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EVALUATION OF STATE TAXES AND TAX INCENTIVES AND THEIR IMPACT ON THE DEVELOPMENT OF GEOTHERMAL ENERGY IN WESTERN STATES

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ABSTRACT

The economic impact of existing and prospective state taxes and tax incentives on direct thermal applications of geothermal energy are evaluated. Study area is eight western states which have existing potential geothermal activities. Economic models representing the geothermal producer and business enterprise phases of four industrial/commercial uses of geothermal energy are synthesized and then placed in the existing tax structures of each state for evaluation. The effects of the state taxations on net profits and tax revenues are determined. Tax incentives to accelerate geothermal development are also examined.

INTRODUCTION

The accelerated utilization of geothermal energy resources for direct thermal applications can greatly enhance the energy and economic development of the Western States. Economics and/or profits for the energy producer or user are a key factor in the implementation of direct thermal applications. State, local and Federal taxes all significantly influence the cash flow and profit percentages of geothermal operations. Several published and unpublished studies have been carried out on the quantitative effects of the applicable Federal tax laws, particularly those encompassed in the Energy Tax Act of 1978. This study addresses the economic impact of state and local taxes and tax incentives on future geothermal developments in several western states. The primary objectives are to determine the variability in cash flow and net profit after state and local taxes for the geothermal producer and/or user and to estimate the tax revenues generated by geothermal developments for different taxation levels and various tax incentives. Both existing and prospective taxations and tax incentives are examined.

TECHNICAL APPROACH

Principal components of this state tax study are the existing (1979) state and local tax structures of each of eight western states, realistic business economic models of four types of direct thermal applications, computer simulations of cash flows and tax payments, evaluation of selected tax incentives on profitability, and aggregations of prospective state tax revenues for three scenarios of future geothermal activity. The state and local tax structures have been compiled from the study by Wagner (1977), state tax statutes and regulations, and interviews with state tax officials. The four geothermal business economic models consist of the following: low temperature process heat for a greenhouse for wholesale flower production; space and hot water heating for an apartment complex; process heat for a food processing industry; and small-scale electrical power generation and cascaded direct thermal heat for a small industrial park. The economic models have been composed from commerce, industry and DOE data. The computer simulations are performed using the System for Economic Evaluation under Risk (SEER) program of Science Applications, Inc. (Grange et al., 1978). The selected tax incentives are those being utilized or considered by certain state governments and others available to state taxing authorities.

STATE TAX STRUCTURES

All relevant state and local taxes for both the geothermal energy production operation and the energy-using business operation have been considered and compiled for this study. This approach has been used since in numerous direct thermal applications the energy producer and user may be one and the same party for taxation purposes. Nevertheless, tax computations for an integrated operation require a distribution of the capital investment, operating expenses, and incomes between the distinct economic phases of the total operation. Detailed descriptions of the state and local taxes are contained in the project report (Bronder and Meyer, 1980).

GEOTHERMAL/BUSINESS ENTERPRISE ECONOMIC MODELS

The basic physical and operational features of the four business economic models are listed in Table 1. The four models represent different plant sizes, land areas, number of geothermal wells, well depths, and energy requirements. They are intended to represent a cross-section of prospective small-scale goethermal producer/business enterprises, but they do not constitute a comprehensive sampling and do not include larger scale electrical power plants.

A summary statement of the capital investment factors for the four models is provided in Table 2. The summary statement distinguishes between the geothermal energy production operation and the energy-consuming business enterprise. The geothermal producer statement itemizes the separate investments for the reservoir system (intangible and tangible), transmission system and conversion system. The business enterprise statement itemizes the capital investments for land, buildings, personal property, heating and cooling system, machinery and plant equipment, and inventory or working capital. The total geothermal capital investments range from $304 thousand to $10.5 million; the business enterprise investments range from $624 thousand to $29.5 million for the four models. The geothermal energy requirements range from 23 X 10^9 Btu/yr to 150 X 10^9 Btu/yr plus 1000 KWe.

COMPUTER SIMULATIONS

The life cycle investment analyses have been carried out, using the SEER program, for single units of each of the four geothermal producer/business enterprises in each of eight western states. Base year is 1979. SEER is a generalized system which can be applied to any investment that generates future cash flows over time. SEER contains special tax calculations for mineral and energy resource investments. Profitability measures computed by SEER include: discounted cash flow rate of return, net present value, payback period, discounted payback period, revenue requirement, and wealth growth rate. All calculations are performed with after-tax net cash flows.

Taxes by level of government were computed year by year for a 30-year life cycle. In the first stage analysis the life cycle simulations of the reservoir and the transmission systems are calculated separately from the energy consuming enterprises. The norm for reservoir and transmission systems was a rate-of-return of 30% on equity investment and a 12% rate-of-return on indebtedness. The second stage of the analysis was the integration of the reservoir and transmission system with the business operation. At this stage, the rate-of-return for the total integrated enterprise was assumed to be 16% for the equity investment and 12% on indebtedness.

SAMPLING OF COMPUTATIONAL RESULTS

The economic effects of taxation are documented numerically in terms of net present value, payback period and discounted cash flow rate of return versus average annual state and local taxes. By way of illustration, a selection of data for the food processing enterprise are presented in Table 3. The State of Nevada serves as a good reference point since it was the lowest tax state and had a consistently high profitability and short payback period. For example, the total integrated food processing enterprise in Nevada had a payback period which was 5.5 years less than the highest tax state, a discounted cash flow rate of return, which was 5 percentage points higher, and a net percent value after a 16% rate of return, which was $3.7 million higher compared to the highest tax state. A graphical representation of the net present value data for the total integrated enterprise reveals that a decrease of $430,000 in net present value (after a 16% rate of return) occurs for each $100,000 in annual state and local taxes.

In the case of the reservoir and transmission system alone, the food processing simulation showed a similar pattern. The payback period varied from 4.8 years in Colorado to 2.4 years in Nevada, and the discounted cash flow rate of return rose from 21% in Colorado to 34.5% in Nevada on the same enterprise. The annual state and local tax was $83,000 in Nevada, $718,000 in Arizona, and $670,000 in Colorado from the reservoir and transmission system portion of the food processing operation. Property and income taxes were almost entirely responsible for the differences.

The property tax is a particularly important factor as an impact on profitability because the property tax is imposed from the initial year of investment unless there are exemptions. State income taxes are not as great a factor as a rule, because of the delay in tax liability over time associated with accelerated depreciation, depletion, and investment tax credit. Furthermore, new enterprises are generally not very profitable during the first several years of the life cycle.

MAJOR FINDINGS

The state by state comparisons reveal a wide difference in total tax bills for the geothermal reservoir and transmission systems as well as the related energy consuming business enterprises. The differences are not traced to energy taxes, such as severance taxes, since these are seldom imposed upon geothermal activity. The basic reason for the wide differences are the state income tax rates and provisions and the property tax imposition. Sales taxes were not a sizable factor unless the energy output was subject to a yearly tax as in the case of the small scale energy systems.

State and local taxes had a significant effect on net present value, payback periods, and discounted cash flows. While the economics of decision-making were not specifically addressed, the differences in taxes appear large enough to be a factor in decisions to go forward with a capital investment or to decide against it. Where there is flexibility in the location of an operation, the differences among the states in the taxes levied would appear high enough to be a factor in the locational decision.

Recent Federal tax changes, which have been adopted almost in their entirety by the states,

Table 1. Basic features of geothermal producer/business enterprise models

Model	Physical Size (sq. feet)	Land Area (acres)	No. of Wells	Well Depth (feet)	Geothermal Energy Requirement (10^9 Btu/Yr)
Greenhouse	100,000	60	2	1,500	27
Apartment Complex	300,000 (500 units)	20	2	1,000	23
Food Processor	200,000	80	3	7,000	346
Industrial Park	(5-10 Small Plants)	100	4	2 @ 10,000 and 2 @ 5,000	150 + 1000 KWe

Table 2. Summary statement of capital investment factors

	Greenhouse	Apartment Complex	Food Processor	Industrial Park
Geothermal Producer Statement				
Reservoir investment	$203,700	$138,000	$4,536,993	$7,998,300
Transmission investment	100,000	219,500	804,000	1,176,500
Power conversion system	-------	-------	-------	1,131,400
Direct thermal transfer system	-------	-------	-------	549,100
Total Capital Investment	$303,700	$357,500	$5,340,993	$10,855,300
Business Enterprise Statement				
Land	$ 40,000	$500,000	$ 400,000	
Buildings	294,000	10,500,000	3,000,000	
Personal Property	-------	500,000	-------	Not
Heating & Cooling System	120,000	1,000,000	800,000	Applicable
Machinery/Plant Equipment	120,000	-------	6,000,000	
Inventory/Working Capital	50,000	-------	19,332,000	
Total Capital Investment	$624,000	$12,500,000	$29,532,000	

Table 3. Selected data on state taxes and business profitability

State	Greenhouse AAST(10^3)	Greenhouse NPV(10^3)	Apartment Complex AAST(10^3)	Apartment Complex NPV(10^3)	Food Processor AAST(10^3)	Food Processor NPV(10^3)	Small Scale Energy AAST(10^3)	Small Scale Energy NPV(10^3)
Total Integrated Business Enterprise								
Arizona	31.	72.6	342.	-4,400.	718.	-58.	306.	-2,000.
Colorado	35.4	64.8	392.	-4,100.	670.	1,100.	222.	-1,500.
Idaho	19.5	142.	246	-3,800.	580.	1,800.	173.	-1,300.
Montana	20.	151.	251.	-3,200.	731.	2,100.	211.	-1,100.
Nevada	9.8	174.	92.	-3,100.	83.	3,800.	79.	-720.
New Mexico	16.	157.	239.	-3,600.	476.	2,500.	212.	-1,300.
North Dakota	15.2	174.	217.	-3,500.	535.	2,800.	148.	-960.
Utah	12.	164.	196.	-3,600.	310.	3,100.	167.	-2,100.
Reservoir and Transmission System Only								
Arizona	11.	5.7	12.	-85.	153.	-109.	170.	12.
Colorado	7.	15.2	8.	-71.	118.	-428.	143.	18.
Idaho	7.	13.8	6.	-101.	57.	-302.	110.	38.
Montana	3.	20.9	4.	-56.	111.	-182.	106.	90.
Nevada	3.	18.5	2.	-32.	31.	+167.	41	-24.
New Mexico	5.	19.7	5.	-49.	107.	+38.	110.	30.
North Dakota	4.7	23.0	1.9	-3.	92.	-205.	85.	87.
Utah	3.	20.6	4.	-48.	41.	+152.	44.	105.

AAST = Average Annual State Taxes, NPV = Net Present Value have mitigated the impact of the state income tax. Depletion allowances, expensing of intangible drilling costs and accelerated depreciation have reduced the impact of the state income taxes. A feature not adopted by the states has been an investment tax credit for geothermal energy production or usage. Tax credits which are being extended to other alternative energy sources should be extended to geothermal energy.

Property taxes are burdensome on geothermal energy because of the capital intensity of such economic developments. There has not been a great deal of attention given to geothermal energy insofar as property taxation is concerned.

The Nevada exemption of intangible drilling investments deserves attention and action by other states. And while taxation of the resource *in situ* has not been an issue in most of the states, it could very well become an issue. There does not appear to be an exemption of geothermal resources *in situ* under the property tax statutes or state constitutions of the western states studied. Water rights were found to be taxable in the western states included in this study; exceptions were Utah and Idaho, which exempt water rights when used for irrigation purposes.

POLICY RECOMMENDATIONS

In order to accelerate geothermal and related using enterprise developments, the following tax policy should be considered:

1. Investment tax credit should be allowed by the states for geothermal energy production and delivery systems. Tax credits should be applicable to the operation without any time restriction.
2. Exploration costs should be made deductible as an expense as are development costs.
3. Sales taxes should not be applied to geothermal developments either as an initial tax on tangible investments or on the productive output on a yearly basis.
4. Severances taxes should not be applied to geothermal extraction.
5. Property taxes should be reduced by exemption of intangible drilling investments in the reservoir development as is now done in Nevada. In states where property is classified for taxation, alternative energy sources such as geothermal should be classified at a low percent of full value for property tax assessments. In order to accelerate alternative energy development, the states should consider an exemption such as the five-year exemption of property taxes allowed in North Dakota for certain job-creating businesses. The present methods of assessing and taxing geothermal energy should be examined to ascertain whether a capitalization of income approach would be more realistic or whether or not more rapid depreciation schedules should be used.

The thrust of the recommendations is to foster tax policies to accelerate geothermal development. At a minimum, the incentives adopted for solar energy should be extended by the states to geothermal energy. It is recognized that state and local tax systems have been created over the years within a statutory and constitutional framework. In order to accelerate alternative energy development, there may be required some alteration of traditional tax structures. It is hoped that this study will provide an improved guideline as to what the necessary changes should be.

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