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CH2M HILL

MEMORANDUM

TO: Joe Hanny, EG&G
FROM: Herschel F. Jones, CH2M HILL
DATE: 18 September 1978
RE: Proposed Market Penetration Plan for Geothermal Energy
PROJECT: B12144.A0

At the invitation of Mr. Bob Schultz, I met with you and other members of the EG&G geothermal planning and program staff on 7 and 8 September 1978 at your offices in Idaho Falls. On the 7th we generally discussed the problem in order to provide me with some orientation. On the 8th we followed an agenda which you prepared.

As you know, marketing is selling, and selling is a matter of answering objections. For "objections" in this case we can substitute "obstacles" to financing and developing geothermal resources. These obstacles were discussed at our meetings.

The principal obstacle, we agreed, was the risk or uncertainty now connected with geothermal development. The prospective investor in a geothermal project is faced with the following uncertainties:

1. The temperature of the geothermal source
2. The chemical composition of the source
3. The size of the geothermal source

The first two can be determined by one or two wells, but the third uncertainty may require up to 30 wells to fully define the reservoir. Inasmuch as each well can cost up to \$750,000, the entrepreneur who wants to invest his funds could be faced with a \$22.5 million cost before he can exploit a geothermal source.

Another obstacle is really up to 21 obstacles. These are permits and authorizations the entrepreneur must obtain before he can explore and exploit a geothermal source. Obtaining such permits may require a further investment of up to \$1 million. Much of these funds will go for legal fees and environmental assessments.

In the light of these obstacles to geothermal development, it would appear that a program for such development must find a way to reduce the risk to the entrepreneur. This can be accomplished in two ways:

1. Large government subsidies to companies building geothermal systems
2. Making insurance available to cover the risk of dry holes or failing reservoirs

Since there is not enough experience upon which to estimate reservoir life, insurance based on experience cannot be provided; so government subsidies that reduce risk to entrepreneurs wishing to drill for geothermal sources appear to be the answer.

Government can also speed up the process by which permits are obtained. In fact, obtaining such permits might be an excellent assignment for DOE.

If geothermal use is to grow according to the targets now proposed, several demonstration projects need to be developed in the next few years. These may need to be promoted by very large subsidies. The form of these subsidies has not been decided. They could take the form of tax relief such as used to be available for oil and gas drilling, or they could be in the form of loans, which would be forgiven if the reservoirs prove to be inadequate.

Considerable discussion centered on what kind of firms should be the sales target for the penetration plan. For high-temperature geothermal projects, electric generation appears to be the best use. There would appear to be no question but that electric utilities would be anxious to use proved high-temperature steam deposits once they were developed. However, electric utilities are not accustomed to taking the risks of exploration and development. Furthermore, with their staff limitations they can only afford to develop large sources of power. It takes as much staff time to obtain permits and develop plans for a small- or medium-sized project as for a very large project. Also, in order to keep costs as low as possible, utilities must capture the benefits of large-scale operations.

It is therefore most likely that the oil and gas companies will prove to be the best targets. They are used to taking risks of the kind presented by geothermal energy. They will only respond,

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however, if the rewards for finding and developing geothermal are sufficient. Possibly the arrangement between Pacific Gas and Electric Company and the Union Oil Company at The Geysers will have to be followed. There Union Oil is paid for the steam it delivers at the current rate per Btu that PG&E is paying for oil for its oil-fired generation.

For medium-temperature geothermal sources the ultimate consumer will be manufacturing plants that require large heat sources for their processes. The companies owning such plants will be interested if the heat is offered at lower costs than conventional sources--oil, gas, or coal. Because the geothermal is frequently in remote areas, the low cost of heat must compensate for any increase in transportation costs of raw materials or finished product.

As with utilities, most manufacturers are not accustomed to taking the kind of risks which characterize geothermal development. They will use geothermal after it is developed if it is cheap enough to increase their profits. A break-even situation such as The Geysers will probably not be sufficient to get them to switch from conventional fuels. This poses a dilemma since oil companies may not wish to assume exploration and development risks unless they receive at least as much per Btu as they would if they discovered and developed gas or oil fields. A government subsidy will likely be required for many years in this situation.

Low-temperature geothermal suitable for space heating is the most widely available. It may also be the most difficult to develop because of the expense of distribution systems and the limit which delivery costs put upon their use.

As the real prices of oil, gas, and coal escalate, geothermal will become more attractive. Also, as communities in the vicinity of geothermal sources expand in size, geothermal will be more in demand.

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