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Article from:

Proceedings of the Fifth Annual Geothermal Conference and Workshop, June 23-25, 1981, San Diego, California. Palo Alto, California: Electric Power Research Institute, 1981.

THE FINANCIAL COMMUNITY'S PERSPECTIVE ON THE ROLE OF DEMONSTRATION PROJECTS IN THE DEVELOPMENT OF GEOTHERMAL ENERGY

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For a new technology to achieve significant use in the electric power industry, it is generally thought that the technology must pass through three stages: scientific feasibility, demonstration and commercialization. At present, geothermal energy is passing through its demonstration stage and appears poised to enter the takeoff phase of full scale commercialization. Should the geothermal industry make this transition over the next few years, it is expected to make a noticeable contribution to U.S. energy needs during the late eighties and nineties, particularly in the western United States. My talk will focus on the perceptions of the financial community on the progress which geothermal energy is making in its demonstration stage.

Like the utility industry, financial institutions have not wanted to finance geothermal technology until it has been successfully demonstrated as both feasible and economic. This lack of confidence is reflected in the limited participation of the financial community in geothermal energy development. For example, there are now only two commercial banks actively financing geothermal projects and, for the most part, their financings have been done under the DOE's Geothermal Loan Guaranty Program.

Commercial banks, however, are ready to assist creditworthy parties in financing the development of geothermal projects without a DOE guaranty, assuming they have a full corporate guaranty for the life of the project. Indeed, this may be the only financing option available, since the Reagan administration has recommended to Congress that the Geothermal Loan Guaranty Program be eliminated along with most other research and development activities in geothermal energy. The impact of these actions will not be favorable on the industry and it may change the course of geothermal development. For example, it may lead to more "demonstration plants" being built before larger scale plants are constructed, a trend being reinforced by other technical, regulatory and economic considerations.

This is not to say that the outlook for geothermal development is poor. The outlook at The Geysers, for example, is very good and is illustrative of what will happen during commercialization. Here the pace of development is accelerating. The diversity of participants is increasing. Natomas' buyout of Magma Power Company's quarter-interest in The Geysers for $400 million indicates the value of such holdings. Commercial banks are now prepared to provide production payment loans on developed portions of this resource and traditional "project financings" for development programs are now being discussed where guarantees will run only through completion (completion being defined as several months of continuous operation at a predetermined percent of capacity). Major prerequisites for obtaining such financings are the ability to provide a satisfactory completion guaranty, the drilling of several successful exploratory wells (confirming the presence of a steam resource in commercial quantities), and a steam sales contract from an established utility. All this has come about because of the demonstrated reliability of this field for power generation purposes as well as the improving economics of geothermal development brought on by rising energy prices. Techniques to abate hydrogen sulfide have reduced lenders' environmental concerns and the regulatory environment also appears increasingly favorable.

Yet it is well recognized that The Geysers is a resource of exceptional quality. For the use of geothermal energy to become widespread, it must become equally feasible and nearly as economic to exploit hot water resources, particularly in the Imperial Valley. This area is now the focus of development activities for several reasons: its tremendous potential (some 3,000-7,000 MW) and high temperatures as well as its proximity to the major, expanding markets of southern California which are largely dependent on oil, not coal or nuclear energy, for electrical generation. Finally, to the extent that the technical problems caused by the hypersaline and corrosive brines in the Imperial Valley can be solved, it portends well for the use of any geothermal resource in the western United States.

There are now two demonstration plants in the Imperial Valley. As we have heard, these have

been a mixed success, due to a variety of technical problems. The financial community has been following these developments closely to learn as much as possible about the "state of the art". On the technical side, we see drilling and production posing little difficulty, though directional drilling in highly fractured zones is a challenging exercise and concern remains about the reliability of downhole pumps. Fluid handling remains a key problem. Corrosion, precipitation and scaling are major problems and the more difficult fluids found in the Salton Sea area have yet to be taken on. The expected efficiency and performance of various conversion systems (binary, single/double flash as well as direct contact) have not been rigorously demonstrated by these two plants and still need confirmation. Finally, injection must be more successfully accomplished. Maximizing field performance, disposing of spent fluids and preventing potential subsidence all depend upon reinjection.

This brings me to the other half of the geothermal equation: the resource. On the one hand, we have much more information about geothermal resources than power plants due to the 200 or so wells which have been drilled outside The Geysers since 1975. This has given us a much better idea of where these resources are and what their potential is. Nevertheless, such information does little to ease a lender's concern about either potential production problems like those encountered on the Baca project or the risk of premature reservoir depletion. Similarly, we feel the production data from the Brawley and East Mesa fields does not have a direct bearing on how other geothermal systems will behave, even in the Imperial Valley.

Indeed, long-term production data from these operations will only have an indirect benefit on the overall development of geothermal energy. This will come about by increasing our confidence in techniques to predict reservoir performance. However, until our confidence in such techniques is increased dramatically, only multi-year production data will induce a lender to assume reservoir risk. In the meantime, we continue to view each project as somewhat of a "demonstration project".

Fortunately, there may be a least one potential short-term solution to this specific problem: reservoir insurance. Insurance companies are financial institutions who are in the business of taking on risks like these. They can provide insurance both against losses arising out of project termination due to resources inadequacy, as well as losses resulting from premature reservoir depletion. The cost of such insurance is not exceptionally high, but neither is the comfort provided by present policies. Nevertheless, I expect such insurance will become a more important part of geothermal financing, especially given today's high rates of inflation and interest which make the potential benefits from expediting geothermal development worth the cost of the insurance.

There are two other aspects of geothermal development going through a phase analogous to demonstration. These are the tax treatment for geothermal development and the PURPA regulations. Over the last few years, Congress has enacted these incentives for geothermal development, but implementation is another matter. For example, the IRS is using its own definition on the activities/assets eligible for the Alternative Energy Tax Credit and PURPA is being challenged in the courts. Hence, the uncertainity created by these matters impairs the ability of the industry to raise the necessary capital to finance geothermal development.

In closing, I would like to indicate that I see limited validity to the life cycle concept for geothermal energy. My concern does not arise due to questions about the hardware and systems for exploitation of geothermal resources. Here the technology can be shown to be feasible, demonstrated, and if practical, commercialized. My problems with this concept is on the resource side of the equation. With the substantial differences from reservoir to reservoir, each new resource will have to demonstrate its adequacy over an extended period of time before it can be considered to be fully commercial like The Geysers. This is not to say that the subsequent power plants on the same resource will each need to be viewed as a new project, but that the performance of one field will tell us little about how we can expect another field to perform. Gradually this concern will be reduced as we become more confident in reservoir prediction techniques, but in the meantime each geothermal project and its technology/resource matrix must be individually evaluated.