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**A Review and Analysis of the Adequacy of the
Legal and Institutional Framework for Geothermal
Development in Washington State**

by

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ABSTRACT

The legal and institutional framework within which geothermal energy must develop has its origin in the early 1970s. In 1970, the Federal Geothermal Steam Act was passed into law and in 1974 the Washington State Geothermal Act was passed.

The legal and institutional framework thus established by the state and federal governments differed substantially in format, content, and direction. In many instances, the legal and institutional framework established left as many questions unanswered as answered, and in some cases, the framework has proven to be more of an obstacle to development than an aid.

From an examination of how the state and federal governments have addressed the varying needs of geothermal development and how the courts have interpreted some of their decisions, it is clear that in order to ensure that the legal and institutional framework is adequate to serve the needs of geothermal development, it must address, at a minimum, the following topics: (1) providing developers with access and a priority right to carry out exploration and development activities; (2) characterization of the resource so as to minimize conflicts with other natural resources; (3) establishing ownership; and (4) giving careful consideration to such lease terms as rentals and royalties, lease renewals, and diligence requirements.

In addition, the framework must address groundwater law and its implications for geothermal development and how geothermal development will be considered in terms of establishing utility law.

At the local level, it is imperative that geothermal be given careful consideration when decisions on resource management, zoning, and regulation are made. Local governments also have the power to establish programs which can provide substantial incentives for geothermal development and, by so doing, ensure that geothermal energy contributes to economic stability and growth.

A REVIEW AND ANALYSIS OF THE ADEQUACY OF THE LEGAL AND INSTITUTIONAL FRAMEWORK FOR GEOTHERMAL DEVELOPMENT IN WASHINGTON STATE

STATE AND FEDERAL ISSUES

INTRODUCTION

To a large extent, the regulatory and commercial aspects of geothermal development have been addressed in varying degrees by the United States Congress and by the legislature of the state of Washington. Often the conclusion reached and the direction given by these bodies have been significantly different. Too often the legislation has left as many questions unanswered as answered or created as many new problems as it resolved. In some unfortunate cases, the legislation has, in fact, proven to be more of an obstacle to development than an aid.

A review of the legal and institutional framework within which geothermal resources will be developed necessarily must begin with a thorough discussion of leasing at both the state and federal levels and how conflicts of ownership and leasing can result from differences in how state and federal governments define and characterize geothermal resources. Leasing questions will be followed by a discussion of groundwater law and how conflicting uses can affect development. And, finally, jurisdiction over development, production, and use will be considered.

Such a review of the established legal and institutional framework will allow for a careful evaluation of factors which are having or could have serious impacts upon the development and utilization of geothermal resources and should give insight into how these issues can be resolved.

Providing access and a secure right to the resource for exploration and development is provided for through leasing.

The development of statutes for the regulation of geothermal leasing in the United States began with the passage of the California Geothermal Resources Act of 1967 and the

Federal Geothermal Steam Act of 1970. The state of Washington followed suit and passed the Geothermal Resources Act in 1974. The major differences in the statutes at the state and federal levels can be traced to how geothermal resources are defined and characterized.

LEASING

Resource Definition

Geothermal resources are related to water, gas, and minerals, to both the surface and subsurface estates, and to both water rights and mineral titles. How geothermal resources are defined affects other resource definitions as well as all aspects of regulation.

There are, therefore, two basic tasks in defining geothermal resources. The first is to describe the physical properties which distinguish geothermal resources from other natural resources and thus clearly establish what is subject to geothermal leasing, taxation, and development regulations. Second, a definition must relate geothermal resources to groundwater, subsurface minerals, and other established resources. An ideal resource definition should be both anticipative and retrospective. It must look forward to future leases, exploration, and development activities while, at the same time, look backward in order to place geothermal resources into the framework of inherited leases, reservations, and property titles (Sacarto, 1976).

How well legislation accomplishes these two tasks will have a profound influence upon the reduction of future conflicts of ownership.

The California Geothermal Resources Act of 1967 made the first attempt at defining geothermal resources and reads as follows:

'Geothermal resources' shall mean the natural heat of the earth, the energy, in whatever form, below the surface of the earth present in, resulting from, or created by, or which may be extracted from, such natural heat, and all minerals in solution or other products obtained from naturally heated fluids, brines, associated gases, and steam, in whatever form, found below the surface of the earth, but excluding oil, hydrocarbon gas, or other hydrocarbon substances.

The Federal Geothermal Steam Act of 1970 (Public Law 91-581) defined geothermal resources thusly:

'Geothermal steam and associated geothermal resources' means (i) all products of geothermal processes, embracing indigenous steam, hot water, and hot brines; (ii) steam and other gases, hot water, and hot brines resulting from water, gas, or other fluids artificially introduced into geothermal formations; (iii) heat or other associated energy found in geothermal formations; and (iv) any by-products derived from them.

The federal definition defined by-product so as to exclude oil, hydrocarbon gas, and helium.

Both the California and the federal definitions provide a detailed description of the physical properties which distinguish geothermal resources from other natural resources but fail to relate geothermal to such things as groundwater and minerals.

Washington took a somewhat different approach to defining geothermal resources:

'Geothermal resource' means only that natural heat energy of the earth from which it is **technologically practical to produce electricity commercially** and the medium by which such heat energy is extracted from the earth, including liquids or gases, as well as any minerals contained in any natural or injected fluids, brines, and associated gas, but excluding oil, hydrocarbon gas, and other hydrocarbon substances (RCW 79.76.). (Emphasis added.)

The principal difference in the Washington definition is that it restricts geothermal resources to those **"from which it is technologically practical to produce electricity commercially."** Geothermal resources were so defined in Washington State to provide for a clear division of responsibilities for purposes of regulation. The Department of Natural Resources, which normally regulates oil and gas drilling, was, by this mechanism, given the responsibility for the regulation of the high temperature and pressure resources, while the Department of Ecology, which normally regulates groundwater, was given the responsibility for low temperature and pressure resources. Unfortunately, because no definite cut off temperature was set but instead let to float, the Department of Natural

Resources can now be expected to be required to regulate resources with temperatures down to approximately 100°C (212°F). This is because advances in technology have made the generation of electricity possible at temperatures much below that which was anticipated at the time the Act was passed into law.

A definite temperature cut off would tend to take the guesswork out of where an applicant should apply for a resource or drilling permit and allow for a distinct separation of agency responsibilities. This would also clarify whether or not the fluids are available through appropriation as groundwater or lease as geothermal.

Although this was the objective of the Washington Legislators at the time the Geothermal Resources Act of 1974 was passed, they could not anticipate that rapid developments in technology would, in time, completely change the definition and possibly place an undue burden upon both the developer of direct use projects as well as the developer of moderate temperature resources for electrical generation where neither high temperatures or high pressures present the degree of risk associated with the development of high temperature resources.

Resource Characterization

As the legal definitions recognize, geothermal resources are similar in many respects to water, minerals, and gas. The result has been considerable disagreement--including litigation--over the essential nature of the resource and corresponding ownership rights. Such a climate of uncertainty has impeded geothermal development and made resource characterization a major issue which must be dealt with in order to ensure that geothermal exploration and development can proceed in a timely fashion.

The federal government, in passage of the Geothermal Steam Act of 1970, avoided the question of how geothermal resources should be characterized. The Steam Act chose instead to direct the Justice Department to bring suit to quit title geothermal resource ownership. The courts were asked to decide whether or not geothermal resources had been reserved for the federal government as part of the mineral estate. The action brought by the Justice Department (United States of America vs Union Oil Company of California) began in 1971, and a verdict in favor of the United States was not reached until October 1977 under the title Ottobonie vs the United States of America. This delay resulted in a moratorium on leasing all lands patented under the Stock Raising Homestead

Act of 1916 until the case was decided. It resulted in a loss of considerable revenue to the United States, as well as slowing development by several years in prime areas such as The Geysers in Northern California. The delay and problems of lost revenue could have been avoided if Congress, in passing The Geothermal Steam Act of 1970, had simply characterized the resources as mineral and, therefore, belonging to the owner of the mineral estate.

The California Legislature, in the passage of the California Geothermal Resources Act of 1967, also avoided this very important question, and again it was left up to the courts to decide the issue and to characterize the resource. It was not until the case Pariani vs California was decided in 1981 (California Court of Appeals, 1981) that geothermal was declared to be a mineral resource for purposes of ownership and leasing of lands in California.

In Washington, the legislature declared that "notwithstanding any other provision of law, geothermal resources are found and hereby determined to be *sui generis*, being neither a mineral nor a water resource (Bloomquist, et al., 1980).

The *sui generis* characterization of geothermal resources serves only to cloud the ownership issue and is, for all practical purposes, meaningless because it fails to clearly characterize the resource and therefore does not clarify the question of ownership.

Whether geothermal resources are characterized as water or mineral, it is best to have such a solution explicitly legislated so that ownership can be clearly determined. In three court decisions, geothermal resources have been determined to be part of the mineral estate (supporting the concept of geothermal resources as an energy fuel). It is therefore desirable, especially in view of the court decisions, that the state legislature carefully evaluate whether legislation characterizing geothermal as a mineral resource should be introduced. If introduced, such legislation should, however, also recognize the dynamic nature of a geothermal system and the critical importance of water to the extraction of the heat energy.

It is evident that the characterization of the resource accomplishes the second task and allows for the placement of geothermal resources into a framework of historical leasing, reservation, and property titles.

Resource Ownership

By clearly defining geothermal resources to be either water or mineral, the problems associated with the establishment of ownership will be greatly reduced.

Mineral ownership derives from an estate in land, which may be 'severed' from property rights to the overlying surface. Groundwater, at least in the west, is generally held in the public domain while being an aspect of surface ownership in most eastern states. In the case where the resource has been determined to be *sui generis*, the state may assign the resource to the owner of the surface estates or the mineral estate, or may, in fact, claim the ownership of all geothermal resources in the state regardless of ownership of the surface or mineral estate and separate from existing water rights.

The federal government claims geothermal ownership wherever it holds the mineral estate, either jointly with the surface estate or as a mineral reservation where the estates have been severed. This claim was upheld in the *Ottobonie vs U.S.* case which was mentioned earlier. Absent, implied, or explicit reservation of water pursuant to the establishment of a federal enclave, the states have primary control over water resources.

Washington has declared geothermal resources to be the property of the surface owner (Bloomquist, et al., 1980), but it is presently unclear, because of the impractical way in which the state has defined geothermal resources, what is truly included in this assignment and what remains available for appropriation as groundwater. The state claims ownership of all groundwater underlying state and school lands. In order to gain access to low temperature geothermal resources below these lands, a commercial lease would have to be obtained. It is likely that the assignment of geothermal resources to the surface owner in Washington will result in a number of court challenges by those who have maintained an interest in the mineral estate when estates have been severed. Ironically, the state of Washington is one of the largest owners of mineral rights on lands where the mineral and surface estates have been severed.

Summarizing the situation, it is extremely important that geothermal resources be defined to be easily distinguishable from other natural resources so that a clear assignment to an estate can be accomplished and ownership determined. Although

ownership questions could be settled by the courts, a legislative approach would be much preferred to avoid the serious delays which have occurred in deciding ownership questions by the courts in California and at the federal level.

Resource Access

Providing reasonable access and priority rights to public lands for geothermal exploration and development is crucial if geothermal resources are to become an important additional energy resource.

There are a number of ways private developers can be provided access to public resources. Resource rights may be simply applied for and conveyed at little or no charge, e.g., federal mining claims and non-competitive oil and gas leases, or made available through competitive bidding procedures (Sacarto, 1976).

Bidding may take the form of cash bonuses, annual rentals, production royalties, profit shares, or work commitments. Regardless of whether the resource is transferred by competitive or non-competitive means, developers may be required to pay annual rentals, production royalties, and diligently explore for and develop the resource.

Access can be provided through two or three procedures which can include exploration or prospecting permits and/or non-competitive leases for lands of unknown potential while requiring competitive bidding for particularly valuable resource areas. Another approach would be to allow for exploration and prospecting permits but require all leasing to be by competitive bid.

The federal government has adopted a three tiered approach to providing access to public lands. Prospecting permits, the first tier, are available to developers and allow for geological, geochemical, and geophysical surveys, as well as the drilling of holes to a depth of 900 m (3,000 feet). These permits are non-exclusive and are not convertible to leases. Non-competitive leases are the second tier and are available on lands of unknown potential to the first qualified applicant. Competitive leases, the third tier, are available

in Known Geothermal Resource Areas, or KGRAs* to the highest qualified bidder. A noncompetitive lease application can, however, be rejected at anytime up to when the lease is issued if the area is declared a KGRA by the Bureau of Land Management. Legislation considered by the 98th Congress, as well as the 96th and 97th Congresses, would, if enacted, protect the standing of a lease application in the case where an area was reclassified as a KGRA before leases are issued. This provision is extremely important because it allows an applicant to undertake exploration activities without the risk that success could cause him to lose his rights to a noncompetitive lease. Although attempts to pass legislation containing this provision have been unsuccessful to date, it is expected that such amendments to the Geothermal Steam Act of 1970 will be reintroduced.

Competitive bidding for KGRA lands is by cash bonus bidding only. However, legislation considered by the 98th Congress (Senate Bill S 558) (United States Senate, 1983) called for a percentage of all KGRA lands to be offered on other than a cash bonus basis--namely royalty bidding. Non-cash bonus bidding allows small companies and utilities to equitably compete for leases because no large outlays of money are required up-front. Although this legislation did not pass, it is expected to be reintroduced.

Washington has proposed to lease all lands through a competitive bidding process (Sacarto, 1976; Washington Department of Natural Resources, 1982). The Washington system under consideration is based upon the system adopted in Montana and would allow for the negotiation of a lease if no bids are received.

Careful consideration should be given to several factors when evaluating the mechanisms used to transfer public resources.

* KGRA is defined as "an area in which the geology, nearby discoveries, competitive interest, or other indications would, in the opinion of the Secretary of the Interior engender a belief in men who are experienced in the subject matter that the prospects for extracting of geothermal steam or associated geothermal resources are good enough to warrant expenditures of money for that purpose," United States Geological Survey, 1979.

The system should provide for **multiple forms** of access. Exclusive or non-exclusive exploration or prospecting permits can effectively attract developers to wildcat areas. Such permits can be even more effective in encouraging exploration if developers are given preference to convert a permit to a noncompetitive lease or the right to match the highest bid if the leases are awarded through competitive bidding.

Noncompetitive leases provide a mechanism by which developers can secure rights to a resource with little cash outlay and are extremely important in attracting developers to unproven areas. The filing of a noncompetitive lease application should provide protection for the applicant against reclassification of the area as a KGRA before the lease is granted. Such protection can guarantee that the applicant will be granted a lease on a noncompetitive basis if work performed by the applicant results in the reclassification and/or the applicant can be given the right to match the highest bid if the reclassification is the result of work performed by another applicant. Senate Bills S 588 and S 883, which were under consideration by the U.S. Congress (United States Senate, 1983), contained provisions which would have provided these forms of protection to federal lease applicants.

Although competitive leasing results in the greatest initial monetary benefit to the public, it can discourage or prevent certain developers (e.g., public utilities) from gaining access to public lands. This is most detrimental where leases are offered only on a competitive basis as is being proposed in Washington. For example, the lower economic value of low to moderate temperature resources (less than 150°C) seldom warrants large outlays of money and may result in many areas not receiving bids. This severely inhibits exploration and development in these areas if the state is unwilling to negotiate a lease with an applicant. Competitive leasing can also provide great difficulties for public bodies which cannot expend large sums of money on high risk ventures. In addition, this is a problem for public entities because they must obtain approval of expenditures through a public forum, which provides other bidders with advance knowledge of bids which are to be submitted.

Several possible solutions to these problems exist. First, competitive areas might be limited to those areas where a significant high temperature discovery has been made so that the value of the resource may be accurately determined by both the lessor and potential lessees. Legislation considered by the U.S. Congress would have limited KGRAs

to areas where there is physical evidence of the existence of geothermal resources capable of generating electricity (Senate Bill S 558, Sec. 3, United States Senate, 1983). It is important that such areas be limited to those possessing high temperature resources capable of being utilized to generate electricity as the economic value of resources for direct applications seldom can justify the additional expenditures and risk required by competitive bidding.

Second, the use of non-cash bonus bidding, i.e., royalties or profit sharing, allows for maximum return to the public without tying up needed exploration dollars for cash bonuses. This also allows for full participation by public entities.

Third, work commitments instead of cash bonuses or royalty bids can speed development by freeing needed capital for exploration activities, but will not provide maximum return to the public from the exploitation of public resources if not tied to royalties or profit-sharing. (Work commitments are agreements made by the potential lessee to conduct exploration activities at a specified rate, including drilling of temperature gradient and deep exploration wells.)

Fourth, cash bonus bidding can be employed and still allow for public utility participation if the bidding system requires that sealed bids be submitted by private developers in advance of bids by public entities. This allows public bodies a period of time for gaining approval of the expenditure of funds through the public process. This, however, assumes that there is no other prohibition against the use of such funds by the public entities involved.

Fifth, a mechanism should be provided for reclassifying KGRA lands which have been offered but which have received no bid. Senate Bill S 558, Sec. 4, considered by the 98th Congress (United States Senate 1983), would have allowed this on federal lands, and although S 558 did not pass, similar legislation is expected to be reintroduced (Freihofer, 1984).

Acreage Limitations

The federal government has set limits on the size of leases and limitations upon holdings in any one state. The Geothermal Steam Act of 1970 limited lease size to a maximum of

1,036 hectares (2,560 acres) with a minimum of 260 hectares (640 acres). In addition, the Steam Act limits individual holdings to 8,290 hectares (20,480 acres) per state (United States, 1970).

Washington has proposed a minimum lease size of 16 hectares (40 acres), but has not established a maximum number of acres which can be held.

Setting limits on minimum lease size has drawn criticism from small developers of low temperature resources. The minimum limits require tying up a great deal of acreage with accompanying rentals for applications of geothermal energy which often can be successfully undertaken on less acreage.

The maximum lease size adopted by most states, generally 260 hectares (640 acres), appears to be of little consequence, although, if a sizeable application fee is required per application, the 260 hectare (640 acre) maximum could result in a financial burden on a large-scale development because of the total number of applications which would have to be filed.

On the other hand, the federal limitation upon individual holdings in a given state has been singled out by developers as the most serious impediment to geothermal development in the United States. Developers contend that the 8,230 hectare (20,480 acre) limitation imposed by the federal government severely handicaps the successful operator since an average of two discoveries in a state effectively eliminates a company from additional exploration. Because of this, once a skilled group of technical personnel are trained, there are insufficient resources to allow them to continue an orderly progression of exploration and development. The limitation has, in addition, forced many companies at or near the acreage limitation to give up attractive prospects because other prospects were identified which they felt deserved a higher priority than acreage already held.

The U.S. Congress considered legislation during the 98th Congress (Senate Bills S 558 and S 883) which would have raised the acreage limitation to 20,700 hectare (51,200 acres) per state, and exempted from this limitation any leases under development (United States Senate, 1983). Although this legislation did not pass, the Secretary of Interior will raise the acreage limitation to 20,700 hectares (51,200 acres) through administrative changes made possible by provisions of the Geothermal Steam Act 1970. The acreage increase will

become effective December 26, 1985 (Geyer, 1985). An exemption of acreage under development from the limitation would appear to provide for industry's desire to have an even greater acreage allowance than the 20,700 hectares (51,200 acres), without creating a problem by having too much acreage tied up which is not under development. Such an exemption is expected to be reintroduced (Freihofer, 1984).

Rentals and Royalties

Annual lease rentals are normally assessed for the opportunity to explore on public lands and serve primarily to cover the cost of regulation and administration. Rentals may also provide the lessor with a tool for ensuring diligent exploration because required expenditures on exploration must equal a set amount or increased rentals will be assessed.

Rentals on federal and state lands usually begin at \$1 per acre per year. The minimum rental on federal KGRA lands is \$2 per acre per year.

On federal lands, the rental increases to \$3 per acre, beginning with the sixth year, but with the provision that expenditures on exploration may be deducted from the increased amount. Exploration expenditures, in order to qualify, must equal \$4 per acre in year six, \$6 per acre in year seven, and \$8 per acre in year eight, \$10 per acre in year nine, and \$12 per acre in years 10 through 15.

Washington has proposed the use of increasing rentals as a means of encouraging diligent exploration.

Royalties are assessed on production and ensure that some portion of the value of the public resource is returned to the public treasury.

Royalties, unlike cash bonuses and rentals, involve no risk to the developer and, therefore, appear to treat equitably both large and small developers as well as public and private entities. However, the manner in which royalties are calculated may significantly penalize a developer engaged in the direct utilization of geothermal resources in comparison to developers of electrical generation projects. Although royalties on both electrical and direct use products range from 10-15 percent for state as well as federal leases, the way in which a royalty is calculated can and does make a significant difference in the amount different developers will pay. In the case of electrical generation, the

royalty is based upon the selling price of the steam or electricity. On direct use projects, the royalty is theoretically based upon the value of the heat energy available as determined by the cost of equivalent fuels, i.e., well head gas or mine mouth coal. However, if a direct use project involves the sale of energy, the royalty is based on gross sales.

The following example clearly illustrates how differences in royalty calculations can seriously affect the economic viability of direct use projects. If developer 'A' leases and develops a geothermal resource on federal lands and sells the energy to user 'B', the 10 percent federal royalty is assessed against gross sales. If, on the other hand, the developer and the user are the same entity, and no sale takes place, then the royalty is based on the equivalent cost of the cheapest conventional fuel in the area. The royalty is then inflated at the same inflation rate as that of the conventional fuel. If the lessee happens to be a corporation in a 48 percent effective federal income tax bracket, the royalty would be subtracted from sales and reduce the company's tax liability by 48 percent of the royalty. The net effect would be a 5.2 percent royalty. If the royalty is assessed against a non-taxable entity such as a public utility or a municipal heating district, it can become one of the major annual costs of the geothermal project. For example, the Klamath Falls, Oregon, Business Core Heating District is projected to pay for itself in seven years. If it were necessary to drill the production wells on federal lands and pay a 10 percent royalty on the energy consumed, this same project would suffer a \$3,600 per year loss for the first 10 years in terms of annual equivalent costs. If the annual cost of operating the Klamath Falls system included a federal royalty of 10 percent, the breakdown of the annual costs for the first year of operation would be as follows: (Higbee, 1979)

	<u>Percent</u>
Electrical pumping costs	24.8
Maintenance costs	19.7
Federal royalty payments	55.5

The inequity of royalties levied on developers of direct use geothermal energy has resulted in legislation being introduced into the U.S. Congress that would have lowered the royalty on such projects from the present 10 to 15 percent to 5 to 10 percent. The same legislation would have allowed the Secretary of the Interior to "defer royalty payments for non-electric geothermal developments when it is deemed to be in the public

interest, for municipal, cooperative, or other political subdivisions lessees where legal limitations on front-end financing otherwise would prohibit or significantly deter development" (United States Senate, 1983).

However, the deferring of royalty payments and reductions in the percentage do not solve the problems associated with the way in which a royalty is calculated. A possible solution to this problem is, however, under consideration by the Washington State Department of Natural Resources (Washington Department of Natural Resources, 1982). The method of calculation encourages full use of the resource by rewarding the developer who utilizes more Btu per unit of resource with a lower royalty per Btu (Table 1). The system should also result in a greater return to the state treasury because even at the lower royalty, the full use of the available Btu's will result in a higher total payment.

The system under consideration in Washington deserves a thorough evaluation at both the state and at the federal level. If it is adopted it could have a substantial impact upon the number of direct use projects which could be undertaken on both state and federal lands.

Lease Terms, Adjustments, and Renewals

Geothermal energy is unique because it must be utilized on site, whether it be for electrical generation or direct utilization, and it often involves substantial capital outlays requiring amortization periods of 20-30 years for utilization facilities, pipe lines, and/or electrical transmission lines. Because of these factors, the effective lease life, adjustments of lease provisions during the life of the lease, and lease renewals are of great importance to developers. Equally important, from the government's side, is the prevention of land speculation on the part of the lessee, the ability to make adjustments in lease provisions to ensure compliance with state and federal environmental regulations, and assurances that a reasonable portion of the revenue generated from public lands is returned to the public treasury.

The use of exploration or prospecting permits which require work commitments, and which are granted for periods of 1-3 years, is an excellent way to prevent speculation.

TABLE 1

Table 1. Pricing of direct use low temperature geothermal energy (\$ per 1000 gallons)

Discharge temperature (°F)																						Base price \$/1000 gal. †	
T°	270	260	250	240	230	220	210	200	190	180	170	160	150	140	130	120	110	100	90	80	70	T°	
10	\$ 0.073	\$ 0.068	\$ 0.065	\$ 0.061	\$ 0.058	\$ 0.055	\$ 0.053	\$ 0.050	\$ 0.048	\$ 0.046	\$ 0.044	\$ 0.042	\$ 0.040	\$ 0.039	\$ 0.037	\$ 0.035	\$ 0.034	\$ 0.033	\$ 0.031	\$ 0.030	\$ 0.029	10	0.458
20	0.146	0.137	0.129	0.122	0.116	0.110	0.105	0.100	0.096	0.092	0.088	0.084	0.080	0.077	0.074	0.071	0.068	0.065	0.063	0.060	0.058	20	0.917
30		0.205	0.194	0.183	0.174	0.166	0.158	0.151	0.144	0.137	0.132	0.126	0.121	0.116	0.111	0.106	0.102	0.098	0.094	0.090	0.086	30	1.375
40			0.258	0.245	0.232	0.221	0.210	0.201	0.192	0.183	0.175	0.168	0.161	0.154	0.148	0.142	0.136	0.130	0.125	0.120	0.115	40	1.833
50				0.306	0.290	0.276	0.263	0.251	0.240	0.229	0.219	0.210	0.201	0.193	0.185	0.177	0.170	0.163	0.156	0.150	0.144	50	2.292
60					0.348	0.331	0.316	0.301	0.288	0.275	0.263	0.252	0.241	0.231	0.222	0.213	0.204	0.196	0.188	0.180	0.173	60	2.750
70						0.386	0.368	0.351	0.336	0.321	0.307	0.294	0.282	0.270	0.259	0.248	0.238	0.228	0.219	0.210	0.201	70	3.208
80							0.421	0.401	0.383	0.367	0.351	0.336	0.322	0.308	0.296	0.284	0.272	0.261	0.250	0.240	0.230	80	3.667
90								0.452	0.431	0.412	0.395	0.378	0.362	0.347	0.333	0.319	0.306	0.294	0.282	0.270	0.259	90	4.125
100									0.479	0.458	0.439	0.420	0.402	0.386	0.370	0.355	0.340	0.326	0.313	0.300	0.288	100	4.583
110										0.504	0.482	0.462	0.443	0.424	0.407	0.390	0.374	0.359	0.344	0.330	0.317	110	5.042
120											0.526	0.504	0.483	0.463	0.444	0.425	0.408	0.391	0.375	0.360	0.345	120	5.500
130												0.546	0.523	0.501	0.481	0.461	0.442	0.424	0.407	0.390	0.374	130	5.958
140													0.563	0.540	0.518	0.496	0.476	0.457	0.438	0.420	0.403	140	6.417
150														0.578	0.555	0.532	0.510	0.489	0.469	0.450	0.432	150	6.875
160															0.592	0.567	0.544	0.522	0.501	0.480	0.460	160	7.333
170																0.603	0.578	0.555	0.532	0.510	0.489	170	7.792
180																	0.612	0.587	0.563	0.540	0.518	180	8.250
190																		0.620	0.594	0.570	0.547	190	8.708
200																			0.626	0.600	0.576	200	9.167
210																				0.630	0.604	210	9.625
220																					0.633	220	10.08
%	15.88	14.93	14.09	13.34	12.66	12.05	11.48	10.95	10.46	10.00	9.569	9.163	8.778	8.413	8.066	7.736	7.420	7.117	6.827	6.548	6.280	Royalty rate	

Example: Lessee uses 100,000 gallons of fluid during one month @ an input temperature of 200°F and a discharge temperature of 100°F. The monthly production royalty due is \$0.326/1000 gal or \$32.60.

*T = °F extracted by geothermal energy conversion process.

† Basic price: \$5.50 per million BTU.

But it may discourage exploration if the permits are not convertible to leases, or if such permits do not provide the holder of the permit with a preference to a lease if and when leases are offered.

Noncompetitive and competitive leases are normally issued for periods of 5 to 20 years (Sacarto, 1976). The longer the primary lease term, the more important it is that the lease carry reasonable diligence requirements to minimize having public lands locked up by land speculators. It is also extremely important that the lease term be of sufficient length to ensure that the developer has a reasonable opportunity to fully evaluate the leased area.

Most leases carry clauses which ensure an extension of the primary lease term if the developer is actively engaged in exploration and/or drilling, and all state and federal leases provide for the extension of the lease once production of geothermal resources in commercial quantities begins. Such an extension is usually limited to 40 to 50 years, but may be renewable.

One very important consideration which has surfaced since the enactment of most state and federal leasing statutes is a need to provide for an extension of the primary lease term where, through no fault of the developer, commercial production cannot begin although resources capable of being developed have been discovered. Legislation considered by the U.S. Congress (Senate Bills S 558 and S 883) allowed for such an extension and Section 7 of S 558 reads as follows: "...However, in the event construction of the (utilization) facility or facilities has not been possible due to administrative delays beyond the control of the lessee or due to the demonstrated marginal economics of such a (utilization) facility or facilities, and substantial investment in development of the lease has been made, the Secretary (of the Interior) will consider an additional extension of the extended primary lease term of up to 10 years: Provided, that the lessee be required to submit annual reports detailing bona fide efforts to resolve the administrative delays or to bring the (utilization) facility or facilities into economic production" (United States Senate, 1983). In 1985, Senator Hecht of Nevada introduced S.1322 "Geothermal Steam Act Amendments of 1985." S.1322 would provide for up to three successive five year extensions if--"

(1) the lessee has submitted a report to the Secretary detailing bona fide efforts to bring such lease or approved cooperative or unit plan of development into commercial production, given the then current economic conditions; and either

(2) actual drilling operations, to a depth specified by the Secretary, were commenced prior to the end of its primary term and prior to the end of each successive five-year extension period on such lease or on another lease to the benefit of such lease where, at the time application for extension is made, both leases are included in an approved cooperative or unit plan of development; or

(3) in the opinion of the Secretary, substantial investment has been made during the primary term and during each successive five-year extension period on such lease or on another lease to the benefit of such lease where, at the time application for extension is made, both leases are included in an approved cooperative or unit plan of development."

A hearing on S.1322 is expected in early 1986.

Readjustment of terms during the period of the lease is extremely important, and must take into consideration what effect frequent renegotiations will have upon compounding the risks already inherent to geothermal development in deterring investment.

The Federal Geothermal Steam Act of 1970 provides for a readjustment of lease terms and conditions at not less than 10 year intervals after the date the geothermal steam is produced. However, readjustment of rentals and royalties is restricted to not less than 20 year intervals beginning 35 years after the date geothermal steam is produced (United States, 1970).

Frequent readjustments in rentals and royalties deter investments in geothermal development, and appear to be unnecessary because if royalties are based upon the price for which the energy is sold, revenues will increase at a rate proportional to the rate at which the value of the energy is inflating. The pricing formula for direct use resources being considered by the state of Washington (see Table 1) would, however, require frequent adjustments in the base price upon which the royalties are calculated.

Frequent adjustments in terms other than rentals and royalties have also drawn criticism and have resulted in a reluctance on the part of utilities to utilize geothermal resources for power plant operation (United States Department of Energy, 1979). However, as a result of the Report of the Interagency Geothermal Coordinating Council on Geothermal Streamlining Recommendations, legislation was introduced to modify the readjustment provisions of the Geothermal Steam Act of 1970. Senate Bills S 558 and S 883 both contained language which would have revised the adjustment period clause. Section 8 of S 558 is as follows. "The Secretary (of the Interior) may adjust the terms and conditions,...,of any geothermal lease issued under this Act at not less than 20 year intervals beginning 20 years after the date production is commenced, as determined by the Secretary..." This would make for a 20 year readjustment period as opposed to the present 10 year period (United States Senate, 1983).

Leases should also provide preferences to lease holders in the event that leases are to be renewed. Most renewal clauses, however, carry provisions for the renegotiation of lease terms (Sacarto, 1976).

Diligence Requirements

One of the most controversial provisions of leasing statutes is the requirement for diligent exploration. Diligent exploration can be encouraged through the use of escalating rentals (discussed in the section on rentals and royalties) or diligent operation can be mandated by requiring that specified sums of money be expended on exploration, or that certain activities, such as deep drilling, begin after a specified number of years. The requirements are necessary to ensure that lands are not held for speculation. Diligence requirements, however, should not be structured to force industry to expend large sums of money inappropriately. For example, drilling should not be required before the use of other less expensive exploration steps have been completed. The problems which diligent exploration requirements present to industry are compounded during a power surplus such as is currently being experienced in the Pacific Northwest. Industry is forced to expend large sums of money in order to maintain a lease, while knowing full well that such expenditures may not be recovered during the foreseeable future or that the primary lease term may expire before a power purchase agreement can be obtained. Lease holders are thus in a position that requires them to expend large sums of money with little guarantee of a reasonable return on investment, or drop the lease.

Diligence requirements, like provisions for the extension of lease terms, should provide for **exemption** or **extension** if justifiable by the lessee.

Senate Bills 558 and 883 which were considered by the 98th Congress (United States Senate, 1983) both contained provisions for modifying the diligence requirements of the Geothermal Steam Act of 1970. The need for such provisions in future legislation should, however, be carefully evaluated in terms of their effect upon industry in a period of forecasted energy surplus, and by the fact that the Department of the Interior adopted new rules in 1984 which increase rentals or required expenditures on exploration beyond the fifth year of the primary lease term.

Washington has proposed in its draft Rules and Regulations for Geothermal Resource Leasing that during the first five years of the lease, the operator would be required to spend on approved exploration and development, a minimum of \$20 per acre during the first two years; during the third year, not less than \$15 per acre; during the fourth year, not less than \$20 per acre; and during the fifth year, not less than \$25 per acre. The draft would provide for the lessee to pay the state the scheduled amount in lieu of the performance of development work or improvements. Beginning the sixth year of the lease, the lessee would be required to be producing geothermal resources in paying qualities or:

- o the lessee shall be engaged in drilling of production and/or reinjection wells with no more than 90 days elapsed time between the completion of one well and the spudding of the next, or
- o the lessee shall be engaged in deepening, repairing, or redrilling of any wells without 90 day cessation of operations, or
- o the lessee shall be diligently constructing facilities for the processing, conversion, or use of geothermal resources, or
- o the lessee shall be diligently attempting to obtain necessary permits and environmental approvals for commercial operation.

Although Washington's proposed diligence requirements should be given serious consideration as a way to guarantee performance by a lessee, they would require a great

deal more administration than existing or proposed federal requirements and may be totally inappropriate due to the energy surplus which is, at present, dictating energy policy decisions.

Summary

The preceding review of legal and institutional aspects of leasing is not a comprehensive treatise on the subject, but rather an attempt to highlight those issues which have the greatest impact on geothermal resource development. Because leasing affects mainly high temperature development for electrical generation, a majority of these problems affect only the development of such resources. Geothermal resources utilized directly for industrial processes, space heating, and in agriculture and aquaculture applications seldom will be subject to state and federal leasing laws, but instead will be affected more directly by local permitting and land use ordinances and the availability of water rights. These subjects are all covered in subsequent sections of this report.

Gaining access to lands through leasing and the provisions of the lease are only two of many areas where legal and institutional requirements can have a profound influence upon a developer's ability to successfully complete a geothermal project. Other subjects which must be evaluated include groundwater law, environmental reviews, exploration and development permits, facility siting requirements, and utility regulations. These subjects are examined in the following sections.

GROUNDWATER LAW

Groundwater is an integral part of any geothermal resource (except hot dry rock) being the medium by which the heat energy of the earth is conveyed to the surface. Most states have recognized the importance of groundwater in their definitions or characterizations of geothermal resources. In some states, geothermal has been declared to be a groundwater resource (Sacarto, 1976). In other states such as Washington, geothermal resources are divided into high and low temperature regime(s) for purposes of regulation with high temperature resources being considered geothermal and the low temperature geothermal resources being considered to be groundwater (Bloomquist, et al., 1980). By making such a distinction, the lower temperature resources have become subject to groundwater law and development regulations and not geothermal leasing and development regulations.

Groundwater is treated as a public resource in most western states including Washington. Because historical uses of groundwater included domestic, agricultural, and industrial purposes, but not geothermal, conflicts between existing uses and the needs of the geothermal energy industry have become a serious consideration and one that can serve to severely limit geothermal development, especially in critical groundwater areas.

In Washington, as long as the resource is used solely for electrical generation, a water right is not required. However, if the resource is cascaded for other uses, a water right must be obtained. Resources incapable of commercial electricity production are considered groundwater resources in Washington and are regulated as such.

However, despite all attempts to minimize conflicts resulting from competing use, and to ensure that geothermal resources can be developed, conflicts have arisen and often with devastating results. Perhaps the best example of conflict between competing uses of geothermal energy can be found in the experience of Klamath Falls, Oregon.

The city of Klamath Falls, Oregon, began evaluating the feasibility of constructing a downtown geothermal district heating system in 1977, and by late that year received notification from the U.S. Department of Energy that it would receive demonstration funds under a federal USDOE grant program. The city began by drilling two successful production wells, and after confirming the resource, construction of the system began in earnest. Klamath Falls, however, is an area where geothermal energy has been utilized by a few hundred homeowners and commercial establishments since the early 1900's. These users began to worry that the city system would, in spite of injection of the fluids into the reservoir, adversely affect their own geothermal energy supply. Because of these fears, a citizen's initiative, organized by the Citizens for Responsible Geothermal Development (CRGD), was successful in gathering over 1,500 signatures within the city. When the initiative measure was voted on in 1981, the future of the city's geothermal system received a serious setback. The initiative, which passed 788 to 567, prohibited "persons, cooperatives, organizations, municipal corporations, or any political subdivision of the state of Oregon from withdrawing geothermal water 'from a well unless it is returned' undiminished in volume to the **same well.**" (Emphasis added) The effective result of the initiative was to prevent the city from using either of the two wells (even though the entire system was completed and ready to begin operation in 1982) and forced the city to

consider alternative heat sources (United States Conference of Mayors, 1982).* The future of the system is still in limbo. However, long term reservoir tests were completed in 1983 which indicated that existing wells would be only marginally affected by the operation of the city's district heating system, and the initiative was amended by the City Council in early April 1984 allowing for testing of the system (Allen, 1984). On November 9, 1984, the city began a full operation test of the system with the intent of operating throughout the 1984-85 heating season. At the end of that test, a determination will be made regarding future system operation. What future legal action, if any, that the CRGD or other groups will take is at this time unclear.

In Pagosa Springs, Colorado, approximately 30 well owners and the owner of a hot springs resort--fearful that the construction of a proposed district heating system would adversely effect the availability of geothermal resources for existing use--succeeded in delaying the start of the city's geothermal district heating system by more than two years. And, although the city began operation of the system in late 1984 or early 1985, it may be some time before the courts settle the water right issues which have been at the heart of the conflict (Rogers, 1984).

The Klamath Falls example, as well as the problems experienced by the city of Pagosa Springs, Colorado, only serve to emphasize the importance of groundwater to direct use geothermal development (Allen, 1984). The Oregon court decisions are extremely important to the development of local geothermal district heating systems as it provides a means by which local jurisdictions at least in Oregon can control the development of geothermal resources for such purposes. A determination should be made whether or not such local control can be exercised in other areas.

* The state of Oregon challenged the initiative in Circuit Court, lost, and appealed the decision. The Appellate Court upheld the lower court ruling, as did the Oregon Supreme Court (Derrah, 1984). The essence of the ruling is that local governments have the authority to adopt regulations consistent with the policy of the Ground Water Act as outlined in ORS 537.525 (Lienau, 1984).

The conflict between geothermal development and historical uses of groundwater has also been a major concern in the Raft River geothermal field in southern Idaho. The area has been declared a critical groundwater area and further exploitation of groundwater resources in the area is prohibited. The unavailability of groundwater for use in the cooling towers of the Raft River geothermal facility has required that geothermal fluids be used for cooling, resulting in technical problems and increased cost of operation. In order to obtain an appropriation for the needed cooling water, an existing water right would have to be purchased resulting in diminished agricultural production in the area.

ENVIRONMENTAL ANALYSIS

Providing adequate protection for the environment which balances the relative priorities of developers' rights under the Geothermal Steam Act of 1970 against the rights of the general public embodied in the National Environmental Protection Act (NEPA), resource management laws, and management plans for the lands involved is undeniably a major responsibility of government. How that protection is structured and administered by responsible state and federal agencies will have a profound impact upon a developer's ability to successfully complete a geothermal project in an economical and timely fashion.

The federal government and the state of Washington have adopted environmental statutes which require that all major activities proposed be subjected to a review of possible environmental impacts.

The Geothermal Steam Act of 1970 was the first major legislation to be enacted after the passage of the National Environmental Protection Act, and managers of federal lands, as well as developers, were presented with an uncharted course to follow. The result has often been confusion and serious delays in the leasing of federal lands and in the processing of permit applications.

The worst delays have occurred in the processing of federal noncompetitive lease applications and the offering of federal KGRA lands for lease sale. The primary cause of these delays was the view of surface management agencies that pre-lease environmental analyses must consider the environmental impacts of all exploration and development activities--in other words, a pre-lease environmental analysis was based upon a worst case development scenario. The situation was aggravated in the Northwest where the United States Forest Service (USFS) was assigned surface management responsibilities and the

Bureau of Land Management (BLM) subsurface management responsibility in the same area. The General Accounting Office in 1980 found that "The Forest Service...has made considerably less progress in leasing its lands (than the BLM)...Unless geothermal leasing is given higher priority within the Forest Service, we believe it could be a matter of concern for future geothermal development." The situation has improved dramatically since the late 1970s, and at present the USFS claims that most lease applications can be processed within one year. There are, however, lease applications in extremely sensitive areas or wilderness study areas which date back to 1974 that have not been processed.

In 1983, the U.S. Forest Service began experimenting with the use of Conditional Right Stipulations (CRS). The CRS was to be used in order to get away from the need to employ the worst case scenario in the preparation of environmental analyses and to speed leasing. Under CRS, pre-lease environmental analyses were limited to determining areas which were totally unacceptable to development activities. Detailed environmental reviews would be undertaken only in response to specifically proposed activities in a lease area. In this way, the environmental review would be restricted to the evaluation of each proposed activity in relationship to the exact area where the activity would be undertaken. For example, since very little environmental degradation would be likely to occur from surface geological exploration or geophysical and geochemical surveys, an extensive environmental review would not be required. However, as the drilling of deep exploratory wells was planned and sited, an environmental analysis of much greater detail would be required, but such an analysis would be restricted to the immediate area where the drilling was to take place. Finally, if a commercial geothermal resource was encountered and a permit application for facility construction was filed, a detailed environmental analysis could be completed which was based upon the qualities of the resource, knowledge of any environmentally hazardous substances present in the fluids, the proposed conversion and disposal technologies, and the proposed site for facility construction.

Although the use of CRS appears to have been quite successful with leases being issued after only minimal delays, its use was discontinued in April 1984. The Contingent Right Stipulation Test was, according to the U.S. Forest Service, terminated because "the degree of acceptance has not been sufficient to continue." (Department of Agriculture, 1984.) This could signal a return to the delays which have plagued the industry since 1974

unless the surface management agencies are able and willing to base pre-lease environmental reviews on completed forest management or land use plans, or a greater priority is given to the processing of lease and permit applications.

The final passage of Wilderness Bills affecting lands in Washington in 1984 has served to simplify the preparation of environmental analyses for the leasing of Forest Service lands.

Environmental analyses on state lands are not expected to result in serious delays in the issuing of leases or subsequent permits and licenses and should not be considered a major constraint to exploration and/or development.

EXPLORATION, DRILLING, AND PRODUCTION PERMITS

Permits for exploration, drilling, and production on available federal lands are issued by the Department of the Interior, Bureau of Land Management (BLM), pursuant to the Geothermal Resource Operational Orders (United States Geological Survey, 1979).

Permits to conduct surface exploration and to drill temperature gradient holes to a depth of 150 m (500 feet) are issued to an applicant after a finding of no significant environmental impact by the BLM. Applications for such permits, entitled a "Notice of Intent and Permit to Conduct Exploration Operations," can be filed by developers on all federally managed lands, including lands in KGRAs and including lands which are under lease application by another developer. Federal permits may also be issued to lease holders, as well as to non-lease holders, which allow for the drilling of exploration holes to a depth of 900 m (3,000 feet) upon the approval of a Plan of Operation filed by the applicant.

All post-lease exploration activities on federal lands are carried out under a Plan of Operation approved by the BLM and with the concurrence of the surface management agency. Permit applications for all such post-lease exploration activities require the completion of an environmental review by the responsible surface management agency before permit issuance (Fujimoto, 1984).

All pre- and post-lease exploration activities on state and private lands are under the jurisdiction of the appropriate state agency which, in Washington, is the State Geologist or the Director of the Department of Ecology.

The state of Washington regulates drilling on all state and private lands, but claims no authority to issue permits related to exploration, drilling, or production on federal lands.

Resource production on all federal lands is regulated through a Plan of Production approved by BLM. Before such a Plan of Production can be approved, the applicant must gather environmental baseline data describing the existing environment for one year. No Plan of Production can be approved by the BLM until after completion of an environmental review, and such approval must have the concurrence of the surface management agency if other than the BLM. A finding of significant environmental impact during the review process will require the preparation of an Environmental Impact Statement (EIS) pursuant to the National Environmental Protection Act before the plan may be approved. The EIS will be prepared by the Bureau of Land Management and must be approved by all other responsible land management agencies.

Production permits are issued by the state of Washington for all lands where the state claims ownership of geothermal resources, and the state may require unit operation of lands of mixed ownership if necessary for the conservation of natural resources which underlays in common state, private, and federal lands.

ENERGY FACILITY SITING

The securing of permits and licenses related to the siting of energy conversion facilities and transmission lines is an extremely important step in the development of geothermal resources, and the complexity of the process involved in obtaining such permits can have a serious consequence upon the timeliness and cost effectiveness of development.

BLM, as the lead agency for facility siting on federal lands, would serve to coordinate the processing of all applications to construct energy conversion facilities on federal lands. The construction of related transmission lines is regulated on federal lands by the responsible surface management agency. The construction of geothermal energy conversion facilities is regulated under the provisions of the Geothermal Resource

Operational Orders, and all permits to construct conversion facilities and/or transmission lines must have the concurrence of the appropriate land management agency. On state and private lands this responsibility often resides with the Energy Facility Siting Evaluation Council, the Department of Natural Resources, or the Department of Ecology.

A very important element of state energy facility siting statutes, and a critical role of the implementing authority, is to provide for the coordination of permits and license applications through all state and local agencies affected by such an application and ensure that the coordination with other agencies makes siting of all energy facilities a one step process for applicants. This procedure saves both time and money and ensures that all applications are handled and evaluated in a consistent manner. Once a siting certificate for a transmission or energy conversion facility is granted, all state and local agency permits and licenses must automatically be granted. Each permitting agency, however, retains the authority to enforce all requirements of the permit or license issued. Examples of some of the permits required include: conditional land use permits, construction permits, drilling permits, a permit for the disposal of liquid wastes, and permits for air emissions.

In Washington, the Energy Facility Siting Evaluation Council (EFSEC) maintains siting jurisdiction over all lands, private and state owned, but only in the case where on-site improvements to an existing facility exceed \$250,000, or a proposed generating plant has a capacity of 250 MWe or more (Bloomquist, et al., 1980). Thus, geothermal development would not be expected to fall under the jurisdiction of the EFSEC and would instead be regulated by the Departments of Natural Resources and Ecology. The exemption of most geothermal developments in Washington from EFSEC regulations may, as some developers contend, simplify the siting process, but, on the other hand, the ability of the EFSEC to coordinate the processing of an application through all state and local agencies could result in substantial savings in both time and money, and as such, could help to shorten the lead time from exploration to plant construction and power on-line.

UTILITY EASEMENTS

The culmination of any successful geothermal exploration and development project is to deliver the energy to the user. However, the ability to deliver energy to market, either in the form of hot water or electricity is dependent upon both the economics of constructing

pipelines or power lines, and also upon the developer's ability to obtain easements across federal, state, local, and/or private lands for the construction of such pipelines or electric transmission lines. The lack of existing power lines or lines with available capacity has been singled out as one of the major impediments to geothermal development in Nevada and has also been identified as one of the economic barriers to development in the Pacific Northwest area (McClain, 1984).

The ability to obtain easements to cross both public and private lands is simplified if such easements are for "public use." The public use requirement is satisfied by most definitions of a "public utility," and, therefore, a closer examination of utility law is needed in order to determine the utility status of both geothermal electrical and geothermal direct use projects.

Public utilities are entities (individuals, corporations, associations, etc.) that supply services considered indispensable to the public, and are thus "affected with a public interest" (Nimmons, et al., 1979). Although "services" are defined differently from state to state, suppliers of heat, water, electricity, and natural gas are commonly considered to be subject to public utility statutes.

Washington Revised Code § 80.04.010 defines public service companies to include gas, electric, and water companies, among others.

Thus, under utility statute, both electrical generating and district-sized direct use projects would be considered to be public utilities entitled to apply for easements across state and federal lands for the construction of needed pipelines and electric transmission lines. This does not, however, imply in anyway that geothermal developers should desire to be regulated as public utilities (see section on District Heating Authorization and Regulation). However, utility law clearly indicates that geothermal developers would be eligible for utility status should it be necessary to gain an easement.

Applications for such easements are made through the appropriate office of the responsible land management agency. Applications require the preparation of environmental reviews and, if there is a finding of significant environmental impact, an environmental impact statement will be required and prepared under provisions of the

appropriate state or national environmental protection act. If the easement is granted, the applicant will be required to pay annually the fair market value of the interest in the land being acquired.

Easements are also required to cross city or county properties and may be granted as a public use by the city or town councils, boards, or county commissioners.

If pipelines, transmission lines, or other facilities for developing or using a geothermal resource must cross privately owned lands, the geothermal developer must negotiate with the landowner(s) for the necessary easements, and, if that fails, seek to acquire such an easement through the right of "eminent domain." Eminent domain is the right of the state or other entities operating in the public interest to take private property for "public use" (Perlmutter and Birkby, 1980).

In order to use eminent domain, the developer must file a complaint in court describing the proposed public use, the source of the right to such use, the property interest sought, and the present ownership(s). The court must determine whether the proposed use is an authorized public use and establish the amount of property to be taken. The court may also determine the appropriate compensation to be paid by the petitioner.

It is clear that both district-sized direct application and electrical generating geothermal projects may be included under utility law and that such projects built for "public use" are assured that utility easements can be secured.

However, the benefits obtained in acquiring easements through utility status may be offset by other aspects of utility law and developers may choose to fight utility status because of the adverse effects of regulation. A complete discussion of the effects of utility regulations is unfortunately beyond the scope of this study.

DISTRICT HEATING AUTHORIZATION AND REGULATION

Introduction

The primary focus of the direct utilization of geothermal resources has been on the use of such resources for district heating. It is thus extremely important to give consideration

to what entities logistically would be involved in the development of district heating systems, what the legal status of district heating systems is, and how development of such systems can be expected to be regulated.

Geothermal district heating development logically could be considered to be actively pursued and developed by the following participants:

1. Energy companies,
2. Industrial and commercial users,
3. Utilities, and
4. Municipalities.

Energy companies, including major oil and gas exploration companies, have shown a great deal of interest in high-temperature geothermal resources for generating electricity. However, these same companies have expressed very little interest in exploring for or developing low- to moderate-temperature geothermal resources for district heating. This can be attributed to a relatively low rate of return on such projects in relationship to the high cost and high risk associated with exploration and drilling.

Industrial and commercial users willingly would use geothermal heat if it were delivered to them by a district heating supplier much as conventional energy supplies are, but are generally unwilling to take the risks of exploring for or developing geothermal resources themselves because of their lack of expertise in the development of energy projects (King, et al., 1980).

Investor-owned utility companies are generally unwilling to engage in high risk geothermal exploration and development activities because utility commissions are reluctant or refuse to allow the inclusion of "dry holes" in the rate base or the allowable rate of return would be too low because of regulation.

Publicly-owned utilities are often statutorily prevented from engaging in high risk geothermal ventures or are unable to assume the risks of geothermal exploration and development.

Finally, municipalities have shown much reluctance to engage in high risk ventures because of a lack of available funds for such projects, a lack of in-house expertise to successfully undertake such a project, and because they lack clear legislative authority to become involved in district heating.

Although some entities have been historically unwilling or unable to become involved in the development of district heating systems, there are small, independent geothermal resource companies who are involved in the exploration for or development of geothermal resources. These projects usually involve the development of mini district heating systems such as industrial and office parks, shopping centers, hotels, condominiums or townhouse complexes, and single-family residential tracts. And although these companies have also expressed an interest in installing city-wide district heating systems which use geothermal resources, the public utility implication of such projects and the risks of becoming a regulated public utility have increasingly been voiced as profound disincentive to the development of these types of projects by small, independent geothermal developers.

In spite of these problems, the development of geothermal district heating systems has begun to accelerate, and with the aid of federal funding, systems are now in operation in Boise, Idaho; Klamath Falls, Oregon; and Ephrata, Washington. Others are being considered for North Bonneville, Yakima, Grandview, and Sunnyside, Washington.

To fully understand the increased interest in geothermal district heating we must examine the legal changes which have occurred in the state to make such development possible and attractive to public as well as private sector developers, and to examine whether or not a framework conducive to the development of district heating has been adequately established.

Public Sector Participation

One of the biggest impediments to public sector participation in district heating was removed when Washington passed legislation to guarantee the rights of local governments to engage in district heating and clarified their right to finance, construct, own, and operate district heating systems within their jurisdictions.

Such authorization served as an important step toward furthering development of district heating systems by the public sector. However, another major impediment to local government development of geothermal district heating systems--the inability to engage in high risk ventures because of the lack of funds to engage in exploration and resource development--continues to delay or impede public sector participation.

One possible way in which such funding could be made available has been adopted by the state of Minnesota. The Minnesota legislature authorized the sale of \$100,000,000 worth of bonds which will be used to assist communities engage in the study, design, and construction of district heating systems. The Washington State Energy Office is looking into the need and desirability of requesting that similar legislation be introduced in Washington.

Another mechanism for municipalities to obtain necessary funding may be provided through private sector participation in the design and construction of district heating systems. However, as mentioned earlier, the public utility implication of such projects and the risks of becoming a regulated public utility have discouraged such participation.

Private Sector Regulation

Because most conventional financing institutions are reluctant to fund high risk ventures, and because federal and state funding is, to a large extent, unavailable at present, most geothermal district heating projects will have to be financed largely by equity investors whose primary inducement will be return on investment. Investors must, therefore, have assurance that if economically exploitable resources are confirmed through high risk drilling ventures that applications can be developed which yield a rate of return commensurate with the risk.

Presently, private developers cannot confidently predict whether the most likely geothermal applications actually will result in public utility status under current law and practice if the application requires resource distribution as would be the case with a district system.

Another major concern is the prospect that cost-based rate regulations probably will yield at most a 15 percent return on investment--far below the minimum 35-40 percent return generally considered necessary to attract investors to high-risk geothermal projects.

Other consequences of traditional utility regulation include possible disallowance of the cost of unsuccessful wells, denial of the federal 15 percent business energy investment tax credit, and the imposition of administrative and financial burdens which may be disproportionate to the benefits which the developer and its investors might anticipate from relatively small-scale heating operations dictated by resource limitations.

Recent legislative initiatives directed toward removing the disincentives which traditional public utility regulations impose may, however, provide a way through which the private sector can become actively involved in district heating.

The state of Washington (Engrossed Substitute House Bill 114, 1983) has adopted a much simplified operating permit system in place of traditional regulations. Under the permit system, geothermal sales are conditioned only on UTC issuance of a permit which:

1. specifies a geographic service area;
2. authorized non-exclusive services within that area, whether or not served by another utility; and
3. provides for UTC review and approval of basic system design, and of essential terms in the supplier's proposed form of customer contract, including length of term, a maximum rate or rate formula (unrelated to cost of service), and a streamlined dispute resolution procedure.

Such a system eliminates the major barriers to development described earlier, while still affording geoheating customers basic protection against supplier abuses which could arise once customers have been induced to make the initial investment needed to utilize the resource.

CONCLUSION

The maze of federal, state, and local legal and institutional requirements can sorely test the endurance and patience of most developers of geothermal energy. Delays in obtaining leases as well as required licenses and permits have, at times, taken up to 10 years, and often have been cited as the primary reason for the lack of geothermal assessment and development in Washington and in general throughout the United States.

The problems, however, have diminished over the years--federal and state legislatures and regulatory agencies have striven to establish a legal and institutional framework conducive to geothermal development. And, although many of the barriers identified are presently being addressed through state and/or federal legislation and changes in implementing rules and regulations, it is imperative that the state and the responsible regulatory agencies work together to ensure that barriers to geothermal exploration and development are removed in as timely a manner as possible so that cost-effective geothermal energy will be available when it is needed.

LOCAL ISSUES

INTRODUCTION

The state and federal legal and institutional framework covered in preceeding section is based upon a 15 year history of experience in the promotion and regulation of geothermal energy. Local jurisdictions have, however, only recently begun to address the needs of geothermal development. Because of this, the following section is more an analysis of what can and should be done rather than an analysis of existing programs, statutes, and regulation adopted specifically to affect geothermal development and is based, to a large extent, upon the work of Kurt Creager.

Major local issues involve resource ownership and management conflicts between jurisdictions and policy barriers created by local and regional agencies.

Emerging regulations and caselaw will serve to complicate or simplify the tangle of barriers and disincentives now present depending upon their outcome. For example, the final ruling on the case of Holly vs. Totus (Bob Olney, 1984) may serve to articulate the sovereignty of the Indian Nation and the Nation's ability to regulate surface and groundwaters on their reservation. The Washington State Department of Ecology, the U.S. Environmental Protection Agency, and the Yakima Indian Nation have all promulgated rules for the management of groundwater resources on the Yakima Indian Nation reservation. However, a federal court ruled in Holly vs. Totus that the Yakima Indian Nation Water Code could not be enforced because it imposes criminal penalties for non-Indian violators of the Code. The courts have ruled that the Indian Nation can only impose civil penalties against people who are not enrolled members of the Tribe. The Code is expected to be revised and reinstituted by the Tribal Council, depending on the outcome of a pending appeal filed by the Yakima Indian Nation (Kurt Creager, 1984).

Secondary and cumulative impacts of statutes, policies, and regulations often create barriers to the development of geothermal energy. For example, the traditional view of separating land uses through the use of zoning often separates uses so effectively that district heating systems may not be economically feasible to offset the use of electric and fossil fuels for space heating.

NEED FOR EFFECTIVE RESERVOIR MANAGEMENT PRACTICES

Similar to other renewable resources, geothermal energy must be managed to protect its use for future generations. In addition, geothermal energy development must be managed to avoid groundwater pollution and cooling of deep aquifers by poorly constructed irrigation wells. Similar to the feasibility of geothermal development, environmental impacts must be evaluated and mitigated on a project by project basis. Since geothermal reservoirs are often irrespective of political boundaries, there is a need for new coordinating mechanisms or a restructuring of existing mechanisms to allow local governments, the state, and other interests to manage geothermal reservoirs in the best interests of the public (see section on Groundwater Law, p. 20-23).

LOCAL POLICY ISSUES AND GEOTHERMAL ENERGY

Local plans and policies governing land use, economic development, resource management, and energy conservation have the potential to encourage or discourage geothermal development. The plans, policies, and strategies developed by local governments in the region for these purposes have been assessed according to eight geothermal development factors: energy conservation, energy education, economic development, growth management, resource development, resource management, density clustering, and mixed land use. These factors may directly or indirectly influence the feasibility of developing geothermal energy sources, particularly for district heating purposes.

Energy Conservation

Goals and policies encouraging energy conservation may provide the basis for an aggressive program to develop renewable resources, including geothermal, where it is economically feasible.

Energy Education

Local plans and policies that encourage energy education could provide the basis for a consumer program detailing the relative costs and benefits of geothermal energy. Information regarding consumer investment options, energy tax credits, permit requirements, life cycle costs, and the operation and maintenance of groundwater heat

pumps, as well as other direct use options could encourage consumers, builders, and business people to consider geothermal energy in perspective with other heating and cooling technologies when making investment and construction decisions.

Economic Development

Local strategies and plans that encourage economic development in the community could also provide the basis for strategies to attract business and industry with supplies of geothermal energy. Depending on the heat requirements of the enterprise, the geothermal fluid could be used directly or boosted with natural gas, biomass combustion, electricity, or other energy sources or used with a heat pump. Tax-exempt financing, access, the local labor force, and utilities are critical concerns for economic development. In addition, the availability of a relatively inexpensive cost-effective process heat could become an integral part of a comprehensive economic development strategy for many communities.

Growth Management, Density Clustering, and Mixed Land Uses

Plans and policies that encourage growth management, density clustering, and mixed land uses could provide the basis for land use patterns that make district heating systems cost effective. Generally speaking, where geothermal fluids of sufficient temperature and quality are available, a district heating system is most cost effective when population density is moderate to high. Concentrations of residential, commercial, or industrial heat customers increase the thermal load placed on the system justifying the cost of the system. Dispersed commercial and industrial customers and low density residential districts require an extensive heat distribution system which can rarely be economically justified given the cost of distributing geothermal fluids at the present time.

Resource Management and Development

Plans and policies that encourage the management and protection of groundwater resources for domestic and agricultural use could provide the basis for a locally-based program to manage the geothermal groundwater aquifer. Policies and strategies that are designed to stimulate the development of natural resources could also be focussed to accelerate the development of geothermal energy for beneficial residential, commercial, industrial, and agricultural purposes.

LAND USE AND DEVELOPMENT REGULATIONS

Local zoning, subdivision, planned unit development, and other ordinances often establish requirements and regulations that have direct and secondary effects on the development of geothermal energy.

Zoning Ordinances

Local zoning ordinances govern the use of property to protect the health, safety, and general welfare of local residents. The ordinances commonly establish prescriptive standards on use limitations, maximum development density, minimum lot size, lot width, property line setbacks, height restrictions, and other limitations. Variances, special property use permits, and conditional use permits are characteristically used to provide flexibility to the landowner in their effort to develop their property and to retain local control over the use of the property to achieve the intent of local plans and policies.

Some local ordinances offer incentives to landowners and developers in the form of added density bonuses allowing more homes or larger structures to be built in exchange for improvements that would not normally be required. Many jurisdictions also offer expedited permit processing and review, tax benefits, and other incentives to encourage development to be responsive to local goals and objectives.

Density Standards and Lot Area Requirements

The most fundamental effect that local zoning ordinances can have on the economical development of geothermal district heating systems is their minimum lot size and maximum density limitations. Generally speaking, more compact and densely developed land is better served economically by district heating systems. Such developments require less piping and usually have a greater heat load. Local ordinances that encourage planned unit developments and lot infilling and offer bonus density incentives for energy-efficient land uses or structures are the most favorable for geothermal district heating.

Bonus Density Incentives

Some cities offer bonus density incentives for developments that utilize renewable energy resources and/or provide public and private recreation facilities. In these cities, bonus density provisions are intended to provide an incentive to the developer whereby the maximum basic density allowed in a given zone can be increased 25 percent if certain

requirements are met. These ordinances specify that "residential structures must utilize renewable energy source property described by the Department of the Treasury Internal Revenue Service, (IRS) Publication 903, to provide a minimum of the annual space heating needs of each dwelling unit. The renewable energy source property includes passive and active solar, geothermal, and wind systems." Unfortunately, the IRS defines geothermal in such a manner to exclude the majority of warm groundwater resources present in Washington from consideration for federal tax credits. If strictly interpreted by the IRS definition of geothermal, a minimum of 50°C or 122°F, most of the resources present in Washington would not be eligible for bonus density incentives.

LOCAL POLICY ISSUE RECOMMENDATIONS

1. Local and regional comprehensive plans should motivate and guide public and private investments in energy conservation and education. When such plans are updated in the future, they should specifically address geothermal and warm groundwater resources as resources to be developed and managed according to local goals and objectives.
2. Local economic development strategies should balance resource management and development objectives to encourage the cost-effective development of geothermal energy and other renewable resources.
3. Clustering of homes and the practice of encouraging mixed land uses should be recognized as efficient ways to save energy, to provide public services such as transit, sewer, water, energy, and heat (in the case of district heating systems) and to protect valuable agricultural lands.
4. Local governments who suspect or are aware of geothermal resources in the community should seek technical assistance to define the feasibility of putting these resources to beneficial use in the community in order to realize local goals and objectives.

5. Where the favorability for geothermal or warm groundwater resources is demonstrated, local governments should establish policies related to the following:
- a. Capital Improvements--when sewer, water, street, or other capital improvements are constructed, the distribution of heat should be considered. There may be distribution lines, valves, and other components of a district heating system that may be cost-effectively installed while other improvements are installed. To ignore heat distribution while planning capital improvements may foreclose such improvements later on resulting in a lost opportunity or increased system costs.
 - b. Coordination of Utilities and Easements--when considering the creation of new utility corridors and easements or the abandonment of existing rights-of-way or easements, heat distribution should be considered. A utilidor policy leading to the coordination of power, communications, storm drainage, irrigation, water, and/or sewer utilities may make heating system expansion or creation less expensive in the future and consistent with overall development plans.
 - c. Land Use--local zoning, subdivision, planned unit development, and other ordinances should recognize the location and potential use of local geothermal resources. Land uses which are compatible in terms of heat requirements could be encouraged to locate and develop in close proximity maximizing the ability to cascade waste heat from one land use to another with lower temperature requirements. Geothermal production areas may be better utilized by diverting small lot segregations from an area which could serve as a resource to the community.
 - d. Environmental Impacts--local zoning and other regulations should recognize site specific impacts that may result from geothermal development.

Education of groundwater users concerned about different issues, such as groundwater resources for irrigation, fisheries, drinking water sources, and geothermal heat can also be valuable. However, such a program would require several actions to be successful:

1. More detailed information would be needed regarding aquifers at different depths throughout the populated areas of the region.
2. Studies would need to be made by the Department of Ecology or others regarding optimum well spacing, casing, and injection criteria.
3. Some kind of information delivery system would need to be agreed upon and established.
4. All interest groups such as electric utilities, local governments, and irrigation districts should develop a common understanding about mutual roles and responsibilities for establishing and managing such an educational program.

Incentives

One of the most appealing ways for local governments to achieve local goals and objectives is through the use of incentives. Often incentives are the most difficult approach to take because of their fiscal impact and, to a lesser extent, the questions of equity that are raised when they are used. Cost can be recouped through higher property tax assessments which are self-imposed by county voters. Other incentives used by local governments are often tied to the regulatory process. For example, cities may offer bonus density incentives for new residential developments which use geothermal energy resources to provide a substantial proportion of their annual space heating needs.

The so-called equity question sometimes is a concern where incentives are used. For example, people who voluntarily meet a standard or who followed local regulations and complied with the same standard are offered some kind of incentive. This argument has been voiced where "permit fast tracking" has been proposed to give preferential treatment to a proposed project that required permit approval. This type of incentive has been proposed for housing development proposals that meet community goals for low and

6. Local governments should provide information about local geothermal resources and their potential use as a matter of policy to all interested parties.
7. Incentives to encourage geothermal energy development should be considered in the revision of local zoning and other land use regulations.
8. Counties should consider action to coordinate with the U.S. Forest Service or Bureau of Land Management in designating any areas in the county unsuitable for geothermal energy development on federal lands.
9. All local governments should consider the establishment of a conditional use permit procedure for geothermal development activities if such development is expected to occur.

LOCAL RESOURCE MANAGEMENT OPTIONS

Traditional Local Government Practices

Traditionally, local governments have utilized one or a combination of three practices to manage natural resources: education, incentives, and regulations. Perhaps the best example of education for resource management practices is the joint sponsorship of County Agricultural Extension offices by counties and land grant universities. Incentive approaches which local governments can offer to achieve objectives differ widely according to the resources available.

Regulatory approaches are used by most local governments for land use and development controls through the use of subdivision standards, zoning regulations, shorelines development standards, environmental notification, disclosure requirements, and other regulations.

Education

Existing groundwater users and prospective groundwater developers can all benefit from education about how groundwater aquifers can best be managed for continued productivity. Advice on well spacing, casing recommendations, reinjection practices, and new technology (pumps, heat exchangers, etc.) may avoid serious resource problems later.

moderate income housing or energy conservation. The difficulty with this type of incentive is in the argument that, if a permit is able to be fast-tracked, the permit review system must be inefficient in the first place.

Despite these difficulties, incentives have their place, chiefly to soften the impact of a purely regulatory approach to resource management. An incentive-based program should consider the following issues.

1. The ability to utilize industrial development bonds (IDB) for geothermal energy development should be included in any effort to encourage the increased use of geothermal energy. Resource management practices should be considered as conditions to any approval of IDB's to be used to develop geothermal energy sources.
2. Local governments should consider the revision of local land use ordinances and plans to offer bonus density incentives to encourage the use of geothermal district heating in future years.

Regulations

Local government regulatory approaches for effective resource management include zoning regulations, subdivision and planned unit development standards, and utility policies. Local efforts initiated under state guidelines to coordinate the proliferation of water systems and to manage the development of critical groundwater service areas are occasionally used by local governments to protect drinking water supplies. A variation of this management practice may be applied to geothermal groundwater management in the future.

- o Zoning may be useful to manage resources for several reasons. It may be used to encourage certain types of development which enhance cascading, or the more efficient use of waste heat by encouraging land uses that are compatible in terms of heat requirements to locate in close proximity to each other.

Zoning may also be used to encourage the preservation of large parcels of land for suitable pooling of the groundwater resource. This could be achieved by discouraging small parcel development on geothermal production areas that might otherwise be lost. Any use of zoning to manage geothermal groundwater resources

will require a great deal of popular and political support to be successful. This can only be accomplished by an aggressive education program to explain the private and public benefits of resource management.

- o Subdivision and planned unit development regulations specify site and lot improvements required by the permitting jurisdiction. They also establish a series of procedures necessary to obtain local approval to develop and sell subdivided and/or improved properties pursuant to state enabling legislation. The expansion of district heating systems in a commercial development or a geothermal area may be facilitated through local subdivision regulations.
- o The concept of coordinating utility easements in the planning stage of subdivisions may also be implemented through local subdivision regulations. This concept could be utilized to make best use of land for geothermal transmission and distribution lines. Even if geothermal district heating is not proposed in new land developments, careful attention to the placement of utilities and easements may allow less expensive installation of heat distribution lines at some time in the future.
- o The State Public Water System Coordination Act (RCW 70.116) provides a procedure to help coordinate the development of water utilities and to integrate water system development with land use planning within specific areas of the state. This procedure can be initiated by the county with jurisdiction or the State Department of Social and Health Services. As adopted by the state legislature, the Act only applies to the coordination of public drinking water supplies. Therefore, at some point in the future an adaptation of this planning and coordination procedure may be desirable to Washington State. However, until there is a need for such coordination among geothermal users in the state, such a management process would probably be excessively cumbersome and actually discourage the use of available geothermal and warm groundwater resources in Washington.
- o Design Consistency--Local utility policies and regulations could establish consistent design specifications for geothermal district heating systems thereby allowing convenient mergers of systems and lowering system maintenance costs.

- o . Service Area Coordination--Local governments can encourage coordination among heat suppliers by establishing service area boundaries and policies discouraging duplication of facilities by competing providers, the proliferation of small systems, and overlapping service areas.

- o The State Environmental Policy Act (SEPA)--Provides a mechanism for local governments to review and evaluate development proposals not otherwise exempt from state law (RCW 43.21c). Despite the fact that some well drilling, utility construction, and water right acquisition activities are exempt from this law, local governments may still have the opportunity to review rezone proposals, land subdivision, and development proposals that either employ the use of geothermal or warm groundwater fluids or could directly affect the future use and quality of such resources. SEPA is administered by state and local governments in accordance with the Washington Administrative Code (Chapter 197-10; Guidelines Interpreting and Implementing the State Environmental Policy Act). Local governments must also adopt the necessary ordinances and rules to assure that the regulations have the force of local law. Local governments may choose to condition the approval or deny a non-exempt development proposal on the basis of local policies and standards relating to the adverse impacts expected from such a proposal. Therefore, to use SEPA to manage local geothermal or warm groundwater resources would require management policies and guidelines within the local government's comprehensive plan, zoning, and other land use ordinances. Substitute Senate Bill #3415 was adopted during the 1983 legislative session and amends the Planning Commission Act (RCW 35.63) which requires cities and towns to address the protection of groundwater resources used for public water supplies in the land use element of local comprehensive plans. If local zoning, subdivision, shoreline management, and other ordinances are structured to implement the groundwater protection policies and strategies, the State Environmental Policy Act can also be used to condition the approval or deny development proposals that are determined to adversely affect groundwater quality and supplies.

CONCLUSION

Local jurisdictions in Washington State have just begun to address issues, pertinent to geothermal development and to begin to establish the legal, regulatory, and institutional framework which will be required to ensure orderly geothermal development.

Local jurisdiction can have a profound influence upon geothermal development. Land use plans and zoning ordinances can provide for the needs of geothermal development. Adopting incentive and educational programs which will encourage investment in local geothermal development will help to ensure public acceptability.

Without the establishment of a sound local government policy toward geothermal development, development will be more difficult, more expensive, and often impossible or impractical to pursue.

REFERENCE LIST

- Allen, Eliot, 1984, Personal Communication.
- Bloomquist, R.G., Basecue, N., Higbee, C., Justus, J., and Simpson, S., 1980, Washington: A guide to geothermal energy development: Oregon Institute of Technology, Geo-Heat Center, 134 p.
- California Court of Appeals, 1981, Harry Pariani, et al. v. State of California, 1 Civil Code 47185 filed 5/20/80, 1st District Court of Appeal.
- Creager, Kurt, 1984, Geothermal development and resource management in the Yakima Valley: A guidebook for local governments: Yakima Conference of Governments, 69 pp.
- Derrah, H., 1984, Personal Communication.
- Freihofer, Daniel, 1984, Personal Communication.
- Fujimoto, Robert, 1984, Personal Communication.
- Geyer, John, 1985, Personal Communication.
- Higbee, Charles V., 1979, An argument for eliminating federal royalties on low temperature geothermal energy, hearings before the subcommittee on energy resources and materials production of the Committee on Energy and Natural Resources: U.S. Senate on S.1330 and S.1388, U.S. Government Printing Office, Publication No. 96-50, pp. 113-114.
- King, D., Nimmons, J.T., and Haneman, W.M., 1980, The role of gas and electric utilities in direct applications of geothermal resources: Earl Warren Legal Institute Publication, 213 p.
- Lienau, Paul J., 1984, Personal Communication.
- McClain, David, 1984, Personal Communication.
- Nimmons, John T.; Ross, L.; and Metzger, J., 1979, Overview of state public utility regulation impact on geothermal direct heat applications: The Earl Warren Legal Institute, University of California Berkeley, 22 p.
- Olney, Bob, 1984, Personal Communication.
- Perlmutter, S. and Birkby, J., 1980, Montana geothermal handbook--a user's guide to agencies, regulations, permits, and aids for geothermal development: Montana Department of Natural Resources and Conservation, Renewable Energy Bureau, 93 p.
- Rogers, Chuck, 1984, Personal Communication.
- Sacarto, Douglas M., 1976, State policies for geothermal development--uncovering a major resource: National Conference of State Legislatures, 94 p.

- United States Conference of Mayors, 1982, groundwater and geothermal: urban district heating applications: U.S. Conference of Mayors, Office of Development Progress, 91 p.
- United States Department of Agriculture, 1984, Termination of contingent right stipulation test: Federal Register, Vol. 49, No. 73, p. 14775.
- United States Department of Energy, 1979, Geothermal streamlining recommendations--a report to the interagency geothermal coordinating council from the streamlining task force on streamlining the federal leasing and environmental review procedures.
- United States Geological Survey, 1979, Geothermal Steam Act of 1970 and Regulations on the Leasing of Geothermal Resources, Title 30, Chapter II of the Code of Federal Regulations and Title 43, Chapter II of the Code of Federal Regulations, U.S. Department of the Interior, 51 p.
- United States, 1970, Geothermal Steam Act of 1970, Public Law 91-581 (84 Stat. 1566-1574) (30 U.S.C. 1001-1025).
- United States Senate, 1983, Hearing before the Subcommittee on Energy and Mineral Resources of the Committee on Energy and Natural Resources, United States Senate Ninety-Eighth Congress. First session on S.558, a bill to amend the Geothermal Steam Act of 1970 (30 U.S.C. 1001 Et Seg.) to expedite exploration and development of geothermal resources, and S.883, a bill to amend the Geothermal Steam Act of 1970 (30 U.S.C. 1001 Et Seg.) to expedite exploration and development of geothermal resources, 150 p.
- Washington State Department of Natural Resources, 1982, Draft rules and regulations for geothermal resource leasing.