant or equipment, for public use." Such corporations would be under general Public Service Commission jurisdiction, including "rate-making authority, and would be required to apply for a certificate of public convenience and necessity from the Public Service Commission in order to organize.

Market Expansion.

No programs have been developed to date that encourage market expansion of the geothermal resources.

Note: The 1980 Legislature passed a comprehensive Geothermal Resources Act, but it was vetoed by the Governor.
Characterization

Definition.

Hawaii's definition of geothermal resources includes heat, energy, the material medium and by-products. The resource is declared to be a mineral.

Relationship to Water.

Hawaii water law is unique and the relationship of the geothermal resources to water is unclear. The state is presently engaged in a comprehensive review of the water resource in Hawaii.

Ownership.

Ownership of the resource is in the mineral estate. It appears that native Hawaiians may have a legal claim to state geothermal resources. This claim is not absolute but is politically potent.

Access and Allocation

Permitting and Leasing.

Exploration permits are required to conduct any exploration activity on state or reserved lands. Permits are issued by the Department of Land and Natural Resources. The Board also issues geothermal mining leases which convey to the lessee the exclusive rights to drill, discover, develop, operate, utilize and sell geothermal resources on state and reserved lands.

Resource Allocation.

(see below)

Pooling and Unitization.

Developers may commingle geothermal leases pending certain conditions, and may apply to the Board of the Department of Land and Natural Resources to implement unitization agreements.
Regulation

Drilling Controls.

Geothermal drilling regulations have been issued by the Department of Land and Natural Resources. Applications must be filed for permits to reinject and such reinjection wells are subject to periodic surveillance.

Resource Protection.

The Department of Lands and Natural Resources is responsible for environmental protection. The Department has also promulgated regulations with regard to well-spacing.

Streamlining.

There are no specific streamlining provisions in Hawaii.

Financing and Marketing

Taxation.

Hawaii enacted legislation to provide property tax exemption for building improvements to use geothermal energy. Legislation was also enacted which determines applicability of excise taxes on geothermal gross proceeds, provides for royalties in lieu of a severance tax, and clarifies utility access.

Financing.

Hawaii has not created public financing programs.

Utility Markets.

State law exempts non-fossil power generation and transmission facilities from Public Utility Commission regulation when energy is used by the producer or sold directly to a public utility. Public Utility Commissions are authorized to require public utilities to purchase surplus power from such facilities. Rates paid by public utilities to geothermal developers for geothermal steam, or electricity from geothermal steam, are subject to Public Utility Commission regulation.

Market Expansion.

Counties are authorized (either individually or together with utilities) by Hawaii law to develop geothermal and other alternative energy resources.
MARYLAND

Characterization

Definition.

Maryland defines geothermal resources as the natural heat of the earth, above 49°C, including the transfer medium and associated by-products. The definition is broad enough to incorporate both hydrothermal and hot dry rock systems.

Relationship to Water.

The Maryland definition incorporates a temperature threshold of 49°C to distinguish geothermal resources from groundwater. Separate geothermal permits are required to explore for and produce the resource, in lieu of standard groundwater permits; geothermal production effects on standard water supplies are taken into account in the permit process.

Ownership.

Ownership of the resource is unclear in Maryland. The Maryland Geothermal Act subjects geothermal production to state control and approval, thereby giving the resource a quasi-public nature.

Access and Allocation

Permitting and Leasing.

The legal right to the surface must be demonstrated in order to obtain a geothermal permit. The Maryland geothermal statute requires application to the Department of Natural Resources in order to obtain a permit before commencing any geothermal resource exploration or development.

Leasing procedures and terms are implicitly left to the discretion of the Board of Public Works.

Resource Allocation.

The Maryland geothermal statute institutes an "appropriation" system for the resource, but statutory guidance is lacking regarding the nature of the system.
Pooling and Unitization.

No provisions under current law.

Regulation

Drilling Controls.

The Department of Natural Resources is charged with the responsibility of coordinating, evaluating, organizing and promulgating all policies, plans, and programs concerning the state's natural resources. At present the state has no specific geothermal drilling controls.

Maryland has no statewide policy on reinjection.

Resource Protection.

The Department of Natural Resources has responsibility (see above) for environmental controls. An application by utilities to the Public Service Commission for a certificate of public convenience and necessity simultaneously serves as an application for the necessary water use and air quality permits. There is not currently such a system specifically for geothermal power plants.

Streamlining.

Under the Maryland Geothermal Resources Act a geothermal developer is required to advise the Department of Natural Resources regarding all permits. There are no streamlining procedures.

Financing and Marketing

Taxation.

Geothermal resources were not specifically considered when the tax statutes and regulations of the state were established; consequently, they are not explicitly dealt with in the tax codes.

Financing.

Maryland has no public finance programs under which geothermal resources could be included.
Utility Markets.

It is not clear whether geothermal district heating facilities would be authorized in Maryland, or whether they would be defined as public service companies.

Market Expansion.

There are at present no programs to encourage geothermal market expansion in Maryland.
NEVADA

Characterization

Definition.

Nevada has defined geothermal resources as heat, for regulatory purposes; while for tax purposes, geothermal resources are defined to include heat and associated energy; fluids and gases, whether naturally occurring or injected; and by-products, excluding hydrocarbons.

Relationship to Water.

Nevada applies the appropriation doctrine to all water, whether surface or subsurface, including the steam, water or brines associated with geothermal energy.

Ownership.

The federal government owns 86.7 percent of the land in Nevada, while the state owns only 0.2 percent.

Access and Allocation

Permitting and Leasing.

The federal leasing system will be dominant in Nevada, but the state has developed a leasing system under the authority of the Division of State Lands, for state-owned lands.

Resource Allocation.

It appears that Nevada presently applies the prior appropriation method with regard to the allocation process of the geothermal resources.

Pooling and Unitization.

Nevada geothermal regulations do not address pooling or unitization of geothermal resources.
Regulation

Drilling Controls.

The Division of Water Resources has promulgated general regulations which apply to geothermal wells. All well drillers must be licensed and must file a notice of intent to drill with the State Engineer.

Production of geothermal resources is regulated, as are other underground water supplies, and therefore the State Engineer has not promulgated regulations specific to geothermal production.

Resource Protection.

Nevada has statutes relating to water and air pollution which would be applicable to geothermal development. Geothermal development is subject to the land use/zoning powers of political subdivisions of the state.

Streamlining.

Specific streamlining provisions have not been developed in Nevada.

Financing and Marketing

Taxation.

Nevada allows a property tax credit of up to $2,000 for homeowners installing alternative energy equipment. Nevada also exempts non-producing geothermal leases from ad valorem taxation but, in general, taxing of producing leases is uncertain.

Financing.

Nevada authorizes counties to sell bonds backed by state credit for electrical generation projects.

Utility Markets.

Nevada authorizes general improvement districts to "develop natural sources of energy...for space heating."

Market Expansion.

Beyond the legislation mentioned above, Nevada has provided no incentives for geothermal market expansion.
NEW MEXICO

Characterization

Definition.

New Mexico statutes define geothermal resources as the "natural heat of the earth" and the energy which may be extracted therefrom, material medium and associated by-products, excluding hydrocarbons. New Mexico has a dual regime, differentiating between "low-temperature thermal reservoirs" (less than the boiling point of water at the altitude of occurrence) and high-temperature thermal reservoirs.

Relationship to Water.

New Mexico's lack of an explicit characterization of geothermal resources makes unclear their relationship to water. However, the dual regime approach permits separate consideration of deep, high-temperature resources and shallow, low-temperature ones. The State Engineer and Oil and Gas Commission have joint jurisdiction over geothermal fluids. The State Engineer will apparently require appropriation of only offset water rights in interference situations.

Ownership.

Due to the lack of explicit characterization, ownership of geothermal resources is also unclear. The state issues leases on the basis of mineral ownership.

Access and Allocation

Permitting and Leasing.

The state land commissioner may designate an area as a Known Geothermal Resource Field (KGRF) and thus be available for leasing only through written competitive bidding.

Resource Allocation.

The allocation method in New Mexico is by correlative rights. The Oil Conservation Division of the New Mexico Energy and Minerals Department is authorized to protect the correlative rights of all geothermal resource owners.
Pooling and Unitization.

The Oil Conservation Division may apportion production in a geothermal system with the consent of lease holders. Furthermore, the Division may grant approval for the combining of two or more contiguous leases into a unitized area for purposes of exploration for and production of geothermal resources.

Regulation

Drilling Controls.

The Oil Conservation Division has promulgated regulations relating to drilling for geothermal resources. These drilling regulations differ for exploration and development wells. Low-temperature thermal wells are not subject to the well-spacing requirements and face less strict bonding requirements.

Resource Protection.

The Geothermal Resources Conservation Act authorizes the Oil Conservation Division to regulate and conserve the resource.

Streamlining.

Nevada law has not addressed this area.

Financing and Marketing

New Mexico laws have not addressed issues with regard to taxation, public financing or utility markets. The state does maintain a direct use demonstration fund.
Characterization

Definition.

Oregon defines geothermal resources as the natural heat of the earth, the heat, all minerals in solution and all by-products.

Relationship to Water.

The Oregon definition excludes shallow (under 2,000 feet), low temperature (under 250°F) resources from the act. Treatment of high-temperature geothermal resources is unclear.

Ownership.

Ownership in Oregon is assigned to the surface estate.

Access and Allocation

Permitting and Leasing.

The Division of State Lands provides exploration permits and leasing procedures.

Resource Allocation.

No explicit provisions.

Pooling and Unitization.

Unitization and production restrictions come under the authority of the Department of Geology and Mineral Industries.

Regulation

Drilling Controls.

The Department of Geology and Mineral Industries has issued comprehensive rules and regulations "Relating to Exploration and Development of Geothermal Resources" in Oregon.
Resource Protection.

The regulations set forth by the Department of Geology and Mineral Industries provide environmental controls. The Oregon Energy Facility Siting Council has the responsibility for siting certain energy facilities in the state. Oregon requires land use plans under the Comprehensive Planning Coordination Act, and any use of the state's lands must fall within the parameters set by the plans. Fluid injection policies have been formulated by the Departments of Water Resources, Environmental Quality, Geology and Mineral Industries and Energy, but have not yet been implemented.

Streamlining.

This issue has not been addressed in Oregon.

Financing and Marketing

Taxation.

Oregon allows an income tax credit up to $1,000 for residential geothermal space heating.

Financing.

Oregon has established a loan program for veterans which allows up to $3,000 for residential geothermal energy facilities. An Energy Conservation and Production Fund financed by state bond issues has been established to assist utility companies and individuals in development of non-nuclear energy resources.

Utility Markets.

District heating is authorized under the comprehensive Geothermal Heating Districts Act.

Market Expansion.

No programs have been developed to date that encourage market expansion of geothermal resources.
Characterization

Definition.

Utah statutes do not define geothermal resources.

Relationship to Water.

Geothermal resources are included within the jurisdiction of the Division of Water Rights.

Ownership.

Ownership of the geothermal resources is unclear. The state may issue both leases and water rights to geothermal resources.

Access and Allocation

Permitting and Leasing.

Geothermal well permits are conditional on obtaining water rights. Leasing regulations are under the authority of the State Land Board. Newly offered lands are leased by cost bonus bidding; otherwise leases are granted by application.

Resource Allocation.

Prior appropriation.

Pooling and Unitization.

Unit agreements can be obtained on request of the developers or on initiative of the State Engineer.

Regulation

Drilling Controls.

Drilling regulations are issued by the Division of Water Rights. Main features include: permit required for injection wells; approval by State Engineer required for temperature gradient wells.
Resource Protection.

Areas of resource protection are covered under the drilling regulations. Features which specifically relate to resource protection include: plan of operation; well spacing; unit agreements; equipment; abandonment; and environmental protection, which protection is enforced through applicable federal, state and local standards.

Streamlining.

Streamlining procedures have not been developed at this time in Utah.

Finance and Marketing

Utah laws have not addressed issues with regard to taxation, public financing, utility markets, or market expansion.
VIRGINIA

Characterization

Definition.

Virginia has no statutes specifically relating to geothermal resources. The state's definition of water, which includes all surface and subsurface waters which affect the public welfare, is broad enough to include hydrothermal resources.

Relationship to Water.

Lacking a formal definition, geothermal resources in Virginia would probably be defined as groundwater and be subject to the provisions of the Virginia Groundwater Act.

Ownership.

If geothermal resources were defined as water, they would be a public resource, subject to state jurisdiction.

Access and Allocation

Permitting and Leasing.

There is no permitting or leasing procedure for geothermal resources in Virginia. Virginia does have a mineral leasing system, but geothermal resources would not be leasable under this system as geothermal resources are not included in the definition of "mineral."

Resource Allocation.

Virginia has no geothermal allocation system, although if geothermal resources are defined as groundwater they would generally fall under a system of "appropriation."

Pooling and Unitization.

This issue has not been addressed in Virginia.
Regulation

Drilling Controls.

This issue has not been addressed with regard to geothermal resources. Although, if geothermal resources are defined as groundwater, regulation would be the responsibility of the State Water Control Board under the Virginia Groundwater Act. Reinjection policies would also fall under the State Water Control Board.

Resource Protection.

Virginia has statutes which address air pollution, water pollution, wetlands, critical environmental areas and environmental quality. There are no statutes which specifically address geothermal resources.

Streamlining.

Virginia has instituted a "one-stop" permitting mechanism whereby a master application serves as a vehicle to obtain a wide range of required state permits.

Financing and Marketing

Taxation.

Virginia statutes allow provisions for the exemption of alternative energy property from property taxation. Virginia individual income tax is graduated and deductions are based on those allowed by federal income taxation. Federal guidelines for depletion allowance are followed and intangible drilling expenses are deductible.

Financing.

(see Utility Markets)

Utility Markets.

Counties, cities and towns may issue general obligation bonds or revenue bonds in order to finance "waterworks and other public utilities," but whether such an authorization is adequate to cover geothermal district heating is uncertain.

Virginia has statutes authorizing "Industrial Development Authorities" and "Area Development Authorities." Such utilities are not presently, but could be, directed to consider geothermal utilization.
Market Expansion.

Virginia has not addressed this issue with regard to geothermal development.
Characterization

Definition.

The Washington Geothermal Resources Act defines geothermal resources as those from which it is technologically practical to produce electricity commercially. Under the Act, geothermal resources are characterized as *sui generis*, neither mineral nor water resources.

Relationship to Water.

Under Washington law, geothermal resources are defined as separate from water (see above). However, no statutory guidance is given regarding interference situations.

Ownership.

The Geothermal Resources Rights Act assigns the ownership of high-temperature geothermal resources to the surface estate.

Access and Allocation

Permitting and Leasing.

The Department of Natural Resources has drafted leasing regulations which affect both electricity-generating and direct-use wells on state-owned lands.

Resource Allocation.

No explicit provisions.

Pooling and Unitization.

Washington has no explicit provisions with regard to pooling or unitization.
Regulation

Drilling Controls.

The Department of Natural Resources has developed drilling regulations which are applicable to all lands within the jurisdiction of the state.

Resource Protection.

In response to the Geothermal Resources Act, the Department of Natural Resources' geothermal drilling rules and regulations include provisions for site-specific well-spacing. Well-spacing regulations take into consideration topography, economic efficiency, multiple use of lands and protection of correlative rights. The Department's rules also incorporate provisions for environmental protection.

Streamlining.

Washington has not addressed this issue to date.

Financing and Marketing

Taxation.

No taxation incentives for geothermal resources have been developed.

Financing.

Washington has developed no public financing programs for geothermal resources.

Utility Markets.

Washington laws do not authorize geothermal district heating, but three existing entities could be expanded to include such authority: Public Utility Districts, Municipal Utilities and Metropolitan Municipal Corporations. Washington allows utility investments in geothermal resources to receive a 2 percent higher rate of return.

Market Expansion.

No programs have been established which encourage expansion of geothermal development.
Characterization

Definition.

Wyoming laws define hot water and geothermal steam as underground water.

Relationship to Water.

Geothermal resources in Wyoming appear to be defined as "water," and as water are under the control of the State Engineer.

Ownership.

All water in Wyoming is owned by the state, with usufructuary rights in the public.

Access and Allocation

Permitting and Leasing.

The Wyoming Board of Land Commissioners has established a comprehensive leasing system for geothermal resources on state-owned lands, although there is at present no statutory authority which empowers the Board to develop these regulations. On private lands, owners must apply for water-use permits from the State Engineer.

Wyoming claims the right to water resources on federal lands (absent federal reserved water rights); it is unclear whether this assertion extends to federal geothermal resources.

Resource Allocation.

By statutory definition of geothermal resources as groundwater, Wyoming applies the prior appropriation doctrine.

Pooling and Unitization.

Allocation techniques come under the jurisdiction of the leasing system of the Board of Land Commissioners, as subject to water law.
Regulation

Drilling Controls.

The Board of Land Commissioners has promulgated rules and regulations which set forth drilling controls on state-owned lands. The only drilling controls on private lands are regulations that require all water users to apply for water-use permits from the State Engineer.

Resource Protection.

It is unclear whether Wyoming statutes regarding water and air pollution actually include geothermal pollution control authority.

Public Service Commission authority does not specifically include geothermal resources, and public utilities isolated at one site are exempted from Public Service Commission regulation.

The Industrial Siting Commission regulates development of energy generating plants larger than 100 Mw.

Financing and Marketing

Wyoming laws have not addressed issues with regard to taxation, public finance, utility markets or market expansion.
YAKIMA GEOTHERMAL SYMPOSIUM

THUNDERBIRD MOTOR INN
SEPTEMBER 24, 1980

8:00 A.M. TO 8:45 A.M.  REGISTRATION
8:45 A.M. TO 12:00 A.M. MORNING SESSION EXPLORATION & GEOTHERMAL AGRICULTURAL APPLICATIONS

* WELCOME
R. GORDON BLOOMQUIST, Washington State Energy Office

* GROUNDWATER OCCURRENCE—Flow and Availability for Heat Utilization
JAY E. LEHR, National Water Well Association

* GEOTHERMAL RESOURCES IN WASHINGTON AND PROBLEMS RELATED TO EXPLORATION
J. ERIC SCHUSTER, Department of Natural Resources, Division of Geology and Earth Resources

* BREAK

* GEOTHERMAL APPLICATIONS FOR AGRIBUSINESS
PAUL LIENAU, Oregon Institute of Technology

* ELECTRICAL GENERATION FROM LOW TEMPERATURE RESOURCES
ROY PARODI, American Thermal Resources, Inc.

* STATE POLICY CONCERNS RELATED TO GROUNDWATER HEAT PUMPS
VIRGINIA PAGYS-SMITH, National Conference of State Legislatures

12:00 P.M. TO 1:30 P.M.  LUNCHEON

* NEW FEDERAL LEGISLATION—What Will be the Effect?
BILL RICE, U.S. Department of Energy Headquarters

1:30 P.M. TO 5:00 P.M.  AFTERNOON SESSION GEOTHERMAL DISTRICT HEATING

* DISTRICT HEATING SYSTEM PLANNING
ELIOT ALLEN, Eliot Allen and Associates

* HEAT PUMP TECHNOLOGY
GENE RYAN, Oregon Institute of Technology

* ECONOMICS OF DISTRICT HEATING
CHARLES HIGBEE, Oregon Institute of Technology

* UTILITY LAW—How Does it Apply to District Heating?
JOHN NIMMONS, Earl Warren Legal Institute, Univ. of California

CONTINUED.....
* GEOTHERMAL RESOURCES IN THE YAKIMA AREA—Potential Low Temperature Utilization
  ARUN JHAVERI, John Graham and Company
  RICK R. COLVER, Paddock & Hollingbery, Inc., P.S.
  JAMES A. MILLER, Roger Lowe Associates, Inc.

* INTEGRATED COMMUNITY ENERGY SYSTEMS
  D. W. WADE, Resource Development Associates

* PANEL
  D. W. WADE
  JAY H. LEHR
  ELIOT ALLEN
  DEBRA JUSTUS
  VIRGINIA FAHYS-SMITH

5:00 P.M. TO 6:00 P.M.  NO HOST RECEPTION

8:00 A.M. TO 6:00 P.M. CONTINUOUS SHOWINGS OF . . .

* USER-COUPLED CONFIRMATION DRILLING PROGRAM
  Sponsored by the U.S. DEPARTMENT OF ENERGY

* GEOTHERMAL UTILIZATION
  Sponsored by OREGON INSTITUTE OF TECHNOLOGY, GEO-HEAT UTILIZATION CENTER

* EARTH, HEAT, POWER
  KOMO-TV Geothermal Special, Video Tape