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A COMPARISON OF GEOTHERMAL DIRECT-USE PRICING TERMS IN SEVEN WESTERN STATES

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ABSTRACT

A comparative survey of pricing terms in twenty-one direct-use projects in seven western states is summarized. The survey was undertaken to determine the character of pricing strategies which are currently in place or proposed for direct-use projects. A majority of projects are shown to base their geothermal price on a discounted natural gas rate. The average discounted rate for non-profit projects is calculated to be 56% of current gas rates; for profit projects the average is 66% of gas rates. The average delivered geothermal price for all projects basing rates on gas and oil was $3.80/MMBtu as of March, 1982.

INTRODUCTION

Within the seven western states of California, Colorado, Idaho, Nevada, New Mexico, Oregon, and Wyoming, many geothermal direct-use projects involve contractual agreements between the resource supplier and user. Twenty-one such projects were surveyed for the prices and terms which are currently in place or proposed. A majority of the projects (43%) are still under construction; 33% are operating; and 24% are still in a proposal stage.

Factors which are examined in the projects include resource and load data, contractual terms, and delivered energy prices (exclusive of system efficiency). The survey is summarized in Table 1; and detailed by state and project in Table 2.

HEAT MEASUREMENT

The geothermal heat to be priced is measured in some manner, e.g. gallons per minute at a constant temperature. The majority of projects price the heat at the point of use, i.e. the temperature and flow of the resource as it enters the point of use and as it departs. In nearly all projects resources are not actually consumed, only heat is extracted.

Some projects price the resource at the wellhead, again based upon flow rate and temperature drop. A minority of projects, typically older operations, include the price of the heat in a larger sum, e.g. a building rental or land lease payment.

Table 1

SURVEY SUMMARY

Project Status (as of 3-82)	Number of Projects	% of Survey Sample
Operating	7	33
Construction	9	43
Proposed	5	24
	21	
Type of Wellhead Developer		
Municipal/Non-profit	10	48
Private/Profit	11	52
	21	
Projects with partial federal funding	11	52
Basis of Geothermal Price		
Based on percentage of oil cost	3	14
Based on percentage of gas cost	12	57
Based otherwise, e.g. flat rate	6	29
	21	

SYSTEM EFFICIENCY

In measuring the heat to be sold, system efficiencies are generally not considered in the price; thus prices shown in Table 2 are for usable heat. To clarify, fossil fuel systems usually have a maximum efficiency of 80% in converting delivered heat into usable heat. In contrast, direct-use geothermal systems meter heat used across the customer's system, so efficiency is generally not a factor. Therefore, a new geothermal customer may only use 80 MMBtu of geothermal heat for every 100 MMBtu of fossil fuel which was historically consumed. The result of neglecting to consider this difference in efficiency in computing geothermal heat prices is a geothermal revenue stream significantly lower than anticipated.

ALTERNATE FUELS

As in other areas of economics, the prices of alternatives directly influence the price of the commodity in question. In this case the alternatives are fossil fuels such as oil, natural gas, and coal. The majority of projects have pricing

formulas tied to a percentage of natural gas costs, with a sufficient discount to make conversion to geothermal energy financially attractive. Natural gas has been selected in most projects because it is generally the least costly alternative fuel in an area; and because of its similarity to geothermal production and distribution practices and costs.

DISCOUNT RATES

Discount rates ranged from 0 to 50 percent of current alternate fuel prices. Some projects offered a flat fee (per MMBtu) at frozen 1981 fossil fuel rates. Others start with a base price equivalent to some percentage of current fossil fuel rates, but with an annual escalation factor which is not connected to fossil fuel prices. Still others offer the geothermal heat at a floating rate with a maximum price ceiling or limit.

It should be noted that some risk exists in indexing geothermal heat to alternate fossil fuels. Should these fuels drop in price, as oil did recently, revenue problems may develop for geothermal producers. Conversely, the rate of increase in fossil fuel prices is hard to predict, and thus, could possibly exceed allowable increases given in the escalation clauses of price agreements.

ECONOMIC DEVELOPMENT

In several of the surveyed projects, economic growth and diversification for the community, rather than energy savings, was the driving force behind the project. In these cases incentives to businesses which locate in "geothermal industrial parks" may include free heat for a certain period, or heat at even greater discounts than offered elsewhere in the community.

SUMMARY

The results of the survey are summarized as follows:

- A majority of the projects (57%) base their geothermal price on some discounted rate of natural gas, because it is usually the least costly alternative fossil fuel, and its similarity to geothermal production and distribution operations.

- For those projects basing geothermal prices on discounted natural gas rates, the average geothermal price for non-profit projects is 56% of current gas rates, and for profit projects the average is 66% of gas rates.

- The average price of delivered geothermal energy for those projects with prices based on gas and oil rates is $3.80/MMBtu as of March, 1982.

- A majority of the projects escalate their geothermal price annually with corresponding increases in fossil fuel prices; a small minority of the projects utilize other escalation factors, e.g. an arbitrary rate not indexed to fossil fuels.

- Only one project includes a fixed demand charge in addition to the price rate for heat consumed.

- The prices in place or proposed for 52% of these projects have been affected to an undetermined extent by various federal subsidies, e.g. DOE, EDA, HUD.

- Nearly all of the private developer projects are structured such that the developer "wholesales" the geothermal heat to another distribution entity, usually a local governmental unit, so as to allow the private developer to avoid public utility regulation; indicating that PUC jurisdiction is still a significant impediment to large-scale, i.e. district heating, geothermal commercialization.

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Table 2

PRICING & TERMS BY STATE AND PROJECT

Project (Status[1])	Resource	End-Use Load	Contract Terms	Price/MMBtu[2]
		CALIFORNIA		
A. (Construction)	160-170°F; 600 GPM; 2 wells; 900 ft.	14 public bldgs; 40% load factor initially	City to sell to customers at base price of 67% of current oil price; annual escalation is limited to a maximum of 5% of base price, not indexed to oil increases.	7.14
B. (Construction)	150°F	126 homes & greenhouse park	Same as above	7.14
C. (Construction)	180°F; 2500 GPM; 2 wells	State prison and greenhouse complex	Same as above except price drops to 50% of oil after equipment is amortized.	7.14
D. (Operating)	174-205°F; 6 wells	30 greenhouses	Resource developed by single user; landowner receives royalty of flat rate per greenhouse.	NA
E. (Proposed)	Power plant effluent	Unknown	Lessee/developer to sell effluent @ 50% of gas rate; also possibility of Federal royalty of 10% of coal price because of land-ownership.	2.57
		COLORADO		
F. (Operating)	116°F; 700-1000 GPM artesian; 3080 ft.	36,000 ft. shopping mall	60% of gas rate.	2.53
G. (Construction)	131-148°F; 1800 GPM 2 wells; 300 ft.	10 public bldgs; 54 businesses; 63 residences; initially 29 x 10^9 Btu/yr	40% of gas rate.	3.35
H. (Proposed)	150°F; 110 GPM springs; also 240°F @ 1600 GPM from 4 wells	Businesses, public bldgs; residences	60-90% of gas rate.	2.04-3.06
I. (Proposed)	122°F; 1200 GPM; 155 ft.	40,000 sq. ft., 4-story office bldg.	None developed, but likely to be % of gas rate.	NA
		IDAHO		
J. (Operating)	170°F; 900 GPM artesian; 2 wells, 400 ft. ea.	250 residences.	Water district sells both heat & domestic water based on actual consumption according to pipe diameter.	NA
K. (Construction)	160-170°F; 700 GPM artesian; 6 local and state wells; 400-2000 ft.	500+ residences & businesses.	Wellhead developer sells to City @ 54% of gas rate; City then distributes and sells to customers @ 70% of gas rate.	2.58 to City; 3.35 to customers
L. (Operating)	159°F artesian springs; estimated 1000 GPM.	Approximately 60 homes & businesses	Only written agreements between resource/owner & 2 customers: motel and pool purchase resource temperature & flow under same terms; both flat fees; other customers purchasing by oral agreements which vary widely.	$200/yr flat rate.
		NEVADA		
M. (Construction)	180°F; 250 GPM; 1000 ft.	150-unit condo complex; total 15.6 x 10^9 Btu/yr	Developer to sell to individual users at 85-100% of gas rate.	3.40-4.00
N. (Construction)	180°F; 485 GPM artesian well	Bank, laundry, & motel	Utility/developer to sell heat at 50% of gas rate; escalation allows only 50% of gas escalation.	1.90

Table 2 continued

Project (Status[1])	Resource	End-use Load	Contract Terms	Price/MMBtu[2]
		NEW MEXICO		
O. (Construction)	NA	Industrial users	Developer negotiating with user for 70–100% of gas rate, with possible flat rate during first two years as incentive.	NA
P. (Operating)	140° F; 550–600 GPM; 2 wells	11 college campus bldgs.	System O&M cost given for comparative purposes; no sale occurs.	2.50
		OREGON		
Q. (Operating)	140°F; 70 GPM; effluent	2 bldgs. currently; 23 max. potential	First one or two years free if employment is created in industrial park, then approximately 33% of gas, plus demand charge.	1.85
R. (Construction)	219°F; 2 wells; 728 GPM	14 public bldgs; total 36 x 10^9 Btu/yr.	Initial rate and demand charge unknown, but roughly equal to 50% of gas; possible future reduction to 30–40% of gas, plus undetermined demand charge.	3.00
S. (Operating)	87°F; 100 GPM; springs.	Waste water to greenhouses.	Flat rate for land and resource combined; resource portion estimated to be $150/mo.	NA
T. (Proposed)	200°F; 2-8 wells; 870 GPM each; 2000 ft.; Base case, 8 wells	1170 residences; 120 commercial; 1 fuel plant; total; 183 x 10^9 Btu/yr.	Price estimated to cover developer's O&M and PUC-approved investment return; also, 16.25% royalty on gross revenues goes to underlying resource holder, and 3% to City as franchise fee.	8.20
	Mini-dist., 2 wells	Mini-District Case: 50 commercial & public bldgs; 1 fuel plant; total 17 x 10^9 Btu/yr.	Different service area, same terms, except no 3% City fee because of exemption.	10.30
		WYOMING		
U. (Proposed)	130–160°F; 10K-25K GPM; 13–33 wells; 500–900 ft.	Case 1: 1700 residences; 230 businesses; 1 hospital; total 603 x 10^9 Btu/yr. Case 2: 100 residences; 100 businesses, 1 hospital; 3 schools; total 153 x 10^9 Btu/yr.	70–100% of gas rate.	2.66–3.50

[1] As of March, 1982.

[2] Prices are for delivered heat as of March, 1982; system efficiency is not considered in calculating the prices shown.