

PRELIMINARY REPORT ON
LEGAL AND PUBLIC POLICY SETTING
FOR GEOTHERMAL RESOURCE DEVELOPMENT
IN HAWAII

Hawaii Geothermal Project
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Robert Kamins
Donald Kornreich
George Sheets

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LEGAL AND PUBLIC POLICY SETTING
FOR GEOTHERMAL RESOURCE DEVELOPMENT
IN HAWAII

Preface

This is a preliminary report which considers some of the social policy issues raised by the prospects for geothermal resource development in the State of Hawaii. In one sense it is paradoxical to report on these issues in advance of the event, for there is still much uncertainty about the quantity and quality of geothermal resources in this state, and therefore their significance for the Hawaii economy can yet be sketched only in a provisional way. It would be much easier for the state government if it could defer any action relating to geothermal resources until the facts are in, but, for reasons stated in the following pages, delay would inhibit geothermal development in a period of urgent search for new power sources.

The facts are being researched under the Hawaii Geothermal Project at the University of Hawaii, financed by grants from the National Science Foundation, the State and the County of Hawaii. Geologists and geophysicists are studying the resource to determine if and where it can best be tapped; engineers are seeking to design the best technology for utilizing the resource to generate electricity in a relatively non-polluting way. But this research takes time. It will be several months before a test geothermal well is drilled and more than a year after that before a pilot plant can be constructed and put in operation to demonstrate the feasibility of geothermal power in Hawaii.

And yet, basic policy issues present themselves to the state government even before the size and shape of geothermal development can become clear. Economic anticipation, including land-leasing speculation in rights to exploit geothermal resources, flies ahead of the demonstration of economic feasibility. Private and public planning must take that anticipation into account.

Thus the executive branch of the Hawaii state government has had a bill introduced before the current session of the state legislature to determine the nature and ownership of the resource. Such determination would reduce legal uncertainties surrounding this new resource and thus advance its economic development.

Current events heighten feelings of urgency for geothermal development in Hawaii. The national fuel crisis begins to bear heavily on a community which uses oil intensely, and threatens to increase

further a level of unemployment already higher than the national average and considerably above what Hawaii had experienced in the last decade. It is against this background of an urgent search for an indigenous fuel supply and a new economic base that this preliminary report has been written.

I. SOCIOECONOMIC CONSIDERATIONS

INTRODUCTORY

Hawaii's endowment of natural resources is most uneven and this elementary fact has shaped its development. The Islands' have an exceptional climate, but exceptionally limited mineral deposits; magnificent mountains with regionally abundant rainfall, but an insignificant potential for hydro-electric development; good harbors and coastal plains to accommodate transportation networks, but no fossil fuel to power either vessels or vehicles. The energy budget of the state offers the greatest paradox. The economy of Hawaii demands large quantities of energy for its mechanized plantation agriculture, federal facilities, tourist accommodations and other income-generating enterprises, as well as for household consumption. And these islands are literally bathed in energy -- from the sun, from the tradewinds, from the waves and tidal action of the ocean -- but the energy sources remain locked and unusable. Instead, the state has had to rely on imported petroleum which becomes ever more costly and uncertain of supply.

One fifth of the state's oil imports, about 8 million barrels in 1973, is used for the generation of electricity by the public utility companies which sell this service. Since Statehood, the quantity of electricity they have distributed has trebled, and the amount of oil used for power generation has increased proportionately. Further, over this 14-year time span, the per capita consumption of electricity in Hawaii has risen by about two and one-half times, reflecting more intensive use of electric energy both in homes and business, and indicating that the demand for electricity will continue to rise, even though the growth curve of population in the state has flattened out. It is reasonable to expect that under a technology centered on fossil fuels, the cost of electricity, which has swung up sharply in the past few years, will continue to mount. Fuel oil, which averaged about \$2.50 per barrel to Island electric companies in 1970, for some utilities costs more than \$10, with no indication when the price rise will end. Part of this increase was caused by a switch to low-sulfur oil to meet air quality requirements, but the larger rises of recent months are traceable to the partial embargo imposed by the Mid-eastern oil countries and the reactions of the world fuel markets to these changes.

Hawaii's position in the national energy crisis is one of great vulnerability. It is a high-cost area, and has specialized in relatively energy-intensive economic activities. This vulnerability is currently being demonstrated by the effects of the reduction in oil supplies on Hawaii's business, notably in cutting the number of

airplane flights to and among these islands, and thereby the number of tourists who can be accommodated, the gross incomes of hotels and restaurants, the construction of hotels and other visitor facilities, etc.

One expedient now urged nationally and locally to help meet the fuel shortage is to relax environmental standards, such as those which require public utilities to burn oils low in sulfur so as to minimize air pollution. Hawaii's population, however, has become sensitive to adverse environmental effects, recognizing their potential harmfulness to tourism, the state's largest and most rapidly growing industry, as well as to the quality of life enjoyed here by residents and visitors alike. We have reached the point -- as developed in recent utility rate hearings in Hawaii -- where the community has been offered the choice of allowing more air pollution by the utility companies or accepting further increases in electricity rates, already among the highest in the nation.

Technological developments in other regions of the world suggest one possible means for developing an indigenous source of energy and thus escaping the dilemma or at least of reducing its impact on our economy and environment. Experience in Italy since 1904, and more recently in California, New Zealand, Iceland, Japan, the USSR, Mexico and other areas, has amply demonstrated the feasibility of deriving energy from geothermal sources deep under the surface of the earth. This heat can substitute for fossil fuel in creating vapor to drive the turbines of electric generators, or may be used directly in industry and residences. Since there is no burning, the geothermal generation of power can avoid much of the pollution costs inherent in the use of fossil fuel, not all, since any likely system of energy conversion will have some adverse environmental effects, but most.

Exploration and demonstration

The University of Hawaii, under a grant from the National Science Foundation, augmented by funds from the State of Hawaii and Hawaii County, is now engaged in an exploration of the geothermal potential on the Big Island. Infra-red measurements, electromagnetic and electrical resistivity studies have located several potential areas for geothermal development. Ongoing research will identify the best locations for drilling holes, probably during the next fiscal year, deep enough to tap the geothermal resource for energy sufficient to run a pilot generating plant. The planned capacity of the pilot plant is 10 megawatts -- about one-seventh of the peak demand of the Hilo Electric Light Company, which presently supplies the Island of Hawaii from a combination of steam, diesel and small hydroelectric generators under its own operation, plus energy purchased from sugar companies which is generated in part by the burning of bagasse.

Operation of the pilot plant will at once provide for the application to Hawaii of technology used in other geothermal areas, perhaps modified for greater efficiency in its local use, and for the testing of the capacity of the resource. (Italian experience, which is by far the longest, suggests that 30 to 60 years may be a conservative range for the life expectancies of steam fields. Less is known about the characteristics of hot water and hot dry rock fields, the other forms in which geothermal resources may occur, but their useful life span may well fall within the same range.)

Part of the University's research project is predicated on the assumption that geothermal energy in Hawaii will be manifested not in dry steam -- such fields seem to be comparatively rare because they require a combination of high temperatures and low pressure in the ground water -- but in hot water which does not boil underground because it is at high pressure.^{1/} It is expected that the hot water will be brine (ultimately derived from the surrounding ocean) sucked up through the lens of fresh water which floats above the salt water. The complexities of relationship between the geothermally heated salt water and the fresh water overlaying it are being traced; it is visualized that the hot water supply is spread out laterally as well as vertically, so that it may underlie land considerably distant from the well from which it is extracted.

Public Policy and the Scope of Geothermal Development

This ambiguity of the geographic source of geothermal energy is paralleled by the ambiguity of its nature. How is this new resource to be categorized? It is heat -- but heat carried by water or aqueous vapor. And the water itself carries minerals in solution, minerals which may have some economic value, potentially ranging from common salt to gold. Indeed, one of the ultimate tasks of the University geothermal research project is to investigate the feasibility of obtaining several possible by-products, including the extraction of common and rare minerals. It could well be that in time the value of by-product utilization may rival or exceed that of the electrical power now being sought as the immediate output from geothermal development.

^{1/} Deriving energy directly from the hot magma, the third possibility, is a process still being worked on, whereas technology for using steam or hot water already is well developed.

Either of the categorical constituents of this new energy source, i.e. the water which bears the heat or the minerals dissolved in the water, could reasonably be used as the basis for defining geothermal resources under the law. The next part of this report discusses the legal considerations underlying these alternative definitions as well as a third, which is to define the resource as sui generis, a thing in itself, falling outside existing categories of natural resources, neither water nor mineral.

Here we briefly address other aspects of identifying the ownership of this potential, the considerations of economics and social policy, which are affected by the legal definition arrived at. Geothermal "deposits" are a new resource, until now quite unexpected by the people who live and own property in Hawaii, one which requires intensive development to be of economic significance, and whose payoff is inherently uncertain. What should be the policies of the state government, if it desires to advance the development of its geothermal potential in the interests of the people of the state?

Two general policy stances can be envisioned. One is that of *laissez-faire*: the legislature or courts would find that the resource occurring under private lands is the property of the landowner; for geothermal resources under state lands, the government would lease the right to extract geothermal resources to the highest bidder. This approach would minimize state responsibility and give freest scope to private initiative.

The second approach would be to declare that geothermal "deposits" belong to the state, whether classified legally as mineral, water, or sui generis. Under state ownership, the new resource would be subject to maximum control by the government; the government itself might develop the resource or lease it for private development. In either case, owners of private land overlying the deposit might retain the right to deny or permit access to their lands, a right with an economic value which would be determined by the market for geothermal energy or the by-products from its production.^{2/}

^{2/} If the landowners faced a market consisting of only one buyer, they might not get the full value for the use of their lands to reach geothermal resources. That would be true if the monopsonist were the state or a private enterprise.

Two different kinds of considerations may operate in choosing among these policy approaches -- considerations of economic efficiency and equity. The efficiency question is, would geothermal resources be developed more advantageously under public or private ownership? The equity question is, what is the fairest distribution of economic benefits which may flow from geothermal resources?

The equity, or fairness, consideration revolves around the question of whether owners of private lands overlying geothermal deposits should receive a larger or smaller windfall gain from the exploitation of the new resource. As suggested just above, they would receive some payment for allowing entry to and use of their land, even if the underlying resources were determined to belong to the state. However, they might well get more money for extraction of the geothermal matter if it were owned by them, and while federal^{3/} and state taxation would reduce the differential, some would remain. Whether this outcome is viewed as desirable is a question loaded with ideological content.

So, in the abstract, is any general answer to the question whether the development of geothermal resources is more likely to be carried to some optimal stage -- such as maximizing net income and employment, with minimal environmental impact -- if it were to be

^{3/}

Curiously, however, there seems to be a rather standard royalty payment among the still few states which have provided for them, either by state fiat for public geothermal lands or through the marketplace for private lands. That standard is 10% of the gross value of the geothermal product as it comes out of the ground. Ten per cent is provided for by law for production on state lands in California, Idaho and Utah, while in Alaska the royalty may be set anywhere between 10 and 15%. In California, the only state with much actual geothermal production, the standard royalty for leasing private geothermal lands is also 10%. Annual rentals paid for exploration and drilling rights, however, show greater variation. In California, the state charges \$1 per acre, while rents paid by developers to private landholders have ranged from 15 cents to \$15 per acre [Donald F. X. Finn, "Geothermal Leases, Royalties & Financing" (unpublished paper) March 1973]; Alaska Statutes, Sec. 38.05.181-k; Idaho Code, Sec. 47-1605. Under the Federal Geothermal Steam Act of 1970, a normal standard royalty of 10% of gross value is also established for geothermal steam, while royalty for by-products is 5%.

determined to be a public or a private asset. Abstract answers require assumptions as to how the state government would act if it had title: whether it would suppress development by interposing red tape, delaying applications for geothermal leases, charging excessively high royalties, or by other counter-productive behavior. Contrary assumptions are that the state government would be eager to develop the new resource, reasonable in charging for its exploitation, and cooperative with private developers -- assuming it itself did not undertake the development. The history of state action in economic development is mixed, but certainly the Hawaii government has been more eager than reluctant in making the essential natural resources, land and water, available to plantation agriculture and ranching, and in providing cash subsidies, currently more than \$1 million annually, for the development of tourism in Hawaii.

The case for preferring either private or public ownership of geothermal resources as the more likely to advance their development is thus inherently conjectural, since it depends on assumptions as to how the state would exercise its stewardship. The only statement which can be made with complete confidence is that definiteness one way or the other, to provide certainty as to who owns the resource, is necessary for geothermal resource development. Without reliable knowledge of ownership, the inherently risky business of finding and tapping geothermal deposits would become too loaded with uncertainty to attract either private or public investment. It is on the premise that some certain regime of law is essential for an early start to geothermal development that the following legal section of this report is based.

The perceived scope of a geothermally based industry may strongly affect policy approaches to the new resource. If geothermal development is viewed merely as providing an energy source to substitute for oil in generating electric power for Hawaii County, the choice of public versus private ownership of the resource is of limited social consequence. Public or private, the energy extracted would probably go to Hilo Electric Light Company, the only electric power enterprise on Hawaii, displacing some or all of its oil purchases, holding down its costs of production (or it would not make the conversion) and presumably its rates. Approximately 8 per cent of the state's population would be benefitted as customers, employees or owners of Hilo Electric, plus the few people who would derive income from the geothermal field itself. Local benefits might be appreciated, but the impact on the state economy would be quite modest.

A larger development of the potential geothermal resources of Hawaii could take advantage of the fact that the production of geothermal power is characterized by strongly decreasing average costs; within

observed ranges the bigger the plant the cheaper is its operation. Experience at The Geysers, California, has shown that as plant capacity is increased over wide ranges, both plant costs and operating costs per kilowatt hour of electricity generated fall markedly. For example, the average cost of power from a 28 megawatt plant (which would supply about a third of total demand on the Big Island) would be twice the unit cost of supply from a 137 megawatt plant.^{4/}

To utilize these economies of scale and make a significant addition to the economy of the entire state, the uses of geothermal resources would have to be expanded beyond oil import substitution to support a diversified geothermal industry. For this to happen, one of three breakthroughs beyond the extraction of geothermal resources would have to be accomplished:

1. Creating on the Island of Hawaii major new industries based on geothermal water and power.
2. Perfecting means of transmitting electrical energy, surplus to the needs of Hawaii, to Oahu and other centers of economic concentration. Conceivably, this can be done by cable or by hydrogen conversion^{5/} but neither technology is yet available for commercial application.
3. Developing and marketing by-products of the geothermal resources, other than power. A long list of potential by-products has been suggested; their feasibility for local production has yet to be researched.

^{4/}

Data from Alvin Kaufman, "The Economics of Geothermal Power in the United States", in U. N. Symposium on the Development and Utilization of Geothermal Resources (Pisa, 1970), Vol. 2, Part I.

^{5/}

By electrolysis, using geothermally derived electric current, water is broken down to hydrogen and oxygen. The hydrogen can then be shipped in tankers or cylinders to an industrial site, where, recombined with oxygen, it forms water and releases energy, which can be used to generate electricity; alternatively it can be burned directly as a fuel source.

If any of these breakthroughs could be achieved, the payoff to the entire state economy could be significant in terms of income generated and jobs created, great enough to justify an extraordinary effort, including state planning and even subsidy. For example, one assessment of the potential for extracting various minerals from manganese nodules and crusts mined from the sea around these islands envisages a labor demand for approximately 500 employees per plant, plus the demand for support services. However, the energy requirements for a processing plant are enormous, ranging up to 200 megawatts, and so geothermally derived electricity may be critical for this energy-intensive industry. Further, some of the chemical reagents needed in the processing of nodule minerals, which otherwise would have to be imported, can be obtained as by-products of geothermal development, helping to reduce costs and make the mineral processing plant economically viable.

Other pieces of an energy-mineral complex would have to be assembled and fitted to create this new industry. These include exploratory mining, research into mining methods, purchase or lease of a mining ship, provision of drydock facilities, harbor modification to accommodate the ship, construction of a processing plant, provision of a large supply of fresh water, expansion of the Foreign Trade Zone for storage and transshipment of metals, etc. Environmental protections would have to be provided to guard against pollutants generated by the processing plant.

Some of these inputs can be supplied by private enterprise without special stimulus; others may occur only with government subsidy (in money or services); and some can be supplied by government alone. This mixture of public and private enterprise contributions may reasonably be anticipated for any other large-scale application of the geothermal resources of the state, whether in developing a lumber/pressboard industry or applying low-cost electricity to storing and processing the crops of diversified agriculture. To maximize the economic benefits of the geothermal resources, in terms of income and jobs, some means of bringing these inputs together efficiently will have to be effected.

That coordination could conceivably come from a large private corporation which was prepared to assume most of the risks by itself investing in all of the facilities available to private enterprise. In the example of the geothermal-manganese nodule complex, a major corporation might contract (perhaps go into a joint venture) with a local utility company for the provision of the megawatts of electricity it needed, buy or lease the mining ship, acquire docking facilities, build the metal processing plant, etc., while depending on the state government to provide fresh water, Foreign Trade Zone facilities, necessary harbor modifications to accommodate its ship, and environmental monitoring. The large investment required (estimated at up to \$100 million for the purchase of the mining ship and construction of a pro-

cessing plant alone) would inherently be risky, and the risk may be unbearable unless the corporation were assured of government action to provide the necessary public inputs.

Another possible model for large-scale exploitation of the geothermal resource is one of multiple conversion. It may be feasible to run the geothermal water through an electric power plant, then to a nearby industrial site (such as a paper or textile plant) which requires hot water in large quantities, and finally to a desalinization plant to be transformed into fresh water, with the salts and minerals being concentrated in the remaining brine for economic extraction.^{6/} Again, an exceptional amount of planning and coordination of investment and operation of plant would be required to maximize the economic benefits of the geothermal potential.

How such planning and coordination may come about can only be surmised until the size, quality and costs of Hawaii's geothermal resources become better known, and even with the stimulus of the present national energy crisis that discovery may take a few years. If the size of the resource is up to the expectations of some geophysicists, its development will warrant careful thought as to the role of the state government. That role could be as planner -- through the Department of Planning and Economic Development setting forth a program of geothermal development and the conditions which private industry would have to comply with in utilizing this new resource. Or, the Hawaii government may itself want to establish a corporation for over-all geothermal development, either completely governmentally owned -- following the model of the Tennessee Valley Authority -- or as a joint venture with private capital -- in the manner of the Communications Satellite Corporation.

Further, the policy of the county governments with respect to land use may come into play, since in Hawaii the counties share with the state power to control the uses to which land is put. If geothermal sites are discovered in areas currently classified as agricultural or conservation districts, under state control, the development of the sites into production units may be deemed to have changed

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The UN has been working on a geothermal project in Chile intended to produce electric power, desalinated water and minerals. Joseph Barnea, "Multipurpose Exploration and Development of Geothermal Resources", in Natural Resources Forum, UN Department of Economic and Social Affairs, (New York, 1971), Volume I, No. 1, p. 57.

the land classification to urban, so placing it under county regulation. Collaboration by both levels of government would be required to clarify the land zoning regulations applicable to geothermal development.

Summarizing the discussion of public policy choices concerning ownership of geothermal resources to this point, if the state were to declare them to be owned by the holders of overlying land, that declaration may initially hasten geothermal development -- or at least of activity in obtaining exploration and drilling leases and raising speculative investment funds. A declaration of state ownership would tend to hold back such activity, but could provide an institutional basis for long-term planning of geothermal development to maximize the beneficial use of the resources which may be discovered. Failure to make a determination of ownership either way would inhibit both private initiatives and government planning for its participation in the development.

II. LEGAL CONSIDERATIONS

The geothermal resource which produces a unique form of energy is only at the threshold of its development, and so is the body of law explicitly applicable to it. The very fact that the law relative to geothermal energy is just emerging and therefore uncertain poses a significant problem to the early development of this energy source. For example, many basic issues regarding the legal aspects of the geothermal resource require answers: Who has the right to, i. e., who "owns", the resource in place? Is the right to extract geothermal fluid based on ownership of overlying land? Is the resource subject to appropriation by other than the overlying landowner? Have land patents or grants reserved the resource to the State? If there is no such reservation, should ownership in private parties be recognized?

The question of ownership of the geothermal resource is inextricably connected with the definition of the resource. Is it water? Mineral? Something unique in nature which is neither water nor mineral? Depending on its definition, the resource is subject to a different set of legal doctrines, established by both statutory and court-made law, which affect property rights in the natural endowment.

There is no general agreement as to the classification into which geothermal resources fall; approaches have been advanced for all three categories -- water, mineral, sui generis.⁷⁷ Therefore, it would seem that any of these alternatives are reasonably available to the Legislature, or it could choose not to categorize the resource and leave the question to the courts. And, indeed, it is probable that property rights to geothermal deposits ultimately will be decided by the judiciary, since any definition provided by the Legislature is likely to be challenged by parties adversely affected by the categorization and the resulting effect on the declaration of ownership.

However, the Legislature has the opportunity, precisely because of the paucity of law relating to geothermal resource ownership, of determining the direction the law will take, including the outcome of the judicial review. This follows from the assumption that in the absence of controlling law, the courts will accept any reasonable

⁷⁷ Appendix 1 to this report provides examples of how the federal government and several mainland states have legislatively defined or treated the resource.

definition of the new resource and determination of its ownership. Should the Legislature act to settle the interlocked questions of definition and ownership, that action could provide a necessary legal framework for the development of the resource in Hawaii, a framework which could reasonably be relied on for investment decisions by private enterprise and government alike.

To choose between action and inaction in legislating on the nature and ownership of the geothermal resource, the state government requires some public policy criterion for its decision-making. One was suggested in the first part of this report: the urgent need for geothermal development in this state, not only to replace oil during the national energy crisis, but to provide an imperatively needed industrial base for employment and incomes in Hawaii. If this urgency is accepted, it is reason to provide without delay a legal regime under which the new resource can be developed with minimal uncertainty as to how the state will treat property rights in the geothermal economy.

HAWAII AND THE FEDERAL EXPERIENCE

With respect to policy-making intended to advance the rate of geothermal development, there is an interesting analogy between the situation of Hawaii now and that which faced the federal government prior to 1970. Aside from Hawaii, the states (all in the western part of the country) which have geothermal resources contain extensive amounts of land either presently owned by the federal government, or in which, while the surface has passed from federal ownership, the minerals have been reserved to the United States. In these states, it has turned out, the bulk of the known geothermal resources lies beneath such "federal" lands. It has been generally recognized that the slow development of the geothermal potential in all these states except California has been attributable, in large part, to the absence of reliable statutory authority permitting its development on

the public lands.^{8/}

To resolve these uncertainties, the Geothermal Steam Act of 1970 was enacted. Its purpose is twofold: to encourage development of the geothermal resource both on federally owned and reserved lands, and to assure effective protection of the public interests involved. The Act seeks to accomplish these objectives by, among other things, providing for federally regulated leasing of public lands for geothermal development and the payment of royalties based upon a percentage of the value of the energy produced or utilized.

Concerning the right to geothermal resources underlying lands, the surface of which had passed from federal ownership, Section 21 (b) of the Act provides that:

Geothermal resources in lands the surface of which has passed from Federal ownership but in which the minerals have been reserved to the United States shall not be developed or produced except under geothermal leases made

^{8/}

Over the years the Department of the Interior had taken the position that it lacked authority to dispose of this resource on lands under its jurisdiction. Furthermore, most of the public lands in question were not owned outright by the United States but had been patented under the Stock-Raising Homestead Act of 1916, (43 U.S.C. 299), which reserves to the United States "all coal and other minerals"; legal issue arose as to whether the reservations in such patents include geothermal resources.

The Solicitor for the Department of the Interior took the position that such mineral reservations do not cover geothermal resources. Nonetheless, the rights of such patentees to the geothermal resources underlying their lands remained unsettled, since opinions had been expressed by lawyers representing private interests who contended that the geothermal resource is a mineral and should be governed by the mining laws. There had been no authoritative judicial determination of the question, and notwithstanding the Solicitor's opinions the United States had not quitclaimed whatever interests it may have had under the reservations. Bible, "The Geothermal Steam Act of 1970", 8 Idaho Law Review 86, 90-92 (1971).

pursuant to this chapter. If the Secretary of the Interior finds that such development is imminent, or that production from a well heretofore drilled on such lands is imminent, he shall so report to the Attorney General, and the Attorney General is authorized and directed to institute an appropriate proceeding in the United States district court of the district in which such lands are located, to quiet the title of the United States in such resources, and if the court determines that the reservation of minerals to the United States in the lands involved included the geothermal resources, to enjoin their production otherwise than under the terms of this chapter:

Provided,

That upon an authoritative judicial determination that Federal mineral reservation does not include geothermal steam and associated resources the duties of the Secretary of the Interior to report and of the Attorney General to institute proceedings as hereinbefore set forth, shall cease.^{9/}

9/

The rationale for directing the Attorney General to sue is stated in the House Report on the Act:

One reason for the lack of development of the geothermal steam potential of the United States can be directly attributed to the absence of reliable statutory authority to permit its development on public lands.

In order to obtain an authoritative judicial determination of the ownership of geothermal resources in lands the surface of which has passed from Federal ownership with a reservation of minerals to the United States, a new section 20 (b) [now Section 21 (b)] was adopted by the committee. This directs the Attorney General to initiate an appropriate proceeding to quiet title of the United States to such resources if and when development of such resources occurs or is imminent.

(House Report No. 91-1544 on Public Law 91-581, The Geothermal Steam Act of 1970. 3 U.S. Code Cong. & Adm. News 5113, at 5115, 5119.)

It should be noted that technically the Act does not define or declare the resource to be mineral. Rather, it provides that the resource in lands the surface of which has passed from federal ownership but in which minerals are reserved to the United States are subject to the Act. If the federal courts determine that the resource is within the reservations, it is to be developed and produced under the provisions of the Act. The substantive impact of this approach is equivalent to a statutory declaration that the resource is mineral because had Congress expressly declared the resource to be mineral it would still have been for the courts to decide whether the mineral reservations in land conveyances made before such declaration included the resource.

The situation in Hawaii with respect to the legal status of the geothermal resource is somewhat analogous. Hawaii, because of a unique historical evolution culminating in Statehood, has very little "public land" held by the federal government. However, this same historical evolution has resulted in substantially all land privately owned in Hawaii being conveyed by the State or its predecessors subject to reservations in the Hawaii government. In other words, the State retains certain rights in most privately owned lands because of reservations made when lands were conveyed by the State or its predecessors in sovereignty, the Kingdom, Provisional Government, Republic and Territory. Consequently, the situation concerning ownership of geothermal resources in Hawaii raises the same kind of issues which were posed to the federal government prior to the passage of the Geothermal Steam Act. However, it should be noted that the legal framework within which these issues must be resolved does present some major differences when viewed as a State of Hawaii, rather than as a federal, matter.

The most material difference concerns the type and scope of the reservations respectively available to the federal government and the State of Hawaii for asserting ownership of the geothermal resource. The Congress, in enacting the Geothermal Steam Act, had to rely upon the rather narrow mineral reservation contained in the Stock-Raising Homestead Act,^{10/} the only reasonable basis available to it for asserting a federal interest in geothermal resources underlying public lands whose surface had previously been conveyed to private owners.

^{10/}

The portion of the Geothermal Steam Act (Section 21-b) which deals with the reservation of mineral rights to the United States is currently being litigated. In the case of United States v. Union Oil Co., 35. al. -- F. Supp. -- (N.D. Cal., 1973), the district court held that based upon the language of the Stock-Raising Act of 1916, and the court's interpretation of the legislative history of the Act, the mineral reservation therein does not extend to geothermal resources. The court construed the language of the Stock-Raising Homestead Act relative to the mineral reservation narrowly, and further concluded that geothermal resources were water, not mineral. The case is being appealed.

In contrast, the reservations in land grants in favor of the Hawaiian government, dating from the time of the Great Mahele, are based upon a more general statute,^{11/} and recently have been broadly construed by the Supreme Court of Hawaii so as to encompass not just minerals but the "important usufruct of lands", which the court has held to include flowing water.^{12/}

^{11/}

See Hawaii Laws 1847, 85; Revised Laws of Hawaii 1925, Vol. II, App., 2124, 2128, and Hawaii Revised Statutes, Section 182-1(3) set forth at note 28, below.

^{12/}

See McBryde Sugar Co. v. Robinson, 54 Hawaii 173 (1973) at pp. 184-187. The Court stated that it is generally accepted that the Great Mahele itself did not transfer title to land. Rather, the Land Commission Act of December 10, 1845; Laws 1846, 107; R.L.H. 1925, Vol. II, App., 2120, created a Board of Land Commissioners to quiet titles to the land which had been maheled. The Court then held that the commissioners were authorized only to convey certain limited rights in land possessed by the King. These were:

"[H]is private or feudatory right as an individual participant in the ownership, not his sovereign prerogatives as head of the nation. Among these prerogatives which affect lands are the following:

"3rd. To encourage and even to enforce the usufruct of lands for the common good . . ."

"These prerogatives, power and duties, his Majesty ought not, and ergo, he cannot surrender."

54 Hawaii 174, at page 186.

LEGISLATIVE ALTERNATIVES

Background

A review^{13/} of the actions taken by mainland states which possess known geothermal resources establish that:

(1) No state legislature has affirmatively declared the resource to be the property of the overlying landowner;

(2) Two states have expressly asserted public ownership of the resource. Montana has defined the resource to be water, thereby facilitating public ownership because under its constitution all "waters within the state are the property of the state".^{14/} California, which for several^{15/} years has merely sought to regulate the development of the resource, is now asserting public ownership in litigation proceeding in its state courts, on the grounds that the resource is mineral and is subject to reservations made in state land patents.^{16/}

13/

Based primarily upon replies from the western states to inquiries made in the summer of 1973 on behalf of the Hawaii Geothermal Project.

14/

See Sections 2 and 3 (1) of Chapter No. 452, Montana Session Laws 1973, (the "Montana Water Use Act") set forth in Appendix 1, below.

15/

See Sections 3700 and 3701 of Chapter 4, California Public Resources Code (1971), set forth in Appendix 1.

16/

Pariani, et al v. California, et al, Case No. 657-291, Superior Court, City and County of San Francisco, State of California, pending. This is a companion case to that proceeding in the federal courts concerning the Geothermal Steam Act. See Note 10, above.

Furthermore, recent dispositions of state lands in California contain a clause expressly including the geothermal resource among the reserved mineral deposits.^{17/} While the Montana and California approaches to public ownership are quite different, both states have relied upon characterizations of the resource that fit it into pre-existing legal regimes that provide a reasonable basis to support such declaration or assertion of ownership.^{18/}

(3) Idaho has defined the geothermal resource to be sui generis, or unique in nature.^{19/} While the Idaho statutory definition establishes a rational basis for regulating the resource, it does not in itself resolve the ownership issue.

(4) Other states with known geothermal resources, without defining the resource to be water, mineral or sui generis, legislatively provide for its regulation.^{20/}

(5) Finally, Hawaii and a few mainland states have yet taken no definitive action either to define the resource or to declare the state's position relative to its ownership.

^{17/}

See Allen, "Legal and Policy Aspects of Geothermal Resource Development", 8 Water Resources Bulletin 250 (April 1972), at page 253. In Pariani v. California (note 16, *supra.*), the mineral reservations in issue reserve to the state "all oil, gas, oil shale, coal, phosphate, sodium, gold, silver, and all other mineral deposits". See California Public Resources Code, Section 6904.

^{18/}

See Allen, *op. cit.*, for a good, brief discussion of the alternative approaches that could be used (by mainland states) to fit the resource into legal regimes to determine ownership.

^{19/}

The Idaho Legislature stated that: "Geothermal resources are found and hereby declared to be sui generis, being neither a mineral resource nor a water resource, but they are also found and hereby declared to be closely related to and possibly affecting and affected by water and mineral resources in many instances." Section 3 (c) of Idaho Geothermal Resources Act, 1973, reproduced below in Appendix 1.

^{20/}

For example, New Mexico, Arizona and Utah in Appendix 1.

Approaches

The following pages briefly set forth the alternative approaches available to the Hawaii Legislature for establishing a legal regime applicable to geothermal resources, a discussion based upon the experience of other states as well as at the federal level, and our understanding of applicable Hawaii statutory and decisional law. Emphasis is placed upon assessing these approaches relative to their impact on stimulating early development of geothermal energy within Hawaii, taken to be a policy objective for the Islands.

A. State Ownership of the Geothermal Resource

The primary question is whether the resource should be subject to private ownership or held in the domain of the state. If the latter solution is desired, there are three basic approaches available to the Legislature for asserting ownership of the geothermal resource by the state.

1. Following the precedent of Montana, the Legislature could categorize the geothermal resource as "water", and on that basis, claim it for the state. However, while it would not be unreasonable to treat the resource as water, it is not clear that state ownership would be established thereby. In Hawaii, unlike Montana,^{21/} there is no express statutory or judicial pronouncement that can be relied upon to directly support state ownership of subsurface water, which almost certainly is what would be at issue should the legislature determine that the geothermal resource be considered as water.^{22/}

^{21/}

Under the Montana Constitution (Article IX), the Legislative Assembly has the power to declare, and did so declare in the Water Use Act, that "any use of water is a public use, and that the waters within the State are the property of the State for the use of its people...." (Section 2.) See Appendix 1.

^{22/}

The issue of surface vs. subsurface water is probably moot in Hawaii where geothermal resources are thought to be found at rather great depths. However, the situation is somewhat different in some mainland areas. In this regard, see "Acquisition of Geothermal Rights", 1 Idaho Law Rev. 49 (Fall, 1964); Brooks, "Legal Problems of the Geothermal Industry", 6 Natural Resources Journal 511 (Oct., 1966), at pp. 527-530.

To the contrary, almost a half-century ago, in City Mill Co. v. Honolulu Sewer & Water Commission,^{23/} the Hawaii Supreme Court held that owners of land under which there is an artesian basin are owners of the waters in the basin. In so ruling, the court added that while land grants since the Great Mahele recognized the reservation of all minerals to the government, "there was no reservation whatever of the subterranean waters".^{24/} However, in the recently decided case of McBryde Sugar Co. v. Robinson,^{25/} the Supreme Court, relying heavily upon its construction of the grant of authority to the Land Commission created to implement the Great Mahele, held that "flowing" or surface water is an important usufruct of land and "was specifically and definitely reserved for the people of Hawaii for their common good in all of the land grants".^{26/}

While McBryde represents a broadening of the reservations in land grants in favor of the state (previously assumed to be limited to minerals)^{27/} to include surface water, it is not clear that the court would further extend these reservations to include subsurface water for the purpose of affirming a legislative assertion of public ownership of the geothermal resource as (subsurface) water. First, such a decision would necessarily affect all subsurface water rights and not just those associated with "geothermal water". Second, the McBryde decision was rendered by a closely divided court, two of whose members have now retired. Since it is readily conceivable that a future court could limit, if not overturn, McBryde, a legislative classification of the resource as "water" would be a hazardous basis for sustaining an assertion of state ownership, if that is desired.

^{23/}
30 Hawaii 912 (1929)

^{24/}
Ibid. at page 934 (Emphasis added)

^{25/}
54 Hawaii 174 (Jan., 1973, one Justice dissenting in part). Affirmed, per curiam, on rehearing, ___ Hawaii ___ (Dec., 1973, two Justices dissenting).

^{26/}
54 Hawaii 174, at page 186.

^{27/}
See following note and also City Mill Co. v. Honolulu Sewer & Water Commission, 30 Hawaii 912, 934 (1929) (dictum), quoted just above.

2. The legislature could characterize the geothermal resource as "mineral" within the meaning of Hawaii's mineral laws, thereby asserting that it is subject to reservations in favor of the state contained in land conveyances from the time of the Great Mahele.^{28/} This, in fact, is what is proposed by the geothermal resources bill (S.B. 1520-74) introduced on behalf of the Governor's office before the 1974 Hawaii Legislature, and reproduced as Appendix 2 to this report.

A reading of the McBryde cases, the dissenting as well as the majority opinions, leads us to conclude that the court would not have the difficulties posed concerning the resource if it were characterized as mineral rather than water. First, the crux of the majority approach in McBryde is supportive of public ownership of resources for the common good.^{29/} Second, the most compelling argument advanced by the dissenting justices is that the government through a long history of statutory and decisional actions has recognized private rights in water and that private interests have been consistently acting in reliance on that recognition since the days of the Kingdom.^{30/}

Therefore, if the geothermal resource which, unlike water, has not been the subject of private use and in regard to which private economic activities have not yet been established in Hawaii (although future expectations are now probably forming) is characterized as mineral, the question of any ancillary impact of a court decision relative to established or presumed rights would not come into play. In other words, should the Legislature define the resource as mineral it would go far toward removing from judicial inquiry the area of dispute that split the court in the McBryde cases, while still retaining the public ownership of resources approach that a majority of the court seems to favor.

^{28/}

Statutorily asserted in Hawaii Revised Statutes, Section 182-1 (3), which defines "reserved lands" as "those lands owned or leased by any person in which the State or its predecessors in interest has reserved to itself expressly or by implication the minerals or right to minerals, or both".

^{29/}

⁵⁴ Hawaii 174, 186-187

^{30/}

Ibid. 201-209 (Marumoto, J., dissenting, in part, and concurring, in part; Levinson, J., dissenting opinion).

This latter point is particularly significant because as long as scientific evidence can be brought to bear to establish the reasonableness of a legislative determination that the resource is mineral, the Hawaii court is likely to uphold that determination, regardless of how courts or legislatures in mainland jurisdictions ultimately characterize the resource.

3. The legislature could declare the geothermal resource to be sui generis, or unique in nature. However, it is not clear whether the state would be determined to be the owner of the resource in such case. It can be argued that the reservation to the state of the "usufruct of lands" includes unique-in-nature substances and, therefore, the geothermal resource is reserved to the state. In light of the McBryde case, such an approach is not unreasonable, and could avoid the terminological difficulties of calling the geothermal resource either water or mineral, as well as the additional legal problems that would be involved in defining it as water. However, unlike the approach of defining the resource to be mineral, a sui generis definition would not in itself constitute an assertion of state ownership based upon an existing legal regime, but would require the courts to apply and extend the McBryde rationale to a resource new to Hawaii jurisprudence.

B. Private Ownership of the Geothermal Resource

Although no state is known, either by constitutional provision or statute, to have declared the geothermal resource to be the property of the overlying landowner, no express legal authority has been found which precludes the Legislature from declaring private ownership, should it choose. Thus, the issue is one of policy and judgment -- whether, in light of the assumed policy objective of achieving an early development of the resource, this approach would provide developers with sufficient certainty to encourage their undertaking the substantial financial risks required for developing and producing geothermal energy.

One aspect of the legal setting which bears upon the choice of legal regime, public or private ownership, is the possibility of law suits to challenge a legislative declaration in either direction. In the event of a declaration that geothermal resources belong to the owners of overlying land, interest groups favoring public ownership could readily challenge that determination in the courts, so prolonging during litigation the present uncertainty as to the legal status of the resource. Considering the McBryde case, it is difficult to predict how the Hawaii Supreme Court would rule on a new, water-related subterranean resource, and while the issue was pending the risk factor would remain high, probably to the detriment of geothermal development.

Of course a declaration of public ownership is just as likely to be litigated as one of private ownership. However, it would seem that the Legislature can more readily provide for the contingency of a Supreme Court decision over-turning a declaration of public ownership than it can if the reverse were the case. In other words, should the Legislature declare the State to be owner of the geothermal resource it can provide certain safeguards for developers, so that they would be more willing to undertake early development of geothermal energy, even against the possibility that the courts might ultimately hold that the resource is not owned by the State. Such safeguards could include refunding lease rents or royalties paid to the State, as well as indemnifying the developers for additional costs involved in negotiating new arrangements with the overlying landowner. The State, through its administrative agencies, could seek to bring the private landowners into the initial phase of the development process, as third-party participants, until the courts settle the question of the State's ownership claim.

However, in the situation of a legislative declaration of private ownership, it would be more difficult for the State to provide such safeguards against a reversal by the courts. The State would not have been a party to the leases and other contractual arrangements concerning development of the resource.

Further, under private ownership of geothermal resources the State would have little, if any, control over the kind and number of developers that entered into these arrangements with the landowners. Questions such as the involvement of foreign as well as domestic developers, and the possibility of one developer obtaining an unwanted monopoly would be left to the happenstance of the marketplace. Once development is initiated under a statute declaring the private ownership of the resource, it would be most difficult for the State, should it later be held by the courts to be the owner of geothermal "deposits", to step in and redirect development interests along different lines.

Finally, the question of the susceptibility of geothermal development under a regime of private ownership to federal anti-trust regulation should be considered.^{31/} Given the size of investment required to produce geothermal power, it is likely that exploitation of the resource would be undertaken by only one -- or at most a few -- companies, which would then sell the power to the electric company which has a legal monopoly on the island which it serves. In Hawaii

^{31/}

This question is considered by Michael Remy, "Legal and Institutional Aspects of Geothermal Development", unpublished paper of the Resources Agency of California, dated October 12, 1972, at page 26.

ownership of large areas by relatively few landowners^{32/} could further narrow the market, for if geothermal resources were to be tapped solely from the land of one large estate, a linkage of monopolies could result: a single landowner leasing to a single geothermal developer selling to a single utility company. Should the Legislature decide to declare the resource to be the property of the overlying landowner, therefore, consideration should also be given to providing safeguards to alleviate the possibility of anti-trust actions which could inhibit the early development and production of geothermal energy.

32/

For an analysis of land ownership patterns in the State of Hawaii see Statistical Report No. 98, "Land Use and Ownership Trends in Hawaii", of the State Department of Planning and Economic Development (Dec. 1973). Table 11, at page 25, provides the following data relative to land ownership in Hawaii in 1968, the most recent year for which data were available.

<u>Total area in State:</u>	4,128,263 acres
Owned by:	
1. federal government	355,769 acres
2. state government	1,584,715 acres
3. major private owners*	1,917,560 acres
4. other owners	270,219 acres

* Holding 1,000 or more acres in fee simple.

On the Island of Hawaii (which has most of the known geothermal resources of the state), the State owns 43.76% of the land, the federal government 8.20%, the major private landowners 41%, and the remaining private landowners less than 8%. The 11 largest private landowners in the County of Hawaii own 35.31% of the land (Ibid. Table 9, at page 50).

C. Regulatory Action Only

The Legislature, following the approach of several states, might only establish a regulatory program relative to the geothermal resource, and leave the ownership issue entirely to the courts. However, such an approach would, in the opinion of the authors, leave the public, the overlying landowners and potential developers alike without a framework of property rights to guide their economic decision, tending to inhibit development of the resource, pending judicial resolution of the ownership issue without legislative input. Further, the Hawaii government could be faced with a situation similar to that unfolding in California, where the state originally limited its legislative program to regulation of the resource but now is asserting public ownership as a defendant in litigation.^{33/}

D. No Legislative Action

The Legislature may decline to act in regard to the legal status of the resource or to establish a regulatory program for its development. Such an approach would not only create a situation like that discussed under the last alternative, but would produce even greater delay until an appropriate regulatory program could be formulated once the courts had acted.

^{33/}

See Note 16, above.

III. REGULATORY PROVISIONS

Hawaii's present law does not define or explicitly regulate the use of geothermal resources. The statutes relating to natural resources are either too general or too specifically directed to other particular resources to be readily applicable to geothermal operations. Whereas several mainland states in the geothermal belt west of the Rockies have had experience with petroleum exploitation, and could readily modify their oil and gas regulations to the new case of geothermal, Hawaii has had no occasion to develop this branch of regulatory law.

However, the need for regulation is apparent when one considers the nature of geothermal production, which is quite similar to oil and gas development, involving drilling deep into the ground, releasing liquids or gases under high pressure, and distributing the materials obtained from the well over distances. Any of these operations can have adverse effects on nearby land and the ecology if they are not carefully controlled. Given the unusual character of Hawaii geology -- and particularly its underground supply of fresh water -- regulation fitted to local conditions is essential to environmental protection as well as to the safety of persons and property near the geothermal wells.

Adoption of reasonable standards and procedures under state law would tend to encourage the development of geothermal resources, not hinder such development, since operators in this field are accustomed to work against government requirements. In the absence of safety, environmental and economic regulations, there would be great uncertainty as to how the law will apply in case of dispute, and uncertainty does not encourage development.

Geothermal development or exploration is now going on in large areas of the geothermal zone of the western United States and consequently most of the 11 Rocky Mountain and Pacific states, as well as Alaska, have adopted statutes and rules to regulate geothermal production. As the following table shows, regulatory practices vary considerably, with respect to requiring permits, bonds, environmental impact statements, etc. In general, however, each state has designated one primary regulatory agency within the government and charges that agency with overseeing geothermal development so that public interests are protected.

The rules of California are of particular interest, since of all 50 states it alone has experienced geothermal production on a commercial scale. To obtain the benefit of this experience, the Hawaii Geothermal Project has engaged as consultant Mr. David N. Anderson, the chief geothermal officer of the State of California.

OVERVIEW CHART OF
GEOTHERMAL LAWS AND REGULATIONS
IN THE WESTERN UNITED STATES

State	Geothermal Law	Geothermal Regulation	Geothermal Regulation on State Lands	State Controls All Water Resources*	Water Well Permit Required	Drilling Fee Required	Drilling Bond Required (Thousands \$)	Impact Statement to Drill Required
Alaska	Yes	Yes	Yes 1972	Yes	Yes/No	\$100	\$5-10	No
Arizona	Yes 1972	Yes 1972	Yes	No	No	\$ 25	\$5-25	No
California	Yes 1965	Pend. (1973)	Yes 1967	No	No	\$ 25- 1,000	\$5-25	No
Colorado	No	No	No	?	?	?	?	?
Idaho	Yes 1972	Pend.	Pend.	Yes	Yes	\$500	\$10	No
Montana	Yes (1973)	No	No	Yes	Yes	\$ 75- 150	\$5-10	Condi- tional
Nevada	No	No	No	Yes	Yes	\$ 25+	No	No
New Mexico	Yes (1973)	Yes (1973)	Yes 1967	Yes	Yes	?	?	No
Oregon	Yes 1971	Yes 1971	Yes 1972	Yes	Yes	\$ 25	\$5-25	No
Utah	Yes 1973	No	Yes	Yes	Yes	\$ 10+	?	No
Washington	No	No	No	Yes	?	?	?	No
Wyoming	Yes (1973)	No	No	Yes	Yes	\$ 2	No	No

1967 - Effective Date
(1973) - Pending Date

? - Undecided

* See text

Adopted from David N. Anderson, "Geothermal Laws & Regulations in the Western United States", (unpublished paper presented in May 1973)

His observation is that the great detail in the California statute dealing with geothermal resources has tended to discourage development. Instead, given the many unknowns in the deeper geological structure in this state, he recommends that a geothermal statute be limited to general and basic provisions, leaving most specifics to a body of regulations which would evolve from and be modified by experience in Hawaii.

California placed geothermal regulation within the agency responsible for overseeing the most closely related kind of resource extraction by putting it within the Oil and Gas Division in the Department of Conservation. Since Hawaii lacks such precedents in regulation of subsurface resources (except water, which the government itself distributes), researchers on the Hawaii Geothermal Project met with representatives of the public agencies most directly concerned to seek their recommendation as to where responsibility for regulating geothermal development should be placed. Consultations with administrators from the Department of Land and Natural Resources, Department of Regulatory Agencies, and the Department of Planning and Economic Development plus deputy attorneys of the Department of the Attorney General indicated a unanimous opinion: it best fits the pattern of state government to place geothermal regulation within the Department of Land and Natural Resources, which already administers (i) the land, under which geothermal resources must occur, (ii) water, with which geothermal resources are intimately related, and (iii) minerals, with which geothermal resources are likely to be infused. The Department therefore undertook the preparation of a bill for introduction at the 1974 Hawaii Legislature to provide for the regulation of geothermal extraction. The bill is reproduced below as Appendix 2.

TAXATION

A particular form of regulation which the Legislature may want to consider does not fall within the province of the Department of Land and Natural Resources. This is the impact of taxation, which can influence both investment in geothermal extraction and operations of the firms developing the new resource. Within the present Hawaii revenue system, there are three taxes which would impinge on geothermal development -- the real property tax, general excise and net income tax.

Hawaii's real property tax, administered by the state government but with rates set by the counties, is assessed against 70% of the "fair market value" of land -- more or less, usually less. Assessors look to actual sales prices to guide their valuation of land in any given location and use; acreage overlying geothermal

deposits may now be assessed in their present "highest and best use" as agricultural or conservation land, and taxed at the lowest rates provided by statute.

Discovery of valuable geothermal deposits would introduce an element not previously experienced in Hawaii property tax administration, since subsurface minerals have not yet been extracted here in large economic value, and so there is no history to guide or foreshadow the outcome in detail. However, there are necessary actions under the property tax law and administration which would generally determine the order of events. On the discovery of geothermal resources under private lands, or speculating on their existence, developers would buy from the landholders exploration and drilling rights, to be supplemented with other agreements to use the land if geothermal resources are extracted. Obtaining a permit to drill, or even actual drilling and production, would itself probably not cause a reassessment of the land, since the basis for the new taxable value would not yet have been established. That would not happen until either: (i) land deemed to be in the same geothermal area had been sold, at prices presumably reflecting this new resource, or (ii) the landholders had received income from the geothermal resource over a period of time long enough to set a basis for capitalizing their new returns into the estimated market value of the geothermal lands. Rezoning of geothermal lands from agriculture or conservation uses to urban may be involved. When these things happen, property taxes on geothermal land would rise, capturing for the county government, which receives all property tax revenues here, a portion of the windfall gain enjoyed by the landholder. However, given the low tax rates imposed by county governments in Hawaii (nominally about 1.7%, actually closer to 1% of the market value of property) the additional property taxes collected on geothermal land are not likely to have any discernable effect on their development.

It may be different with the general excise tax, the chief money raiser for the state government. It is an exceptionally comprehensive levy, applying to each sale of a good or service as it moves through the economy. Thus, if geothermal steam or superheated water were to be sold by a well operator to an electric company using that heat source to generate power (the arrangement at The Geysers, California), the sale would be subject to a tax of 3% on the gross receipts. Since both sale and tax would be avoided if the utility company itself operated the geothermal well, there would be a tax advantage in vertical integration. (Whether it would be worth while for a utility company to take on the geothermal development function to save the tax is another question.)

The corporate income tax would be another fiscal consideration affecting geothermal development in Hawaii. Its rates are moderately high -- 5.85% on net income up to \$25,000 and 6.435% over \$25,000 -- but its provisions are not exceptionally onerous on new and risky industries. Notably, the law allows a carryforward of operating losses for five years (and back for three), as under the federal law.^{34/} Since the Hawaii tax is deductible from the federal corporate levy, which is 48% on net income over \$25,000, in effect the 6.435% tax is virtually cut in half as a net charge against profit-making firms.

It is then the federal tax law which is of greater significance for geothermal enterprises, and the treatment which expenditures for geothermal exploration in Hawaii is not clear. The leading case in this new area of tax law held that the geothermal steam produced at The Geysers, California is a "gas" and therefore entitled to the highly advantageous treatment of percentage depletion under the U. S. income tax laws and that the costs of exploration for such "gas" can be currently deducted for tax purposes.^{35/} However, there is no assurance that such favorable tax treatment will be extended to areas where geothermal energy is encountered in the form of hot water rather than steam, and this uncertainty may have some effect on the investment of private funds in geothermal search and initial development.

In the Hawaii tax structure itself there is no levy which is obviously discouraging of geothermal development, such as a severance tax based on the volume of production, which some mainland states impose on mining. The fiscal policy issue relative to geothermal which Hawaii may be faced with is not as to how the tax structure should be modified to accommodate the new industry, but what subsidies -- which can be in the form of tax remission but might be more effective if granted outright -- the industry should receive to achieve its optimal development as a new economic base for the State of Hawaii.^{36/}

^{34/}

However, Hawaii does not allow the three-year carryback of capital losses, as does the federal law, starting with 1970.

^{35/}

Reich v. Commissioner, 454 F. 2d 1157 (9th Circuit, 1972)

^{36/}

As this report was being written, a bill was introduced into the Hawaii Legislature to provide exemption from state and county taxation to geothermal lands, installations and operations.

IV. SUMMARY

The purpose of this report is to set forth some of the public policy issues involved in the development of a new resource potential, that of geothermal energy. It assumes, within the context of the fuel shortage and resulting economic slowdown which this state is now experiencing in company with the rest of the nation, that it is in the public interest to develop rapidly the geothermal resources now being investigated by the University on the Island of Hawaii.

A geothermal development limited in application to the Big Island would have only minor economic significance for the entire state. To take full advantage of Hawaii's geothermal potential, and the greater efficiency of larger geothermal energy plants, either new industrial applications of the geothermal resource on Hawaii or transmission of energy from Hawaii to Oahu would be required. And such economic-technical breakthroughs would almost certainly need government participation, as well as massive private investment.

Further, any significant geothermal development program needs a coherent legal setting, that is a clear understanding of how the new resource is treated under the law -- who owns it and how its use is regulated. Therefore, the report considers the alternatives of public and private ownership of geothermal resources in Hawaii, noting the precedents established in the few western states which have enacted geothermal laws and also by the federal government. It concludes that while either determination is of course open to the Legislature, within the structure of Hawaii law the greater likelihood for a statutory declaration that would be sustained by the courts would be a declaration of public ownership.

The worst legislative outcome would be to take no action and thus throw the question to the judges without any public policy input from the legislative branch. Until the question was litigated, all parties would be left with an uncertainty as to ownership which could only inhibit investment in and development of the geothermal resources.

With respect to the appropriate regulatory agency for geothermal production in Hawaii, the choice seems clear, since the Department of Land and Natural Resources already has jurisdiction over both water and minerals, which are respectively the vehicle for and the by-products of the geothermal resource. An administrative bill introduced before the 1974 Hawaii Legislature defines geothermal resources as minerals and by that fact places them under the Department for regulation and management.

APPENDIX 1

Several definitional approaches, as well as legislative assertions of ownership, are set forth below to provide the reader with an understanding of how other jurisdictions have acted relative to the geothermal resource.

THE FEDERAL GOVERNMENT

- Section 21 (b) of the Geothermal Steam Act of 1970 (84 Stat. 1566, Pub. Law 91-581, 30 U.S.C. 1020 (b):

Geothermal resources in lands the surface of which has passed from Federal ownership but in which the minerals have been reserved to the United States shall not be developed or produced except under geothermal leases made pursuant to this chapter. If the Secretary of the Interior finds that such development is imminent, or that production from a well heretofore drilled on such lands is imminent, he shall so report to the Attorney General, and the Attorney General is authorized and directed to institute an appropriate proceeding in the United States district court of the district in which such lands are located, to quiet the title of the United States in such resources, and if the court determines that the reservation of minerals to the United States in the land involved included the geothermal resources, to enjoin their production otherwise than under the terms of this chapter: Provided, That upon an authoritative judicial determination that Federal mineral reservation does not include geothermal steam and associated resources the duties of the Secretary of the Interior to report and of the Attorney General to institute proceedings as hereinbefore set forth, shall cease.

- The regulations promulgated by the Department of the Interior to implement the Geothermal Steam Act are set forth in the Federal Register at Title 30, Part 270, p. 35068:

Section 270.2 Definitions.

(g) "Geothermal resources" means (1) all products of geothermal processes, embracing indigenous steam, hot water, and hot brines; (2) steam and other gases, hot water, and hot brines, resulting from water, gas, or other fluids artificially introduced into geothermal formations; (3) heat or other associated energy found in geothermal formations; and (4) any byproduct derived

therefrom.

(h) "Byproduct" means (1) any mineral or minerals (exclusive of oil, hydrocarbon gas, and helium), which are found in solution or developed in association with geothermal steam and which have a value of less than 75 per centum of the value of the geothermal steam or are not, because of quantity, quality, or technical difficulties in extraction and production, of sufficient value to warrant extraction and production by themselves, and (2) commercially demineralized water.

STATE APPROACHES

ARIZONA

ARIZONA REVISED STATUTES TITLE 27 CHAPTER 4 OIL AND GAS

ARTICLE 4. PRODUCTION AND CONSERVATION

AN ACT

Relating to minerals, oil and gas; providing for regulation of geothermal resources exploration and production; prescribing standards and procedures, and amending Title 27, Chapter 4, Arizona Revised Statutes, by adding Article 4.

Be it enacted by the Legislature of the State of Arizona:

Section 1. Legislative intent

It is hereby found and determined that the people of this state have a direct and primary interest in the development of geothermal resources and that this state should exercise its power and jurisdiction through the Oil and Gas Conservation Commission to require that wells drilled in search of, development of, or incident to the production of geothermal resources be drilled, operated, maintained and abandoned in such manner as to safeguard the life, health, property, natural resources and the public welfare and to encourage maximum economic recovery.

Sec. 2. Title 27, Chapter 4, Arizona Revised Statutes, is amended by adding Article 4, Sections 27-651 through 27-666, to read:

ARTICLE 4. GEOTHERMAL RESOURCES

27-651. Definitions

In this Article, unless the context otherwise requires:

. . .

5. "Geothermal resources" means:

- (a) All products of geothermal processes embracing indigenous steam, hot water and hot brines.
- (b) Steam and other gases, hot water and hot brines resulting from water, other fluids or gas artificially introduced into geothermal formations.
- (c) Heat or other associated energy found in geothermal formations, including any artificial stimulation or induction thereof.
- (d) Any mineral or minerals, exclusive of fossil fuels and helium gas, which may be present in solution or in association with geothermal steam, water or brines.

CALIFORNIA

CALIFORNIA LAWS FOR CONSERVATION OF GEOTHERMAL RESOURCES--1971

An act to add Chapter 4 (commencing with Section 3700), Division 3 Public Resources Code, relating to geothermal resources.

(Approved September 17, 1965, Ch. 1483; amended 1967, Ch. 1398.; amended 1970, Ch. 110; amended 1971, Ch. 1213)

The people of the State of California do enact as follows:

Chapter 4. Geothermal Resources

3700. It is hereby found and determined that the people of the State of California have a direct and primary interest in the development of geothermal resources, and that the State of California, through the authority vested in the State Oil and Gas Supervisor, should exercise its power and jurisdiction to require that wells for the discovery and production of geothermal resources be drilled, operated, maintained and abandoned in such manner as to safeguard life, health, property, and the public welfare, and to encourage maximum economic recovery.

3701. For the purposes of this chapter, "geothermal resources" shall mean geothermal resources as defined in Section 6903 of this code.*

* Section 6903. For the purposes of this chapter, "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.

IDAHO

Legislature of the State of Idaho] [Second Regular Session
[Forty-first Legislature

IN THE HOUSE OF REPRESENTATIVES
HOUSE BILL NO. 732
BY STATE AFFAIRS COMMITTEE

AN ACT

TO REGULATE THE DEVELOPMENT AND USE OF GEOTHERMAL
RESOURCES: MAKING LEGISLATIVE FINDINGS AND STATING
LEGISLATIVE PURPOSE AND POLICY; PROVIDING A SHORT
TITLE; DEFINING TERMS; ...

Be It Enacted by the Legislature of the State of Idaho

SECTION 1. It is hereby declared that the state of Idaho claims the right to regulate the development and use of all

of the geothermal resources within this state and that geothermal resources are natural resources of limited quantity and of a unique value to all of the people of the state.

The legislature of the state of Idaho further declares that the geothermal resources of this state may provide an outstanding opportunity for enhancement of our economy and quality of life with a minimum of environmental degradation through a utilization of this energy source. It is also recognized that the process of utilization and development of our geothermal resources on a large scale may be associated with risks to the maximum sustained yield from these resources, risks to our valuable groundwater resources, and risks to the environment in the immediate locality of and around the installations at which such utilization is done.

The legislature further finds that there is presently substantial interest in the geothermal resources of this state, that regulation in the public interest is imperative, and that regulation must take effect at an early date.

The legislature does therefore declare that it is the policy and purpose of this state to maximize the benefits to the entire state which may be derived from the utilization of our geothermal resources, while minimizing the detriments and costs of all kinds which could result from their utilization. This policy and purpose is embodied in this act which provides for the immediate regulation of geothermal resource exploration and development in the public interest.

SECTION 2. This act may be known and cited as the Idaho Geothermal Resources Act.

SECTION 3. Whenever used in this act the term:

. . .

(c) "Geothermal resource" means the natural heat energy of the earth, the energy, in whatever form, which may be found in any position and at any depth 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 the material medium of any geothermal resource. Geothermal

resources are found and hereby declared to be sui generis, being neither a mineral resource nor a water resource, but they are also found and hereby declared to be closely related to and possibly affecting and affected by water and mineral resources in many instances.

NEW MEXICO

LAWS OF 1973

CHAPTER 75

AN ACT

RELATING TO THE CONSERVATION, REGULATION AND PREVENTION OF WASTE OF GEOTHERMAL RESOURCES; GIVING THE OIL CONSERVATION COMMISSION AUTHORITY TO REGULATE, CONSERVE AND PREVENT WASTE OF GEOTHERMAL RESOURCES.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF NEW MEXICO:

Section 1. The oil conservation commission is hereby vested with the authority and duty of regulating the drilling, development and production of geothermal resources and with the authority and duty of conserving and preventing waste of geothermal resources within this state in the same manner, insofar as is practicable, as it regulates, conserves and prevents waste of natural or hydrocarbon gas. "Geothermal resources" as used herein shall mean the natural heat of the earth, or the energy, in whatever form, below the surface of the earth present in, resulting from, created by, or which may be extracted from, this 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 and other hydrocarbon substances. Nothing in this section shall be construed to supersede the authority which any state department or agency has with respect to the management, protection and utilization of the state lands and resources under its jurisdiction.

House Bill 156

Approved March 15, 1973

MONTANACHAPTER NO. 452
MONTANA SESSION LAWS 1973
SENATE BILL NO. 444

AN ACT PROVIDING A SYSTEM FOR THE APPROPRIATION AND USE OF SURFACE AND GROUNDWATER; PROVIDING A PROCEDURE FOR THE DETERMINATION AND CONFIRMATION OF EXISTING WATER RIGHTS; ...

BE IT ENACTED BY THE LEGISLATIVE ASSEMBLY OF THE STATE OF MONTANA

Section 1. Short Title. This act shall be known and may be cited as the "Montana Water Use Act."

Section 2. Declaration of policy and purpose. (1) Pursuant to article IX of the Montana constitution, the legislature declares that any use of water is a public use, and that the waters within the state are the property of the state for the use of its people and are subject to appropriation for beneficial uses as provided in this act.

(2) A purpose of this act is to implement article IX, section 3 (4) of the Montana constitution, which requires that the legislature provide for the administration, control, and regulation of water rights and establish a system of centralized records of all water rights. The legislature declares that this system of centralized records recognizing and establishing all water rights is essential for the documentation, protection, preservation and future beneficial use and development of Montana's water for the state and its citizens, and for the continued development and completion of the comprehensive state water plan.

(3) It is the policy of this state and a purpose of this act to encourage the wise use of the state's water resources by making them available for appropriation consistent with this act, and to provide for the wise utilization, development, and conservation of the waters of the state for the maximum benefit of its people with the least possible degradation of the natural aquatic ecosystems. In pursuit of this policy, the state encourages the development of facilities which store and conserve waters for beneficial use, for the maximization of the use of those waters in Montana, for the stabilization of stream flows, and for groundwater recharge.

(4) Pursuant to article IX, section 3 (1) of the Montana constitution, it is further the policy of this state and a purpose of this act to recognize and confirm all existing rights to the use of any waters for any useful or beneficial purpose.

Section 3. Definitions. unless the context requires otherwise, in this act:

(1) "Water" means all water of the state, surface and subsurface, regardless of its character or manner of occurrence, including geothermal water.

. . .

UTAH

WATER AND IRRIGATION

CHAPTER 189

S.B. No. 64

(Passed March 8, 1973. In effect
May 8, 1973)

GEOHERMAL ENERGY AND ASSOCIATED RESOURCES ACT

An Act Enacting Section 73-1-20, Utah Code Annotated 1953; Granting to the Division of Water Rights Specific Authority to Regulate Geothermal Energy and Associated Resources.

Be it enacted by the Legislature of the State of Utah:

Section 1. Section enacted.

Section 73-1-20, Utah Code Annotated 1953, is enacted to read:

73-1-20. Division of water rights authorized to regulate geothermal energy and resources.

(1) The division of water rights is given jurisdiction and authority to require that all wells for the discovery and production of water to be used for geothermal energy production in the State of Utah, be drilled, operated, maintained, and abandoned in such manner as to safeguard life, health, property, the public welfare, and to encourage maximum economic recovery.

(2) In carrying out its responsibility under this act, the division of water rights may utilize personnel, equipment, or other assistance of any division or department and may transfer funds to that division or department to reasonably compensate it for use of its personnel or facilities.

Approved March 16, 1973.

APPENDIX 2

1974 HAWAII GEOTHERMAL BILL

(a) Text of Bill:

S.B. NO. 1520-74
[& H.B. No. 2197-74]

A BILL FOR AN ACT

RELATING TO RESERVATION AND DISPOSITION OF GOVERNMENT
MINERAL RIGHTS

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. Findings and determination. The Legislature of the State of Hawaii finds and declares that the geothermal resources of the State provide an energy potential which may be utilized to supply power economically with minimal adverse environmental effects. It is the intent of the Legislature to establish in law the definition and ownership of the geothermal resources, to encourage their development, and to provide for their administration and management in the public interest.

SECTION 2. Section 182-1, Hawaii Revised Statutes, is amended to read:

"Sec. 182-1 Definitions. In this chapter, if not inconsistent with the context:

(1) 'Minerals' means any or all of the oil, gas, coal, phosphate, sodium, sulphur, iron, titanium, gold, silver, bauxite, bauxitic clay, diaspore, boehmite, laterite, gibbsite, alumina, all ores of aluminum and, without limitation thereon, all other mineral substances and ore deposits whether solid, gaseous, or liquid, including all geothermal resources, in, on, or under any land, fast or submerged; but does not include sand, rock, gravel, and other materials suitable for use and used in road construction.

(2) 'Board' means the board of land and natural resources.

(3) 'Reserved lands' means those lands owned or leased by any person in which the State or its predecessors in interest has reserved to itself expressly or by implication the minerals or right to mine minerals, or both.

(4) 'State lands' includes all public and other lands owned or in possession, use and control of the then Territory of Hawaii or the State of Hawaii, or any of its agencies and this chapter shall apply thereto.

(5) 'Occupier' means any person entitled to the possession of land under a certificate of occupation, a nine hundred and ninety nine year homestead lease, a right of purchase lease, a cash freehold agreement, or under a deed, grant, or patent, and any person entitled to possession under a general lease, and also means and includes the assignee of any one of the above.

(6) 'Force majeure' means any fire, explosion, flood, volcanic activity, seismic or tidal wave, mobilization, war (whether declared or undeclared), act of any belligerent or any such war, riot, rebellion, the elements, power shortages, strike, lock-out, difference of workmen, any cause which prevents the economic mining of the lease, or any other cause beyond the reasonable control of the party affected, whether or not of the nature or character hereinabove specifically enumerated.

(7) 'Mining operations' means the process of excavation, extraction, and removal of minerals, and the development of any and all geothermal resources, from the ground, design engineering, other engineering, erection of transportation facilities and port facilities, erection of necessary plants, other necessary operations or development approved by the board preceding or connected with the actual extraction of minerals and the development of geothermal resources.

(8) 'Mining lease' means a lease of the right to conduct mining operations, including geothermal resource development, on state lands and on lands sold or leased by the State or its predecessors in interest with a reservation of mineral rights to the state."

SECTION 3. Statutory material to be repealed is bracketed. New material is underscored. IN printing this Act, the revisor of statutes need not include the brackets, the bracketed material or the underscoring.

SECTION 4. This Act shall take effect upon its approval.

INTRODUCED BY REQUEST:

/s/D. C. McClung