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DIRECT UTILIZATION OF GEOTHERMAL RESOURCES, A PRODUCERS VIEWPOINT

Gerry Huttrer

Intercontinental Energy Corporation

Geothermal resources can be generally separated into two categories; those with temperatures in excess of 150°C that are suitable, with state-of-the-art technology, for generation of electricity and those below 150°C suitable for industrial, agribusiness, spaceheating and balneological utilization.

Potential developers of geothermal resources have a choice, therefore, whether to seek and produce high or low temperature energy. This paper presents the positive and negative considerations of involvement by a producer in low and medium temperature projects.

Positive Aspects

1. Relatively small front-end investment required

   Low and medium temperature resources are quite abundant. Their geographic locations are well documented and access is commonly existent. For this reason, expenditures for geophysical and geochemical exploration are not great and in many cases are almost unnecessary. Additionally, drilling depths for these resources are relatively shallow (less than 2,000 feet) compared to depths tested for high temperature resources and, when tapped, medium temperature fluids require less sophisticated wellhead plumbing than do two-phase high temperature deposits.

2. Rapid Construction and Development

   Low and medium temperature projects can be brought on stream in 2-4 years from the time of inception as compared to 8-10 years for power generation projects.

3. Rapid Payout

Because rates of return on investment (with tax-credits considered) can be 25-30%, and because initial investments are relatively small, payout periods can be 3-4 years. This compares favorably with the 5-8 year payout calculated for high temperature projects.

4. Small Land Holdings Required

Direct utilization of low and medium temperature resources can be undertaken while controlling as little as 10 acres, though 40-160 acre operations might be more typical. The costs and effort needed to acquire and hold such lands is considerably less than that required to obtain, explore and lease the 8-15,000 acres that comprise most high temperature prospects.

5. Rate of Return

Though gross revenues from direct use projects can not compare with those received from ownership of a good steam field, they are adequate, for well chosen operations, to provide a 25-30% ROI that is acceptable to most small and medium sized producers.

Constraints

1. Financing

Banks have traditionally been very conservative about lending money in the early stages of development of geothermal resources. They worry about the staying power of the end-user, the reservoir longevity, the possible deleterious effects of the water constituents, in short, the possibility of default on their loan. This situation is being mitigated by the GLGP and it is currently being addressed by cost sharing and forgivable loan programs proposed by DOE and its contractors.

2. Reservoir Longevity

Because commercialization of geothermal has not been in progress very long, few track records have been established for reservoirs. Estimates, based on geologic, geophysical and meteorlogical data can be and have been made, but only time will tell if they are accurate. Meanwhile some sort of reservoir insurance is needed so as to assuage the doubts of propsective lenders and of end-users.

3. Engineering Uncertainties

Design of end user facilities is more complicated for installations utilizing natural fluids with variable constituents than it is for those constant quality, constant temperature fluids. Designs must be extra flexible and must allow for periodic replacement of plumbing without significant process disruptions.

4. P.U.C. Regulation

This very serious potential constraint to development of space heating projects must be addressed immediately. PUC regulations may affect (depending on individual state laws) any producer that supplies heat to a significant number of users. Since the PUC permits only a 10-12% ROI to utilities and since exploration costs are not considered to be part of the investment, such a ROI is totally unacceptable and could prohibit development of district heating projects by industry.

The problem is being studied by the Earl Warren Legal Institute and hopefully some flexible guidelines will be drawn so as to allow adequate profit to geothermal heat producers.

Project Criteria

Though low and medium temperature resources are abundant in the western

U.S., potential producers need to evaluate prospects with the following criteria, as a minimum, in mind:

A) The Resource 1) It must be of adequate temperature, 2) it must be recoverable in adequate amounts (flow rate); 3) it must be of good chemical quality, 4) it must be adequately replenished by precipitation and 5) the resource reservoir must be of an extent adequate for constant, consistent production for at least 20 years.

B) Location The resource must be situated geographically in a place that has the following attributes in order to be attractive to potential end users:

1) Transportation via major all weather highways, railroad and/or air should be nearby. Airports should be within 100 miles if possible; railheads within 25 miles.

2) Labor should be available locally so that workers do not have to be accommodated on site (with attendant costly facilities that do not provide much revenue).

3) Climate may be critical for certain end-users such as carnation or rose growers, fish farmers etc.

4) Topography Resource sites should be amenable to construction of end-user facilities without extensive work. Sites in narrow, rocky valleys, far from paved roads are obviously less attractive than more accessible flat sites.

5) Fresh Water availability for non-thermal processes.

SUMMARY

It can be seen, then that the producer of low and medium temperature geothermal resources has to walk a narrow line in locating a resource and matching it to an end user. The economics of each project must be very carefully evaluated for each site. If all of the homework is carefully done, utilization of the resource will be maximized and its potential savings vis a vis conventional energy fuels will be realized.