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A FEW THOUGHTS ON PRICING GEOTHERMAL ENERGY

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My remarks will primarily be directed towards the pricing of geothermal energy produced from the "hot water" reservoirs, because it is those reservoirs that give promise of the greatest potential. However, there are a couple of points about The Geysers' "dry steam" field that should be stressed.

The first is that the purchaser of the steam at The Geysers, Pacific Gas & Electric Company, is currently producing most of its electricity by burning oil. On today's market it costs about 25 mills for the oil used to generate one kilowatthour of electricity. This compares to only 14.18 mills currently being paid for geothermal energy at The Geysers (including .5 mills for reinjection).

The second point to be stressed is that The Geysers contract requires the plants to be operated "as close to full capacity and as continuously as practicable..."

Engineers usually argue that energy should be priced on a Btu basis, or, in the case of geothermal energy, on the basis of pounds of steam or hot water, instead of on the basis of mills per kilowatthour as is done at The Geysers.

If 100,000 pounds of steam at The Geysers were priced at \$70.00, one would find that such a price roughly equates to the busbar price now being paid. The pounds of steam basis would appear to give the user an incentive to improve its efficiency and minimize service station use; on the other hand it also involves some complications such as changes in temperature, pressure, quality, and quantity over a long period of time.

My personal opinion is that there would be no major advantage in changing the formula we are using at The Geysers at the present time; but that subject is worthy of continued study and perhaps additions to value because of increased efficiency, or otherwise, should be shared by the developer and the utility.

Turning to the hot water fields, there is considerable dispute as to the value of hot water. What is the value of 150°C hot water? 200°C? The only figure that we really can grasp at this time is that utilities will pay a kilowatthour price that is competitive with alternate sources of energy that are available. From the utility company standpoint, initial calculations will be made in mills per kilowatthour.

Our short or intermediate term goal is to see developed a system whereby 100 pounds of 180°C hot water can be converted into one kilowatthour of electricity. Assuming plant costs are the same, and it costs 25 mills for the oil that will make one kilowatthour, then it would be competitive to charge 25 mills per 100 pounds of 180°C hot water. However, we know that until we can demonstrate that the goal can be reached, no utility will agree to pay such a price for hot water.

Accordingly, we can hardly expect a contract at this time based upon Btu content or pounds of hot water. However, like at The Geysers, such a method of pricing is worthy of continued study, and when we can more clearly establish what can be done with hot water we can discuss a pricing method that will be in the best interest of all concerned.

I want to join with the many others who stress the unknowns involved in producing geothermal energy from a hot water reservoir. Discovering a field, testing it, and getting into production involves indeterminable millions of dollars, and a timetable that often seems to stretch out forever. Nobody knows what it will cost to operate such a reservoir. We believe that the typical case will involve the use of expensive downhole pumps; pump life has been variously estimated by different experts as being from one to ten years. Nobody knows how long temperature and volume will be maintained at a specific site; accordingly the need for replacement wells or additional wells is not known. I could proceed at length with such uncertainties.

The risks I have just described are sometimes called "geologic risks," and explorers for natural resources are not unaccustomed to taking such risks. The far greater problem, and the primary obstacle to an accelerated geothermal program, is the ridiculously costly and time-consuming bureaucratic red tape. Imaginary environmental problems require money and time beyond belief. Regulations often appear to be incomprehensible. Tax incentives are minimal. There is just no way for industry to evaluate the risk involved in what we now call these "institutional problems."

In the face of all this, there are those who urge government price regulation. It should be clear that where costs are not subject to being ascertained, price regulation is impossible; attempts at such regulation would increase the developers costs, the price, and create another bureaucratic staff that would find itself running in circles.

Likewise, there are those who urge that pricing be based on cost plus a reasonable profit. This is similarly impossible. No purchaser in his right mind would agree to pay the costs, whatever they might be.

Moreover, I fail to comprehend why such concepts should be urged for an emerging industry. If there is a sincere desire to hold down energy costs, it would certainly be far more meaningful to adopt policies involving coal, oil, gas, and uranium. And this perhaps raises questions about the cost of food, construction, clothing, and so on. Usually, attempts at price control have resulted in higher prices.

In conclusion, as of this time, it is my personal opinion that there is no practical way to price energy from hot water fields other than on the basis of mills per busbar kilowatthour, subject to some requirements calling for the user to be efficient and to operate continuously.