DOE/ET/27241-T2 M+R 27241 8.1

J. M. Energy Consultants, Inc. Report No. 1029

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DOE/ET/27241--T2

DE82 008499

An Analysis Of The Obstacles To Financing Geothermal Hydrothermal Commercialization Projects And The Government Programs Designed To Remove Them

March 20, 1981

Prepared For The Division Of Geothermal Resource Management, Asst. Secretary For Resource Applications, U.S. Dept. of Energy, Pursuant to D.O.E. Contract No. DE-AC03-79-ET-27241

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TABLE OF CONTENTS

Page	
i	TABLE OF CONTENTS
1	CHAPTER ONE: Introduction - The Risks Associated with Geothermal Hydrothermal Commercialization and Their Impact Upon Project Financing
13	CHAPTER TWO: The Federal Government's Response - Programs Designed to Ameliorate Risk and Provide Financial Incentives

CHAPTER ONE: Introduction - The Risks Associated with Geothermal Hydrothermal Commercialization and Their Impact Upon Project Financing

Introduction:

Commercialization of geothermal hydrothermal resources in the United States began in the late 1950's with the exploration, development and production of the dry steam hydrothermal field at The Geysers by Magma Power Co. and Thermal Power Co. This was followed rather quickly in the early 1960's by a flurry of exploration activities in the hot water hydrothermal systems of the Imperial Valley and Mono-Long Valley areas, of southern and eastern California, respectively. But unlike the situation at The Geysers, where commercial development has proceeded over the next two decades at an ever-increasing rate, commercial exploitation of the West's numerous other hydrothermal fields stalled rather abruptly and has only recently begun to show signs of life. Why has hydrothermal commercialization of these non-steam hydrothermal systems not kept pace?

A close examination of these two contrary trends reveals that there existed a distinct set of differentiating circumstances which have served to block commercial growth outside The Geysers and delay hydrothermal geothermal's ascent to a more prominent role in America's energy fuel hierachy. All of these various differences fall under the loose heading of "risks" if we accept the definition of "risk" as "the possibility of suffering harm or loss."[1] For it is their presence which has conjured up dark images of "possible loss" in the minds of investors, bankers and potential users for nearly twenty years, thus posing obstacles to financing hydrothermal projects.

These risks may be broken down into five distinct categories: 1) resource risk; 2) technological risk; 3) regulatory risk; 4) something we chall call "investment parity risk"; and 5) a factor we shall label "institutional risk aversion." We shall now deal with each of these in turn and attempt to assess their impact upon hydrothermal financing.

1) Resource Risk: This first type of risk is virtually unique to geothermal resources among energy fuels.[2] Hydrothermal utilization projects, whether for electric or non-electric use, must be sited on the producing field itself. Unlike a facility using coal, oil, uranium, or natural gas, a geothermal-based project is not independent of the vagaries and uncertainties associated with estimating the useful life of any subsurface mineral/energy fuel deposit or reservoir.[3]

Should the hydrothermal field developer's reservoir performance forecast prove incorrect and the field's productive

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1 The American Heritage Dictionary of the English Language (1976) at p. 608 (paperback edition).

2 Although hydroelectric power plants may also face it.

3 A coal-fired powerplant, it should be noted, is built and designed to burn only a certain specific type of coal.

capacity decline below that level required to supply the user's facility at any time prior to the end of its projected useful life, then that user faces lost investment dollars, replacement costs which in all probability far exceed those incurred in the initial geothermal project and, possibly worst of all, "lost" productive capacity while they scramble to get a "substantive" fuel and either retrofit their geothermal-based plant or build a new one elsewhere. For The Geysers, much of this risk was reduced during the 1960-1967 period as PG and E and Magma/Thermal matched their reservoir predictions to actual performance. But the far more numerous hot water hydrothermal systems could not use Geysers dry steam experience as a guide.

Looking at this senario from the perspective of the user and salting in the higher uncertainties associated in estimating geothermal reservoir performance, as opposed to oil or gas,[4] it is not hard to understand why geothermal field developers and both electric and direct users seemed to be constantly "talking past each other" in negotiations. The site-specific nature of hydrothermal and other geothermal usage is a risk-creating characteristic that is unique among energy fuels and thus new to the various user communities. Its role as a financial disincentive in blocking geothermal hydrothermal commercialization can hardly be overestimated.

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4 Telephone conversation between the author and E. A. "Pete" Sims, Pacific Res. Mgt. (Los Angeles), formerly of DeGolyer & McNaughton (Dallas).

2) Technological Risk: Assuming for purposes of argument that the resource-related risks we have noted could have been ameliorated, either generically or on a project-specific basis, hydrothermal resources still forced risks involving utilization technology. Unlike dry steam fields, hot water systems cannot fit into existing electric utility and industrial methods of energy fuel utilization. Conventional electric and industrial turbines are driven by steam, which is created by burning the energy fuel in question (coal, oil/gas or nuclear) under a boiler. By a quirk of its existence, The Geyser dry steam field merely cut out a step in this process, i.e., the combustion of the fossil fuel. Hot water systems, it might be argued, should have also found ready acceptance since it is a relatively easy process to convert hot water under pressure into steam by "flashing" it, i.e., suddenly reducing the pressure.

Unfortunately, there were several problems involved with such a procedure. First of all, "flashing" results in a large loss of fluid volume. At 150°C., e.g., almost none of the hot water is effectively transposed into steam most of it simply disappears.[5] At 300° C., by contrast, fully 33% survives for use.[6] Thus, only a few of the numerous discovered hot water fields were of sufficient temperature to even be considered for use by the "flashed steam" method. And by virtue of their very

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5 Donald E. White, "Characteristics of Geothermal Resources in Geothermal Energy (1972) (Kruger & Otte, Eds.) pp. 69-84, of 81.

6 id.

high temperatures, they contained numerous dissolved minerals which constantly "plugged up" and corroded well bores and other hardware and rendered the process extremely uncertain. There was also the problem of hydrogen sulfide (H_2S), carbon dioxide (CO_2) and other noncondensible gases which could survive the "flashing", causing air quality difficulties and putting back-pressure on the turbines. Thus, the ultimate performance of a "flashed steam" facility was open to question. Nor did any such facilities exist until the late 1960's - early 1970's, and all of those were outside the U.S (in New Zealand, Japan and Mexico).

If the hot water were to be kept intact and itself used to generate electricity, an additional problem arose. Conventional turbines all utilized steam, not water. Only hydro-electric power plants could be said to use water and they did so in a fashion totally inapplicable to the geothermal hydrothermal environment. A scramble therefore began to come up with a utilization technology that could allow the less-than-scorching (below 400° C) systems to be exploited. Without going into any great detail, the nominees have included the "total flow" concept,[7] the "helical screw expander" concept[8] and the "binary cycle."[9] Although these and others appear to present attractive

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7 Developed by Lawrence Livermore Laboratory.

8 Developed by Roger Sprankle.

9 Developed by several entities including the Magma group of companies (their patented "Magmam ax" process is presently being tested on a pilot plant at East Mesa). D.O.E. is also testing a binary concept at Raft River, Idaho.

long term prospects, as of this writing none have yet succeeded in eliminating the technology utilization obstacle to financing most hydrothermal commercialization projects. Technological risk was and is a major hurdle to geothermal hydrothermal commercialization.

3) Regulatory Risk: While the two types of risks we have just surveyed lean more to quirks of nature, the remaining three are for the most part man-made. What we have dubbed "regulatory risk" involves two major components: 1) Federal land management policies; and 2) Federal, State and local substantive environmental regulation in the areas of air quality, water quality and solid waste disposal.

We have dealt with both of these topics at some length in previous reports under this contract,[10] so we will not delve into their intricacies here, other than to point out how their presence has discouraged investment in geothermal hydrothermal commercialization. The Federal land problems, in particular, have beleaguered the hydrothermal industry for the entire twenty year period. It took nearly ten years for Congressional passage of legislation allowing access to the hydrothermal systems beneath the Federally-controlled lands.[11] Another three years

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10 See, e.g., J. M. Energy Consultants, Inc. Rpt. No. 1028 (Feb. 20, 1981) for a detailed look at the latter and Rpts. No. 1025 (Oct. 20, 1980), 1026 (Nov. 20, 1980) and 1027 (Jan. 10, 1981) for treatment of the Federal land problems.

11 P.L. 91-580, Dec. 24, 1970; 30 U.S.C. 1001-1025.

passed before leasing and operating regulations were put into place[12] and the first geothermal lease sale held.[13] Seven years later, only a meager 16% of the lands identified by USGS and BLM as "known" areas have been offered for lease, while a whopping 27% of the noncompetitive lease applications for "wildcat" acreage remain unprocessed by Forest Service and BLM, some after five or six years.[14] Several of the early "grandfather" areas, such as Mono-Long Valley, are yet to be put up for lease.

Those operators who have been able to obtain Federal geothermal leases have been further dogged by protracted delays in the issuance of drilling permits.[15] Keep in mind that these two steps - leasing and exploration - are but the first steps toward commercial development. Delays of the kind experienced by the geothermal industry ones the past ten years literally "choke off" commercialization before it can even get rolling. The very act of bidding on a Federal lease has become an extremely risky act.

These Federal land problems have slowed the march of hydrothermal resources to such a degree as to obscure the potential risks lurking in the air, water and solid waste

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12 The former of 43 CFR Part 4200 (BLM), the latter at 30 CFR Part 270 (U.S.G.S.).

13 On January 20, 1974, tracts at The Geysers were put up for bid.

14 J. M. Energy Consultants, Inc. Report No. 1024 (Aug. 20, 1980).

15 Geothermal Streamlining Recommendations, Report of the Streamlining Task Force to the IGCC (Jan. 1979).

regulations of all three levels of government. But at The Geysers and in Imperial Valley,[16] where the predominance of privately-owned land and the corresponding absence of the Federal land management risks just noted have allowed the greatest commercial progress to take place, this additional regulatory risk factor has come to the fore.

At The Geysers, local air quality regulators have slowed commercial extension of the field into Lake County. This was due to H_2S-related problems. The Lake County Air Pollution Control District (LCAPCD) refused to issue field development or plant permits until stringent and expensive abatement measures were added to the proposed projects.[17]

In the Imperial Valley, by contrast, the major concerns revolved around land subsidence and water quality. Creation of a county General Plan Element and a Master EIS for each system were therefore required, with much attendant delay.[18]

Recent additions to the environmental regulatory quiver in the air quality and water quality areas were thoroughly

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16 Pilot power plants have been or soon will be operating at: Niland (So. Cal. Edison/Union Oil and S. D. Gas & Electric/ Magma Power); Brawley (SCE) Union and McCulloch Geothermal Cal. Dept. of Water Resources); Heber (SCE/Chevron); and East Mesa (Republic Geothermal and Magma Power).

17 See Rpt. No. 1028, op. cit.

18 id.

discussed in a previous report.[18] Their full impact has yet to be felt and will not be until the land management "bottleneck" is broken and prospects advance to the production/utilization stage where serious regulatory consideration will probably be encountered as the 20-30 year impacts of projects are evaluated.

In sum, the "regulatory risks" associated with geothermal commercialization, particularly in the key arena of Federal land management, have served as a powerful disincentive to investment in hydrothermal resources over the past two decades.

4) Investment Parity Risk: Prior to passage of the Energy Tax Act of 1978,[19] potential geothermal investors faced an impossible situation in evaluating competing investments vis-a-vis geothermal. Unlike geothermal, oil, gas, coal and other natural resource projects presented attractive tax shelter opportunities on both initial capital investment and future cash flows.[20] When the resource, technology and regulatory risks of hydrothermal projects were added to this basic lack of tax parity, there was little choice in the matter. As a result, geothermal developers scraped and scrambled for capital with little success and only those firms receiving geothermal-driven cash flows from The Geysers could afford to make additional outlays at any high level. The difference in tax treatment

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19 P.L. 95-618.

20 The intangibles option (26 USC 263(c)) granted the former and percentage depletion (26 USC 613(b)) the latter.

made for the major difference in the projected rates of return of geothermal vs. non-geothermal investments. The "investment risks" of choosing the geothermal project were therefore all too clear throughout this period, deterring both large oil/energy corporations and individual investors looking for limited partnership interests in private or public drilling programs put together by the smaller development firms. This aspect, however, as a risk element to financing has now been removed.

5) Institutional Risk Aversion: With the regulatory and other risks discouraging both corporate and individual investors and financial institutions, geothermal developers with attractive hydrothermal prospects turned to large and small utility and industrial users as a source of project funding. Their logic was simple. Based upon post-1973 energy cost escalations and the growing recognition by these users of the risks of total non-availability of fuel due to embargo, catastrophe or cut-off by a larger supplying entity, the geothermal option was given a hearing. Having one's own energy supply tied up for the next 20 to 30 years at prices set by an arms-length contract with a geothermal developer seemed attractive to many user firms. It was particularly so in the energy-intensive fields of primary metals, paper and wood products and chemicals. Entities like Amax, Inc., Weyerhauser and Dow Chemical were soon collaborating on drilling projects with a wide assortment of the smaller geothermal developers. An analogous situation was soon found among electric utilities, with the primary thrust coming from

smaller publicly-owned entities like Northern Calif. Power Agency (NCPA), the Calif. Dept. of Water Resources (DWR) and the City of Burbank.

But this trend, however encouraging, has thus far failed to provide financing on the level necessary required to get hydrothermal commercialization off and running. N.C.P.A., D.W.R. and the Sacramento Municipal Utility District (SMUD), e.g., have all chosen The Geysers. The reasons seem fairly obvious.

The high risks associated with subsurface energy fuel/mineral exploration and development are simply not compatible with the extremely high degree of risk aversion which is endemic to regulated utility and large industrial firms. It is simply not part of their industrial or psychological makeup. Added to this were the negative results experienced by several of these entities as a result of their initial geothermal joint ventures. It is little wonder that few, if any, such arrangements have surfaced over the past several years. There is no question that the user community is amenable to hydroghermal resources, but their role in financing those projects will probably not extend to field exploration and development on any great level.

<u>Summary</u>:

We have spent a fair amount of effort in laying out the various hydrothermal resource-related "risk" factors which have hampered commercialization efforts thus far. We have done this in order to set the foundation on which any proposed or existing set of financial incentives must stand. No effort at creating incentive programs will be effective if it does not address, cumulatively and specifically, the risk factors which have rendered it almost impossible to obtain financing for most hydrothermal commercialization projects.

We will now turn our attention to the various incentive programs enacted by Congress over the past six years in an effort to overcome these obstacles with an analytic eye to both the logical support for their enactment and the perceived impact of each.

CHAPTER TWO: The Federal Government's Response - Programs Designed to Ameliorate Risk and Provide Financial Incentives.

Introduction:

In attempting to remove the risk obstacles we have noted in Chapter One the Federal government has created a series of programs to provide financial incentives for goethermal development. These can be broken down into four categories: 1) tax incentives; 2) indirect financial incentive programs; 3) direct grant/cost-sharing programs; and 4) attempts at reducing regulatory risk through the enactment of legal and institutional reforms.

1) Tax Incentives: The Energy Tax Act of 1978[1] granted to all geothermal resources the benefits of the current deduction for intangible drilling costs[2] and percentage depletion[3] on geothermal income. The Act also provided for an additional 15% investment tax credit on the tangible portion of facilities utilizing geothermal resources.[4] Thus, in one fell swoop, the tax and investment disparity risk factor which had inhibited geothermal investment for so long was removed. In fact, given the additional ITC and the higher level of depletion allowed, such resources now enjoy a slight advantage.

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1 P.L. 95-618.

2 ibid., at § 402(a).

3 ibid., at § 403(3).

4 ibid., § 301(a)(1).

But its two years of existence on the Federal code-books has also shown that this particular risk factor was not alone in delaying hydrothermal commercialization. Resource, utilization technology, regulatory and institutional aversion risk hurdles remained to be confronted.

2) Indirect Financial Incentives: GLGP & Reservoir Insurance.

a) Geothermal Loan Guaranty Program (GLGP): Foremost of these incentives has been the Geothermal Loan Guaranty Program (GLGP), enacted by Congress as Title II of the Geothermal Energy Research, Development and Demonstration Act of 1974.[5] The GLGP established the Federal government as the 100% guarantor of loans for up to 75% of the total costs of a geothermal project.

When first enacted, the GLGP was actually a bit out of synch with the life cycle, if you will, of hydrothermal commercialization. Exploratory activities are traditionally funded with tax-sheltered dollars, whether from investors or by corporations re-investing sheltered income. And the exploration stage itself must wait for the assemblage of leases. Therefore

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5 P.L. 93-410, 88 Stat. 1079; 30 USC § 1141 et. seq.

6 30 USC § 1141(c). For certain publicly-owned entities, the Energy Security Act of 1980 increased this percentage to 90%. See P.L. 96-294, 94 Stat. 611 (June 30, 1980), at § 641.

until land packages could be put together, tax sheltered drilling dollars expended and a commercial resource not only discovered but proven to the satisfaction of users and bankers (through step-out drilling, interference testing and reservoir performance estimates) no real commercial loan situation even existed. Thus, the regulatory and investment parity risk factors (as well as perhaps those related to resource life and utilization technology) logically precede the institutional aversion risk hurdle which the GLGP addresses in any case only partially. The GLGP approach, while necessary, comes into the commercialization picture at the end of the pre-production cycle, which the other four factors we have discussed each create obstacles much closer to the initiation of any project's life and therefore assume primacy in developer and investor calculations1 It is therefore not surprising that the bulk of the GLGP applications are from The Geysers[7] and (secondarily) from the Imperial Valley[8] where, as we have noted throughout this report, the other risk factors have been removed to a great extent. At The Geysers, e.g., reservoir performance estimates have twenty years of actual production to reference, utilization technology is "off the shelf," no Federal lands complicate the picture and a 1967 court decision[9] provided tax parity a full decade before passage of the Energy Tax Act of 1978. Were

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7 The Bank of Montreal/N.C.P.A. power plant is the Sonoma County portion of The Geysers.

8 Republic Geothermal's East Mesa project and McCulloch Geothermal's South Brawley project.

9 Reich v. C.I.R., 454 F.2d 1157 (9th Cir. 1972), 52 TC 700 (U.S. Tax Court, 1969).

such the case elsewhere, the GLGP's impact would have been several quantums higher.

b) Reservoir Insurance: While Congress enacted the GLGP in 1974, long before the need for it had arisen, definitive action has yet to be taken on a more pressing issue. The point was first raised, to the author's knowledge, by Donald F. X. Finn in January 1975.[10] Finn pointed out that the "resource risk" obstacle was of primary importance and some sort of "insurance" was necessary to obtain utility/user acceptance.

Unfortunately, no one in power heeded this call and the efforts at creating such "reservoir insurance" fell mainly into the hands of Finn and a few other independent consultants,[12] one of whom opined in 1978 that "some mode of reservoir insurance must be devised to bridge the gap between present [resource] uncertainty and future assurance."[13]

In 1979, a Philadelphia insurance brokerage firm, Corroon & Black, Inc., decided to make a thorough study of the problem and attempt an innovative solution. By the beginning of 1980, they had convinced themselves of the feasibility of a reservoir insurance program from the underwriter's perspective.

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10 See Proceedings: Conference On Geothermal Energy And The Law (U.S.C. Law Center 1975), at p. 23.

11 id.

12 McNamara, "Geothermal Reservoir Assurance - A Problem That Must Be Faced," 6 Geothermal Energy Magazine 24 (Feb. 1978).

13 id.

Insurance Company of North America (INA) agreed with them and in 1980 initiated the first geothermal reservoir insurance program. INA's policy contemplates only a seven year term, however, and this has caused some concern in the industry. It should not, since a new policy could be written at that time with an even stronger basis in predicting reservoir performance. Initial premium rates have apparently also alarmed some developers, but again this is to be expected in a field as totally new as this one and with such scant actuarial backup. A similar experience (high initial premiums followed by dramatic reductions based on several years of failure-free experience), occurred in the insurance of nuclear power plants during the 1955-1968 period. It is worth keeping in mind, however, that private insurer's only undertook nuclear insurance with the active participation of the Federal government under the Price-Anderson Act.[14] The U.S. put a "ceiling" on the amount payable by insurance for any nuclear disaster and itself carried the bulk of the coverage up to that limit after an initial underwriting by a pool of private insurers.

Since the insurability problems posed by geothermal-reservoir insurance somehwat parallel those of nuclear in the sense of presenting an inadequate historic and statistical base upon which to gauge risk and therefore set premium rates, as

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14 42 USC 2210, Act of Aug. 30, 1954, c. 1073, ch. 14, § 170, as amended.

well as posing a need for a Federal "back up" program, the Division of Geothermal Energy asked the Congress to authorize some sort of Federal reservoir insurance.

As enacted on June 30, 1980, the Energy Security Act of 1980[15] dealt with a broad range of energy financial incentives. Among these was Title VI which was dubbed the "Geothermal Energy Act of 1980."[16] Subtitle B of that Act dealt specifically with geothermal reservoir insurance.[17] Congress therein directed the Secretary of Energy to "conduct a detailed study of the need for and feasibility of establishing a reservoir insurance and reinsurance program . . ."[18] This study was to be completed within one year and a report with recommendations submitted to Congress at that time.[19] Congress then proceeded to set forth the "terms, conditions and provisions" of such a program should the D.O.E. study result in a positive recommendation.[20] Basically, the terms contemplated a Federal program reimbursing developers or users with an investment of at least one million dollars[21] should a geothermal reservoir "cease to provide sufficient quantities of geothermal resources at minimum conditions required to maintain an economically or technically viable operation for utilization of the geothermal

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15 P.L. 96-294, 94 Stat. 611, June 30, 1980 (5.932).
16 P.L. 96-294, §§601-643; 30 USC 1501 et. seq.
17 P.L. 96-294, §§621, 622.
18 P.L. 96-294, §621; 30 USC 1521.
19 id.
20 id.

esource."[22] Only those unable "to obtain other insurance at reasonable premiums for the amount of investment subject to risk . . . shall be eligible . . ."[23] Federal "back up" or "reinsurance" with "any private insurer" was also contemplated.[24] Any payments were to be made out of the Geothermal Resources Development Fund set up to back up geothermal loan guarantees.[25] If D.O.E. felt that additional terms or authority were needed to encourage private insurer participation, it was directed to request same in the report cited above.[26]

It is not yet clear if the DGE study/report in question is or will ever be carried out. If not, it will be a tragedy for hydrothermal commercialization. The need for both private and Federal participation in reservoir insurance is great indeed. All sectors of the industry have consistently supported it and such a program involves little in the way of direct budget outlays. Given the large incentive it would provide for commercialization by removing the resource risk obstacles, the cost-effectiveness of such a program would probably be quite high. In any event, the study/report required by Section 621 of the Energy Security Act should be carried out expeditiously to see if such role is, in fact:

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21 P.L. 96-294, § 622(c); 30 U.S.C. 1522(c).

22 P.L. 96-294, § 622(b)(3); 30 U.S.C. 1522(b)(3).

23 P.L. 96-294, § 622(c); 30 U.S.C. 1522(c).

24 P.L. 96-294, § 622(k); 30 U.S.C. 1522(k).

25 P.L. 96-294, § 622(h); 30 U.S.C. 155(h). The Fund is established by 30 U.S.C. 1144.

1) cost effective; 2) a proper exercise of governmental power in the economy; and 3) a significant incentive for hydrothermal commercialization.

3) <u>Direct Financial Incentives: Grants/Loans/Cost Sharing</u>.

By the late 1970's, it became evident that more risk amelioration was required than could be provided by either the GLGP (1974) or the tax parity legislation (1978).

One result of this realization was the initiation of a series of cost sharing and grant programs to respond to the resource, utilization technology and institutional aversion risk factors by providing direct Federal dollars for high risk activities by direct end users.

Acting first through a cost-shared deep drilling program (for electric prospects) and several PRDA/PON solicitations (for non-electric sites), DGE attempted to provide several dozen demonstrations of sufficient resource and utilization feasibility confirmation. This was done for the benefit of user firms who would not put up high risk dollars themselves but who stood ready and willing to utilize hydrothermal resources if their commercial viability could be shown. Funding for the non-electric programs has increased to the level of roughly

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26 P.L. 96-294, § 622(k); 30 U.S.C. 1522(k).

forty million dollars ($40 million) in Fiscal 1981,[27] while the electric drilling funding has been terminated.

The aforementioned Energy Security Act also took a large step in support of this posture by authorizing direct loans for both reservoir confirmation[28] and utilization feasibility.[29] These programs were apparently intended to compliment, and perhaps eventually supplant the budget line items already in existence, although provision was made by Congress for "forgiving" both types of loans if the projects proved to be "economically or technically unacceptalbe for commercial development."[30] Thus the ultimate budgetary impact might be more like that of a direct grant program.

Congress authorized eighty-five million dollars ($85 million) for the reservoir confirmation program[31] and five million dollars ($5 million) for the feasibility study loans.[32] However, no sums were actually appropriated for either in DOE's 1981 Fiscal Year budget. Whether or not that was due to the presence of the large ($40 million) direct grant/cost sharing program already noted is unclear. Nor is it clear if either set of programs will survive the new Administration's proposed severe budget cuts in the Fiscal Year 1982 budget.

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27 DGE FY 1981 Budget.
28 P.L. 96-294, §§611-616; 30 U.S.C. 1511-1516.
29 P.L. 96-294, §631; 30 U.S.C. 1531.
30 P.L. 96-294, §611(c)(confirmation) and §631(b)(2)(feasibility).
31 P.L. 96-294, §616; 30 U.S.C. 1516.
32 P.L. 96-294, §631(f); 30 U.S.C. 1531(f).

In February of this year, the Geothermal Panel of the Dept. of Energy's Energy Research Advisory Board (E.R.A.B.), after considering lengthy reports onthe subject, recommended that annual outlays of fifty to one hundred million dollars ($50-100 million) be made for reservoir confirmation and feasibility studies over the next decade.[33] The full E.R.A.B. adopted that position at its meeting the next day.[34] However, the fate of both this program and the forgivable loan variant established by Congress in the Energy Security Act are up in the budgetary air at this time.

The Congressional authorization does have the advantage of covering both electric and direct use confirmations. This would be helpful since no cost-shared deep drilling programs have been funded by DOE for several years (geopressured aside) and the electric demonstration plants in which DOE has been participating[35] on a cost share basis are also in danger of being cut out of next year's Federal budget.

At the very least, the direct use-connected programs, whether by grant or forgivable loan, should be retained if further study affirms the favorable decisions of DOE, Congress and the E.R.A.B. advisers over the past few years as to their

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33 Minutes of Feb. 4, 1981 E.R.A.B. Geothermal Panel Mtg., Washington, D.C.

34 Minutes of Feb. 5, 1981 E.R.A.B. Mtg., Washington, D.C.

35 Raft River (Id.); Baca (N. Mex.); Puna (HI) and Heber (Calif.).

positive effort in reducing the resource, utilization technology and institutional aversion risk factors. As with reservoir insurance, these incentives appear likely to be highly cost-effective methods of encouraging investment in and commitment to hydrothermal commercialization.

4) Legal & Institutional Reforms:

a) Steam Act: None of the programs discussed thus far has dealt with the last remaining risk factor, that resulting from the regulatory blanket which has thrown over hydrothermal commercialization, particularly on the Federal lands. Persistent legislative efforts at reducing the delays and blockages involved in assembling land packages and exploring them appear to be on the verge of success, however. Both Houses of Congress last year passed legislation amending the 1970 Geothermal Steam Act to increase acreage limits, impose deadlines for BLM and USGS action on non-competitive lease applications, drilling permits, operating plans and the offering for lease by bid of KGRA lands.[36] The definition of a KGRA was somewhat tightened and a process instituted to speed up leasing in the future.

After the Reagan election triumph, however, the industry decided to drop the bill, then in lame duck Congress, in hopes of obtaining a better act from the new, more Republican

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36 H.R. 6080 (Santini) passed the House on Feb. 13, 1980. S. 1388 (Church) passed the Senate on June 24, 1980.

Congress. Their goals are to further tighten the KGRA and time deadlines and delete provisions restricting development around certain national parks and monuments (the so-called Burton Amendment)[38] and imposing new diligence requirements and lease bidding procedures.

In any event, whatever bill finally emerges, coupled with the pro-development land management posture of the new Interior Secretary - James Watt- will undoubtedly go a long way towards reducing this key aspect of the regulatory risk factor.

b) Utility Regulation: The Energy Security Act's Title VI also eliminated other portions of hydrothermal regulatory overburden by specifically including geothermal plants of up to eighty megawatts ($80MW_e$) in the Federal Energy Regulatory Commission's (FERC) authority to exempt certain small power facilities from both Federal and state utility regulation.[39] This removed a large roadblock from the path of developers who sought to overcome user fears by building and operating their own plants and selling the users the power for the first few years.

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37 ibid., various sections.
38 H.R. 6080, §16.
39 P.L. 96-294, §643; 16 USC 796, 824i, 824; and 824 a-3.

c) Environmental Regulation: A previous report[40] noted that the Solid Waste Disposal Act (SWDA) Amendments of 1980[41] had effectively deregulated geothermal drilling as far as the extensive Federal solid waste regulation by EPA under the Resource Conservation and Recovery Act of 1976 is concerned.[42] This is a large plus, but there should also be study as to the impacts of EPA's (and through them the states' and localities') air quality regulation (particularly the "visibility" protection to be given certain Federal lands) and water quality under the new Safe Drinking Water Act (SDWA) regulations.[43]

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40 Rpt. No. 1028 (Feb. 20, 1981).

41 P.L. 96-482, 94 Stat. 2335; 42 USC 6901 et. seq.

42 P.L. 96-482, § 7 and 29; 42 U.S.C. 6921, 6982.

43 See Rpt. No. 1028, op. cit., at Chapter 1 and 2, respectively.