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THE EFFECT OF HUMAN JUDGMENT ON GEOTHERMAL LEASING  
A CASE STUDY

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ABSTRACT

At numerous geothermal sites, Federal geothermal leases are necessary in order to explore for and develop geothermal energy, especially where there is power generation potential. In some instances, geothermal lease applications filed as early as 1974 are still "pending." On National Forest lands in particular, issuance of geothermal leases has been slow. Of the 4,052 non-competitive geothermal lease applications on BLM lands, 22 percent were issued; whereas of the 1,718 applications on U.S.F.S. lands, only 1 percent were issued as of 1978 (Beeland, et al, 1978).

PURPOSE AND OBJECTIVES OF STUDY

Several studies have been conducted on the "institutional" barriers to geothermal development. But these studies have been directed primarily to the legal, regulatory and procedural barriers. Psychological characteristics may be important, as well.

According to T. E. Stewart (1973):  
"Decisions on environmental systems are a product of the interactions among three systems."

These are, according to Stewart, the bureaucratic/political system, the environmental/technological system, and the human judgment system. Indeed, the latter is an integral part of the first two systems, with all participants making judgments concerning their particular areas of responsibility. This study was conducted, therefore, with three aims in mind:

- Learn what judgment "policies" had been employed,
- Learn what effect those judgment policies had, if any, on the non-issuance of leases, and
- Assess how judgment analysis might be used in similar future situations and make recommendations for its use.

SOCIAL JUDGMENT THEORY AND ANALYSES

Behavioral scientists have indicated findings from experiments concerning human judgment-making that:

- The cognitive limitations of the human mind are such that simplifying methods are intuitively used,
- Additional data may result in poorer judgments,
- Judgments are generally biased and inconsistent,
- Descriptions of one's judgment process and criteria are generally inaccurate,
- Judgments about "factual" data and values may become muddled, and
- Judgment analysis can help clarify judgment processes, provide cognitive feedback, and help improve judgments and resolve conflict. The technique analyzes the components of judgment information obtained through interviews, primarily, but also from written materials (Slovic, Fischhoff and Lichtenstein, 1977).

To investigate the applicability of judgment analysis to geothermal leasing required a case study approach. The case selected was the application by Petro-Lewis, later assigned to Amax Exploration, for geothermal leases in the Chalk Creek area of Colorado. Three interviewees were selected, those persons who seemed to be the key judgment makers (although not necessarily the final decision-makers). Two of them were U.S.F.S. staff, who prepared two of the environmental assessments (EA's), one for the Forest Supervisor and one for the Regional Forester. The third person was a representative of Amax Exploration, the Current lease applicant.



Service to the Regional Foresters that stated the need for a deliberate, Service-wide reorientation of the U.S.F.S. minerals program. It established time limits for review and recommendation on leasing proposals and operating plans. The objective of eliminating the backlog of leases within the next two years was expressed. (Nelson 1979).

The Regional office is in the process of substantially revising the environmental assessment. The preliminary draft recommends issuance of the geothermal lease with appropriate stipulations and careful review and evaluation of Plans of Operations subsequently submitted by the lessee.

#### JUDGMENT POLICY ANALYSIS

Some significant differences in judgment policies among the key participants in this case were obvious. First, the issues varied from one to another, generally along organizational lines. Among all participants, their own organizational mandate was, however, primary. The order in which the issues were ranked and weighted by the participants varied. Other issues identified as primary judgment factors were environmental features, especially wildlife, outdoor recreation and visual resources, geothermal energy value, energy supply and energy market.

Several cognitive simplification methods were apparent as well. For instance, the manner in which the participants dealt with uncertainty clearly varied among them and affected the events.

The uncertainty in the case is a critical issue as it often is in any decision involving an unseen, unproven resource. Unlike forest timber, neither the exact location nor the value can be precisely or even adequately addressed a priori. As so aptly expressed:

"Absence of evidence is not evidence of absence", where minerals are concerned (Schlessler, oral comm.).

One of the U.S.F.S. staff interviewed ignored the uncertainty by assuming the "worst case," the construction of a power plant. The other U.S.F.S. interviewee was able to avoid it by postponing a final decision on a power plant until later when more information would be available. The lessee's representative hoped to eliminate uncertainty by obtaining reasonable assurances that development would be allowed.

Another such simplification method in this case, as in many such decision processes, was the confusion of facts with values. Judgments differed about factual issues such as:

- The amount of National Forest land to be affected.
- Whether or not a power plant and road could be concealed by trees, hills and ridges.

- The effect on wildlife.
- The effect on outdoor recreation.
- The ability of the U.S.F.S. to control post-leasing operations.

The values that were confused and addressed concurrently with those facts were related to such questions as:

- Are power plants ugly?
- Are road cuts ugly?
- Are they too ugly to allow?
- Is winter range more important than geothermal energy?
- What is the importance of the geothermal energy supply?

Because of the variation in judgment, the conclusions reached by the participants differed. The lease applicant believes the geothermal resource to be of very high quality and the development impacts both very limited and mitigable. The U.S.F.S. Forest Supervisor's analyst recommended issuance of some leases and denial of some, because of serious impacts on environmental values.

The U.S.F.S. Minerals Director at the Regional level indicated he would recommend issuance of the leases, because he believed that any impacts could be sufficiently mitigated and that the public right to production of the geothermal energy was an important value.

#### FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Several of the reasons why geothermal leases have been seldom issued (and then only after long delays) on U.S. National Forest Domain have been documented in previous studies. They include the complexity of the leasing process, outside pressures, lack of sufficient staff, and conflicts among U.S.F.S. mandates (Beeland, et al, 1978).

This study indicates that values, perceptions and assumptions on "judgment policies" affected the lease application process by adding to the review time. The use of cognitive simplifying methods or intuitive thinking aids that tended to distort judgments were also indicated.

After the fact, social judgment analyses such as this one can help to understand past events. Social judgment analysis can assist in improving judgment-making performance, as well. Several recommendations are suggested:

- When important judgments are to be made, identify the issues, the weights and the way in which the trade-off requirements are viewed by the various participants.

The clarification can focus attention appropriately.

- Separate facts from values, explicitly. Then assure that statements about the way things are or will be are based on adequate evidence.
- Use outside, uninvolved experts when necessary to determine what the facts are. The decision maker or his analyst may be too close to the problem.
- Deal with uncertainty explicitly. Establish probabilities for outcomes, again drawing upon outside experts if necessary to help estimate those probabilities.

The objective of this study was to learn what part judgment policies played in the decision-making process and how that information might be used to improve the process in the future. One lease application case was investigated in some depth. While one can not generalize from this one case about all geothermal lease applications on National Forest lands, this case does not seem atypical. In any event, some insights were gained that can be generalized and can be used to better or, at least, better understand similar situations, as follows. Judgments are inherent in such a decision process as are cognitive simplifying methods. They differ among participants, even in cases where participants share many values. They seem to be inherent to the human condition, not simply a flaw of "subjectivity" usually found in people with whom one disagrees. If one obtains feedback about one's own and others' judgment policies, during the process, differences may then more easily be resolved.

Understanding of social judgment analysis and its use in the analysis of cases such as this one can aid decisions in a variety of situations. Regarding Federal geothermal leasing decisions, it may become even more applicable. Given the U.S.F.S. directive relieving some institutional delays, lease application decisions may hinge to an even greater extent in the future upon the judgment policies of the participants.

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