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PRICING OF GEOTHERMAL ENERGY
WORKSHOP PANEL REPORT

Paul Kruger, Chairman

The panel convened to review the various philosophies and approaches to the pricing of geothermal energy for the generation of electric power. In most countries of the world, the price of the electricity is set by many factors, among them the economy of the nation and the costs associated with the general national energy situation. In those countries where the energy resources and the facilities for electricity production are state-owned, the breakdown of costs between resources and generation may be internally decided. In the United States, the energy resources and the electricity generating and distributing facilities are generally owned by different entities. The electric utilities purchase the energy resources as independent operators. The price of major fuels, such as oil, gas, coal, and uranium, are generally set in the international marketplace. Because of the nontransportability of geothermal heat and the limited extent of its utilization by utilities, the price of geothermal fluids for electrical energy production must be arranged on an individual, local basis. Further creating a complex arena in which such arrangements can be executed are the institutional differences among the concerned parties, that is, a utility, generally considered to be highly regulated, an energy resource company, accustomed to high-risk resource development, and the levels of federal, state, and local government agencies involved in licensing and regulation. Thus many possibilities exist in the quest to find a suitable policy for the pricing of geothermal fluids. The panel, consisting of three members of the resources industry, two members of the electric utilities, and one member of a state energy commission presented the following views.

The price of energy delivered to a geothermal plant should be dependent on the thermodynamic properties of the fluid as well as such factors as reliability of supply and price of other available fuels. The price could be determined by the net quantity of heat delivered (e.g., in millions of Btus above some negotiated reference temperature). This method puts the cost of energy to the utility in the same framework as other fuels and encourages the utility to improve its efficiency in terms of the number of geothermal Btus required per kWh. (See details in the Summary of Greider.)

An alternate concept considered pegging the price of geothermal energy to a stable resource, such as coal, in order to allow for changes in generating efficiency over the life of the "fuel" contract. Provisions for reduced or improved performances, such as changes in fluid enthalpy or turbine efficiency, would be added to allow the producer and the utility to share in the resultant change in total electricity cost. A formula to relate such changes relative to the cost of producing electricity by coal was proposed. (See details in the Summary of Dolan.)

A third concept, for pricing geothermal fluids, especially for the more technically uncertain hot-water resources, is adaptation of the pricing policy used at The Geysers steam field, in which the return to the supplier is determined by formula of the costs of alternate fuels available to the utility, adjusted for the differences in plant costs. Under such a contract the return (in mill/kWh) is

determined by the output and efficiency of the plant, which would be required to be operated "as close to full capacity and as continuously as practical" (See comments in the Summary by Falk.)

A fourth concept is making the geothermal resource producer responsible for the generation of electricity, in which the price of the electricity at the busbar becomes the subject of the negotiation between supplier and utility. This method could be useful to the utility short in capital or with little experience in the production and conversion of geothermal energy and useful to the producer who can manage the production/conversion cycle with greater efficiency. (See details in the Summary of Bell.)

A fifth alternative among these field-plant relationships is for the utility to purchase part or full ownership of the geothermal resource. In this system the utility has greater control over resource development and availability but incurs greater risk. The acceptability of such risk under present public utility commission systems is uncertain. (See details in Summary of Corrigan.)

The possibility of governmental regulation of wellhead prices for geothermal steam has been raised by the state of California. An early study recommended that wellhead price regulation of geothermal energy would not provide more equitable pricing in the public interest, nor would it accelerate the use of geothermal energy in any way. However, the possibility of regulated pricing remains as one of the philosophies and methods of the pricing of energy. (See details in Summary of Anderson.)

Several approaches to the pricing of geothermal energy were raised by the panel. There are others. In the U.S. framework of a resource producer providing a "fuel" for conversion to electricity by a utility, the possible arrangements for pricing are large in number. The costs of producing geothermal fluids are uncertain and vary by resource type. The costs of generating electricity are also uncertain and vary by conversion technology. Cooperation between producer and utility is evidently needed. Arrangements can range from utility ownership of the resources to electrical energy conversion by the developer. Advantages and disadvantages are apparent for any combination. Therefore, pricing arrangements also require a high degree of cooperation and trust between producer and utility with the general concurrence of the pertinent regulatory agencies. The panel has made a first step in bringing this complex problem into the public forum. EPRI should be encouraged to continue the dialogue between the interested parties.