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# A BLUEPRINT FOR FINANCING GEOTHERMAL DISTRICT HEATING IN CALIFORNIA

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# "A BLUEPRINT FOR FINANCING GEOTHERMAL DISTRICT HEATING IN CALIFORNIA"

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## Foreword

This is the final report done under contract with the California Department of Conservation. A draft report was circulated in November to a variety of government agencies, and individuals in the geothermal development, investment banking and academic communities. The comments received were extremely helpful in producing this final report. In addition, the authors were fortunate enough to utilize the services of John Nimmons in the process of final editing. The authors, however, take sole responsibility for the recommendations and conclusions contained in this paper.

It is stressed that the legal and investment climate surrounding geothermal development is in a state of flux. This paper depicts the current climate and recommends certain changes that would make it more favorable to direct heat geothermal development. As this environment changes, the best approach to financing projects will change. In addition the physical and economic attributes of each project will dictate a different method of packaging. Thus, this paper is a point from which private developers and investors, and federal, state, and local governments can begin to develop new direct heat projects. The particular economic and financing strategies will have to be worked out for individual projects as they occur.

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# EXECUTIVE SUMMARY

The purpose of this contract was to determine what actions, if any, could significantly improve the prospects for use of direct heat geothermal district heating in California. The initial focus of effort was on space heating in a municipal context, but early research suggested that as a general rule only through cascading with industrial uses will space heating be economically feasible. Thus, we have utilized a liberal interpretation of district heating as including both residential and commercial space heating and industrial or agricultural processing.

We found that the basic tools to implement direct heat use of geothermal energy in the form of state and federal programs, such as guaranteed loans, drilling assistance, special tax incentives and tax-exempt bond financing, were largely in place. What is needed, however, is the proper structuring of institutional relationships so that these tools or incentives can be best utilized. In addition, modifications in federal law covering tax-exempt bonds, and in state and local bond authorities, as well as state public utilities regulation, would be required. Finally, the marketabililty of state and local revenue bonds would have to be improved through some form of guarantee, insurance or risk pooling. The organization responsible for this effort would also be able to provide the needed financial, management and technical expertise to help the private and public sector package individual projects.

Our specific program proposals are based upon several conclusions, the most important of these are:

1. The exploration, testing, and development of initial production wells are relatively risky (and if successful, rewarding) operations. The distribution phase, once the resource has been developed, is not.

2. The use of many federal programs and tax incentives is best suited for private developers. The Federal Geothermal Loan

Guarantee Program in particular is not currently useful for tax-exempt bond financed projects.

3. Local public agencies are not capable of taking risks; and, in fact, cannot currently assume the risk involved even in the least risky phase of distribution.

4. The objective of utilizing as many incentives as possible, and properly assigning risks and rewards, is realized by utilizing private sector development with the possibility of tax-exempt bond financing at some point, structuring both phases so as to minimize public utility regulation.

5. Many potential users are not currently aware of all the possibilities and means of financing of direct heat geothermal energy and consequently cannot make intelligent decisions without some technical and financial management assistance. Until this assistance is brought to bear in a meaningful way, there will be a great gap between the level of economic and technical feasibility and the successful delivery of direct heat projects.

Our recommendations include the following:

1. Encourage private development backed by the User Coupled Confirmation Drilling Program and the Geothermal Loan Guarantee Program during the exploration and production stages. After the resource is proven, either public or private ownership and management is possible, depending on the public utility regulatory situation. Tax-exempt bond financing through a variety of sources should be available at this stage. Bonds issued by the California Alternative Energy Financing Authority under AB 2324 or by local governments under AB 74 (the California Industrial Development

Financing Act) can be available to the private sector to reduce long-term capital costs through refinancing.

2. If public agency ownership and management of distribution is deemed advisable or necessary for particular projects:

   a. Federal law or regulations governing tax-exempt bond financing should be changed to make it more applicable to cascading uses of direct heat geothermal energy.

   b. The authority of state and local agencies to issue revenue bonds for direct heat geothermal projects should be expanded by amending AB 2324 to allow the state to issue bonds for local government acquisition of direct heat projects and enacting legislation to allow creation of geothermal heating districts with authority to issue bonds.

   c. The absence of PUC jurisdiction over certain arrangements between the public and private sector should be clarified.

3. If private ownership of distribution is deemed advisable or necessary for particular projects:

   a. The federal law or regulations for tax-exempt bond financing mentioned in 2(a) supra. should be similarly changed.

   b. Any PUC rate regulation of small direct heat projects should be based only on a discount from prices of conventional forms of energy, and not on the costs to the developer/distributor, particularly with the current low rate of return.

4. Since use of tax-exempt bonds, either for private refinancing or public acquisition of projects once the exploration and production stages are complete, means that under present federal policies, geothermal loan guarantees will no longer be applicable; and since general obligation bonds are not politically feasible, some assurance of repayment of the bonds other than project(s)' revenues must be available if the bonds are to be marketable. Such assurance could be obtained by three different actions:

   a. Use the political power of the state to convince the U.S. Treasury to drop its opposition to guaranteeing tax-exempt bonds.

   b. Create a California Geothermal Financing Insurance Program. This agency could insure, for a fee, tax-exempt bonds. A limited <u>insurance</u> program rather than loan guarantees is believed to be more practical at the state level because of the State Constitutional requirement that all guaranteed obligations be fully funded. The insurance program would require a minimum of $5 million of initial funding which could be repaid over the long term from fees collected. We believe this to be the most practical and politically feasible of the options open to the state.

   c. Create a California Geothermal Finance Authority backed by the insurance concept as suggested above, but with the direct authority to issue bonds. This option is less politically feasible given the opposition to proliferation of state bonding authorities, and in many ways is not necessary given the passage of AB 2324 and AB 74, allowing state and local governments, respectively, to issue bonds for <u>private</u> energy projects.

5. Even under the current state of law and regulations, it is possible for public entities to issue taxable bonds backed by a geothermal loan guarantee with interest differential payments (the difference between the interest rate on taxable and nontaxable bonds) made to the issuer. The Department of Energy has indicated that it is enthusiastic about the potential of this program.* However, the Reagan Administration's philosophy toward cash subsidies could conceivably curtail this program in the very near future and, thus, we recommend rapid steps by interested public entities to secure these interest differential payments.

6. Each of the options mentioned in 4 and 5 above should include management and technical assistance capability at the state level to provide local public entities and private users with the necessary sophistication to be willing and able to enter into agreements with private developers. The state entity should also have the mission and capacity to assist both developers and users in packaging a financing program, incorporating federal guarantees, tax incentives and bond financing. Given a market and with the existing federal incentives, there is developing a corps of private developers and equity investors. The bottleneck to project development is in creating such a market, i.e., finding a user, even when the economics are extremely favorable. The inertia of public and private entities, average cost pricing techniques, and the perceived newness of the industry all militate against rapid development even in the face of technical advances and improving economics. Management and technical assistance can, in some part, overcome these problems.

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* Letter commenting on Draft Report from Vito Magliano, U.S. Department of Energy to Michael Gersick, California Department of Conservation, Nov. 6, 1980, p. 2.

7. A necessary precondition to successful financing and implementation of direct heat projects would be a series of financial models for specific locations and probable end uses. These models should determine in each specific case what the best mix of private tax incentives and public financing would be, as well as the structuring of any sale or lease agreement so that maximum benefits are realized. This path is strongly urged if the new Alternative Energy Source Financing Authority (AB 2324) is to be effectively utilized.

# I. INTRODUCTION

The harnessing of California's geothermal energy resources to produce electricity has been a reasonably successful enterprise. The outstanding dry steam resource field called the Geysers currently produces approximately 900 megawatts of power, enough to supply all the electricity requirements of a city of 500,000.[1] By the mid-1980's it is estimated that the total power produced in the Geysers will nearly double that figure. During that time another 600 megawatts of geothermally produced power could be added from other parts of the state.[2] Although it has been a long haul (over 20 years), geothermal energy for electric power in California, at least in the Geysers, is now a respectable business proposition, and there appears to be no major or unusual impediments to raising the necessary capital to finance their electric projects.

## A. Direct Heat Use of Geothermal Energy

There is, however, another key use of geothermal energy which is largely undeveloped in California, that is direct heat application, whereby the heat content of the geothermal fluid is used (either directly or through a heat exchanger) for industrial processing or space conditioning (heating or cooling) or both in combination. Many reasons have been advanced for the lack of progress in direct use of geothermal energy in California. Some of these hindrances, such as the remoteness of the resource from population centers and the mild climate of California, cannot be affected by any general study, but can be overcome in a number of specific projects by creative land use and economic planning, such as engaging a series of end users, industrial, commercial and residential.

One major problem facing direct heat geothermal development which this study does address, is the inability of direct heat projects to attract investors, and consequently to secure the capital necessary to

finance their completion. One of the reasons for this is quite simple; the financial community perceives the application of direct heat geothermal energy as a technology and an enterprise that is still in its infancy. Whether this perception is true or not is irrelevant; the fact that it exists is enough to stifle development. The market for private capital is extremely competitive, and proven investments win out over new ventures.

Another reason for this lack of progress is that potential users are ignorant or skeptical of the possibilities of direct heat geothermal energy. Thus the need for investors never even arises, and in this case the objective becomes one of education and financial and technical assistance for potential users, rather than a hunt for investors.

What is needed in both cases is a record of successes similar to that of electric generation before users will want, and private capital will flow to, direct heat geothermal projects. This is a clear case of "chicken and egg". Successful projects cannot happen without financing, and financing apparently does not occur until there are successful projects. Given a 20-year period and an ample supply of visionary and intrepid entrepreneurs, there is little doubt that direct heat use of geothermal energy could achieve a record of success, enabling its projects to compete successfully in capital markets. However, current economic and political conditions regarding the price, source and continued availability of much of our energy supplies, make it imperative that development of domestic, renewable energy sources be stimulated with some immediacy.

This fact has been recognized by both state and federal governments. There exist many programs which provide for tax advantages, access to tax-exempt bond financing, loan guarantees, and freedom from onerous state public utilities regulation for alternative energy development. (Many of these incentives, in fact, existed prior to the current promotion of alternative energy.)

However, even with these incentives, direct heat use of geothermal energy in California has proceeded at a snail's pace. What

progress there has been has largely occurred because of government grants, which help to demonstrate the technology involved, but do not necessarily indicate commercial viability. Thus the California Department of Conservation desired an evaluation of the principal institutional options available for making large-scale use of direct heat geothermal energy a reality in California. The emphasis of this study was to be for space heating in a municipal context, but cascading of space heating and industrial processing uses was not precluded.

Derek Hansen & Associates was awarded the contract for this study in April 1980. An early evaluation of the existing institutions which could develop geothermal district heating (a district heating system is ". . . one involving the transmission and the retail distribution of geothermally heated fluids from a central extraction source to multiple-end users within a more or less contiguous area . . ." with space conditioning being the predominant use.[3]) indicated that no single existing institution had the necessary combination of interest and ability to finance the exploration, production, and distribution phases of geothermal district heating. It also became clear that creating a new entity, such as a Geothermal Heating District, would not of itself solve the financing problems of an industry that is, as was mentioned before, viewed with some skepticism by the financial community.

What is needed is a blueprint for a series of institutional relationships between the public and private sector. These institutional relationships would be structured in such a way as to take maximum advantage of the private sector's capacity to take risks and to be rewarded for such ventures, and the public sector's ability to organize users and manage and possibly finance at lower cost the distribution of the resource. Maximum utilization of the ability of public (and certain private) entities to borrow at lower rates through tax-exempt bond financing would be an essential part of the relationship, as would the capacity of a private business to use tax incentives. Superimposed on this structure would be federal guarantees for the riskier parts of the operation. Finally, any such relationship would have to be fashioned in such a manner as to avoid

or at least minimize public utility regulation, which the consultants have found to be a major disincentive to private involvement in geothermal district heating. Simply stated the consultants have found that practically all the necessary elements for encouraging geothermal district heating are in place, but no one existing institution is either capable or inclined to take advantage of these incentives. Consequently, Derek Hansen & Associates forsee some legislative and administrative changes which would be required to properly and effectively implement this scheme, but none represent either major policy changes, or major expenditures of state money.

## B. Direct Heat Use and Electric Generation Compared

Since electric generation is the much more familiar and much more successful operation in California, it is important at the outset to detail the key differences in electric generation and direct heat use of geothermal energy. The temperatures required to generate electricity are quite high (at least $325^{0}$ Fahrenheit).[4] Resources of this quality are not commonly found. The Geysers, the Imperial Valley and the Long Valley are the only known fields in California. In order to reach a resource of this temperature, very deep drilling is required. This makes exploration a very expensive process. In addition, except for certain proven areas in the Geysers, the chances of finding a viable resource are extremely risky. The field development necessary for production is also a costly proposition. Once the steam is recovered, however, the end product, electricity, is able to be transported over great distances to be consumed by an infinite variety of end uses.

The temperature required for direct heat use is not nearly as great ($150^{0}$ F for most space conditioning, $250^{0}$ F for most industrial processing).[5] Resources of this quality are much more prevalent. They occur in 34 of California's 58 counties.[6] There are often hot springs or other direct surface indications of where a particular resource is located. Frequently there will be some historic use of the resource. Low

temperature resources are found much closer to the surface than are high temperature resources. All these factors mean that exploration for geothermal energy susceptible of direct heat use is much less risky and much less expensive than exploration for resources that can be used to generate electricity. Production and what little field development may be necessary are also much less costly with a direct heat operation. However, heat cannot be transmitted the distances that electricity can. This immobility of the resource requires that users be located in the immediate vicinity of the geothermal well(s). As geothermal resources of any type are not as a rule located near population centers in California, and as project economics seem to require a fairly constant use of the heat (a constancy not achieved by space heating requirements in California) efficient direct heat use will generally require the location of an industrial user in a relatively remote area.

Thus the key attributes of direct heat use of geothermal energy from a financing standpoint are the relative lack of risk in the exploration stage, and the relative inexpensiveness at all stages. This means that it is possible to use various federal loan guarantee programs at the exploration stage without either the risk or the tie-up of great sums of money that would be needed for electric projects. In more absolute terms there are some direct heat projects that can be financed for less than $1 million apiece and a great deal of projects can be financed for less than $10 million. As will be discussed later, this may have significant implications for tax-exempt bond financing. Finally, if one looks at the very important public policy of demonstrating the economic and technical feasibility of a plentiful alternative energy source, and of spreading the risk involved, a little bit of money invested in direct heat can go a long way. It is not an exaggeration to say that 10 to 20 direct heat projects can be financed for the same amount of money as one electric project.

## II. ANALYSIS OF EXISTING PROJECTS

Once the key attributes of direct heat geothermal energy, from a financial and institutional perspective, have been identified, it becomes apparent that an analysis of some of the few direct heat projects which are in various stages of development in the West could yield positive and negative lessons for future development. Derek Hansen & Associates selected three projects, Boise, Idaho; Brady Hot Springs, Nevada; and Susanville, California, for evaluation.

### A. Boise

The Boise project, briefly described, is a joint effort by the City of Boise and the Boise Warm Springs Water District to drill three new production wells, refurbish two existing wells, build two new transmission lines, and construct a disposal system for the spent geothermal fluid. The wells would be drilled into a new portion of a proven resource now owned by the city. The $140^{0}$ F to $170^{0}$ F water would be transported approximately 1.5 miles to downtown Boise. Once transported, it would be used to heat a majority of hospitals, state, county and city buildings in the area and would eventually be made available to other businesses and residences (74 commercial buildings and 310 single-family homes). There would be no industrial processing associated with the project. The total fossil fuel replacement would be approximately 75,000 barrels of oil per year.[7]

The Boise Warm Springs Water District has been successfully heating homes in the area for over 90 years from what testing indicates is the same resource. While this is an expensive project (nearly $10 million as initially conceived, with the major expenditures being for the transmission and disposal systems), it is hard to imagine one with less risk. The Department of Energy has awarded the project a Program Opportunity Notice (PON) of $4,926,000 and The Economic Development Administration has funded another $500,000, both to be used essentially for the transportation system. The city, the heating district and the building owners have or

will have contributed funds for such things as resource and environmental assessments, and the retrofitting of the heating systems of the existing buildings ($450,000 is the estimated cost of the latter). This left a $2.7 million shortfall. Early in 1980 the project scope was reduced and the short-fall decreased to $1.5 million, most of which would be needed for the wells and the pumphouses.[8]

It would seem that a project of proven economic feasibility, with so little risk of resource failure (the project is basically an expansion in the use of a resource that has lasted for nearly 100 years with no sign of diminution) could easily secure the needed funds, even if there were not substantial federal grants involved.

However, the city and the district do not have the wherewithal to finance the remainder of the system out of existing revenues. Neither entity is willing to use either revenue bonds or general obligation bonds to finance this remainder. General obligation bonds, which are backed by the full faith and credit of the public entity, are viewed as an unacceptable political risk, even for such a "safe" project. Revenue bonds, which are tied solely to the success of the project, are required by Idaho Law to be endorsed by a general election of the affected voters. The additional costs of the election (which, or course, is also required if general obligation bonds are to be sold), coupled with the uncertain marketability of bonds which are to be repaid solely out of revenues generated from a single "safe" but unconventional project, have caused the city to reject this alternative. Use of the credit or bond rating of the Boise Warm Springs Water District was not favored by the district. This was because the district's primary function is to continue to supply its existing customers with low-cost heating. This is in contrast to the city's interest in expanding low-cost geothermal uses and substituting them for existing fossil fuel uses. Pledging revenues, and thus jeopardizing existing low rates to its customers, was not in the institutional interest of the Boise Warm Springs Water District.

Consequently the City of Boise entered into negotiations with a private financing source which was interested in developing a limited

partnership program to finance the development. Under the proposed arrangement the city would lease the resource (which it already owns) to the private developer. This developer would then proceed to drill the wells, make the necessary hookups (at a cost of approximately $1.5 million), and then sell the delivered heat resource to the city as a customer. The investor/developer would be the owner of the project for a considerable number of years, and during that time would be seeking a necessary, substantial rate of return.

By August 10, 1980, Boise and the private developer still had not reached agreement, but seemed optimistic that they were within a few percentage points of a satisfactory conclusion. As tentatively planned, the developer would lease the resource from the city at a nominal price. Once producing, the project's resource would be sold back to the city at rates tied to the cost of natural gas. The rates paid by the city would at no time exceed 75% of the cost of natural gas, and as the price of gas increased, the ratios would change. The private investors are seeking at least a 15% return on their investment over the full life of the agreement. This 15% figure does not represent the actual rate of return to the investors, which will be significantly higher because of the investment tax credits and other tax advantages available to the private geothermal developers/investors, discussed later in this paper. What the 15% does represent is the cost to the city, and serves as a basis for comparison with other methods of municipal financing, such as tax-exempt bonds, also discussed later. The agreement will run from fifteen to fifty years. At the end of fifteen years, and each five years thereafter, the City of Boise has the option of buying the project from the private developers. The resource must, of course, meet specifications set out in advance by the city or there will be no purchase. It must last for the life of the project. To provide for this "uncertainty" the developer has obtained reservoir insurance. Where the developer will secure the needed financing to go ahead with his part of the project, be it venture capital, tax-oriented limited partnerships, loans from financial institutions, or a combination, is not known to us at this time. We are also unaware of whether the developer intends to utilize the Department of Energy's

Geothermal Loan Guarantee Program (which will be discussed in detail at another point in this paper).

## B. Susanville

The City of Susanville, California, a community of 7,000 people located on the northeastern slope of the Sierra Nevadas, has embarked on an ambitious program to utilize its geothermal resources both as a means of low-cost heating of existing public and private buildings and as a vehicle to attract industry to the area. The Susanville City Council and the Lassen County Board of Supervisors represent constituencies that have committed themselves to a degree of energy independence for their area. With the aid of woodwaste from the local logging industry, they see geothermal energy as the key to that independence.

Currently there are three projects initiated in the Susanville area. Each project has progressed due to a major government grant. Susanville, through its former representative in Congress, Biz Johnson, has been quite adept in securing assistance from a plethora of government agencies, many of which are not often associated in the public's minds with geothermal energy. A fourth project is being planned and it too may be able to take advantage of a government grant.

The first project will be to heat public buildings in the central section of the town. The chief source of funding is a PON from the Department of Energy. However, the city hopes to avail itself of State of California funds under AB 900, which allows borrowing for energy improvement for schools and hospitals to be paid back out of energy savings.

The Park of Commerce South project will provide $150^{o}$ F water to approximately 120 homes and then to a planned greenhouse area. The City has applied for an $800,000 HUD grant, a Community Development Block Grant under an innovative energy system program that was designed with Susanville in mind. The Farmers Home Administration has committed $100,000 for a pipeline to the greenhouses, under its Industrial Development program.

The Park of Commerce East project envisions a complex of animal raising, grain and ethanol production. The complex will use water after it has heated the public buildings (cascading). However the temperature of this water will need to be raised again since it will have lost heat. This apparently will be done by the methanol produced. Another potential project is the drilling of production wells in the area near the state prison at Litchfield. After heating the prison, the geothermal water would be cascaded to more greenhouse and agricultural operations which the City hopes will locate nearby. The City had anticipated using Farmer's Home Administration funding, and/or the Department of Energy User Coupled Confirmation Drilling Program for direct heat usage, which will be discussed later in this paper. However, it currently appears that it will have to be completed without aid of the Federal Government. This resource, as were nearly all the resources for the projects discussed above, was identified and tested by a special Bureau of Reclamation project, once again designed specifically for Susanville.[9]

There is much to be learned from the Susanville experience. Susanville has planned its geothermal development to include both space heating and industrial (actually agricultural) processing. Aside from greatly increasing the economic efficiencies of the operation (and there are many who believe that direct heat can be economic only if there is at least one large scale, constant user), the new industry it would attract would greatly alleviate the area's unemployment problem which is largely the result of being a one industry (timber) region. Susanville's ability at grantsmanship is certainly worth study by other communities who wish to develop their geothermal resource.

However, no community can reasonably hope to duplicate Susanville's success at utilizing the political process to obtain government grants. And even Susanville is at the point where it will need private capital if it is to proceed further.

The problems Susanville will have in this area will be similar to the problems Boise is experiencing, compounded by the fact that Susanville

is a much smaller community, with much less flexibility in its budget and much less credibility in the bond market. Susanville is a general law city, and as such its legal ability to borrow money at lower interest rates by issuing revenue bonds for all phases of geothermal development is questionable at least. Under the California Constitution it clearly cannot issue a general obligation bond, i.e., one secured by the taxing power of the city, for any purpose without voter approval in an election, an expensive and often futile exercise in California in the aftermath of Proposition 13 (Jarvis-Gann). The legal impediment regarding the issuance could be circumvented by a joint venture with an entity which has such authority. (Susanville has explored the possibility of a joint venture with the Lassen-Modoc Flood Control District for the purpose of using a bond issue to finance geothermal and biomass power production.)

However, these legal problems are insignificant next to the actual difficulty: on one hand the inability to market the bonds whose sole security is one project in a technology which investors view with suspicion, i.e., direct heat geothermal energy; and on the other hand the perceived unwillingness of the electorate (and consequently the political leadership) to risk the full faith and credit of the city on the success of a direct heat project through a more marketable general obligation bond.

Thus, Susanville appears to be forced into a solution similar to that of Boise. This would entail a joint venture with a private developer. The city would most likely lose some control over management of the resource and rate setting and would have to pay a rate of return to the developer similar to that paid by Boise (15%). This rate is considerably higher than that which could be obtained on the tax-exempt bond market.

### C. Brady Hot Springs

The Brady Hot Springs project, located in the heart of the western Nevada desert, is a commercial processing plant which uses geothermal heat to dry vegetables, principally onions. Geothermal Food Processors, Inc. took over and secured refinancing for an existing project

that had received a Department of Energy loan guarantee, but was in trouble financially. The refinancing was done through the aid of a DOE geothermal guarantee for $3.5 million (out of a $4.8 million total capital cost). The resource is one of extremely high quality (over 250$^{0}$ F), and Geothermal Food Processors, Inc. has a contract with a major onion producer to dry a significant portion of the grower's output. At the present time the project is operating successfully from an economic and technological standpoint.[10]

The Brady project demonstrates that it is possible to make an industrial processing plant work, despite a remote location (the nearest small towns are 20 and 50 miles away), and despite a history of previous economic difficulties. The prime mover behind the development, Mr. Paul Rodzianko, was able to utilize many of the federal tax advantages, discussed later in this paper, as an inducement to investors, as well as secure commercial loans backed by a DOE geothermal guarantee. This, coupled with a secure contract guaranteeing a market for the plant's services, enabled the project to commence operations, provide a needed service for its users, and make money for its investors.

## D. Conclusions

All three of the projects discussed above have one important element in common: a resource the extent and duration of which has been largely confirmed. All three have had historic uses: Boise having had over 90 years of extensive use; Susanville and Brady Hot Springs more recent and less extensive use. Two of the three have been able to obtain some Federal grant assistance in drilling wells to test and confirm their reservoirs. Other projects may not be as fortunate, as grant money is limited, and thus will have to use means other than outright grants to see themselves through the exploration phase, the most uncertain aspect of direct heat geothermal development.

Once the resource was proven, Brady Hot Springs was able to secure the needed capital for development; Boise appears to be on the verge

of doing so. Susanville has not yet reached that point. All have raised or will need to raise the money through private sources (investors, sale and lease back arrangements, or commercial loans), rather than through cheaper tax-exempt bond financing. In order for Boise to obtain the needed capital for development, the City must give up some control over the resource it currently owns. The only commercial loan (Brady) is supported by a DOE geothermal loan guarantee. The Brady experience convinced the consultants of the importance of this tool, along with utilization of tax advantages available to the private sector, in an overall geothermal financing scheme.

At any rate, the cascading of industrial and space heating uses, such as is planned by Susanville, still provides the most economical utilization of direct heat geothermal energy. Many rural communities are plagued with the single industry blues (e.g., timber, tourism) and the accompanying chronic and seasonal unemployment. The addition of an industrial/agricultural processing plant which would utilize the cheap process heat provided by low temperature geothermal wells would greatly stimulate and diversify the economy of such a rural community. These same communities are also beset with increased heating costs for their public facilities, schools, hospitals, etc., and the private residences of their citizens.

Given the need of many communities in the rural areas where the resources are located for cheap heating and an economic boost, and the need of many industries, such as vegetable processing, greenhouses, animal husbandry, and fuel alcohols manufacturing, for cheap process heat, utilization of direct heat geothermal energy in the areas where it is found seems to be a natural solution. Other factors such as land availability and prices, minimal disruption to and relocation of existing infrastructure, zoning regulations, community attitudes, and nearness to raw materials make it desirable for such plants to locate in rural rather than urban areas. There also appears to be a developing demographic trend toward people moving to small communities. Thus a newly located plant could be assured of a work force, and in-migrants would more easily find employment. All these factors indicate that what now seems to be an

unfortunate circumstance, the location of many low temperature geothermal reservoirs away from population centers, could in fact be an advantage, and that the Brady Hot Springs and Susanville experiences will not be isolated examples.

This rather optimistic discussion should not be construed as indicating a wholesale rush of certain industries to rural areas in general or geothermal areas in particular. It is recognized that many other factors, including corporate inertia, would tend to keep industries on the urban fringe. What we do say is that proper identification and education of potential industrial users could convince such users to relocate based upon proximity to low temperature geothermal resources.

Nor should the previous discussion be taken as slighting the potential of other parts of the state where low temperature resources are located near urban areas. It may well be that communities such as Chula Vista, Los Angeles and San Bernardino will be able to utilize their nearby geothermal resources for industrial processing and space heating. Certainly uses in such areas would provide the best possibility for displacement of existing fossil fuel uses.

Another point worth noting in the analysis of these projects is the necessity of securing a specific, dependable market for the geothermal energy. No private developer, or even a government agency that is thinking clearly will undertake the risk involved in exploring for a geothermal resource, if there is no assurance that once the resource is found, it will be utilized, hence bought. On the other hand no user in his right mind can agree to depend upon and pay for a resource which is unreliable and unsuitable for his needs. The answer in Boise's case is a contract whereby the developer agrees to deliver a resource of a certain quality (temperature, pressure, chemical composition) for the uses involved, and duration (as measured by certain agreed upon indicia of reservoir size and ability to recharge). If the specified resource is not delivered, the city pays nothing. The city, in turn, must take an amount which will allow the developer to recover his costs, plus a profit.

In the Brady project, where apparently the user has another means of drying his onions, the contract is simpler: the developer will dry all the onions the user can supply. Those that he can't dry, he won't be paid for. He bears the risk of the failure of his resource or plant, as well as the unlikely possibility of a crop failure, but the onion producer must at least offer him all the onions he can produce. There are many other forms of contracts between the developer and the user which can be written (unless, of course, the developer and user are one, in which case the relationship is understood), but all must apportion risks and supply a market.

In summary, after analyzing these three projects, and becoming familiar with several other projects, several major points come clear:

. There is a demand for direct heat geothermal energy both for process heat and for space heating.

. The most economically feasible way of utilizing this direct heat is through a combination or cascading of these uses.

. If structured in this manner the immobility and somewhat remote locations of the resources would not be the stumbling blocks to utilization that they are often perceived to be.

. Direct heat geothermal development can, for financing purposes, be divided into three stages: (1) exploration and testing; (2) production; and (3) distribution. These stages are characterized by varying stages of risk, by far the most speculative being exploration and testing, the safest being distribution.

. Thus far, most of the risks in the exploration and testing stage have been absorbed by the Federal Government through grant programs which are by their very nature limited. If geothermal development for direct heat use is to stand on its own two feet,

a way must be devised to make private involvement at this stage feasible. (Local government involvement in this phase is inappropriate because it is far too risky, as will be seen in the discussion of the distribution phase.)

. There exist incentives which would enable the private sector to enter the exploration and development phase. These incentives both spread the risk (the DOE User Coupled Drilling Program and the Geothermal Loan Guarantee Program) and provide tax benefits to investors (investment tax credits, depletion allowances, and current expensing of intangible drilling costs).

. Regardless of these incentives, private developers and entrepreneurs will not spend money exploring and testing unless they can be assured of suitable recompense for the risk-taking should they be successful. This means they require: (1) an assured market and (2) a reasonably rapid and unregulated return on investment.

. There is a need to identify markets for direct heat geothermal energy and to educate potential users.

. Involvement of local governments is most appropriate at the distribution stage, but given the tax laws, private ownership, at least for a few years, may still be best.

. Even though this is the most risk-free phase of direct heat geothermal development, local governments have had a difficult time financing distribution. What success there has been involved the surrender of the resource and a payback which is more expensive than that which could be obtained through issuing tax-exempt bonds.

. The reason for this lack of success is that local public entities are not the proper institutions to take <u>any</u> risk,

regardless of how small on the relative scale. Their means of raising money through locally generated revenues and even their ability to spend it are severely limited in California by Propositions 13 and 4. Their ability to borrow money based on their own full faith and credit (general obligation bonds) is almost totally curtailed by Constitutional debt limitations and requirements for voter approval, which is all but impossible under the current political climate.

. There is a less risky form of borrowing money through revenue bonds, which are secured solely by project revenues. These bonds transfer the risk, in effect to the bondholders.

. However the very fact that revenue bonds transfer this risk to the bondholders, makes them difficult if not impossible to market, without some form of guarantee. In spite of all this, once the resource has been proven, it may be possible for public and, with the recent passage of new legislation, interested private entities to borrow money at low, tax-exempt bond rates and market those bonds, without pledging the full faith and credit of small local governments, and without making investors bet on the outcome of a single project.

. The complex interrelationship of various tax advantages and financing mechanisms coupled with the great variety of economic efficiencies involving differing end users makes site specific financial modelling desirable.

## III. FASHIONING A BLUEPRINT FOR DIRECT HEAT GEOTHERMAL DEVELOPMENT

### A. Exploration and Production

#### 1. Marketing Contract

The initial step in utilization of low-heat geothermal energy is finding some indication that there is a viable resource. The U.S. Geological Survey, supplemented in California by the Department of Conservation, has charted the major areas where there are signs of geothermal reservoirs. However, a designation on a resource map is not a sufficient basis on which to begin the process of producing usable geothermal energy. As discussed earlier, the first need is an assurance that if a usable resource of sufficient longevity is produced, it will be bought. The temperature, chemical composition and pressure required for the use are ascertainable. Objective indications of longevity are another matter. There is a large body of opinion which maintains that, given reasonable use and rates of recharge, a typical geothermal reservoir is infinite in duration. However, what constitutes reasonable use and rates of recharge and how these may be assured in each case is not known. The ability to contractually agree to certain objective indicia of longevity may be a function of the conservativeness of the potential user. A possible means of resolving this problem would be as in the Boise situation, the purchase of reservoir insurance (which party should buy it would be determined in the contract negotiations).

#### 2. User Coupled Confirmation Drilling Program

Once a market has been identified, the developer must begin the process of exploration. This involves specific drill site selection, drilling, temperature and flow measurement and logging to determine the extent and consequently the productivity and longevity of the reservoir. This is a difficult task, particularly for the small developer who is the

typical direct heat promoter. The developer must drill a well to the successful depth at the proper point on the ground. He must then measure temperature and flow rate and analyze the productivity and longevity of the resource by a complicated series of techniques. This is known as reservoir confirmation. The current state-of-the-art of discovery and drilling procedures make successful completion of this phase the most risky element of direct heat geothermal development. A single unproductive well could mean financial ruin for a small developer.

The U.S. Department of Energy, wishing to stimulate the industry to a point where it will later be able to function on its own, and anxious to expand the body of knowledge involved in locating low temperature geothermal resources, has devised a means of spreading the risks encompassed in reservoir confirmation. The User Coupled Confirmation Drilling Program is a cost sharing system whereby the DOE absorbs some of the front end costs for drill site selection, flow testing, reservoir engineering, and reinjection well drilling, if required. The percentage of costs which the DOE will pick up will depend on the utility of the resource produced. A totally successful well will bring a 20% cost sharing; a total failure 80%. Thus a developer would be at risk for only 20% of the costs in the event of a dry hole. The DOE expects that this program will function as a loan guarantee, with the developer securing private financing backed by the User Coupled Confirmation Drilling Program. In fact, one of the subsidiary goals of the program is to develop relationships between venture capitalists, bankers and developers that will be useful after the program is ended. This is the rationale for not providing the money directly up front and for not underwriting the entire costs.

In order to take advantage of this cost sharing, a developer must show that there is an end user of the resource, that the user or developer has or can obtain rights to the resource and that if the cost sharing takes place financing can be obtained. He must also demonstrate geologic evidence that a reservoir exists at the proposed site. This can be in the form of documentation of known thermal springs or wells or thermal spring deposits.

When the final testing is completed, the degree of cost sharing will be computed based upon a previously agreed upon formula. Certainly the key element in deciding whether a well is a total success is how the quality and longevity of the resource measure up to the standards in the developer's contract with the user. DOE's first solicitation under this program took place in late May, 1980, and the first awards were scheduled for September, 1980.

3. Other Front End Programs

The newly passed Energy Security Act of 1980 has authorized direct federal loan programs which, depending on the situation, could be expected to supplement or substitute for the User Coupled Confirmation Drilling Program in spreading front end risks. Loans for up to 90% of the costs of feasibility studies are available for direct heat projects. These loans are repayable over a 10-year period and can be forgiven by the Secretary of Energy if the project is determined to be infeasible. Thirty-year loans for 75% of construction costs are also available. Finally, low interest loans have been authorized for 90% of the costs (not to exceed $3,000,000 per project) involved in reservoir confirmation for direct use projects. The loans are repayable out of revenues over a 20-year period, and the Secretary may forgive the unpaid balance if it is determined that development is not technically or economically feasible.

Since the programs are brand new, it has not yet been determined how they will be made to fit in with the User Coupled Program and the Geothermal Loan Guarantee Program (discussed below). But one can assume that they will be made to mesh with these programs in a manner similar to the way the User Coupled and Geothermal Loan Guarantee Programs interact, also discussed below.

4. Geothermal Loan Guarantee Program

Let us now suppose that the developer has drilled a successful test well. Under the User Coupled Confirmation Drilling Program he

receives 20% of his costs from the Federal Government, but probably has a loan outstanding which must be repaid. He must also secure the financing necessary to get the well(s) producing and the resource delivered. This is the point where he could avail himself of the Geothermal Loan Guarantee Program (GLGP), also sponsored by the Department of Energy.

The GLGP is a $500 million program to guarantee private loans for all phases of geothermal development, both electric and direct heat (unlike the user coupled program which is limited to direct heat explorations). Under the GLGP, the Department of Energy will guarantee up to 100% of a loan for up to 75% of a private developer's costs. The developer or his limited partners must provide 25% equity, but this can include previous costs (i.e., initial exploration costs including that portion cost shared under the User Coupled Program). Under the 1980 Energy Security Act, a municipality or a cooperative can now secure a guarantee for loans covering up to 90% of the project.

The program was designed to accelerate the development of geothermal energy by minimizing the lenders' risks, to encourage new-entrants into the geothermal market, and to establish a relationship between private capital and geothermal developers that will be in place after the program is ended (1990). The loan guarantees can be made for a variety of purposes, to include acquisition of the rights to the resource, and production and transmission of the resource. Loans for end use facilities can also be guaranteed under this program, but for the purposes of this discussion production and initial distribution will be emphasized. There are limits to the amount of loans which can be guaranteed ($50 million for a single direct use project), as well as the amount of guaranteed loans which will be allowed a single developer. Because of the relatively lower costs of direct heat uses, these limits have no real bearing on these uses.

Before making a guarantee, the DOE will look at the viability of the resource, the engineering involved, the economics of the project, including marketing, capitalization and management, as well as any

environmental or legal problems the project might have. These review criteria and the types of activities which can receive loan guarantees give an excellent indication of how well the GLGP and the User Coupled Program, discussed above, can dovetail to minimize the liability and unnecessary expenditures of all concerned as well as speed up the process of financing direct heat projects.

5. Tandem Use of GLGP and User Coupled Program

The developer who has a certified successful test well under the User Coupled Program (and has paid for that designation in terms of an 80% cost share) should be able to use that certification to convince the same Department of Energy that such a success makes the further development of the project an excellent risk for a loan guarantee. The "certification" basically states that the developer has convinced the government that his resource is suitable for the use intended, as measured by the contract with the user. This removes a major uncertainty in geothermal development. In addition, before qualifying for the User Coupled Program, he had to show evidence of a contract with a user and ability to get financing for the project. Thus about all that is left under the GLGP evaluation is a check of the production and distribution engineering, and possible legal and environmental problems (the economics are presumably there or financing could not have been arranged in the first place). The developer is now in a favorable position to secure venture capital, a private loan and a federal loan guarantee under the GLGP. Since most of the criteria required by the GLGP have been met in the course of the User Coupled Program, the Department of Energy's legally mandated objective of four months processing time for a loan guarantee should be reduced.

This logical juncture of these two programs, a stated objective of DOE, also allows the developer to limit his front end investment until he is at a point where he is confident of quality and longevity of the geothermal reservoir. For instance, he need not acquire the resource (only options) until he has demonstrated its utility under the User Coupled

Program. Then he can use a loan guarantee to assist in the actual purchase of the resource. He only has to finance up front, assisted by the User Coupled Confirmation Drilling Program, the drilling and testing required to prove the resource. Once this is done and he has a certified success in terms of a resource, he then can use the GLGP for further development, to include production and distribution. [11]

This two step procedure, made possible by the introduction of the User Coupled Program this year, also limits the government's liability, in that it is on the line for only some of the initial costs for reservoir confirmation. If the reservoir is not adequate under the User Coupled Program, the government will not put good money after bad through the GLGP. The DOE did not have this option when all it had was the GLGP. Consequently exploration programs, because of their inherent risks, were not good candidates for loan guarantees. And in fact the recent policy of the DOE has been not to guarantee any loans for the more expensive and risky electric exploration projects. With another program to assume small-scale risks, and the consequent ability to then apply the GLGP, the likelihood of guaranteeing entire direct heat projects has been greatly increased.

There are still some problems with using the GLGP. There is an annual fee based upon the average yearly unpaid balance which can be paid out of guaranteed loan drawdowns until project revenue commences which effectively adds 1% to the loan rate. Because of U.S. Treasury regulations, the GLGP cannot be used to guarantee tax-exempt financing. However, there is a capability to use normal, non-tax-exempt rates, and then get interest differential payments from the program to make up that difference, as was done recently by the Northern California Power Agency in an electric project. This interest differential program may have great potential for public entities. Yet exactly how much money would be available nationwide is unknown since large-scale cash payments would deplete the required reserve in the GLGP fund. Another difficulty is that larger companies cannot avail themselves of the GLGP because their credit rating could not stand a default. They can, however, use Interim Risk Assuming Companies

(IRACs) to absorb any default. There are also many smaller developers who won't have this problem. In addition, the processing time for a loan guarantee had in the past discouraged many potential users. The Energy Security Act now requires guarantee applications to be processed within four months. Finally the limited funds and duration of the program requires that potential applicants secure commitments at the earliest possible time, time which may not allow for development of all potential projects. In addition to the legislatively mandated solution, the processing time problem could be cured, at least for direct heat projects, through a system of dual processing of the User Coupled and GLGP application. The service charge and tax-exempt financing difficulties can be partially alleviated by selecting the proper mix of institutions to be responsible for the various phases of the project and will be discussed later is this paper.

## 6. Tax Advantages Available to the Private Geothermal Developer

Even if the initial phases of geothermal development presented less risk than is currently apparent, we would still recommend private involvement at these earlier stages, mainly because of the federal tax advantages such development encompasses. These advantages, of course, are only available to an entity which has a tax liability, and thus development by a public entity could in a sense "waste" these tax advantages. A brief review of these major tax advantages is now in order.

### a. Intangible Drilling Costs and Depreciation

Intangible drilling costs are those costs which are indirectly related to, but necessary for, a drilling operation. They are generally characterized as project costs that have no salvage value. These costs include such expenses as site preparation, access road construction, and drilling overhead. They exclude such costs as pipes and fittings. Obviously, these costs represent a substantial portion of total drilling costs for many geothermal projects.

Tax law allows (but does not require) these costs to be treated as current expenses, and to be expensed at the time they are incurred, so the tax deductions are realized immediately. For taxpayers in high brackets, out-of-pocket costs can be immediately reduced by as much as 70%. However, it may be in the interests of many developers not to deduct certain expenses that can be treated either as intangible expenses or as depreciable assets. The reason they might elect to depreciate the assets instead is to take advantage of a larger investment tax credit, discussed below. Use of the investment tax credit reduces taxes by the amount of the credit, regardless of tax bracket, and does not reduce the base amount for calculations of the future depreciation. It is easy to see why there will be no single best method of tax treatment, but the treatment for each project will depend on the needs of the specific parties whose taxes will be affected.

As will be discussed infra., a sale of the resource and plant may be in the interest of the developer, both in terms of realizing a quick profit, enabling him to go on to another venture, and also to avoid public utilities regulation. Thus we must look at the tax implications of a sale. If the developer of the property on which the drilling is done decides to sell the property within ten years of date of purchase, in order to realize his gain, some of this tax advantage is lost. If the property is sold at a gain within ten years, then some of the gain will be taxable as earned income. The amount of the gain that will be subject to ordinary income tax rates is equivalent to the difference between the sum of the intangible drilling costs that were actually expensed, and the sum of the depreciation benefits that would have been realized by the developer if these intangible drilling costs had been treated as assets, and amortized on a straight line basis over ten years.

This loss of tax benefits, which has the effect of penalizing a sale, acts as a disincentive to the sale of the property, but might not be decisive in a developer's decision to sell. This is true for two major reasons: First, the developer will have benefited from the current

expensing provision during the period that he owned the property, and the value of those benefits may offset the tax disadvantage of an early sale. Second, a sufficiently attractive sales price will render insignificant the net tax benefit loss.

b. Investment Tax Credit

The investment tax credit is probably the single most attractive tax advantage for geothermal and certain other renewable energy development. The standard investment tax credit is 10%, but under the Crude Oil Windfall Profits Tax Act, a 25% investment tax credit is allowed for geothermal and some other renewables. The investment tax credit covers costs incurred for depreciable items. This excludes such non-depreciables as land or intangibles. Full use of the credit is available for assets with a seven-year or longer depreciable life, two-thirds of the credit is available for assets with a five- to seven-year depreciable life, and one-third of the credit is available for assets with a three- to five-year depreciable life. Assets with less than a three-year depreciable life are not eligible for the investment tax credit.

The importance of the investment tax credit is that it is a direct reduction of the amount of taxes owed and not merely a reduction in taxable income, as is the case with depreciation. Thus the taxpayer's tax bracket does not affect the use of the investment tax credit. It is also important to remember that after the investment tax credit is taken, the full amount of the eligible investment is still used to determine the depreciation schedule. Thus, for example, a high income taxpayer in the 70% tax bracket can deduct 25% of his investment immediately, and then over a seven-year period, can depreciate the investment and recoup another 70% through reduced tax liabilities. Theoretically, certain investors could write off 95% of their investment.

There are other important factors to the investment tax credit. The full credit is not available to publicly regulated utilities, and may

not be used by a developer who uses the credit and leases the facility to a publicly regulated utility or to a public agency. On the other hand, if the owner/developer sells the heat to a public agency, the full credit can be utilized. However, the law in this area is in a state of flux and, thus, the subject merits continued monitoring.

There are other rules regarding investment tax credits, such as the requirement to have an actual operating role in the business and not a totally removed investment role. There are also very important recapture provisions if the asset is sold in a period less than the period of the allowable depreciation (up to seven years). A sale after seven years would not affect the investment tax credit. Even if the asset is sold before the end of the seven year period, of course the taxpayer has had the use of the tax benefit for that period and there is still substantial value to the credit.

It is important to understand that the credit essentially immediately reduces the real investment required in a project. If a project requires $1 million with all of the investment eligible for the investment tax credit of 25%, the real out-of-pocket costs for the investor with sufficient tax liability are $750,000 that year. Often the investment and the reduced tax liability are planned to take place at exactly the same time.

There are also difficulties in utilizing the full investment tax credit and tax-exempt bond financing during the initial seven-year period. In addition, after 1983, under the Crude Oil Windfall Profits Tax Act of 1980, use of the full investment tax credit in conjunction with interest differential payments for taxable bonds will not be possible. Exactly how agreements may be structured to maximize use of both the investment tax credit and tax-exempt bond financing will be an important part of the individual project financial models which we have recommended.

The investment tax credit, when used in conjunction with the Geothermal Loan Guarantee Program, discussed previously, can be a major factor in substantially reducing a developer's true investment costs. Developers at Brady Hot Springs and tax consultants from a variety of sources believe that the use of the federal loan guarantees will not reduce access to utilization of the investment tax credit, even though the investment tax credit rules require that all of the money included in the investment tax credit calculation be considered "at risk". Although the use of the Federal Geothermal Loan Guarantee Program might effectively eliminate the risk on 75% of the investment, investors are betting that since the developer must default on the loan for it to be guaranteed, it is effectively "at risk". Thus, depending on how a project is designed, a large percentage of the total investment may be subject to the investment tax credit. For example, if a project totaled $1 million and the developers received a loan guarantee for 75% of the total, equity required would be $250,000. If 80% of the project, or $800,000, were eligible for the full 25% investment tax credit, the credit would be worth $200,000, effectively reducing tax liabilities to the investors by $200,000, leaving a real after tax investment of $50,000. This amount would be reduced even further by intangible drilling cost deductions, depreciation and depletion. Investment tax credits are in no way related to the capacity to depreciate assets as well. Even if $200,000 is taken as an investment tax credit, the full $800,000 of depreciable capital assets that make up the investment tax credit eligible pool can then be depreciated at the normal rates. Given all of this, it is understandable why there is likely to be no shortage of equity investors in geothermal projects. The bottleneck is in finding the projects themselves.

### c. Depletion Allowance

In many cases, the most attractive geothermal development format will involve leasing the resource from a public or private entity rather than owning the resource. In such cases, depletion would go to the owner of the resource, not the developer, and in cases where the owner is a

public body, depletion would be meaningless. Under the National Energy Act of 1978, percentage depletion is the only allowed method of calculating geothermal resource loss for tax purposes. Under this method, the allowed depletion can exceed the property cost. In the case of geothermal resources, percentage depletion allowed in 1980 is 22% of gross income and falls 2% a year to 15% by 1982, but in no case can the depletion allowance exceed 50% of net income.

Since the depletion allowance cannot exceed 50% of net income, there can be no tax loss as a result of the depletion allowance and the value of the allowance will depend on the structuring of ownership and the divisions of profits among parties involved (for example, when the resource is owned by one private party and leased for development to another). Depletion is an important tax concept that is akin to the "Nixon Papers" tax deduction. In that case, Richard Nixon was able to take a deduction for loss of value of assets which were never taxed in the first place as income. Depletion allows a deduction that assumes a loss of value for property that has never been taxed for the increase in value in the first place. If the taxable income does not exceed twice the amount of the allowable depletion, the taxpayer is likely to have to use the depletion as a reduction in cost of the asset (land), but if there is sufficient income and profit, the taxpayer will be most favorably impacted by taking the percentage depletion.

d. Residential Energy Credits

In addition to these tax benefits available to the developer, residential energy credits are also available to persons who pay for installing geothermal heating systems in their places of residence. As a result of the passage of the Windfall Profits Act, the credit is now equal to 40% of the first $10,000 invested, for a maximum credit of $4,000.

## 7. Venture Capital and Traditional Loans

Up to this point we have treated the incentives available to the private sector in the form of tax benefits and loan guarantees. These incentives, however, require some equity or venture capital, and presume the existence of loans from the financial community which can be the subject of the guarantees.

The favorable tax treatment afforded geothermal development, as leveraged by the GLGP (see above) seems to indicate that if users are found, venture capital will be available. Private loans, however, seem to be another matter. Most of the larger California banks have expressed no interest in making geothermal loans to smaller direct heat projects, even with a 100% DOE guarantee. Fortunately, one bank, the Bank of Montreal (California) is likely to be interested in reasonable projects of any size. The problem for larger banks is the tendency to centralize processing of only their larger loan requests. Some major California banks have a sophisticated capacity to deal with DOE guaranteed loans to larger geothermal electric projects but not to small projects of a direct heat nature. This they tend to leave to a local branch bank, and the local branch banker, not being familiar with either the government guarantee program or geothermal development, is unwilling to take the time to make an intelligent loan decision. A problem peculiar to loans for direct heat geothermal use is that banks must become familiar with the technology of direct heat geothermal energy and the economics of the industry that utilizes it. Aside from being an additional effort, the combination of a "new" technology and an off-beat industry such as catfish raising, may be too much for a banker who already has a desk full of traditional loan applications. Even with a 100% guarantee, banks rightfully feel that they cannot and should not make a loan that they do not understand reasonably well.

## 8. Business and Industrial Development Corporations (BIDCOs)

However, despite a certain sluggishness in traditional money lending circles, there does exist in California (and not in any other state at this time) an important tool for financial assistance to private geothermal developers. California has created a unique set of financial institutions, Business and Industrial Development Corporations (BIDCOs), which are licensed and regulated by the California State Banking Department and are capable of providing a variety of debt and equity financing alternatives for private geothermal developers. BIDCOs may be publicly or privately owned and financed and may fund partnerships, proprietorships, corporations and cooperatives with debt or equity financing. Depending on sponsorship and the objectives of the various sponsors, BIDCOs can and will be available for certain types of financing for geothermal development. A key aspect of a BIDCO for the purposes of direct heat geothermal financing is the ability of a BIDCO to sell and use the leverage of the portion of the loan that is guaranteed by the Federal Government.

There are only three or four licensed BIDCOs at this time, all privately sponsored. There will soon be a state sponsored BIDCO that will concentrate on renewable energy financing, utilizing government guarantee programs (SAFE BIDCO). Certain private BIDCOs could become specialized lenders, knowledgeable in making direct heat geothermal financings and processing the loans through the Geothermal Loan Guarantee Program. The state sponsored alternative energy BIDCO, or eventually another state sponsored BIDCO that specialized in geothermal lending could also provide government guaranteed loans. The importance of the state sponsored BIDCO may be that it would be in a position, before private lenders are ready to make their loans, to take advantage of public funding to help process and develop some of the earlier financings in geothermal energy, and then once the process and the risk factors become better known and understood, pass the responsibility on the private sector banks and BIDCOs.

Possibly the best way to explain how the BIDCO would work would be to provide a case example. If the SAFE BIDCO were interested in geothermal financing, it could indicate a willingness to make a guaranteed geothermal loan. In this case, the difference between the bank and the state BIDCO might be a willingness by the BIDCO to provide more than the 75% of the project cost that would be guaranteed. The state BIDCO might, for example, provide 85% or even 100% of the financing, accepting some risk exposure for the amount over 75%. Once the loan is made, the guaranteed portion can be sold in the money markets. It is considered to be a fully backed asset by the Federal Government. The money is then returned to the BIDCO, and is available for the next financing. Given the fact that in the geothermal loan program, guarantees can be for 100% of the loan, the potential leverage is unlimited or infinite. Even if the state-sponsored BIDCO were to provide 100% financing of the projects, leverage would be four times the amount put into the BIDCO by the state.

The value of the BIDCO is tied directly to the Geothermal Loan Guarantee Program. Without the loan guarantees, the BIDCO is not significantly different from any other state expenditure. There would be no potential to leverage the state's money.

Given the 100% guarantee for geothermal loans and the interest in lending by at least a few banks in the state, the importance of the state-sponsored BIDCO might not be as great in geothermal development as in other alternative energy development. But an important role for the state sponsored alternative energy (SAFE) BIDCO will be to be a leader in taking on new areas of investment, spending the time to research them and work the bugs out of the guarantee programs. Once this is done, banks and private BIDCOs will play the major role in wide-scale commercialization of direct heat geothermal projects.

## B. Distribution

We have now reached the point where the developer, using a combination of venture capital, private loans, and federal loan guarantees, has a confirmed reservoir and a producing well(s). He also has a contract with a user or group of users to deliver the resource. The uncertain, high risk parts of the operation have been completed. What remains is the delivery of the resource in compliance with the terms of the contract.

### 1. Distribution by a Public Entity

One of the key questions is with what institution the developer has contracted to distribute the resource. We have selected for detailed analysis the methods of financing a purchase of the geothermal resource and plant by a public entity. It is clear that purchase of the resource and plant are not the only means of marketing and distributing the resource. It is also true that a public entity is not the only possible, or even likely distributor. In fact, due to recent changes in California law (AB 2324 and AB 74), it may well be that under the present state of the law, private entities under public (state or local government) aegis may have better access to tax-exempt bond financing (a key element in the financing scheme we have developed, which will be discussed infra.) than do many existing local public institutions. In addition, if the problem of public utilities regulation is solved (infra.), the private developer may well want to distribute in order to preserve his full investment tax credit. Keeping this in mind there are nonetheless many valid reasons to support public sector involvement at this less risky stage of geothermal development, and hence, to use public sector purchase as a starting point or model.

Perhaps the most compelling reason is that a public entity may be the only institution that is willing to distribute the resource where there will be a district heating system, as opposed to a strict industrial processing operation. Private resource developers are not interested in

becoming public utilities, susceptible to rate regulation by the California Public Utilities Commission. Under the existing law this may be the case (a full discussion of the law and its implications will follow). Even if the law were changed, the actual business of being a distributor, an unregulated utility, is not an enterprise with which the typical resource developer is comfortable. A resource developer (and his limited partners) often like to be in and out of an operation in a relatively short time, so that the money invested can be turned around and put into another project. Conversely, if there is a loss, he wants it up front and out of the way, taking whatever tax write-offs he can. Some developers, especially smaller ones with limited capital resources, are not interested in waiting for a 20- to 30-year payback that will result from his running an unfamiliar business operation.

Existing investor-owned gas and electric utilities would seem, at first blush, likely institutions to distribute low temperature geothermal resources, and indeed, a large majority of those, recently polled in California by the Earl Warren Institute,[12] answered "yes" to the question "Would you consider becoming a distributor of geothermal energy for direct uses if a suitable resource is developed near a populated section of your service area and hot water is offered to you for resale by an independent resource producer?" [13]

However, this result is somewhat misleading. The question phrased in terms of "would you consider?", requires no real verbal commitment, and even to this non-committal question, the largest utility in California, PG&E, responded in the negative. Further, when asked "If geothermal direct uses become developed in your region, do you expect that existing gas and electric utilities will play a major role?", three of the four major California utilities responded "no" and the fourth "maybe".[14] Further insight to the seemingly positive reply to the first question can be seen from the fact that the utilities expressed an overwhelming preference for serving large industrial users rather than becoming involved in district heating. The reasons given were on grounds of

engineering and economic efficiency and possible avoidance of PUC regulation. This view seems to put the major utilities in the same category as resource developers. The reluctance of these utilities to distribute geothermal district heating is understandable. By its very nature, district heating is a small-scale operation. Committing resources and hiring or training a corps of personnel for such a small potatoes operation as direct heat geothermal district heating probably does not make too much economic sense at the present time.

The Earl Warren poll arrived at similar though less conclusive results, from which these consultants draw similar though less confident conclusions regarding the likelihood of involvement of smaller investor-owned utilities in direct heat geothermal district heating.[15] This is not to state that an investor-owned utility is an inappropriate entity to deliver direct heat geothermal energy (in fact their experience with gas delivery systems and involvement in high temperature geothermal energy makes them very suitable entities) nor that there are not such utilities who will be interested (such as Northwest Natural Gas Company in Oregon). All that we say is that private utilities are not stampeding to distribute direct heat geothermal energy.

Even if resource development companies or privately owned utilities were interested in distributing direct heat geothermal energy, there are other reasons to consider local public entities as appropriate institutions for this role. Public agencies, as will be discussed later, are clearly exempt from PUC regulations. They are also able, assuming equal efficiencies, to deliver heat at cheaper rates since a profit is not required and taxes are not paid. Often the local jurisdiction has been actively involved in trying to make direct heat geothermal heating a reality at a very early stage and consequently would be the most experienced institution to manage and deliver the resource. In addition, a public entity that has been involved from the beginning is often the most capable institution to deal with other government agencies, either those bearing gifts in the form of grants, or those adding burdens such as

environmental and other regulations. Finally, where geothermal energy is being used as a tool for local economic and employment development, a local jurisdiction is certainly the most logical distributor.

2. Financing Distribution By a Public Entity - Tax-Exempt Bond Financing

As discussed in the preceding section, it is often in the typical developer's interest to divest himself of the geothermal plant within a reasonable time of its attaining production capability and to allow another institution to distribute the resource (subject, of course, to the tax considerations involving sale, discussed supra.). If it can raise the money, it is also in the interest of the distributor to acquire ownership and control of the resource and plant at once, and thus avoid a long-term payout and consequent high markup, such as in the Boise situation.

On the other hand, there may be some developers who, because of the desire to secure maximum benefit of the tax advantages discussed earlier, may wish to maintain ownership and control of the system for some seven to ten years. This would be particularly true if such distributors were exempt from PUC regulation. Here one aspect of the Boise agreement appears to be desirable; i.e., a contract between the public entity and the private developer allowing the public entity to purchase the resource and plant at an agreed upon figure at a later date. At this time the local agency, with a proven project that has functioned well for many years, would find it easier to finance this purchase with tax-exempt bonds (see discussion to follow) than would be the case if there were no previous distribution.

At any rate, some point in the distribution phase is the stage where most of the risk is gone from the project. This is the point where a public agency (and now in California, a private enterprise under public sponsorship, see the discussion of AB 2324 and AB 74, infra.) should consider the use of tax-exempt bond financing to come up with the purchase

price of the system, and at a significantly lower cost. The advantage of tax-exempt bonds is that since the interest paid is not includable in the holder's (lender's) gross (taxable) income, the borrower can borrow at cheaper rates.

a. General Obligation Bonds

Tax-exempt bonds basically fall into two categories: general obligation bonds, which are backed by the full faith and credit of the issuing entity, and revenue bonds, whose only source of payback is the income from the enterprise funded by the bond. General obligation bonds are very attractive to the investors because they can be assured repayment from the tax revenues of the political entity, city, county or state, which issues the bonds regardless of how well the bond is used, or how successful is the enterprise it funds. On a state level, in California, general obligation bonds have historically been used to fund parks, veterans' housing and some of the state's water projects. However, as attractive as they are to investors, general obligation bonds for new enterprises appear to have political problems in California at the present time. The political climate that has resulted from the recent financial crisis in New York City and culminated in California with Proposition 13 makes it difficult to secure the required voter approval. (Proposition 13 also limits a local government's ability to secure the bond through local property taxes.) Statewide housing and renewable resources general obligation bonds as well as many local general obligation bonds have been defeated at the polls in California. Although Oregon has passed a $300 million general obligation bond issue for alternative energy, the prospects of California voters doing likewise are uncertain, and thus we believe that a revenue bond approach currently offers the most certain hope of financing the purchase of direct heat geothermal distribution systems.

b. Revenue Bonds

The problem with revenue bond financing of geothermal direct heat energy is, as discussed earlier, the fact that revenue bonds offer the bondholder no source of payback other than the project financed. In some areas where there has been successful experience with this type of financing, such as airports and even golf courses, the market responds well. This is due to the fact that assured income from fees can provide a repayment source. For example, revenue bonds may be used to finance a solid waste conversion site with the local public utility district or a similar body providing approval of a fee increase for garbage to cover the cost of retiring the bonds. Presently in San Francisco, revenue bonds are being used to finance the massive sewer project with the fees charged the public substantially to cover repayment of the bonds. Since sewage transport and disposal is an essential service, bondholders can be assured repayment; the expenditure and subsequent repayment are secured by the need to use the facility and the impracticality of alternative service. While this subvention provision is not identical to taxing authority, since the user at least theoretically can refuse to pay the fee by refusing to use the service, the effect upon conservative bond buyers is quite similar.

We believe this approach, even if fees are guaranteed, will not yet work with alternative energy bonds because of the newness of the enterprise, even at the fairly secure distribution stage. The bond market is both competitive and conservative, and there are many types of proven projects, paying a reasonable return, with which the bond buyers are quite comfortable. However, we have proposed a variety of modifications to the revenue bond approach which would make the source of repayment more secure and the bonds more marketable. This solution must await a general discussion of federal tax law as it applies to revenue bonds.

c. Federal Tax-Exempt Bond Law

There is a major problem with tax-exempt bond financing which should be addressed at this point: not every enterprise is eligible for such favorable tax treatment. Thus a survey of the Internal Revenue Code (IRC) and the implementing regulations is in order.

The general rule is that gross income does not include interest on the obligations of "a state . . . or any political subdivision . . ." (IRC Section 103(b)(1). This in effect allows a state or a political subdivision (a municipal corporation or another governmental unit which has been delegated a part of the sovereign power of the state, and thus could include a geothermal heating district, (see 26CFR Section 1.103-1) to borrow money at cheaper rates since the interest paid to the lender is not taxable. However, this exemption from federal tax does not apply to industrial development bonds (IRC Section 103(b)(1)). Industrial development bonds are those obligations in which all or a major part (more than 25% - 26CFR Section 1.103-7(b)(3)(iii)) of the proceeds are used directly or indirectly in a trade or business, not carried on by a government entity (IRC Section 103(b)(3)(A)), and the payment of which is secured by an interest in property used in a trade or business, or to be derived from payments in respect to property or borrowed money used in a trade or business (IRC Section 103(b)(2)). This restriction applies to output contracts where more than 25% of the output, e.g., electricity, heat, is taken by non-government entities and used in a trade or business (26 CFR Section 1.103-7(c)(5)).

This non-favored treatment of industrial development bonds of states or political subdivisions does not include (and thus allows tax-exempt treatment of) bond issues, the proceeds of which finance, among other things:

"sewage or solid waste disposal facilities or facilities for the local (solely within the area consisting of a city and contiguous county) furnishing of electric energy or gas" (IRC Section 103(b)(4)(E))

or

"facilities for the furnishing of water for any purpose if (1) the water is or will be made available to members of the general public (including electric utility, industrial, agricultural or commercial users) and (2) either the facilities are operated by a governmental unit or the rates for furnishing or sale of the water have been established or approved by a state or political subdivision thereof...(including a state PUC)" (IRC Section 103(b)(4)(G)).

In addition, IRC Section 103(b)(5) allows favorable tax treatment of bonds that would otherwise be considered industrial development bonds, which are used to finance "...acquisition or development of land as the site of an industrial park." The term "development of land" includes "the provision of water, sewage, drainage, or similar facilities, or of transportation, power, or communications facilities, which are incidental to the use of the site as an industrial park, but except with respect to such facilities does not include the provision of structures or buildings." The regulations (26 CFR Section 1.103-9(b)) define industrial park as:

"a tract of land, other than a tract of land intended for use by a single enterprise, suitable primarily for use as building sites by groups of enterprises engaged in industrial distribution or wholesale businesses if either --
(1) the control and administration of the tract is vested in an exempt person (government entity) or
(2) the uses of the tract are normally (i) regulated by protective minimum restrictions, ordinarily including the size of individual sites, parking and load regulations and (ii) designed to be compatible under a comprehensive plan with the community in which the industrial park is located and with the uses of the surrounding land."

Finally "small" bond issues which would otherwise be deemed industrial development bonds and thus taxable as to interest are granted exemptions from federal taxation under IRC Section 103(b)(6)(A) and (D). These sections basically allow for the financing of individual capital

projects of under $1 million or aggregate expenditures of under $10 million over a nine-year period at the election of the local jurisdiction. (The "aggregate" restriction applies to the user or beneficiary, not to the public entity.)

The implications of the above points of federal tax law are quite significant for direct heat geothermal energy. As a starting point, bonds which are tax-exempt cannot be issued by the private sector, but only by a government entity, i.e., a state or political subdivision, which has some attributes of sovereignty, such as police power, or the power to tax or condemn. Even where bonds are issued by a government entity, the Internal Revenue Service must look to the purpose for which the bonds were issued and determine the beneficiary, at least where the size of the issue is over $1 million individual or $10 million aggregate. If the bonds are issued solely for heating houses, there is no problem with tax-exempt status. However, the economic facts of life for direct heat geothermal energy seem to dictate cascading of residential and institutional space heating uses with industrial and agricultural processing uses. And if, as is most likely, more than 25% of the heat output is sold to non-government users, and the bonds are secured by or paid out of trades or businesses, such as commercial space heating or industrial processing, then they are called industrial development bonds and must fall within certain exceptions if the interest is to be tax-free.

One possibility would be the exemption relating to local supply of gas (i.e., geothermal steam) (IRC Section 103(b)(4)(E)). Another would be the exemption for supplying water (IRC Section 103(b)(4)(G)). The use of the exception for the supplying of gas could be hampered in some cases by the limitation to one county. The use of the exemption for water supply could in some cases be hindered by the requirement that private water supply enterprises be regulated by the PUC (thus building in a strong disincentive in terms of sacrificing a 10% investment tax credit as well as the expectation of an unregulated profit, as will be discussed infra.).

Even more crucial, both these exceptions appear to have been interpreted by the IRS in Revenue Ruling 78-12 as not applicable to steam generating plants, i.e., steam is neither gas nor water for exemption purposes. Whether this rather dubious ruling would stand up in court as is, or whether it applies to hot water (as opposed to steam), and whether the IRS would reconsider this ruling or revise its regulations in light of strong public policy considerations arising out of the energy crisis and allow an exemption for geothermal steam/water heat in light of the clear exemptions for electricity and gas, is not known at this time. The consultants, however, urge that reconsideration or reinterpretation be pursued by whatever means.

Where there is more than one plant involved, and where local zoning provisions are made, the exemption for industrial parks appears to be suited for financing the delivery of direct heat geothermal energy for industrial processing (IRC Section 103(b)(5)), but not for the actual construction of the plants themselves. This seems to be allowed since the definition of the development of land includes facilities for the provision of water or similar facilities and power facilities, but after Revenue Ruling 78-12, nothing is certain.

Finally, the $1 million individual and $10 million aggregate (i.e., benefiting the same user over a nine-year period) exemptions can be put to good use in financing direct heat geothermal energy because of the relatively low cost of such projects. This is particularly true if the small issue exemptions can be used in conjunction with the other exemptions discussed in this section. It should be noted at this point that while federal tax law may sanction certain types of industrial development bonds, until this year such bonds for most purposes were not allowable under California law. This year the Legislature enacted and the Governor signed AB 2324 which made it possible for the State to issue bonds for private alternative energy projects, and AB 74 by which local governments can issue bonds for a variety of small private projects to include geothermal energy.

Thus, the distinction between bonds issued by a government entity where the output goes to private, commercial or industrial enterprises, and bonds issued by a government agency for plant and equipment to be owned and operated by a private entity has for tax purposes become blurred, i.e., both are considered taxable industrial development bonds, but both can avail themselves of the exemptions discussed supra.

### d. Authority of Existing Local Public Agencies to Issue Revenue Bonds[16]

We have discussed earlier why it is safe to assume that either by default or for sound public policy reasons local public agencies will in many cases be the distributor of direct heat geothermal energy. The question arises whether existing agencies have the authority under state law to issue tax-exempt revenue bonds (as previously discussed, general obligation bonds are at the present time a political question mark). Counties do not appear to have the authority to operate any kind of public utility and they are limited to issuing bonds for public beaches, boat harbors, golf courses, and ski areas (Government Code Section 23601). General law cities can acquire, own, construct, maintain and operate " . . . works for . . . heat" (Government Code Sections 34000, 39732). However it appears that such cities cannot finance direct heat geothermal systems through revenue bonds, since heat is not included in the definition of "enterprises" which can be funded under the Revenue Bonds Acts of 1941 and 1974 (water systems for domestic, agricultural and industrial use are included (Government Code Section 254309)), but it is uncertain whether in this context it can be construed to apply to direct heat geothermal energy (see the federal taxation discussion, supra.). Charter cities, under the California Constitution (Article XI, Sections 3 and 5) and the provisions of most of their charters, can enact ordinances allowing for the issuance of revenue bonds to finance direct heat geothermal energy. Joint powers agencies of themselves have no more power than local agencies under the Revenue Bonds Act(s), but it may be possible for a charter city which is a

member of a joint powers agency to issue revenue bonds to finance the entire project (see South Pasadena vs. Pasadena Land and Water Company ((1908) 152 Cal 759)). The majority of existing special districts appears not to have the authority to issue revenue bonds for any phase of direct heat geothermal energy.

Thus it appears that there is a major gap in the ability to use tax-exempt revenue bonds to finance direct heat geothermal energy in California. The newly enacted AB 2324 and AB 74 would allow the State and local governments, respectively, to issue revenue bonds for private geothermal development, but AB 74 was clearly not set up to allow bond financing for public sector ventures and AB 2324 does not clearly cover (nor was it intended to cover) public ventures. Only charter cities can issue revenue bonds for direct heat geothermal development. Public sector involvement at the distribution stage may be imperative, and often would be desirable. Certainly revenue bond financing ought to be available for this involvement, and available to more than charter cities.

One option which we recommend would be amendment of AB 2324 to clarify that this state bonding authority would be available to public entities. Another option, which is not mutually exclusive and which we also recommend, is enactment of legislation which would authorize the establishment of geothermal (and perhaps solar and other) heating districts, with full powers to issue revenue bonds. The advantage of special heating districts is that they can be tailored to the specific needs of the particular enterprise. They also can transcend existing political boundaries and thus avoid jurisdictional problems where a reservoir or service area is in more that one city or county. Any geothermal heating district should have, in addition to the power to issue revenue bonds, the authority to receive government grants, sell heat and finance new development even beyond its boundaries, set rates, use eminent domain, tax, and set special assessments. It should also have the power to engage in all phases of geothermal development.[17] This latter recommendation is made even in the light of previous statements regarding the difficulty of government

entities taking the risks involved in geothermal exploration, since often federal grants in effect assume that risk. In addition, as the industry becomes more sophisticated, that risk may diminish.

Another possible option would be amendment of the State Revenue Bond Act to make it clear that at least general law cities can finance geothermal heat distribution systems. However, geothermal heating district authorization would be specifically designed to allow efficient operation of the system as well as financing the system, and would under any circumstance render amendment of the Revenue Bond Acts superfluous.

### 3. Refinancing Private Projects

We have used as a model for discussion the transfer of a project from a private developer to a public entity which will distribute the resource. We have used this transfer to avoid public utilities regulation of the developer (discussed infra.) and to take advantage of tax-exempt bond financing and thus decrease the effective project cost to the developer. With the passage of AB 2324, the California Alternative Energy Finance Authority, and AB 74, the Industrial Development Bond Authority, there is now a way to refinance the project without a transfer using tax-exempt bonds at the stage where the resource is proven. This refinancing would also decrease the project's cost, but distribution of the resource would remain in private hands. The developer could refinance the project with sufficient funds to repay the initial loan (most likely guaranteed by the DOE) and to replace the equity capital that was initially invested. This process of refinancing, which does not involve a sale, should enable the investor to retain substantial tax benefits and show a cash profit without a tax liability. The process is similar to that of refinancing a personal residence, a maneuver that can generate additional cash and yet not involve a taxable gain.

The key to whether refinancing is a better option may be the determination of the value of the investment tax credit versus the lower financing costs. The laws surrounding the investment tax credit preclude taking the full credit if tax-exempt financing is used. As stated before, in considering the sale to a public agency, the conversion to tax-exempt financing may best serve to reduce costs if it is delayed to such a time that the tax benefits that might be lost would be more than offset by the lower interest rates provided by tax-exempt financing.

Basically, AB 2324 and AB 74 provide the authority in state law for private projects under the aforementioned $1 million and $10 million limitations, or otherwise exempt, to be financed out of state or local bond issues. AB 2324 is definitely applicable to this refinancing at the distribution stage, but the applicability of AB 74 is questionable. (Section 91503(a)(2) allows financing of energy projects but specifically does not include distribution, and Section 91503(b)(5) precludes financing of gas and electric distribution.)

Use of tax-exempt financing either through industrial revenue bonds at the local level or state authority as a result of AB 2324 will require approval for financing the private project by a state or local government authority. At this time, the public officials should expect the developer to demonstrate what public benefit will derive. In certain projects, such financing might be necessary to make the project feasible. In others, it would serve to reduce costs, and the resulting savings that could then be split between the consumers and the producers.

All of this again points out the need to develop some practical financial models that take into account the tax benefits from the variety of tax issues involved in these developments.

The disincentives of PUC regulation still remain in any refinancing where the systems remain in private hands. However, we have

recommended (infra.) the elimination of such regulation based on rate of return where the consumer is protected by government pricing control input at the supply contract stage as a return for its providing tax-exempt refinancing.

## C. Public Utilities Regulation[18]

We have discussed the necessary preconditions and incentives to direct heat geothermal development, the advantages of borrowing money at lower rates through the issuance of tax-exempt bonds and the legal authority of local agencies to issue such bonds. Before an array of institutional options can be fashioned to utilize these incentives and advantages, it is necessary to take into account the spectre of regulation of direct heat geothermal development by the California Public Utilities Commission.

The California Public Utilities Commission (PUC) historically regulates businesses which could be considered natural monopolies. This regulation takes three forms, market entry, rate setting, and securities regulation. Control over market entry entails the granting of a franchised monopoly if a showing of public convenience and necessity is made (Section 1001, Public Utilities Code). The applicant must show a demand, financing ability and reasonable rates and charges. The key issue in indicating a demand is that there be no duplication of existing services. This has been construed to mean that it not be identical in kind to existing services (i.e., gas for gas, electric for electric). Introduction of another energy source is not considered duplication. Securities regulation encompasses the necessity of prior PUC approval of the issuance of stock. PUC rate regulation involves limiting utilities' charges based upon three calculations:

(1) invested capital net of depreciation on plant and equipment in actual use plus interest paid during construction for newly opened plants;

(2) operating expenses; and

(3) fair rate of return which is the weighted average of the actual interest cost of debt instruments and the prevailing market rate for equity for companies with similar risk characteristics. The PUC currently allows an additional .5% return on renewable resources investment to include geothermal (PU Code, Section 454(a)).

We have found the possibility of regulation by the PUC, particularly where rates are involved, to be a very strong disincentive to resource developers from entering certain areas of geothermal development. The prospect of having a government agency control or limit profits that result from high risk exploration does not appeal to most resource developers. In addition, the 15% supplementary investment tax credit allowed by Section 301(a) and (b) of the Federal Energy Tax Act as amended by the Windfall Profits Tax Act does not apply to equipment owned by an entity whose rates are regulated by a State Public Utilities Commission.

The law in California defines a public utility as including

> ". . . every common carrier, toll bridge corporation, pipeline corporation, gas corporation, electrical corporation, water corporation, sewer system corporation, wharfinger, warehouseman and heat corporation where the service is performed for or the commodity delivered to the public or portion thereof". (PU Code, Section 216(a)).

Thus, as a starting point a direct heat geothermal operation is a heat corporation. A heat corporation . . .

> "includes every corporation or person owning, controlling, or managing any heating plant for compensation within the state, except where heat is generated on or distributed by the producer through private property alone solely for his own use or the use of his tenants and not for sale to others". (PU Code, Section 224).

It also may be a water corporation, which "includes every corporation or person owning, controlling, operating or managing a water system for compensation within this state." (PU Code, Section 241).

> "Water system includes all reservoirs, tunnels, shafts, dams, dikes, headgates, pipes, flumes, canals, structures, and appliances, and all other real estate, fixtures, and personal property owned, controlled, operated or managed in connection with or to facilitate the diversion, development, storage, supply distribution, sale, furnishing, carriage, apportionment or measurement of water for power, irrigation, reclamation, or manufacturing, or for municipal, domestic, or other beneficial use". (PU Code, Section 240).

A direct heat operation is probably not a pipeline corporation, as this definition excludes pipelines carrying water. (PU Code, Sections 227-228).

Thus, a person or corporation supplying direct heat geothermal energy is a public utility and subject to the rate regulation, securities approval, and perhaps the market entry control (a water corporation is, a heat corporation is not (PU Code, Section 1001)) of the PUC, unless it fits under a specified exemption. The most notable exemption from regulation is that given non-privately owned utilities, including municipally owned utilities and special districts, such as geothermal heating districts. (Article 12, Section 3, California Constitution.)

Another series of exceptions are based on Section 216(a) of the PU Code, quoted earlier in the definition of a public utility which requires that ". . . the service is performed or the commodity delivered to the public or a portion thereof." Section 207 of the PU Code defines public or portion thereof to mean "the public generally or any limited portion of the public, including a person, private corporation, municipality, or political subdivision of the state." Thus, the public is very inclusively, if somewhat tautologically, defined. When this definition is read in connection with that of Section 216(c), it becomes clear that entities which indirectly deliver services or commodities to the public,

i.e., to another ". . . person, private corporation, municipality or other political subdivision of the state . . ." which in turn delivers to the public, are subject to PUC jurisdiction. However, there is an additional court imposed criterion: before an activity or service is subject to PUC jurisdiction, it must be "dedicated to public use". The courts have held that this dedication is evidenced by some act which the public reasonably interprets and relies upon as a willingness to provide service on equal terms to all who might apply and which results in a legal duty on the part of the utility to provide such services. (California Water & Telephone Co. vs. PUC (1959) 51 C2d 478, 494). This has been interpreted to mean that when service is provided to only selected customers through negotiated contracts, no dedication to public use exists, and PUC jurisdiction will not lie. (Richfield Oil Corp. vs. PUC (1960) 54 C2d 419). This public use rationale will also be effective to exclude the PUC from regulating sales of surpluses to selected users (Story vs. Richardson (1921) 186 Cal 162).

Also, as noted above, Section 224 of the PU Code excludes heat (but not water) corporations from the definition of public utility where the heat supplied is on the owner's property and is for his use or the use of his tenants or employees. Section 2705 of the Code does exempt water companies which deliver solely to their stockholders and certain political subdivisions. This exemption is not lost by delivery to a member or shareholder who then delivers to the public at large.

Under this legal framework, it is possible to enumerate many sale and lease arrangements where a developer and users can avoid PUC regulation. These can be set out along with the tax implications in individual project models. For the present, however, it should be noted that the sale of the resource and the plant by the developer to a public entity for the distribution of the resource to the public, and sale of the resource through negotiated contract with individual users, or sales of surplus heat are clearly not subject to PUC regulation. Under the current law, private, non-negotiated sales to residential users, may be subject to PUC jurisdiction. It is not clear whether the developer's leasing of the plant

equipment to a public entity which then distributes the resource to the public comes under the jurisdiction of the PUC. And it does appear that private selling of the resource to a public entity which then distributes to the public is technically subject to the regulatory jurisdiction of the PUC.

Both of these latter methods of transfer (selling of only the resource to a public entity, and leasing of the plant to the public entity) could be important measures for the developer to retain all or part of his investment tax credit upon transfer to a public entity. Thus, legislation to clarify that these types of transfer do not make the developer subject to PUC regulation may be necessary.

## IV. RECOMMENDATIONS

This paper has set out a series of institutional relationships whereby a developer can use a battery of available federal loan guarantee programs to spread his risk and that of his limited partners at the uncertain initial stages of geothermal development. While there is some perceived reluctance on the part of the private financial community to participate at this stage, even with loan guarantees, there appears to be at least some traditional financial institutions as well as Business and Industrial Development Corporations which will fill this void. The spectre of PUC regulation of private sales to utilities or public entities may discourage some developers, but this may largely be perceptual, avoidable with properly structured agreements, and certainly capable of legislative remedy. Thus, the only major institutional problem at the initial phase of direct heat geothermal development would be that of convincing larger numbers of potential users of the viability of direct heat geothermal energy for their operations.

The place where the scheme of encouraging geothermal district heating tends to break down is at the distribution stage. Because of existing institutional considerations (i.e., the possibility or likelihood of PUC regulation), and certain economies of scale, resource developers and utilities are not currently interested. Public entities would seem to be the logical institutions to step into this void, and could, in fact, bring direct heat geothermal applications into fruition more cheaply since they theoretically have access to tax-exempt financing. There are, however, some major difficulties with this supposition: (1) the problems of marketing traditional revenue bonds even for this supposedly safe phase of direct heat applications; (2) the absence of legal authority on the part of most local jurisdictions in California to issue revenue bonds for direct heat geothermal applications; (3) the apparent inability of the state to issue revenue bonds for local jurisdictions to take over distribution systems for direct heat geothermal energy; (4) the difficulty in securing

tax-exempt status under federal law for many geothermal heating projects involving industrial or commercial use that are over $1 million, one time costs, or $10 million, aggregate costs for the same beneficiary over a nine-year period. (Numbers (1) and (4) above would also apply to private entities under public auspices, should they wish to become involved.)

We do not believe it is the purpose of this study to choose between the public and private sector as the best institution to distribute the resource to industrial, commercial, and residential users. We do believe that it is incumbent upon us to recommend solutions which would enable both private and public institutions to deliver the resource, should they choose to do so. Thus, we recommend the following steps to solve the following enumerated problems:

## A. The Problem of Marketability of Revenue Bonds

### 1. Change the Federal Policy Concerning Federal Loan Guarantees for Tax-Exempt Issues Related to Conservation and Alternative Energy Development, Most Specifically, Geothermal Energy Development

Given the degree of regulation of energy producers and distributors and the institutional networks that are most likely going to be interested in direct heat use for geothermal energy, a logical distributor will often be a local governmental body, either a city, a county, or a special district. The review of the Boise project and the problems facing Susanville graphically point out the financial difficulties faced by potential local government sponsors of such projects. General obligation bonds are impossible to get approved in most cases. Revenue bonds are difficult to sell given the uncertainty about such a new industry and the always present possibility of failure which would result in loss to the bondholders. Private financing is generally more expensive, although massive tax benefits may make costs comparable. Nevertheless it is hard to

arrange and negotiate satisfactory terms and prices between a public agency and a private developer and such negotiation often results in a reduction of much of the benefit to the users.

A solution to the problem that is easiest and most sensible would be for the Federal Government to rescind its opposition to loan guarantees for tax-exempt bonds and develop specific guarantees under the GLGP to support geothermal direct heat development by local governments. The reluctance on the part of the Federal Government is based in large part on the previous Administration's effort to substantially reduce or eliminate the use of tax-exempt bonding both for local government-sponsored private ventures and for more traditional types of government involvement. The Federal Treasury reasons correctly that tax-exempt bonds are a major form of subsidy, reducing federal income from taxes to favor development of projects, public and private, that may or may not be that worthwhile. The thrust of the tax-exempt loan guarantee opposition is based on the belief that nothing should be done to expand use of tax-exempts.

Unfortunately, the policy now in effect has done little to curb the use of the tax-exempt bonds to finance projects as frivolous as municipal golf courses or small publicly sponsored industrial development bonds for almost any private commercial purpose, but the policy makes it nearly impossible for revenue bonds to be used by local governments to finance worthwhile conservation and energy development projects.

The most important precedent for federal loan guarantees for energy projects would be the Small Business Administration's loan guarantees for pollution control bonds. The program was spearheaded by the State of California, with the California Pollution Control Finance Authority playing an important role getting the program established and being the first to utilize the program. The CPFA program was designed to help California businesses finance costly government-mandated improvements for abatement of pollution. Initially the program was utilized almost exclusively by large companies such as Standard Oil of California. The large

companies were responsible for the repayment of the bonds, and given their excellent credit ratings, the bonds sold very well. As the Legislature and Administration became increasingly concerned with the fact that only large companies were using the program, the efforts began to get more small companies involved, but this presented a problem in terms of the ability of the agency to sell the bonds. The development of the SBA pollution control loan guarantees provided a 100% guarantee for bonds sold under the program, and the program has proven to be quite successful. (Unfortunately, this program may be in jeopardy.)

A federal loan guarantee program for energy-related tax-exempt bonds could focus exclusively on government program revenue bonds, or could be expanded to include small publicly sponsored industrial development bonds as well. As we have discussed, California now has authority to issue small industrial development bonds at the state level and has authorized such bonds at the local level as well. Further testing of the political climate surrounding the issue would provide better guidance as to whether it is better to seek merely a public revenue bond guarantee or also seek a more expansive industrial development bond guarantee as well. At any rate, it is clear that the Geothermal Loan Guarantee Program just doesn't work for public agencies attempting to develop their own projects without a private developer. The 90% guarantees and the interest differential payments (to make up the difference in taxable and tax-exempt borrowing rates) are helpful and certainly worth pursuing. However, private developers, using all of the tax benefits, can virtually eliminate the real cost of their 25% unguaranteed portion. A public agency has no opportunity to do so, and the agency or the bond buyer must accept at least 10% of the risk. For most local public agencies, working out the capacity to deal with risk is the issue. In addition, we have considerable doubts as to the continued availability of the interest differential payments.

California should not underestimate its ability to influence federal legislation. California's PUC is considered the leader in public

utility efforts for energy policy development. The California Energy Commission is a major force in energy policy innovations and the California congressional delegation is the largest in the nation. In addition, there are indications that a major focus of the Reagan Administration will be to use tax incentives rather than spending programs to effectuate public policy goals. Allowing federal guarantees for tax-exempt bonds covering 100% of the project rather than cash interest differential payments would clearly be consistent with this policy.

It is important to understand that these types of changes do not take place without considerable time and effort. We believe guaranteeing tax-exempt bonds is the most attractive option to substantially change the climate for direct heat geothermal development and merits substantial work on the part of the state. In addition, the benefits will expand beyond the realm of direct heat geothermal development if the concept is useful for a variety of local government energy projects, not just geothermal. This provides the potential for a wider coalition of interests than would be possible for a measure designed only to benefit geothermal development.

We have previously mentioned the great need for financial and management assistance to users and "packaging" aid to developers. Our other institutional recommendations have provided for this (See A., 2 and 3, infra.). However, while the development of federal loan guarantee authority for tax-exempts would largely solve the major financing problems which we see remaining for direct heat geothermal development, the question of providing technical assistance to users and developers would remain. Local governments can issue revenue bonds or industrial development bonds, and the California Alternative Energy Source Financing Authority (AB 2324) can issue industrial development bonds as well, but there is no source of long-term expertise to promote geothermal development by acting as a technical and financial consultant to local governments or businesses potentially interested in geothermal development.

In conjunction with pursuing guarantees for tax-exempt bonds, we recommend that California seek federal funding and possible state funding from the monies available through the geothermal lease program to establish an office of geothermal development, staffed with both technical and financial experts, who are capable of acting as advisors to local governmental agencies within whose boundaries there may be direct heat geothermal potential.

The financial advisor could work with the local government to arrange a deal for a private developer to develop the resources with subsequent arrangements for sale of the facility or resource, tax-exempt buy out or refinancing, and a loan guarantee for the financing. The technical consultant could provide advice on choosing contractors and developers, making sophisticated decisions on the viability of the project, given known characteristics of the resource and the users, and also help determine the economic feasibility of the project. This kind of assistance requires a certain degree of sophistication and could be carried out in part by long-term on-call contract arrangements rather than full staffing of the office itself. Nevertheless, the office will need full-time direction and a specific geothermal responsibility.

A major thrust of the effort to seek federal guarantees for tax-exempt revenue bonds for publicly sponsored private projects should include a clear understanding of the big business bias of the present policy against loan guarantees. Big business can take advantage of the existing state and local bonding authorities by its ability to provide the necessary credit security to potential bond buyers. Small businesses are unfairly restricted from access to this low-cost source of capital, given their inability to assure payment from their other corporate operations regardless of the prospects of the specific expenditure supported by the bond sales. Again, California is in a logical position of leadership on this issue, having spearheaded the development of the Pollution Control Bond Guarantee Program. Potential allies in the battle could well include

the National Federation of Independent Business, the National Small Business Association, and many small business advocates in Congress and the Administration in Washington.

2. Establish a California Geothermal Finance Insurance Program

Our initial inclinations were to suggest a California Geothermal Finance Authority, with full powers to issue revenue bonds (an option that has been moved to third place and will be covered in the next section). However, the passage of Proposition 8, and of AB 2324, its implementing legislation, establishing a California Alternative Energy Source Financing Authority and the passage of AB 74, allowing for local governments to issue small industrial development bonds, were instrumental in suggesting another approach. In addition, the tax laws require recapture of certain tax benefits if there is a sale of the property to a public agency for conversion to tax-exempt long-term financing. These basic considerations suggested that issuance of three types of bonds would be useful in different situations, with existing bonding authority available for all three if the risk issues could be resolved. Local governments that have the authority could issue revenue bonds for projects they would own, or they could issue industrial development bonds for privately-owned geothermal projects. Finally, if a local agency is not available for such bonding, the State Alternative Energy Financing Authority can issue the bonds to support privately developed projects. All three bonds could be tax-exempt under existing Federal law if kept under the $1 or $10 million dollar limits, if fitted under a specific exemption discussed supra, or if less than 25% of the output of the particular project goes to commercial entities.

The main difficulty is that all three bonds are revenue bonds. As previously mentioned, revenue bonds do not guarantee payment to the holder as does a general obligation bond, so the issue becomes one of whether the bonds can be sold, not a matter of authority to sell.

Given the preference of a federal guarantee, but faced with the fact that the State of California cannot force the Federal Government to develop such a program, the question then remains what can the State of California do itself to encourage geothermal direct heat development? The state cannot guarantee as does the Federal Government unless the full amount of the guarantee has been budgeted from currently available funds regardless of the probable loss rate.

While the state cannot guarantee loans, it can develop an insurance program approach. The difference between an insurance program and a guarantee program is that a guarantee is available to back all losses regardless of how many occur, while an insurance program is limited to the amount in the insurance fund. For example, if there were $100 million in bonds, backed by an insurance fund of $15 million, any losses would be covered as long as the losses did not exceed 15% of the total, or the available $15 million.

There is a precedent in California for an insurance pool approach to stimulating private finance. The California Job Creation Program which was designed to stimulate bank loans to minority and disadvantaged business. The program was established in 1969 and was initiated with a $300,000 reserve fund, and an agreement that in exchange the state's major banks would form regional corporations that would agree to lend $2 million. The structure and management of the program encountered problems that are extremely instructive in terms of the problems we will face in developing a similar program.

The Cal-Jobs program was based on an agreement among the major banks to loan individually, but to share a reserve. The problem which could and did arise was what would happen if losses exceeded the amount in the reserve. Would the loss be prorated to each lender under the program, or would the loss be paid in full to the first failures, and if there were losses in excess of the reserve, would the other failures be covered at

all? Under a "sharing" concept, in which loss would be prorated, would this mean that no loss could be paid out until all liabilities were fully realized, or would the losses be paid, with a claim at a later date against the beneficiary of earlier insureds?

Unfortunately, in the case of Cal-Jobs, these questions were never really answered. The solution was for the banks to become actively involved politically and thus they were able to get appropriations to increase the reserve fund in excess of the amount necessary to cover the fund needs. *

Another more practical approach is likely to be the pooling of a group of bonds and negotiations with a single bond buyer of some size to agree to purchase a group of bonds with an agreed upon reserve value. For example, a major bond purchaser (e.g., Bank of America) may agree to buy $25 million of bonds backed by a $5 million reserve, with certain conditions as to acceptance of the individual projects that make up the portfolio. The conservatism of the bond buyer regarding project selection would presumably vary with the size of the reserve.

The insurance fund would require initial funding, but could eventually be self-supporting, and might even pay back the original funding. The bonds sold may well involve an insurance fee. There is considerable interest savings between a taxable bond and a tax-exempt bond. A modest insurance fee could raise a substantial insurance fund over the life of the bond and yet still yield a total interest cost lower than would be the case with a taxable bond or other private financing.

Since the financings are long term, a 1% annual fee can generate a substantial insurance fund over the life of the financing. An amortized

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* The California Housing Finance Agency and the California Veterans Housing Authority have also utilized percentage loss reserve funds. The existence of these funds does not have a direct correlation here since houses or mobile homes are inherently better collateral than geothermal equipment.

loan over a 20 or 30 year life will generate a reserve of 15% or 20% over the life of the amortization (the 1% fee would apply to the outstanding principal so the fee would drop slightly each year on each amortized loan). The reserve fund would be available to fund the next set of bond sales, as would the initial $5 million reserve once the initial set of bonds are paid. There is additional income from interest, and a possibility of setting up the agreement so that the reserve could be reduced on the initial portfolio a few years down the road, if success suggests that the reserve isn't necessary.

Again an example may best explain the potential. The $5 million reserve for the $25 million in bonds might be set up to allow for a reduction by $200,000 each year, either by use to cover a loss, or by returning the funds to a bond insurance pool for future use for other bonds. For example, if after five years there were no losses in the portfolio, the required loss reserve would be reduced to $4 million, freeing up to $1 million for new projects. On the other hand, if losses had been $800,000, for example, only $200,000 would be freed up for other reserves.

The program could also allow for some flexibility in the insurance rate based on actual performance of the participating borrowers. If necessary to cover losses, the insurance rate could be raised to as much as 2% on the loans from the base 1%.

The manager of the insurance program would need to have the capacity to negotiate these conditions under fairly flexible guidelines to meet the needs of the bond marketplace and still provide an important financial advantage to the borrowers. The participation by borrowers is voluntary, so terms can be left flexible assuming that each borrower will determine whether the insurance is in his best interest.

Given the newness of the technology, it is unlikely that a private insurance program would meet the broad energy goals of fostering a more wide-spread utilization of direct heat geothermal energy. A private

insurer would readily accept the virtually riskless projects, but would avoid other projects which although somewhat risky, could prove extremely beneficial to energy users. The public program would need to be prudent, but could attempt a broader application of the insurance to encourage development. It is possible that private insurance will be feasible later on. If effective, ten or twenty years down the road the state could seek bids by insurers to purchase the insurance program and continue the activity free of any government role. Except for the funding to get the program started, no long-term subsidy is anticipated, and there are no specific tax advantages to the state being the insurer rather than a private entity.

We have previously stressed the need for providing management and technical assistance to developers and potential users. There may well be a need for the funding of these management and technical assistance aspects within the administration of the insurance fund, during the early years of the program. Given the broad authority and range of energy issues that will come before the California Alternative Energy Source Financing Authority (AB 2324), it is unlikely that there will be focused geothermal direct heat expertise. Even if that were the case, bonds may be issued by other entities, especially local governments, and they would have no direct relationship with the Alternative Energy Source Financing Authority. The insurance program is the logical place to locate the technical assistance.

The management and technical assistance arm of the program could initially be supported by seeking both state and federal funding, and eventually may be supported by the excess income from the reserve fund. The belief that successful projects can afford to provide a subsidy -- in order to meet management and technical assistance costs, to overcome the elements of risk involved with broader development of geothermal energy, and to support the insurance program -- is founded on the fact that the insurance program will likely provide substantially cheaper financing than would be available without the insurance, especially if the only alternative is private development with conventional financing.

It is important to point out that, with the exception of the short-term profit to the private risk-taking developer during the first two phases of development, the tax-exempt bond financing and insurance program will generally favor the concept of passing along the benefit of lower priced energy to the consumer. The consumer, through access to the low-interest financing, can control the costs and ownership of the resource (usually through a local governmental structure) and, therefore, reap the benefit of the lower cost. One can assume that if this profit were passed on completely to the developers, developers would be able to translate the higher potential profit into a willingness to pay for more exploration, take more risk, and even to promoting use through management and technical assistance to potential users. Thus, the governmental role of attempting to keep prices down takes some of the market profit from the private developer and thus reduces private resources and incentive for further development. If this is the case, the government must take the responsibility to encourage risk-taking and development. The loan guarantees and other incentive programs do this, but the insurance program should actively pursue expansion of development as part of its responsibility.

While the use of tax-exempt bond financing can reduce interest costs approximately one-third and be a major benefit to geothermal development, two other aspects of the program are as important. The first is the system of centralized permanent management and technical assistance to advise potential users, especially public agencies. If each local agency must begin its geothermal education from a ground zero base, the process of project development will be slow and painful, and lag far behind the real economics of geothermal direct heat use. The second is the insurance program or a change of policy by federal authorities regarding guaranteeing tax-exempt bonds. This will enable local agencies heretofore incapable of taking any risks to pursue direct heat projects by spreading the risks involved. Again, it is worth pointing out that the considerable tax benefits may act to encourage private development with a sale of heat

to the public agency, at least for a period of several years. This fact may reduce the need to encourage programs to insure public finance, and may well place the emphasis on refinancing at a date several years after the initial development when the response of the bond market may be more favorable to geothermal direct heat development.

3. Establish a State Geothermal Finance Authority

For a good part of the contract, the inclination was to suggest the formation of a state geothermal finance authority capable of issuing bonds for both local governments and for private projects. The Geothermal Finance Authority would encompass the same "insurance" characteristics as the insurance program now given priority over a Geothermal Finance Authority, but with the added capabililty of issuing bonds directly with new legislative authority to issue such bonds.

Probably for good reason, the state is reluctant to establish too many state bonding agencies for fear of losing control of the quality and volume of tax-exempt bond issues. Thus, given the other options available with the passage of AB 2324 and AB 74, a Geothermal Finance Authority at this time does not seem to have such significant advantage to justify its selection in the face of predicted political opposition.

Nevertheless, a Geothermal Finance Authority is certainly one of the major options that should at least be understood, if not favored at this time.

A State Geothermal Finance Authority, issuing bonds through its own bonding authority, would still face much of the same difficulty that suggests the need for an insurance program. Individual bonds for individual projects would face the same potential project-by-project risk that make the bonds difficult to sell. The Authority, to be successful at issuing bonds, would require some initial funding to provide a loss reserve and would require an insurance program to generate a larger future cushion

in order to continue to add to the number of projects covered by the Authority. Except for the fact that the Authority would issue bonds directly rather than supporting the issuance of other public agencies, the costs would be similar to the insurance program.

The Geothermal Finance Authority would also need to provide the management and technical assistance that is already suggested for the insurance program. The only major difference would be the need of the latter to coordinate between bond issues and the insurance program rather than having full control of the bonds and the insurance. However, given the more attractive political prospects of the insurance program rather than the Geothermal Finance Authority, it seems that this is a small price to pay in return for much brighter prospects of implementation.

## B. Disincentives to Direct Heat Geothermal Development Resulting from State Public Utilites Regulation

### 1. Change the Scope of Activities Regulated by the Public Utilities Commission in Section 216 of the Public Utilities Code

The current definition of activities regulated by the PUC technically includes indirect sales to the public, such as sales of heat by private operators to public entities which then distribute to the public. The spectre of this regulation could discourage private involvement at the development stage where, for tax purposes discussed earlier, there would be a lease or a deferred sale of the district heating plant by the developer to a public entity, but with an interim supplier relationship. Conversations with the PUC staff indicate that the PUC has no interest in regulating these sorts of activities, particularly if it will stifle the development of a direct heat geothermal industry. Under current law, the PUC does not regulate the use of cogeneration technology where sales of electricity from a cogenerator or of waste heat from a power plant are involved (PU Code Sections 216(d); 218.5). In addition, the PUC does not

exercise jurisdiction over electric plants which are leased or sold to a public agency (PU Code Section 246). Under current practice, sales of steam from resources developers in the Geysers to PG&E are not regulated. (This may well be that since electric power sales resulting from geothermal steam plants of under 80 megawatts are not regulated, it would be counter-productive from a policy point of view to regulate steam sales which result in electric power.) Thus, it appears that such supply sales from the private direct heat developer to a public entity are well within the philosophy of non-regulation expressed by these laws and practice, and that it would be reaching to call them indirect sales to the public. However, the mere possibility of regulation could make valuable tax incentives less effective by requiring early sale, and may deter some private development altogether. Section 216 of the Public Utilities Code should be amended to clarify that it does not apply to sales of geothermal heat by a developer to a public entity, or leasing arrangements to a public agency. *

2. The Public Utilities Code Should be Amended to Provide for Excluding the Rate of Return Basis for Regulating Direct Heat Geothermal Energy Sales to the Public if They are Below a Certain Threshold Number of Either Therms or Households Supplied, and if the Heating Plant is Financed with Bonds Backed by the State-Sponsored Insurance Fund (Discussed infra.)

The private sector (utility or developer) will not become involved in distribution of geothermal energy if his rate of return is based upon his costs. We believe that as long as these charges do not exceed the cost of other conventional energy, the consumer is protected,

* The PUC staff has indicated that the Commission would most likely support such clarifying legislation. (November 10, 1980 letter commenting on the draft report of William N. Foley, PUC General Counsel to Michael Gersick, Deputy Director, Department of Conservation)

and there remains an incentive for the private sector to take part. This exemption will not remove the reluctance of the typical geothermal developer to get involved in the unfamiliar business of public distribution, nor will it change the economies of scale that have kept some utilities from considering participation. However, it will remove a major cloud from development of direct heat geothermal energy, and, when combined with existing tax advantages and possible access to tax-exempt financing under the new state laws, might just provide the stimulus for some developers and utilities that were on the fence.

There is a valid concern that total elimination of PUC rate regulation would leave the consumer unprotected. That is why we have recommended that the exemption be granted only where the state has leverage in the contract to provide service, i.e., where the effort is in some way financed and insured by the public (infra.), and that the basis for this leverage be the cost of other energy. Thus, a necessary part of this recommendation would be PUC approval of an initial service contract based upon not exceeding the costs of conventional energy, before any public bond refinancing. *

## C. Federal Tax Law: Questionable Tax-Exempt Status for Certain Geothermal Projects

### Amend Section 103 of the Internal Revenue Code

Whenever more than 25% of the output of a direct heat geothermal project is used either industrially or commercially, as may be an economic necessity, the tax-exempt status of any bond issued by a public entity to

* The PUC staff appears to favor total exemption from regulation of operations below a designated size, but is leery of indexing based upon costs of the fuels. We view this as a major step forward, but do not retreat from our position that PUC approval of the initial service contract based upon the costs of other energy be required where tax-exempt bond financing is used. We recognize that this is a complex area and welcome further debate on the subject (Foley letter to Gersick).

finance it is called into question. There are exemptions, of course, if it can be called part of the development of an industrial park, or if single project costs are less than $1 million or aggregate costs for the same developer are less than $10 million over a nine-year period.

There may be projects that do not fit within these exceptions. Were they similar local electric, gas, or traditional water projects, the bonds issued to finance them would be tax-exempt. Direct heat geothermal was not considered a viable means of supplying energy at the time of the drafting of this section of the tax code; with proper tax treatment it could be now. The State of California should lobby for equal treatment of this form of alternative energy. The best way would be a clean change in Section 103 of the Tax Code. If this would take too long, or if it were politically infeasible, the lobbying efforts should be focused on changing, by regulation, I.R.S. Ruling 78-12 which excludes steam (and perhaps derivatively, hot water) from the exemption granted interest on bonds financing water supply and delivery systems from taxation, even if more than 25% of the output is used for trade or business purposes.

## D. State Law: The Problem of Lack of Authority of Local Governments to Issue Revenue Bonds

### Amend AB 74, AB 2324, and Enact Geothermal Heating District Legislation

As we discussed previously, only charter cities which have broad powers with regard to municipal affairs have the unequivocal authority to issue revenue bonds for direct heat geothermal distribution systems under state law. AB 74 now provides a means for local agencies (cities or counties) to issue revenue bonds for a variety of small private projects to include energy projects (Section 91503(a)(2)). It does not include distribution of energy, and specifically excludes distribution of electric energy and gas (Section 91503(b)(5)). Whether this excludes distribution of direct heat geothermal energy in many or all cases is not clear, since there are other uses of this bonding authority (such as all phases of

industrial and agricultural processing) which are allowed. Any clean-up legislation for AB 74 should make it clear that distribution of direct heat geothermal energy is a permitted bonding activity.

Even if AB 74 were to apply unequivocally to distribution of direct heat geothermal energy, it would not solve the problem for non-charter local entities who wished to finance and operate a direct heat geothermal energy distribution system. AB 74 applies only to private projects. A similar difficulty seems to obtain where AB 2324, the California Energy Source Financing Authority Act, is concerned. Its definition of "participating party" (Section 26003(c)) does not specifically include government entities among those whose energy projects can be financed out of the $200 million in revenue bond authority given this state body. While a case could be made that such entities are covered, conversations with legislative staff indicate that this was not the thrust of the bill. This philosophy should be rethought since local public entities may be the only institutions willing to distribute the very viable alternative energy technology of direct heat geothermal applications, and AB 2324 should be amended to specifically include public agencies as among those institutions whose projects can be financed.

Even with a state alternative energy finance authority, local agencies should have the flexibility to finance distribution of direct heat geothermal energy on their own. There are two ways in which this would be achieved. One would be to amend the State Revenue Bond Act(s) to include distribution of direct heat geothermal energy as a permissible <u>enterprise</u> for local government to fund through revenue bonds. The other would be the passage of new state legislation authorizing the creation of geothermal heating districts which would have the power to issue revenue bonds to finance a variety of direct heat geothermal operations. We favor the latter approach since a geothermal heating district authorization can be tailored to grant a variety of other powers necessary to deal with a variety of situations peculiar to direct heat geothermal energy.

All of the above recommended changes in bonding authorities assume that the bonds issued by the local entities would be covered under the insurance program recommended earlier.

## V. BROAD ISSUES REGARDING ENERGY POLICY IN CALIFORNIA

### A. Fuel Alcohols

One of the most immediately promising uses of geothermal direct heat is for alcohol fuel plants. The single most important input for alcohol conversion in terms of energy use is the substantial amount of heat to process the biomass to fuel alcohol. In fact, many people believe that the heat energy required for this process is so great that fuel alcohol will not be a significant source of energy. But if instead, the heat comes from a renewable source such as geothermal energy, the production of liquid fuels is much more cost and energy efficient, creating a real net increase in available energy supplies. As an example of the interest in these projects, of the 22 direct heat grant applications received at the Oakland office of DOE, 17 are related to fuel alcohols programs.

Developers of geothermal and fuel alcohols programs are going to be involved in a variety of attractive financial options. Federal loans or loan guarantees are available for both kinds of energy development. Fuel alcohol plants are eligible for up to 90% guarantees of loans equal to as much as 90% of total project costs, and geothermal projects are eligible for 100% guarantees of loans equal to 75% of project costs. Nothing prevents a developer from seeking assistance from both programs. Both have similarly attractive investment tax credit provisions.

The important aspect of fuel alcohol plant development is the fact that the industry is just beginning. The location of plants, in addition to proximity to a feed stock source, can be altered to conform to sources of low cost heat energy. Heat energy is an extremely important part of the energy and overhead requirement to run a plant, and a location remote from population centers is generally not a disadvantage because the product (fuel alcohol) and the by-products are generally marketable in farming regions. In fact, since there is often a transportation cost for fuels processed in urban locations, the competitive advantage to rural locations can be better than for urban locations.

The institutional changes which we have suggested here could easily lend themselves to supporting the development of geothermally-fired fuel alcohol plants.

## B. Tax-Exempt Financing for Guaranteed Loans

Direct heat geothermal development is going through a transformation not unlike a variety of other alternative energy options. There is increasing evidence that the money spent by DOE on demonstrations and research, the rapidly rising prices of conventional energy, and the attractive subsidies, mostly in the form of tax incentives, make more and more potential geothermal direct heat projects economically feasible. "Economically feasible" basically means that an economist or accountant can show that use of geothermal direct heat would be less expensive, given our best forecasts on costs and options, than continuation of traditional heat energy sources. The issue increasingly becomes one of financial and institutional barriers rather than technical and economic barriers.

It is appropriate that the California Energy Commission, the Department of Conservation, the California PUC, and the Business and Transportation Agency are effectively ahead of the Federal Government in placing greater emphasis on breaking down the financial and institutional barriers to energy conversion and conservation rather than continuing to focus almost exclusively on technical and economic factors. With this basic perception of the problem in mind, the several observations seem important.

Inasmuch as local political entities, cities, counties, special districts, etc., are the logical focus of a variety of alternative energy programs such as geothermal heat, other district heating, wind powered water pumps, garbage conversion, sewage conversion, and cogeneration, it is important that these entities have adequate financial tools available to them. The political impossibility of general obligation bond financing and

the marketability problems of traditional revenue bond financing documented in this paper with regard to direct heat geothermal energy are also applicable to other forms of alternative energy.

There are several possible solutions to this problem. On the state level, the insurance concept suggested for tax-exempt Geothermal Direct Heat project bonds could be expanded to cover a variety of other technologies. Whether a coordinated program combining different technologies into a single insurance agency or formation of a series of insurance agencies would be most effective, is hard to determine, but either approach should include dividing the insurance management into groups of specialists in each area so that the management and technical assistance is combined with source of insurance.

On a federal level, a possible solution is provided by a change in policy concerning guarantees of tax-exempt issues. There are two types of bonds that could be supported by such a guarantee program. One would be to guarantee revenue bonds for publicly-owned projects. The other would be to guarantee tax-exempt industrial revenue bonds. Getting federal acceptance of the first option is much more likely than the second, but either would have to be pursued not only at the Department of Energy, but at the Treasury as well. The Treasury Department, especially in the Carter Administration, has shown a great aversion to encouraging tax-exempt financing, especially of privately-owned projects as is the case with industrial revenue bonds. The argument to Treasury must suggest that the lost revenues from tax-exempts being issued would be more than offset by the rapid pace of alternative energy development that would result, possibly leading to a more expansive economy and increased overall tax revenues. This is obviously a complex issue with many ramifications, but it is hard to identify a more important issue to alternative energy commercialization.

## C. Objectives for Publicly Operated Alternative Energy Financing Institutions

A key issue to the success of the programs with both a business and a broader socio-economic purpose, is defining the proper objectives for success of the program. Private businesses are blessed with a simple objective, which is to make as much money as possible consistent with running an ethical business and with an understanding of both short-and long-term profit objectives. For an agency such as the Alternative Energy Source Financing Authority or a Geothermal Insurance Fund, the objectives are more complex. On the one hand, there is a desire to be profitable, but on the other, there is a desire to accomplish a social goal by encouraging as much energy conversion as possible. Managing the Alternative Energy Source Financing Authority or the Geothermal Insurance Fund, like management of the new solar BIDCO, for example, will require that the state, the directors, the management, and the users all have some clear concept of what the basic objectives and criteria for success will be. For example, will the new BIDCO be successful if it turns out to be profitable, but to do so, assumes a very conservative financing position, taking little risk, supporting little innovation, and possibly stealing away investment opportunities from the private sector? Or would it be more successful if it showed less profit or even a loss, but managed an aggressive and innovative portfolio, passed on proven investment opportunities to the private sector once its participation was no longer absolutely necessary, and continued to seek out and encourage new start-ups and other creative forms of business that entail greater risk? The natural tendency will be for the new BIDCO to accept the first path, opting for a conservative and profit-oriented approach since this will generally assure the least risk on the part of the BIDCO management.

For our State Geothermal Insurance Program, a similar dilemma will exist. The bond market will force a conservative approach to risk taking and bond sales, but the management and technical assistance provided, the use of funds from one project to help another, and the aggressiveness of the agency dealing with bond markets will all become

important elements of whether the geothermal insurance program is truly successful, or is successful only in respect to avoiding financial difficulty.

## D. Mandating Alternative Energy

This paper has focused on the inertia that impedes geothermal use even where it is economically feasible. This is part of a more complex set of issues involving the requirements to get alternative energy implemented when it is economically competitive, but when institutional factors militate against its use. For example, a developer of a housing tract or an industrial complex may only consider alternative energy if forced to do so by government authorities, even if the economics are good. The developer is not the one who will pay an energy bill over the ensuing decades and may very well not want the bother of exploring energy alternatives. He may or may not consider the user and certainly will ignore the drain on resources available to other users. The residents of the development may also have access to average-priced energy that hides the true economic costs of using conventional energy compared to the use of alternative energy, including geothermal energy.

A condominium development project in Mammoth Lakes may go up using electric heat and air-cooled fireplaces. Electric heat is cheap to install and air-cooled fireplaces, although inexpensive to install, don't provide any heat. There are very possibly significant geothermal heat resources that could be economically developed in Mammoth Lakes. Such development would reduce electric demand, and reduce the need for oil to provide the electricity for these units, which are mostly high-cost luxury vacation condominiums. Others share in the cost of the electric heat for the condominiums, by having to divide what low-cost electric energy is available, from hydro and geothermal resources, with a larger number of users.

Consideration should be given to effective state or local restrictions that would at the very least require such developments to

utilize alternative energy if it were economically competitive, with the economics based on true costs rather than on the biased costs of the developer. Certainly, these are complicated issues, already much discussed by the Energy Commission, among others, but it would be remiss not to point out that this activity would do much to speed energy conversion and overcome the bias of average-price power sales.

## E. State Land Use Policy

We have mentioned at the beginning of this paper that the location of low-heat geothermal resources away from population centers need not be a disadvantage. Rural unemployment problems and high-energy prices, coupled with demographic trends, nearness to agricultural production areas, availability of buildable space, and favorable community attitudes, combine to make rural communities with low-heat geothermal resources ideal for certain types of industrial development where heat is a major part of the process. This includes industries such as agricultural processing and fuel alcohols production.

It is important that the state and local governments recognize this in any business development or environmental planning efforts that are ongoing or will occur in the future. Should the state ever again consider industrial siting or agricultural land use legislation, emphasis should be given to the location of agricultural processing and other heat demanding plants near geothermal resources susceptible of direct heat use. Government should also consider incentives or requirements that result in the utilization of the waste heat from such plants for residential, institutional, and commercial space conditioning.

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10. Magliano, Vito, "The Current Status of the Geothermal Loan Guarantee Program", Special Report No. 9, Geothermal Resources Council, June 1980, p. 77; Paul Rodzianko, "Business Related Factors", Technical Training Course No. 4, op. cit., p. 2; Letter commenting on Draft Report from Paul Rodzianko to Michael Gersick, November 13, 1980.

11. Letter commenting on Draft Report from Vito Magliano, U.S.D.O.E. to Michael Gersick, November 6, 1980, p. 3.

12. King, Nimmons, Hanemann, The Role of Gas and Electric Utilities in Direct Applications of Geothermal Resource, Earl Warren Legal Institute, March 1980.