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RESULTS OF THE GEOTHERMAL RESERVOIR INSURANCE STUDY

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ABSTRACT

On June 30, 1980, Public Law 96-294, referred to as the Energy Security Act, was enacted by the Congress of the United States. Subtitle B of Title VI (Geothermal Energy) of the Act required that a reservoir insurance program study be conducted. The objective of the study was to provide an analysis of the need for and feasibility of a geothermal reservoir insurance program. In conjunction with the analysis, the appropriate level of federal support, if any, was to be determined.

INTRODUCTION

The commercial scale developer and user of geothermal energy, either for generation of electricity or for direct-use, face a number of significant risks that can inhibit development. In the early stages of field development the size and character of the reservoir are highly uncertain, yet the costs to the developer and user in terms of initial wells, surface facilities and power plants are significant. Many of the risks that tend to inhibit development can be transferred from the developer and user to an insurer for a set price thereby reducing economic uncertainties.

One hypothesis is that a geothermal reservoir insurance program would be an incentive for increasing geothermal development and improving geothermal technology. The purpose of the Geothermal Reservoir Insurance Study was to analyze this potential incentive on its own merits -- not to attempt to determine the single best incentive that might be provided to the geothermal industry.

The study involved five major tasks: (1) determine perception of risk by major market sectors, (2) determine status of private sector insurance programs, (3) analyze reservoir risks, (4) analyze

alternative government roles, and (5) provide recommendations.

PERCEPTION OF RISK BY MAJOR MARKET SECTORS

More than forty interviews were conducted with representatives of the developer, user and lender sectors of the geothermal industry. The objectives of the interviews were to: (a) identify the industry representative's perception of the primary risks associated with geothermal development and production, and (b) obtain their perception of the need for a federal geothermal insurance program and its potential impact on geothermal development. The perceived priority risks varied by size of firm, type of resource being developed, size of development and respondent's role in the project. The priority risks commonly identified were:

- Reservoir decline;
- Well failure or damage;
- Environmental, legal and institutional delays;
- Physical damage to plant;
- Financial impediments; and
- Inability of developers and utilities to secure satisfactory long-term sales agreements.

Although the individuals interviewed had differing opinions on the appropriateness and need for a federal geothermal insurance program, they generally agreed that the availability of insurance would speed geothermal development. Insurance would address the uncertainty surrounding this resource and as a result would overcome some of the reluctance to become involved in geothermal projects.

STATUS OF PRIVATE SECTOR INSURANCE PROGRAMS

More than sixty interviews with representatives of the various segments of the private insurance community were conducted to determine the current status of applicable insurance programs and to determine their perception of the

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insurability of the specific geothermal risks previously identified by the major market sectors. Although only one primary insurer has actively sought to provide reservoir performance coverage, many of the firms interviewed indicated a willingness to provide insurance coverage for certain of the geothermal risks including reservoir performance.

The key reasons identified for the current lack of broad participation in insuring geothermal developments were;

- Lack of historical performance data;
- Questionable reliability of available data;
- Potential for unusually large loss;
- Unacceptability of desired policy term; and
- Lack of communication between geothermal and insurance industries.

In considering the insurability of the priority risks identified by the major market sectors, certain specific risks were perceived as uninsurable (e.g., marketability). The remaining risks, although opinions differed widely as to insurability, comprise the set of geothermal risks considered for further analysis.

Although there is currently only limited participation in providing insurance protection for geothermal risks, it is not unusual for developing technologies to be served by only a few insurers. If some insurers gain positive experience in the geothermal industry other insurers have indicated they would be willing to become more involved, thereby increasing competition.

ANALYSIS OF RESERVOIR RISKS

The risks of geothermal development were analyzed to estimate the approximate level of insurance premiums necessary to cover potential losses. Prior to performing actuarial analyses resulting in premium estimates, specific risks were identified and their probability of occurrence and estimated cost consequences were determined. The comprehensive set of individual risks identified for analysis are contained in the following five major risk categories:

- Well Risks
- Reservoir Performance Risks
- Power Plant Risks
- Surface Facility Risks
- Acts of God

Probabilities of occurrence and cost consequences were estimated based on available data and subjective probability

assessments of geothermal reservoir experts. On the basis of the probabilistic analysis, an expected loss and loss distribution for each risk was estimated in terms of:

- Direct Cost to Developer - direct costs to replace or add wells, surface piping, etc.
- Indirect Costs to Developer - loss of revenue from reduced steam sales.
- Direct Cost to User - repair costs from damage to plant or turbines, and unamortized value of plant resulting from total or partial abandonment.
- Indirect Cost to User - Excess cost of replacement power resulting from shut down or reduced capacity.

The expected losses and distributions were estimated for each of three different stages of development (field development, initial operation and full operation) and for each of seven geologic project types (e.g., vapor dominated). Insurance premiums were then estimated using appropriate actuarial methods as a function of the expected losses and loss distribution for each coverage category, along with a provision for administrative expenses.

ALTERNATIVE GOVERNMENT ROLES

After examining the range of possible programs, the following five alternative government roles were selected for detailed evaluation:

- (1) Private market insurance program exclusive of any government involvement.
- (2) Private market insurance program with government providing excess catastrophe reinsurance.
- (3) Private market insurance program with government making available specific excess reinsurance.
- (4) Private market insurance program with primary government insurance to cover those risks not insured by the private sector.
- (5) Government primary insurance program contracted to a third party for underwriting and administration.

Detailed analyses were performed on each alternative including: (a) impact on private insurance sector, (b) financial impact on geothermal industry,

(c) estimated cost to government, and
(d) interaction with other government programs.

RECOMMENDATION

The recommended geothermal reservoir insurance alternative was determined on the basis of its responsiveness to the perceived need for geothermal reservoir insurance and its effectiveness in stimulating development of geothermal resources. Although current means exist to reduce certain aspects of the financial uncertainty of loss to geothermal developers and users (e.g., Geothermal Loan Guaranty Program), there is room for complementing these programs. The Geothermal Reservoir Insurance Study has shown that insurance would provide a means of protecting against the financial uncertainties of geothermal development. The study has also shown that insurance would most likely be a cost effective means of dealing with geothermal project financial uncertainties.

The study determined that there is a viable role for the government to help accelerate the emergence of geothermal insurance supplied through the private sector. Given that:

- it is desirable to provide incentives for the development of geothermal energy as an alternative energy source,
- there are significant risks associated with geothermal development,
- insurance provides incentives for geothermal development by reducing the financial uncertainty of geothermal risks to the insured,
- the geothermal constituency believes that a properly structured insurance program would speed the development of geothermal resources, and
- the private insurance sector currently lacks broad participation in insuring geothermal developments,

there is a need for a temporary government role in a geothermal reservoir insurance program until such time as private insurers are actively providing adequate coverage on a broad basis. In addition, because (a) the significant risks associated with geothermal development can be insured, and (b) there is historical precedent for the government playing a role in insuring highly technical or emerging industries, it is feasible for the government to have a role in a geothermal reservoir insurance program.

Because of the established need for and feasibility of a federally supported geothermal reservoir insurance program, the study recommends:

A private market insurance program for insurable risks underwritten by private insurers should be encouraged. The federal government should support this effort by making available limited excess reinsurance at a specified level decreasing over time. Additionally, through cost support, the price to insurers should be substantially less than what the private reinsurance market might provide.

ACKNOWLEDGEMENTS

This paper has been excerpted from the Geothermal Reservoir Insurance Study prepared for the United States Department of Energy by Coopers & Lybrand and their subcontractor GeothermEx, Inc. The author was Coopers & Lybrand's project manager responsible for the study and is now the National Manager of Alternative Energy Consulting for Alexander Grant & Company. More than forty professionals participated in the study. The author expresses particular thanks to Dr. Richard Fallon and James A. Hall III of Coopers & Lybrand and to Dr. Subir Sanyal of GeothermEx, Inc.

The reader is advised to refer to the Geothermal Reservoir Insurance Study for detailed documentation supporting and expanding on the statements made in this paper.

REFERENCE

"Geothermal Reservoir Insurance Study - Final Report," 1981, United States Department of Energy, Contract No. DE-AC03-81SF11501, 509 pp.