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for geothermal projects, including technological development as well as social, environmental, and economic impact assessments. The commission hopes to accelerate its program with the help of federal matching funds. By funding demonstration projects in hot water resource areas and by developing workable technologies to mitigate problems associated with geothermal development (e.g., noise, odor, brine disposal, freshwater consumption), institutional constraints could be reduced.

10.8 Proposals Made by Various Participants in the Process

10.8.1 Changes in Structure

- Split the siting function from the rest of the energy commission.
- Use a consolidated forum procedure for siting permits.
- Use a unitary agency procedure for siting permits.
- Take over all phases of geothermal development (see Chapters 4, 6, and 9).
- Raise the limits on the minimum size of plants whose site must be approved by the energy commission to the point where no geothermal plants would fall under its jurisdiction.

- Build plants smaller than the 50 MWe minimum for energy commission consideration.

- Assemble a siting division staff that mirrors the conflicts in the public sector.

10.8.2 Changes in Procedure

- Force the energy commission to attempt to learn what it can both from CPUC and from the counties, intervenors, developers, and utilities with experience in this area.

- Act as a disseminator of knowledge about geothermal development to all the actors in the process and to the general public.

10.8.3 R&D Funding Guidelines

- Concentrate on areas not being funded by ERDA, especially nonfringe technology.

- Develop mitigation technologies that will reduce resistance to continued geothermal development.

- Build demonstration plants instead of concentrating on basic research.

- Begin a loan program to subsidize risk for drillers as well as for plant builders.

- Conduct demonstration projects on power generation technologies, particularly those concerned with easy-to-exploit rather than hard-to-exploit resources.

- Conduct demonstration projects on mitigation technologies in power plants and drilling.

- Support activities to increase drilling and exploration technology and manpower.

- Help state agencies that want to build geothermal power plants.

Chapter 10

FOOTNOTES

1. Created by the Warren-Alquist Energy Resources Conservation and Development Act, California Public Resources Code (PRC), Section 25000 et. seq.

2. PRC, Section 25500 et. seq.

3. PRC, Section 25001 to 25007.

4. An interesting, although unresolved, issue is the degree to which CERCDC's consideration of conservation options in preparing the forecasts obviates the need to consider conservation measures in the discussion of project alternatives in the CEQA EIR.

5. On the other hand, as some observers have noted, dissatisfaction with the performance of those agencies led to the creation of CERCDC and suggests that such learning will face definite limits.

6. Interviews with CERCDC Siting and Legal Division staff, June 23 and 24, 1976.

7. PRC, Section 25500 et. seq.

8. Ibid. See also CEQA, PRC, Section 21000 et. seq.

9. PRC, Sections 25120 and 25500.

10. PRC, Section 25501.

11. Title 20, California Administration Code (CAC), Chapter 20, Subchapter 5, Article 3.

12. PRC, Section 25120. See also Title 20, CAC, Chapter 2, Subchapter 5, Article 6.

13. PRC, Section 25540.

14. PRC, Section 25506.5.

15. PRC, Section 25518 and 25518.5.

16. PRC, Section 25526.

17. PRC, Section 25540.

18. Ibid.

CHAPTER 11

REVIEWING NEW STATIONARY SOURCES OF AIR POLLUTION

11.1 Introduction

Permits from local APCDs are required at more than one stage in the geothermal development process. An "authority to construct" and a "permit to generate" are required both for wells and for the power plant.

While the local APCDs are responsible for issuing these permits, the districts are regulated within the limits of general guidelines set forth by the state ARB. The board recently adopted revised rules for reviewing new stationary sources of air pollution, and this action could have a significant impact on future geothermal exploration and power development statewide.[1]

Under California law,[2] the rules adopted by ARB are forwarded to regional air basin coordinating councils for adoption and implementation. These councils are composed of representatives of APCDs in each regional basin. Flexibility is allowed in adopting specific regulations to meet the criteria established by ARB, so long as ARB approves the regulations adopted by APCDs. The council has 60 days from the issuance of a guideline to adopt regulations which ARB feels are adequate. After this period, ARB has the option to adopt regulations for the basin in lieu of the council's own actions.

The proposed new source review rules pose both substantive and procedural questions for future geothermal development. If adopted in the form recommended by ARB, they would require the air pollution control officer (APCO) in each local district to deny the authority to construct or operate a new stationary source of air pollution unless he could determine that emissions from the new source would not be expected to result in the violation of, or contribute to a continued violation of, any state or national ambient air quality standard. Approval would be routinely granted only if estimates indicated that the source would at no time emit more than a limit set by APCD with ARB approval of any air contaminant for which there is a state or national ambient air quality standard, provided that the ambient air standards in the area were being met.[3] These would include such contaminants as the nitrogen oxides, sulfur dioxide, lead, hydrogen sulfide, and organic gases, but would not include carbon monoxide, for which the proposed criteria are 150 pounds per hour or 1,500 pounds per day. If it appears that the limits would be exceeded, a detailed analysis is required to determine whether the source would cause or contribute to an existing violation of ambient air quality standards. If the source did none of these things, it would be approved.[4]

The proposed rules establish a new procedural step. Both the authority to construct and the permit to operate

granted by an APCO are conditional for 90 days, during which time ARB may review and reverse the decision of the APCO.[5] Facing this situation, a geothermal developer may choose to wait out the 90 days to make certain he will in fact be permitted to drill a well, to build a power plant, or to operate one. Ordinarily decisions of the APCO can be appealed within 60 days of issuance, but during this time the permit holder may proceed. Essentially then, the 90-day review period adds ARB as a new actor in the permit process. To the utility, a delay of 90 days may not be serious, because it takes from two to two and one-half years to build a power plant. However, a 90-day delay is significant to the driller, because it represents sufficient time to have completed a well.

The agency that wants development will probably have to wait for the appeal procedure to reach a decision because the procedure has been designed, with the urging of the Environmental Protection Agency (EPA), in order to obtain review of local decisions by a body not filled entirely with local people. In very prodevelopment areas, the decisions at the appeal stage may be generally less favorable; in antidevelopment areas the appeal decisions may be generally more favorable.[6]

11.2 Consequences at The Geysers

During both drilling and power plant operations, non-condensable gases are routinely allowed to escape. The steam at The Geysers contains significant quantities of noncondensable hydrogen sulfide gas. While the concentration generally varies from 80 to 3,000 ppm, and averages 200 ppm, emissions from The Geysers are currently in excess of the state ambient standard of 30 parts per billion.[7] For an average well at full flow (150,000 pounds steam per hour), this would produce an emission of 30 pounds per hour of hydrogen sulfide. Thus, escaping steam at The Geysers could result in emissions in excess of the proposed maxima. When the bit penetrates the steam reservoir during drilling, the steam is ejected at the surface of the wellhead from a device called a blooie line. Steam may be ejected for several hours, but not at the full well flow of 150,000 pounds per hour. After the well is completed, it is allowed to vent freely for several hours at full flow. Free venting is done to (1) test the well, (2) clean out the well bore, or (3) keep the wellhead hot while minor repairs are effected to a malfunctioning turbine or generator. If the use of the blooie line and free venting continue, the APCO would have reason to conclude that the proposed new source criteria would be exceeded and he might be forced to deny necessary permits. The same may be the case during loss of control over wells. It should be borne in mind that drilling, in

itself, and normal bleeding activities pose no problems under the 15 pound per hour standard.

It may be possible to remove the hydrogen sulfide from the steam flow so that drilling can continue. However, the technology for this is as yet untried. The major problem is that, since the steam is not condensed at the wellhead, there is no easy way to extract the noncondensable gases and deal with them separately. Instead, the entire steam flow must be treated. One potential approach is now being investigated by the FMC Corporation. FMC proposes to spray hydrogen peroxide into the steam vented from a well; this method will oxidize the sulfide.[8] Unfortunately, although this process will control the hydrogen sulfide odor, it will simply convert the sulfide to sulfur dioxide and sulfates. Sulfur dioxide is subject to the same maximum rates of emission as hydrogen sulfide; sulfates apparently are not. Since the scheme has not yet been tested in the field, the end products of the oxidation reaction are unknown, although it is known that the composition of the products is dependent on the pH of the steam and that alkaline conditions at The Geysers favor sulfates. FMC estimates the costs of abatement at $20 to $50 per hour, which may be reasonable as long as venting is done only when necessary. Other processes may be devised if APCD adopts the new source review rules as proposed. But it must be emphasized that any sulfide abatement techniques for use at the wellhead are still speculative; time will be

required to find an effective system. Regardless of the success of new abatement technology, the new emissions regulations put a high premium on control over well operations.

Sulfide emissions may be easier to handle at the power plant. There, the noncondensable gases are extracted as a normal part of the operation of the plant. PG&E is now in the process of testing four different hydrogen sulfide removal systems for inclusion on all future power plants.[9] It should be noted that no removal system is perfect, and questions have been raised as to whether even the proposed systems are sufficient to meet the proposed maximum emission standards.

The problem at The Geysers, at least insofar as it involves hydrogen sulfide emissions, may get much less severe over time. The installation of emissions controls on existing plants should eventually allow attainment of ambient air quality standards.[10] Second, assuming ambient standards are met, the limits that trigger new source review may be raised; in fact, Lake County, as noted, has set the limit at 20 pounds per hour or 200 pounds per day for its APCD. Third, the current studies of the air flows in the area may uncover several different air basins in the same general area, so each air basin could be treated separately.

11.3 Problems at Other Sites

The proposed new source review rules pose fewer difficulties for development of hot water resources than for steam. With hot water resources, steam does not typically escape during drilling; the content of noncondensable hydrogen sulfide is much less than at The Geysers; and the gas can be more easily extracted and dealt with at the wellhead. Furthermore, free venting of wells occurs rarely because hot water wells are much easier to shut in than steam wells, which have a tendency to cool off and accumulate water and debris. Power plant emissions would probably be simpler to handle, since most systems envision a closed-loop operation in which the gases, along with the cooled brines, would be reinjected. Nevertheless, in certain areas, conditions may be such that the proposed review rules set standards that would be difficult to achieve.

11.4 Proposals Made by Various Participants in the Process

- Continue existing new source review rules. The new rules were intended to improve the ability of APCDs to reduce emissions, as the earlier rules were thought inadequate. However, the new rules themselves may be unworkable, as the South Coast Regional Air Basin Coordinating Council has stated.

- Raise the maximum emission limits. The maximum limits in the original proposal were 5 pounds per hour; these were raised to 15 pounds per hour or 150 pounds per day as a compromise with a majority of APCDs that preferred 25 pounds per hour or 250 pounds per day.

- Change the limit from a one-time, hypothetical maximum emission to some form of average or limit not to be exceeded more than X days per year.

- Make granting exemptions easier. In areas where ambient air quality standards are being routinely violated, granting variances may be difficult; but in remote areas, where geothermal resources are located, a minimal degradation in an air quality level which is already good could be acceptable.

- Allow consideration of benefits other than air quality improvement. The proposed rule allows consideration of only air quality factors in granting or denying permits and excludes any social or economic hardships that are created. By law, any appeal of a permit denial cannot consider economic or social factors.

- Adjust maximum limits according to the relative risk posed by the pollutant. Presently, emission of all pollutants except carbon monoxide is held

to the same standard of 15 pounds per hour, regardless of the level at which they become noticeably injurious. For example, hydrogen sulfide is harmful at levels much lower than sulfur dioxide. A reduction in risk may result if the sulfide could be converted to sulfur dioxide, but this is not reflected in the proposed rules. Rules could be changed to allow trade-offs between pollutants.

- Include benefits outside the basin. Under the proposed rules, APCD may balance increased emissions at one point within the basin against a resulting reduction in emissions at another point; however, it may not consider emission reductions in another basin. That is, sulfide emission at The Geysers could possibly reduce sulfur emissions elsewhere as geothermal plants substitute for oil burning plants. Demonstrable statewide air quality benefits could be included in the analysis of a new source.

- Shorten or eliminate ARB review of APCO decisions on new sources. Rely on standard appeal procedures alone.

Chapter 11

FOOTNOTES

1. California ARB, "Suggested New Source Review Rules for Determining Impact on Air Quality," October 28, 1975.

2. Health and Safety Code Sections 24198 et. seq.; Health and Safety Code Sections 39274, 39275.

3. ARB's suggested limit for hydrogen sulfide is 15 pounds per hour and 150 pounds per day. Lake County, however, has adopted limits of 20 and 200 pounds, respectively.

4. See the source listed in footnote 7. Also California ARB Staff, "Consideration of Proposed New Source Review Rules for Determining Impact on Air Quality," Staff Report 75-19-4, October 27, 1975.

5. Ibid.

6. Discussion with ARB.

7. Ibid. and data from various environmental documents filed with Sonoma and Lake counties.

8. Discussions with Geothermal Energy Institute, CPUC, and PG&E.

9. Discussion with PG&E.

10. An interesting issue is that PG&E appears to have scheduled its retrofitting of existing plants with abatement equipment in reverse numerical order (e.g., starting with unit 10 and working down to unit 1). Units 3, 4, and 5 are the major emitters, although they produce relatively little power. The intended schedule suggests they will receive no attention for the next two years.

CHAPTER 12

THE POLITICAL ECONOMIES OF COUNTIES

12.1 Overview

Even though the issues surrounding geothermal development will vary from county to county, one can predict, and thus prepare for, many issues by studying the ways in which geothermal development impacts are likely to interact with a given county's political economy--i.e., its attitudes, social and economic activities, and political procedures.[1]

12.2 Varying Impacts of Geothermal Development

Ways in which the impacts of geothermal development will vary from one area to another have already been discussed in previous chapters, particularly Chapters 4 and 5. For instance, steam resources are apt to create more emissions and noise than hot water resources. Emissions are apt to be a more serious problem in areas with stable air masses than in areas with turbulent air. Appropriation of water for cooling is more of a problem where water is scarce.

12.3 Varying Evaluations of Impacts

Similarly, the evaluation of impacts will vary because the impacts differ in their compatibility with the existing attitudes, social and economic activities, and political

procedures in the county. Noise might violently disrupt a retirement or resort area but cause little concern in a desert or agricultural area. In the first case, which occurs in Lake County, the existing social and economic activities are relatively less compatible with geothermal development; in the second, which occurs in Imperial County, the existing activities are quite compatible with development.

The specific details of the attitude or activity in question might be very important. Agriculture and geothermal development appear relatively compatible when the crops are vegetables and grains and the resource is hot water; they appear relatively incompatible when the agriculture is wine grapes and the geothermal resource is steam.

In addition, the compatibility might change over time. Drilling geothermal wells may pose no problem to agriculture; but the operation of a geothermal power plant may create competing demands for water. Attitudes towards geothermal development might also change as the result of accidents that affected local residents.

12.4 Varying Responses to the Impacts and Evaluations of Them

Counties also differ in the political procedures they use to discover and resolve conflicts between potential changes such as geothermal development and their existing attitudes and social and economic activities. In Sonoma

County, where geothermal development provides the largest single source of county tax revenue, the county officials charged with regulating development have divided the county into two areas--the portion of the county inside the federal KGRA, where they allow geothermal development fairly readily; and the portion outside the federal KGRA, where, as of the first half of 1976, they have not allowed development. In Lake County, where development has not proceeded as far and sites of existing activities form a patchwork quilt pattern with sites of potential geothermal activities, officials have responded by proceeding very carefully, evaluating applications one by one, and insisting on use of maximum amount of mitigation technology. They have also, with some encouragement from the state, been relatively quick to tax the increased property value that geothermal resources represent. Napa County has responded by instituting a moratorium on all geothermal activities until it could make a serious decision about the ways in which geothermal development fit into the county's comprehensive plan. In the past, the county has fought vigorously and successfully against activities which a large number of its citizens had decided were incompatible with its desire to maintain the county's rural flavor and its excellence in the production of wine grapes and wine. Imperial County has responded by being very supportive of geothermal development, keeping its environmental review procedures relatively short and treating potential increases in property values as untaxable

while the development process was in what the county felt was an experimental stage. Imperial County also set aside a zone in which geothermal plants were to be constructed, although the differences between the procedural requirements for constructing plants inside or outside the zone were not very great.

12.5 Summary

The existence of differing local political viewpoints, priorities, and conflicts has a major effect on the geothermal development process as a whole. These differences also highlight conflicts between state and local interests in geothermal development. In some cases, the prevailing local view is that geothermal development is incompatible with existing activities. This causes the counties to slow down development more than the state might have done. In other counties, however, the prevailing view that geothermal development is compatible with existing activities results in their facilitating development.

In addition to causing variations in the speed at which geothermal development proceeds, variations in local political economies may produce other differences, as well. For example, the degree of mitigation requirements may vary between counties, as may the kinds of impacts for which mitigation is required.

Even if the preferences and policies of the state were to override those at the county level, local concerns still play an important role. Much of the political opposition to geothermal development may be reduced if the development is sensitive to mitigating impacts that are locally defined. The state's understanding of such concerns depends upon its knowledge of the localities involved and, to some extent, on its ability to communicate with local governments.

12.6 Proposals Made by Various Participants in the Process

- Remove county governments from regulating the geothermal process (see Chapter 10).
- Use technologies that minimize geothermal impacts, such as slant drilling, consolidated pads, non-condensable gas scrubbers, and the like.
- Set limits on the county's use of delay as a device for keeping political peace.
- Set bounds on who can testify at hearings and under what rules.
- Have applicants and governments give more compensation (for instance, funds or research projects) to those suffering from local impacts.

- Use "expediters" from the state and federal government to help smooth the process of local accommodation to geothermal development.

- Allow counties increased levels of continuing control of geothermal operations in return for faster initiation of the process.

- Allow counties and state agencies to preserve areas in which geothermal development will not be allowed in return for their help in speeding it in other areas.

Chapter 12

FOOTNOTES

1. Illustrative points in this chapter are drawn generally from discussion with officials in Imperial, Lake, Napa, and Sonoma counties. More detailed information about conditions in counties in which there are KGRAs appears in the JPL report. County by county analyses are to be done in a further study by JPL for CERCDC.

CHAPTER 13

THE ANALYTICAL CONTEXT

13.1 Geothermal Development: A Complex System

The previous chapters have provided an overview of the geothermal development process and noted some of the factors that are affecting its evolution. The belief is almost universal that the rate of development and utilization of this resource could proceed much more rapidly than it is at present. A wide range of suggestions has therefore been offered to promote more rapid utilization.

The idea that it is possible to "improve the utilization process" is both accurate and deceptively simple. As a general notion, it is quite possible to envision major "improvements" in the overall rate of resource utilization. It appears, however, that such improvements must be accomplished through a series of low-level procedural reforms and policy actions. No single policy change or regulatory modification is likely to induce a massive improvement because the geothermal industry and regulatory organizations are essentially autonomous, independent entities. Rather, serious attempts at improving operation of the entire system must focus on inducing low-level changes. Any one action at the necessary level will have only a minute impact on the total process. It is hoped, however, that the net effect of all changes would be an overall improvement.

Several major themes, or assumptions, have guided the analysis of proposals for change presented in this report. As these assumptions may be somewhat different from those of other analysts, it seems necessary to present them before beginning a discussion of specific proposals for change.

13.2 Major Themes

The first major theme that guided the analysis was a judgment that smoothing or making minor modifications to the existing regulatory process is likely to do more to speed the development of the geothermal industry than attempting wholesale changes to the process. The basic concept that led to this judgment is called institutional learning and holds that in any process certain minimums of time, money, and trouble are required to learn the substance and procedure of the process. When the participants are groups or organizations rather than individuals, the learning takes longer. Also, when participants are involved in the process sporadically, or when they are active in many processes in addition to the one under scrutiny, the learning takes still longer.

In California, a good deal of the required institutional learning in connection with geothermal energy has taken place. Some actors in the process appear to know nearly all they need to know to operate effectively. Some other actors, however, are in the process of acquiring the necessary knowledge. As long as the process stays roughly

the same, all the participants can build on the knowledge they and others in the process have already acquired. But if there are drastic changes in the process, most participants will have to start their learning over. Thus, any new regulatory system would most likely require enormous amounts of time, money, and trouble for the participants to learn the new procedures. Such major changes sharply reduce and perhaps even outweigh the new system's predicted advantages.

The institutional learning assumption leads to a general premise that proposals for change should either help actors adapt to, or promote relatively minor modifications in, the existing system. Several specific proposals follow from this notion.

One kind emphasizes the value of gathering and disseminating information about the substance and procedures to those that need it. Examples would include baseline environmental data, resource exploitation technology, mitigation technology, and discussions of procedural rules.

Another kind of proposal that helps participants adapt to the existing system is aimed at refining and codifying substantive and procedural rules that may be a source of delay or difficulty because of their ambiguity. Some proposals call for written rules rather than informal "understandings" in order to make the rules more stable and easier to distribute. Conversely, some rules must be made more flexible and sensitive to the differences in problems among geographic areas of the state and among types of geothermal resource.

A third kind of proposal to help participants adapt to the existing system emphasizes the use of technological innovations to mitigate some problems of a legal, institutional, or political nature. For example, methods such as slant drilling, consolidated drilling pads, power plant stack scrubbers, and wellhead mufflers can be used to meet environmental constraints. Costs can be reduced through another set of technological innovations such as new exploration methods, slim-hole drilling, underground transmission lines, scaling- and corrosion-resistant materials, and turbines that operate with low temperature and pressure resources. Yet another set of innovations is aimed at ameliorating some legal difficulties through steps such as using administrative hearings to replace court suits, placing limits on hearing testimony, and introducing lotteries to replace administrative allocation of various types of leases.

Another adaptive proposal is geared to reducing administrative problems by using advance planning. Examples of such actions are consolidation of the environmental reviews of several related project, development of stockpiles of valid permits, and careful preparation for negotiations between parties.

Additional actions oriented to speeding utilization of the geothermal resource involve the selective resolution of political and legal problems (i.e., by paying compensation or generating public support for the industry and its objectives).

A final kind of proposal aimed at helping participants adapt to the existing system concerns suggestions for the direction that research and development on geothermal problems should take. Such proposals recommend that most geothermal R&D concentrate on the geographical areas, resource types, and geothermal actors that appear to have the highest prospect of immediate or short-term payoff. For instance, improving the percentage of capacity that PG&E obtains from its existing power plants provides an immediate gain in geothermal electricity. An allied proposal would emphasize ERDA and others providing demonstration grants rather than grants for basic research; and resolving difficulties in existing hardware rather than developing new hardware (which often makes only a marginal improvement over present technology anyway). Similarly, it seems most useful to concentrate on easily exploited resources (hot water) than those with more serious difficulties (e.g., geopressured).

13.3 Major Policy Changes

A recognition of the phenomenon of institutional learning does not lead to a rejection of all major changes. A few major changes in the system, as long as they demand little additional knowledge of substance and procedure, probably contribute markedly.

One kind of major change would have the goal of increasing the attractiveness of geothermal development in competition with other available investments. Proposals in this

vein seek either to reduce the costs and risks of geothermal electricity or to increase its rewards so as to attract more resources into the system. An example of a proposal of this kind is tax credits for geothermal investment.

Another kind of major change that would overcome the normal requirement for institutional learning calls for more organizational integration. Legal, institutional, and political problems often arise when one participant in a system has to deal with another, hence steps that bind two or more participants together may reduce the operational problems within the system. An example in the geothermal industry would be vertically integrated companies. Vertical integration is the rule in the petroleum industry, for instance.

The following sections present the framework this report uses to examine proposals for change. Section 13.4 discusses electricity-generating options. Section 13.5 lays out the criteria employed for selecting proposals to accelerate geothermal development. Section 13.6 describes the type of analysis each proposal will receive.

13.4 The Context for Geothermal Development

The development of geothermal energy in California must take place within the context of all the factors affecting development of electric power in the state. Therefore, a discussion of how geothermal energy "fits" into the overall picture is necessary to make later judgments about the

possible effect of proposals designed to accelerate its development.

Even using the most optimistic predictions, geothermal development will not provide more than 25 percent of California's power needs in the next few decades.[1] By itself, geothermal power offers many advantages. But short-run national energy policy may serve to retard geothermal growth simply because other technologies may be more attractive investments. Energy producers that might wish to develop geothermal resources may be enticed by investment opportunities arising in other energy technologies and thus defer their involvement. Also, California is one of the few states that have large and readily exploitable geothermal resources. Consequently, the general tone of the overall U.S. energy policy will continue to be dominated by other sources of energy such as nuclear fuel, oil and gas, coal, and hydropower. Solar energy may even play a bigger role, since its potential, under current technology, seems to promise more power in more locations than does geothermal development.

There are major problems confronting conventional technologies, however, that may make the geothermal alternative look extremely attractive. These include the public concern about nuclear plant safety; the likelihood of similar societal effects with increased coal usage; the likelihood of steeply rising costs of both nuclear and coal electricity-generating technologies; uncertainty about world

oil and gas prices and availability; limited supplies of domestic oil and gas; and doubt about the technical and institutional feasibility of solar power.

An increase in the cost or trouble of obtaining these other resources might be much more effective in spurring geothermal development than any corrective activities in geothermal development itself. Similarly, in the short run (10 years), a decrease in the cost or trouble of utilizing these other technologies might overcome the results of any improvements that did occur in the geothermal area. This possibility should not lead one to the conclusion that improvements in the geothermal development process are impossible or fruitless. It does suggest that increased geothermal development may be deferred or delayed by changes in these other technologies.

In addition to the relatively small total contribution geothermal development is expected to make to the total energy demand, each geothermal plant is relatively small. With present technology, the economically optimum geothermal plant has a 100 to 200 MWe capacity. On the other hand, an economically optimal coal, oil, or nuclear plant is in the range of 800 to 1,200 MWe. When planning for future capacity, utilities may calculate that the legal, institutional, political, and economic burdens and risks involved in adding 100 MWe of geothermal capacity are substantially higher per unit of output than those associated with other technologies. On an absolute scale, the problem of obtaining 100 geothermal megawatts may be smaller than obtaining 1,000

nuclear megawatts, but the "difficulty per megawatt" may be such that nuclear energy will be a preferred option.

A recurrent theme voiced by utilities is that, other than the dry steam resource at The Geysers, the geothermal generating technology is unproven in the United States. In the absence of mechanisms to reduce risks, there appears to be a general inclination on the part of the utilities to proceed cautiously.

The present technology tends to be simple and cheap compared to nuclear plants. This may make the geothermal course quite attractive to smaller utilities or to companies that want to generate electric power exclusively for their own use. The strong interest shown by New Zealand, Japan, some Central American countries, some counties in California, and some publicly owned utilities occurs at least partly because the economically optimum size is small enough not to swamp their systems. Similarly, Idaho, Utah, and Nevada, with their much smaller energy demands, may find the resource much more interesting than does California.

The federal government, at least through ERDA, appears to be interested in the fringe resources of geothermal development. It puts significant amounts of money into studying the potential of hot dry rock, geopressured zones, and extremely salty brines rather than into exploiting the resources for which technology is presently available. This approach may be appropriate to their agency's mission, but it means that use of easier resources proceeds slower than if the federal government focused on easy resources.

The utilities, whose rate of return depends on the size of their capital base, also have incentives to build expensive plants, although utilities argue that competing incentives are important. A plant that is relatively cheap in terms of capital cost but is relatively risky or otherwise more expensive to operate is much less attractive than a plant that is more expensive but offers more security and/or lower operating costs.

The relatively small size of efficient geothermal plants also holds back the supply industry. Engineering firms accustomed to building large plants (e.g., coal or nuclear) one at a time have a hard time switching to production of smaller, cheaper plants several at a time. Since the efficient size for geothermal plants appears to be between 100 and 200 MWe, anywhere from five to ten geothermal plants are needed to match a single 1,000 MWe nuclear plant.[2] This problem is mitigated somewhat at The Geysers where the hot, relatively clean steam allows use of conventional turbines and other hardware. It will be exacerbated whenever fairly new equipment must be developed, since the price levels required to induce suppliers to develop such equipment for a small market are apt to be very high per unit of generation capacity.

The political acceptability of measures to improve the geothermal development process is likely to be hampered by the political stigma attached to entrepreneurs involved in

the process. This is particularly true of the large oil companies and the utilities. Neither of these groups is experiencing a high degree of public popularity at either the federal or state level. Many geothermal reform measures may be resisted simply because such reform would benefit either oil companies or utilities.

Of course, this factor does not distinguish geothermal development from other sources of energy, for the oil companies and the utilities are involved in many of them. Still, measures to improve the geothermal process have been opposed simply because they helped either the oil companies or the utilities, and this factor must be taken into account in estimating the implementation costs of geothermal measures.

13.5 Selecting Proposals for Change

As noted earlier, many specific proposals have been made to accelerate geothermal development in California. Some of these proposals are not worth analyzing. Some are unlikely to produce the desired effect. This report analyzes three types of proposals: (1) those that appear to have a genuine potential for improving the process; (2) those that have been put forth by at least one major participant in the process; and (3) those that highlight issues likely to emerge in the future.

13.6 Criteria Employed for Evaluating Proposals

All proposals considered in this report are evaluated in terms of how they might aid in accelerating the process of obtaining electric power from geothermal resources. Consequently, acceptable proposals must in some way reduce the time, money, and/or trouble of obtaining geothermal electricity. The measure of time includes the entire period from the first interest by a potential developer to the use of electricity by industry, commerce, or residences. The measure of money includes the cost of the electricity to the final user and the costs incurred by the participants involved in the process. The measure of trouble includes such things as shifts in political power, changes in institutional or regulatory arrangements, and business problems that accompany changes in rules governing geothermal development.

Each proposal can exert time, money, and trouble effects at two stages: (1) in the process of bringing the proposal itself into law or into practice and (2) the effect of the proposal once it is put into practice. These two stages of effects associated with legal, institutional, and political proposals are analogous to the construction and operating stages associated with technical proposals. Just as one must consider the time and money necessary to construct a power plant in addition to the costs of running it, one must consider the costs of promoting and passing some new law or institutional arrangement as well as its effects once obtained.

At present the method for estimating such costs is more art than science. The method involves the following steps:

1. Identify the specific, detailed actions necessary to the day-to-day operation of the proposal once achieved.

2. Identify the participants (groups, organizations, or individuals) who must perform those actions.

3. Estimate the initial positions of these participants toward the proposal desired and toward the specific actions they would have to perform. This step involves identifying the legal, institutional, political, economic, and other incentives and disincentives to performing those actions.

4. For those participants initially reluctant to perform specific actions, identify other (secondary) actions that might alter their incentives. The power of an action to do this stems from the legal, institutional, political, economic, or other connections between the two. This step thus involves finding those connections.

5. Identify the participants who must perform these secondary actions.

6. Estimate the positions of these secondary participants toward the actions they must take. If some of

these secondary participants are necessary but reluctant, the analyst has to repeat the steps of his analysis until he has isolated enough favorable participants to begin implementation.

7. Given the sets of primary and secondary actions, participants, and positions, estimate the time, money, and trouble necessary to obtain the sequence of appropriate actions.

8. Consider these implementation costs and benefits together with the costs and benefits predicted for the measure once achieved. This section will follow through these steps for the proposals selected in the previous section.

Each of these steps requires the analyst to interject a degree of subjective judgment in evaluating participants' perceptions and the values they place on various incentives. To an extent, then, implementation analysis is an art for which the confidence limits are large.

As consequences of the time, money, and trouble involved in both the adoption and operation stages, each proposal has at least three classes of effects: (1) the changes it produces on the problem it is supposed to solve; (2) side effects; and (3) the net effect on the entire geothermal process. Much of the analysis of each proposal in Chapter 14 is based on the insights provided by data obtained in these ratings.

In order to systematically incorporate the judgments about proposed changes from participants in the geothermal development process, the authors asked pertinent individuals to respond to a standardized rating chart. Respondents provided their estimates of the merits of proposed alternatives and their judgments as to the time, money, and trouble likely to be involved in implementing the proposal.

Chapter 13

FOOTNOTES

1. JPL Report, March 31, 1976.

2. C. H. Bloomster, "Economic Analysis of Geothermal Energy Costs." Battelle Pacific Northwest Laboratories.

CHAPTER 14

EVALUATION OF INDIVIDUAL PROPOSALS

14.1 Introduction

In this chapter the study team evaluates the proposals for change that were first listed at the ends of Chapter 3 through 12. These proposals have been suggested both by participants and by the members of the study team as techniques for accelerating the generation of electricity from geothermal resources. We use the following evaluation scheme:

- Adoption Costs. These refer to the amount of effort required to adopt and implement a given proposal. We estimate the effort in terms of time, money, and trouble, as those terms have been defined in Section 2.7 of Chapter 2, and we rate this effort zero, low, medium, or high for each term.

- Changes in the Geothermal Development Process. These refer to the effects of a given proposal, once implemented, on the geothermal development process. We estimate these impacts in terms of the increase or reduction they will bring about in the time, money, and trouble involved in geothermal

development. The increase or reduction is rated as zero, low, medium, or high.

- Overall Effectiveness. This evaluation summarizes the net effect of a given proposal, considering its adoption costs, its impacts, and any possible side-effects. It is based on a five-point scale:

  +2 Will help the process a great deal

  +1 Will help somewhat

  0 Will have little or no net effect

  -1 Will hurt somewhat

  -2 Will hurt a great deal

The judgments on each of the proposals are an application of our insights. In addition, we formally solicited views on most of these proposals from a wide range of participants in geothermal development. Those surveyed included developers, power producers, regulators, and intervenors. Although the views of these participants guided our evaluation, we were not surprised to find that judgments about given proposals were often sharply divided. In some cases, even the members of the study team did not agree. We have tried to indicate where particularly strong disagreements occurred.

For our evaluation, we grouped the proposals according to the stage of the process they affect. Of course, many proposals afftect more than one stage of development. If a proposal concerns one of the five major areas discussed in

Chapters 8 through 12 (financing, environmental reporting, the role of CERCDC, air pollution regulations, or the political economies of counties), it appears in the section devoted to that topic. Otherwise, it appears in the section devoted to the first stage it affects.

14.2 Proposals Affecting Leasing

As noted in Chapter 3, it appears to us that leasing is not a major problem or major impediment to geothermal development at this time. Thus, resolving leasing problems now is unlikely to spur development in any dramatic way. However, as the industry becomes larger, leasing could become a significant source of delay, and some problems that presently are only an annoyance might become major bottlenecks. Consequently, resolving leasing problems now is desirable if leasing is not to become a problem in the future, when there is more demand for exploration and drilling.

Proposal 14.2.1: Increase Staffs of USGS, BLM, and Forest Service to Speed Lease Application Processing

It has been suggested that these three agencies could increase their staffs for this purpose either by assigning more full-time staff members to the job or by hiring outside consultants for this particular purpose.

With respect to assigning internal staff, we assess adoption time of the proposal as low, the adoption money as

low, and the adoption trouble as medium, because of the pressure of other assignments within the three agencies. We believe that the effect such a proposal would have on the process would be a medium reduction in the time involved, a low reduction in the money (delays are cheap at this stage of the process), and a low reduction in the trouble of the process. The overall effectiveness would be positive (0 to +1) but not major, because right now leasing is not a big bottleneck in the total process. As the industry grows, however, this action would help more.

If these agencies hired outside consultants for this purpose, our rating would give the adoption time as medium; the adoption money as medium; and the adoption trouble as relatively high, since hiring outside consultants would only be a stop-gap measure. We think the changes in the process would be far more positive if internal agency staff were used. Even with consultants, however, the overall effectiveness would be positive (0 to +1).

This suggestion fails to recognize the reason for the current allocation of staff inside these three agencies. The agencies have already adjusted to internal and external pressures in order to reach the priorities that they currently assign to geothermal development. It may be very hard to get them to change those priorities unless external pressures convince them to do so.

Proposal 14.2.2: Increase Staffs of USGS and BLM to Enable Them to Hold Competitive Lease Sales at a Faster Rate

One reason for the time between one competitive lease sale and the next is that the government conducts an environmental and an economic assessment of each area it puts up for bid. Presumably, extra or outside staff could enable these agencies to get to these studies faster. If so, we estimate that this proposal would have virtually the same adoption costs and would bring about virtually the same changes in the process as indicated for Proposal 14.2.1.

However, other factors are also at work. If BLM did not insist on setting a minimum bid for acceptance, it would not need to do the economic potential study; as a result, lease sales presumably would occur closer to each other. On the other hand, there are other reasons for delays between one lease sale and the next. One major reason is that the government is likely to get more money for its leases if it does not put too much land on the market all at once. Therefore, even if the agencies could prepare the reports faster, they would still face pressure to delay between one lease sale and another; consequently, this suggestion would not seem likely to produce the intended effect.

Proposal 14.2.3: Raise Acreage Limit on Federal Land Lease Holdings to a Level Comparable with Oil and Gas Limits

In establishing its leasing program, BLM faced substantial pressure to avoid two evils: (1) giving away federal

land too cheaply, and (2) allowing large resource companies (primarily oil companies) to capture large amounts of federal land for competitive purposes without developing them. BLM responded with a system involving short lease terms, low acreage limits, and a high percentage of competitive bids. Several proposals argue that BLM could have avoided these same evils in other ways that would have affected the geothermal development process far less in terms of time, money, and trouble. Examples of these other ways include higher royalties for land obtained noncompetitively, separate limits for land obtained noncompetitively, and special rules about who could obtain noncompetitive leases.

Geothermal lease holders currently are limited to no more than 20,000 acres of federal land in each state.[1] In contrast, holders of petroleum leases are allowed to have as much as 240,000 acres in each state. The proposal has been made to raise the present limit to that of petroleum, or at least to a higher number, such as 100,000 acres. This issue is both important and controversial.

Changing the acreage limitation is just one of many proposals that raise the generic problem of whether large companies will be permitted to dominate the industry right from the initial phase of development, or whether the operating rules will maintain a position for the smaller developer. We are convinced that a preference for one versus the other depends on a value position that is at least partially

independent of purely objective criteria, such as time, money, and trouble involved in geothermal development. There are legitimate arguments for both positions, but a judgment on the matter can only be made in reference to one's value position.

Because raising the acreage limit would require a change in the geothermal legislation, the adoption costs are likely to be high in time, high in money (in terms of the cost of staff time devoted to lobbying), and high in trouble. We give such a discouraging estimate because we think getting Congress to do anything favorable for the resource extraction industries would be very difficult these days.

Raising the acreage limit probably would lower the time, money, and trouble for large operators already involved in geothermal activities. In the short term, it might accelerate the pace of exploration by the large companies. It would also enable large companies to identify a large number of promising areas and then hold them until they could be profitably developed. However, it may cause problems for smaller firms or for those firms that might wish to become involved in geothermal development in the future.

On the other hand, raising the acreage limitation might also aid the small developer who wished to make his money by proving up a lease and then selling out to a large company. With a higher acreage limit, the big companies might be in a position to purchase more leases from the smaller entities.

The determination of the overall effectiveness of the proposal, then, depends on a judgment as to which is more critical to accelerating development: the size and experience of a developer, or a more competitive atmosphere. In any case, we do not think the effects of changing the acreage limit would be felt in the near future.

Proposal 14.2.4: Remove the Provisions for Renegotiation of Federal Leases Every 10 Years

One of the reasons utility companies are leery of utilizing geothermal resources from federal leases is that the federal government has the power to renegotiate its lease with the geothermal resource supplier every 10 years.[2] Utility companies are concerned that they may have to renegotiate the terms of their steam supply contract or lose their supplier after 10 years. This is extremely undesirable when they have built a plant that is planned to operate for 30 years. A serious proposal is that either the power to renegotiate federal lease terms be removed, or that regulations set definite renegotiation rules that would not be so discouraging to utilities.

If the power to renegotiate lease terms is removed, we estimate the adoption costs as being high in time, high in money, and high in trouble, since the change would have to go through Congress. If the proposal is merely to institute regulations governing the conduct of renegotiations, we estimate the adoption costs as being low in time, low in

money, and low in trouble. The primary virtue of such a proposal, however, would be to reduce the utility's anxiety about getting involved with a geothermal plant that uses resources from leased federal land. We think the actual changes in the process would promote a zero or low reduction in the time involved, a zero or low reduction in the money involved, and a medium reduction in the trouble involved. Nevertheless, we estimate the overall effectiveness of the proposal as positive (+1), and we think that it should be seriously pursued even though most results would show up in the long term.

Proposal 14.2.5: Relax Federal Criteria Defining KGRAs and Thus Requiring Competitive Lease Sales

In writing regulations pursuant to the Geothermal Steam Act of 1970, the Secretary of the Department of Interior established very strict standards for determining which federal acres had to be leased competitively and which could be leased without competitive bid.[3] The current regulations are defined so that a very high percentage of the geothermal land is leased through the competitive bid process. This strictness was one of the ways in which the federal government sought to protect the public's interest in federally held resources. However, a counterargument is offered to the effect that the federal government also has an interest in rapid development of the resource, and that such development would occur more rapidly if developers did not have to go through the competitive bid process for most federal leases.

We estimate the adoption costs of this proposal to be low in time and low in money but high in trouble, because attempts to set more favorable terms for resource extraction industries, even at the regulatory level, are very controversial and are likely to encounter severe opposition. With respect to the effect of this proposal on the geothermal development process, the results would depend very much on how fast noncompetitive leases could be processed and how rapidly they would be explored once granted. This proposal would have little or no positive effect unless the processing of noncompetitive leases occurs at a faster rate than it has to date. If the proposed changes were accompanied with action to insure faster processing of applications, we estimate that they would result in a low to zero reduction in the money involved (primarily the cost of the cash bonuses that the federal government is now requiring in the competitive bid process), a low reduction in the trouble involved, and a low to medium reduction in the time spent in exploration on federal lands. We rate the proposal as 0 to +1, and think at least some of its impacts would occur in the short term.

Proposal 14.2.6: Process Overlapping Lease Applications by Lottery, Not by Declaring the Overlap a KGRA

Currently, the regulations require any land applied for noncompetitively by two or more potential lessees to be removed from noncompetitive status and put out for lease

through the competitive bid process.[4] A better procedure would be for the federal government to hold a lottery among such potential lessees. We estimate the adoption costs for this proposal to be low in time, low in money, but high in trouble because it again tends to favor big companies and thus is very controversial. We think the changes it would bring about in the process would be positive, with a low reduction in the time, money, and trouble involved. We rate its overall effectiveness as +1 and we think that some of the impacts will occur in the short term. It should be noted that the impacts of this proposal, unlike those of the previous proposal, are not tied to accelerating the non-competitive process.

Of course, the federal government would lose whatever it might have taken in cash bonuses through the competitive bid process. In return, however, it would get the land leased--and hopefully developed--that much faster. If the government has no other reason to consider that the acres in question constitute KGRAs, we think the trade-off is well worth it.

Proposal 14.2.7: Give the Forest Service Continuing Formal Control Over Operations on Forest Service Land

At this time, BLM must obtain the permission of the Forest Service to lease Forest Service land for geothermal development. The Forest Service staff that approves all such applications has few people and their expertise is

basically in petroleum and more traditional minerals. This proposal argues that the Forest Service's reluctance to give approval to geothermal development stems from its lack of knowledge in this area, its lack of resources to gain that knowledge, and its inability to attach land-use conditions once development has begun. The proposal assumes that this reluctance would abate considerably if the Forest Service's continuing control, which is informal at present, were made formal and explicit.

We estimate the adoption costs of this proposal to be low in time, low in money, and medium in trouble. We think the changes in the process are apt to be low or zero in time, low or zero in money, and perhaps would result in even a slight increase in the trouble involved. We give the proposal an overall effectiveness of -1.

Our primary reason for coming down so hard on the proposal is that we do not think that giving the Forest Service more explicit continuing control will in fact lead it to do anything much differently than it does at present. What such a change will do is create more problems and perhaps even more cost for the developer, who not only will have to live up to the obligations that the Forest Service places in the lease, but also will have to deal with additional Forest Service constraints beyond that. Since we think that more explicit control will not lead the Forest Service to faster processing of noncompetitive lease

applications, but will add yet another control on future operations, we think the effects of this proposal will show up in the long term.

Proposal 14.2.8: Eliminate Minimum Bid Requirements at a Competitive Lease Sale

Currently, BLM will not accept the results of a competitive lease sale if it feels the highest bid is not as high as the economic potential of the acres to be leased. In order to make some determination as to what minimum bid it will accept, it and USGS conduct economic studies. These economic studies add time and money to the procedure of getting acres ready to be leased.

This requirement of a minimum bid is already under administrative appeal. Shell Oil Company was denied a lease on areas for which it was the highest bidder and is taking its complaint to the administrative appeal process.[5]

Unless BLM changes its mind, we estimate the adoption cost as high in time, low in money, and high in trouble. Even though it already has been started, the legal process does not move quickly. In addition, we get a sense that removing the minimum bid is very much against BLM policy, and that, consequently, it will fight very hard to retain this requirement. With respect to the change it would bring about in the process, we rate this proposal as low in time, money, and trouble. Furthermore, although we think the effect of the change would show up in the short term, we rate its overall effectiveness as near 0 because we have

found that, in the past, all parcels of land for which bids were denied the first time were leased in a subsequent bidding. Removing the power to deny bids would get the parcels of land leased one period earlier, but probably would not do much more than that.

Proposal 14.2.9: Remove the Unilateral Federal Authority to Close Down Operations on Federal Land

The Federal Leasing Law gives BLM not only the power to renegotiate lease terms every 10 years, but also the power to close down operations when the agency has determined that such operations are endangering the national interest.[6] Such unilateral power creates a fair degree of uncertainty for operators and power producers--particularly for utilities. However, any changes in this provision--like the changes suggested in Proposal 14.2.4--would have to go through Congress, and the political feasibility of making major changes that would benefit the oil companies seems remote at best. Thus, promulgating a more explicit set of criteria to which this shutdown provision would apply is probably the best that could be achieved.

Proposal 14.2.10: Set a Required Timetable for Development of Leased Land

The federal government already uses a system of escalating rents to encourage quick development of their leases. The state provides a three-year limit and a two-year extension on prospecting permits, which are usually the first arrangement for developing state land. Consequently, the

leases that have been held for a longer time are primarily those on privately owned land. California Assembly Bill #4060 would encourage development on these lands by establishing a geothermal lease tax that would escalate over the years but would allow development expenditures as a credit against the lease tax.

Since that bill is already winding its way through the California Assembly, we estimate the adoption costs to be low in time, low in money, but medium in trouble since a certain amount of trouble is associated with all legislative changes. We estimate the change the proposal would produce in the process would be a low reduction in the time involved in geothermal development but perhaps a low increase in the money and trouble involved. We estimate the overall effectiveness of this proposal to be +1 and think that its effects will occur in the long term.

Like some of the other proposals, this proposal is also likely to become controversial because it could again help large leaseholders. These developers could use development expenses on land in one area of the state to cover the tax liability for leases they are not developing in another part of the state. Presumably, smaller leaseholders would not have the opportunity to cover tax liability in this manner.

Of course, all leaseholders face pressures toward development and pressures against it. The fact that a developer has not done anything with a particular lease may represent a very rational calculation on his part. The

state should try to influence that individual calculation with a tax that reflected the value of externalities such as an improvement in environmental quality or a reduction in the dependence on foreign sources of energy.

Proposal 14.2.11: Require Developers to Make Public Any Data Concerning Areas They Decide Not to Develop

Private developers have tended to treat any test results on land that they either are considering leasing or have been leasing already as highly confidential. Others have felt that such data, particularly when they concern publicly owned lands, represent a valuable source of information to which others should have access, at least in some instances. This proposal is addressed to the latter point. We estimate the adoption cost of the proposal as low in time, low in money, but medium in trouble because of the developer resistance. We estimate its benefits for the process as low to zero in time, money, and trouble, and its overall effectiveness as very near 0. If the land already were abandoned by someone, probably no one else would be particularly interested in it even if the data were made available. If the land were not abandoned, no outsider could drill on it until the present developer had abandoned it. Conceivably, such data could indicate areas unsuitable for development by present technology that could be developed by technology in the future; however, the result, if any, would be very long term.

Proposal 14.2.12: Consolidate State Holdings for Larger Portions of Geothermal Fields

The state government is considering a program of trading some of its holdings with the federal government so that each can consolidate its lands in some geothermal fields. The basic idea is to make development of a field easier, on the theory that dealing with one landowner is easier than dealing with two or more. We estimate the adoption costs of this proposal as high in time, low in money, and high in trouble, principally because of the difficulties that emerge when one government deals with another. We estimate the changes the proposal would bring about in the process as creating the potential for a medium reduction in the time involved, a low reduction in the money involved, and a medium reduction in the trouble involved, primarily because we agree that it is probably faster and easier to deal with one landowner rather than with two or more. We rate the proposal's overall effectiveness as 0 to +1, and we think that the positive effects will show up in the long term.

Proposal 14.2.13: Obtain an Authoritative Court Declaration to Determine Ownership of Geothermal Resources and Land Subject to Minerals Reservations

Many regulatory schemes and land grants do not contemplate the existence and use of geothermal resources. The various governments involved need to know how to treat geothermal resources under current regulatory schemes and land grants. Many of the questions involved will have to

reach the courts, and some already have; others will need executive or legislative action. In theory, the law may require a separate declaration for each type of minerals reservation, but, as a practical matter, the first court declaration will generally be followed in later cases.

In addition to calling for clarification of the status of geothermal resources, this proposal asks that potential analogs to these resources--for example, water, oil, gas, and hard minerals such as coal--receive close scrutiny as to their applicability to particular phases of the geothermal system.

Much of the substance of this proposal has already taken place. In the Ninth Circuit Court, geothermal steam has already been adjudicated to be a gas (like natural gas) for tax purposes. The I.R.S. supposedly has announced that it will test that decision in other circuits and that, if it gets a different decision, it will take the issue to the Supreme Court; this process, however, is apt to take several years. Furthermore, the determination of the status of geothermal resources is still very much up in the air: a district court of the Ninth Circuit has held that geothermal steam is water for the purposes of determining ownership under the Stock Raising Homestead Act; the status of geothermal hot water has yet to be clarified; and the state of California is just going to trial to determine whether geothermal steam is a mineral for purposes of the state

mineral reservation. As a consequence of this activity, we estimate the adoption costs of this proposal to be low in time, money, and trouble, since much of what needs to be done is already happening. In terms of the benefits to be derived, we estimate a medium reduction in the time involved in geothermal development, zero reduction in the money involved, and a medium reduction in the trouble involved--in short, a very positive overall effect.

We give the proposal a high rating on time and trouble because many participants in the geothermal development process stress the importance that status clarification would have for them in the planning of their own activities. We assess the overall effectiveness as +1 to +2 and think that the effects will occur in the short term.

Proposal 14.2.14: Consider the Holding of a Geothermal Lease without Geothermal Development beyond an Established Period of Time as Prima Facie Evidence of an Attempt to Monopolize under the Antitrust Statutes

Since this proposal would require both a legislative change and court activity on the antitrust issue, we think the adoption cost would be high in time, money, and trouble, since antitrust suits are particularly hard to institute, maintain, and win. With respect to benefits, we have the same question about this proposal as we do about others that raise the generic theme of competition versus size and expertise. Because this proposal also suggests a very blunt (and, we think, ineffective) way to impose performance requirements, we rate its effectiveness as -1 to -2.

However, if it turns out that competition really does speed development of geothermal resources, there would be a slight reversal in the generally negative impact we estimated for this proposal. In any case, the impacts would occur in the long term.

Proposal 14.2.15: Require Some Portion of Public Lands with Geothermal Resources to Be Set Aside for Public Use

This proposal would set aside for public use (either by publicly owned utilities or federal and state government agencies) some portion of public lands, both federal and state, that have geothermal resources. Since the proposal calls for a congressional change that will receive stiff opposition, we rate the adoption costs as high in time, money, and trouble. We think these adoption costs would have to be paid whether the proposal set aside certain acres or a certain portion of any resources for public use. We think that such a proposal would result in a low increase in the amount of time involved in geothermal development, zero change in the money involved, and a low to medium increase in the trouble involved. We give an overall effectiveness of -1 primarily because, with the exceptions of Burbank, NCPA, and perhaps DWR, most of the development to date and in the foreseeable future has been and will continue to be undertaken by private business, not publicly owned utilities or public agencies. Conceivably, these two kinds of entities have some roles to play in the picture, but such a role need not require some special favoritism in the leasing process;

publicly owned utilities and public agencies can and have leased land of their own for that purpose without special provisions. In any case, we think the effects of this proposal would show up in the long term.

Proposal 14.2.16: Use a Property Tax on Geothermal Leases with a Credit for Development Expenditures to Encourage Development on Existing Leaseholds

Some discussion of this proposal already appears in the analysis of Proposal 14.2.10. We estimate its adoption cost as medium in time, low in money, and medium in trouble. Although the proposal would require a state legislative change, it is already in bill form as Assembly Bill #4060. We think it will result in a low reduction in the time involved in geothermal development, but a low increase in both the money and the trouble involved. We rate its effectiveness as 0 to +1, and think its effects would occur in the long term.

14.3 Proposals Affecting Drilling and Exploration

Many major delays affecting drilling and exploration operations stem from permitting requirements and environmental impact amelioration standards. Again, although some proposals that might speed the process are controversial, it appears that, in this stage of the development process, positive changes can be brought about with comparatively small amounts of time, money, and trouble.

Proposal 14.3.1: Reduce Bonding Requirements for Wells

Both the state and the county require that people planning to drill exploratory or development wells for geothermal resources post the bond on each well--or, in some cases, on each field. This proposal asks that the amount of bond per well or per field be lower. We estimate the adoption cost of this proposal to be low in time, near zero in money, and very high in trouble because of the general feeling in the counties that bonding requirements are just about right and do not need to be changed. This position, however, is counterbalanced by extremes on opposite ends: some people in the counties feel the bonding requirements should be lower, while others feel that they need to be drastically raised in order to cover the cost of any severe damages that might occur. Developers maintain that the bonding requirements should be the same as for oil and gas wells.

It is our opinion that this is not a serious problem and that it is not worth the controversy that would be generated by attempts to change it. We think the changes in the geothermal development process as a result of this proposal would be low in time, money, and trouble; its effectiveness would be near 0; and any effects that it might have would occur in the short term.

Proposal 14.3.2: Increase the Staffs of the State and Local Agencies That Supervise Geothermal Operations

The basis for this proposal is that county officials who must grant permits for wells would do so more readily if they had more confidence that the conditions they attach to those permits would be enforced by state and local agencies charged with monitoring geothermal operations (e.g., DOG, the relevant APCD et al.). We heard much testimony that such field staffs were too few in number to inspect adequately or as often as the permit-granting officials would like.

We estimate the adoption costs of this proposal to be low in time, medium in money, and medium in trouble. The main problem is that the extra staff would cost money. We estimate that the changes brought about by the proposal would be a low reduction in the time involved in geothermal development because the counties would presumably grant permits more readily; a low increase in the money involved (to pay for the monitoring staff and correcting the additional violations they might find); and a low increase in the trouble involved (since the developers would have to respond to inspections both by preparing for them and by repairing any deficiencies). We estimate the effectiveness of this proposal as 0 to +1 and think that its effects, if any, would show up in the long term, since the counties would not begin to grant permits more readily until they had the confidence that the new staff was there and was doing its job.

Proposal 14.3.3: Start Permit Application Process Earlier

This proposal is the first in a series that is designed to develop industrial participants' capability to cope with governmental procedures. These proposals argue that industrial participants, acting on their own, can take a number of steps to improve the flow in the geothermal system: applying for more than one or two wells with a single permit; applying for more than one permit at a time; stockpiling permits; and using techniques like slant drilling and consolidated pads to drill more wells under a given permit. This series of proposals makes the judgment that advance planning and use of more sophisticated technology would pay for themselves by reducing the time, money, and trouble involved in dealing with governmental actors. For the first of these steps--starting the application process earlier--we estimate the adoption costs as being low in time, money, and trouble; the changes in the process as a medium reduction of the time involved and zero reduction in the money and trouble involved; and the overall effectiveness of the proposal as +1 to +2, with the effects occurring in the short term.

Proposal 14.3.4: Stockpile Permits

This is the second proposal in the series designed to help industrial participants adapt to governmental procedures. We estimate the adoption costs of this proposal to

be low in time, low in money, and low to medium in trouble. Trouble would rise from low to medium only if the counties begin to object to granting permits much faster than the developers are actually drilling. We estimate the changes that the proposal will bring about in the process to be a low reduction of time, money, and trouble. We estimate the proposal's overall effectiveness as +1 to +2 and think the effects will occur in the short term.

We note that Union Oil Company is already stockpiling permits in both The Geysers and Imperial Valley. We also note that this proposal is apt to only help the developer who is big enough to be able to plan far in advance.

Proposal 14.3.5: Obtain One Permit for Several Wells

This proposal is another in the series of proposals designed to help industrial actors adapt to existing government procedures. Union Oil is already following this course of action in the Imperial Valley. Once again, however, this proposal is apt to be useful only to big developers. We estimate its adoption costs to be near zero in time, near zero in money, and low to medium in trouble since it may be difficult to persuade the counties to grant this kind of permit. We estimate the changes that the proposal would bring about in the process to be a low reduction in the time involved, a zero reduction in the money involved, and a medium reduction in the trouble involved. We rate its overall effectiveness +1 and think the effects would occur

in the short term. We note that this sort of procedure is one way to move toward a leasehold EIR since the environmental report for the several wells involved could in fact cover as much area as a leasehold EIR would.

Proposal 14.3.6: Utilization of Slant Drilling and Other Technological Innovations That Alleviate Some of the Major Permitting Problems

This proposal suggests that developers can use new technology, rather than new administrative procedures, to adapt to some of the governmental procedures. Two prime areas where this proposal could apply is in the use of slant drilling and noise abatement technologies. It should be noted that slant drilling is now used in several particular instances in the state. Since there are technical problems with the procedure, however, it may not be widely applicable.

One principal advantage of slant drilling is that fewer drilling pads are involved; it also demonstrates that developers are doing what they can to minimize environmental damage. These factors presumably would cause the counties to give approval to the total number of wells more quickly than they would otherwise. On the other hand, some of the disadvantages of the technique include the facts that experience with the process to date has been mixed; it is a more difficult drilling process; it is apt to produce more failures to discover steam; and there are relatively few drilling teams that have had experience with this type of drilling.

We estimate the adoption costs of this proposal to be low to medium in time, money, and trouble. The developers should find little resistance from the counties in shifting to the slant drilling procedure, but they will have trouble finding slant drilling experts and the process does cost more. We estimate the changes that this proposal would bring about in the process to be near zero in terms of the time and money involved, since we think the reduction in the cost of dealing with the government will cancel out the additional cost of the process. However, we think that there may be a low increase in the trouble involved, since there will be more technical problems with this drilling procedure. We estimate its overall effectiveness as 0 to +1 and think its effects will show up in the short term.

Proposal 14.3.7: Use New Exploration Technologies Wherever Possible

This proposal is yet another way to use a technical device to adapt to a governmental procedure. We estimate the adoption cost of this proposal as very low in all three categories, since developers are apt to adopt new exploration technologies in the normal course of events. Assuming that at least some of these new exploration technologies will be superior, we estimate that the proposal will cause a low to medium reduction of the time involved, a low to medium reduction of the money, and a near zero reduction of the trouble. Since the exploration phase of development now lasts more than two years in some cases, these new technologies

speed up the process markedly. We estimate the proposal's overall effectiveness as between 0 and +1. Because exploration is one of the very early steps in the development process, we think that its effects will occur in the short term.

Proposal 14.3.8: Increase Supply of Drilling Crews, Drilling Rigs, and Exploration Experts

Geothermal development does not face a severe shortage of crews and rigs now; in fact, several developers have sent such crews and rigs back to petroleum development because they did not have enough drilling permits to keep all of their crews and rigs busy. However, the supply is short enough that getting an experienced crew and rig when and where the developer wants them without paying them a premium price is sometimes a problem. The same general problem may occur in the future with a shortage of geologists and other technically trained personnel needed to conduct exploratory analysis.

Presumably, an increase in supply of drilling rigs would come either from training and construction programs or from conversion from other uses such as petroleum. Training geological survey personnel would not be quite as easy since the people in question would have to be college-trained and would need field experience.

We estimate the adoption costs of this proposal to be high in time, medium to high in money, and medium in trouble. In the short run, the proposal is apt to have a low effect

on the time, money, and trouble involved in the geothermal process; however, unless these steps are taken early, the situation is likely to emerge as a serious problem later on. We rate the overall effectiveness of the proposal as between 0 and +1.

14.4 Proposals Affecting Development and Operation of Fields and Power Plants

As noted earlier, the most effective way to accelerate the overall development rate for geothermal resources is to take steps that will bring power plants on line more rapidly. This can be accomplished primarily through a series of small changes in existing procedures or circumstances. Although each of the changes is in itself small, together they will have a relatively large net effect.

This section includes proposals directly affecting development and operation of geothermal fields and power plants. Factors pertinent to licensing hearings, reviews, and other aspects of the licensing procedure are discussed in Section 14.5, and transmission issues are examined in Section 14.6.

Three major themes tend to dominate proposals that deal with geothermal field and power plant operation: (1) the probable value of vertically integrated geothermal companies; (2) the potentially powerful role that the government could play in creating inducements for companies that are trying to develop geothermal resources; and (3) the

powerful role that the government could play in demonstrating the commercial validity of hot water generating plants.

Proposal 14.4.1: Defer Local Property Taxes Until the Geothermal Resources are Sold or Until Revenue Starts

The idea behind this proposal is that holders of geothermal resources who can neither sell them nor convert them into power for sale should not have to pay property taxes at the same level as those who can do so. Some tax deferment already occurs in cases where the developer pays the property tax for the leaseholder and charges such payments against the leaseholder's future royalty payments.

We estimate the adoption costs of this proposal as high in time, money, and trouble. Property tax constitutes the basic source of revenue for local government, and any time someone tries to make major changes in the administration of such taxes, political resistance is very vigorous. Currently, geothermal development occurs in counties with relatively small tax bases, but the energy is used in counties with relatively large tax bases. The political problems of effecting a tax change that would take revenue away from the areas with a small tax base in order to increase the delivery of electric power to areas with a large tax base seem to us to be virtually insurmountable. We think the proposal will do very little to change the time, money, or trouble involved in geothermal development. It might reduce the amount of money somewhat, but any such

reduction would be vastly overshadowed by the troubles inherent in maintaining a special property tax status for geothermal development. We therefore estimate the proposal's overall effectiveness as 0 to -1, and we think that its effects would occur in the short term.

Proposal 14.4.2: Insist on Steam Sale Contracts That Guarantee the Geothermal Field Operator a Minimum Number of Hours of Plant Operation

This proposal is one of a series that argues for changing the conditions in contracts between buyers and sellers of geothermal resources to put the cost of resource delivery and power plant breakdowns on the buyer of the resource rather than on the seller. Another variation is a sales contract based on BTUs delivered.

In The Geysers, PG&E provided help to the developers when their needs were great and received a very favorable contract as a result. This proposal argues that such contracts put a severe restriction on the cash flow that developers need for more exploration and development.[7] The seller, rather than paying only for the electricity that flows out of his power plant, should pay for a certain minimum amount of the resource from the wellhead and should take the responsibility for bringing the resource to his plant and maintaining electricity production.

We estimate the adoption cost of this proposal to be medium in time, zero in money, and high in trouble as a result of utility resistance. We estimate the changes that

the proposal would bring about in the geothermal development process to be a zero reduction of the time involved, a low reduction of money, and a zero reduction of trouble. We rate the proposal's overall effectiveness as 0 to +1, and we think its effects will occur over the long term.

Proposal 14.4.3: Sell Steam or Other Resources at the Wellhead as is Done in the Oil and Gas Industry

Right now, the developer pays for all the installation and maintenance of the piping required to bring the steam from the wells to the power plant site. The cost of this apparatus creates a tremendous cash strain on the resources of the developers. This proposal argues that, in the future, such responsibility should be shifted from the developer to the power plant operator.

We estimate this proposal to have adoption costs that are low in time, zero in money, and medium in trouble. We think the changes it would bring about in the development process would be a low reduction of the time involved, a zero to low reduction of money, and a near zero reduction of trouble, since what the proposal does is to shift responsibility from the private developers to the privately owned or publicly owned utilities. We estimate its overall effectiveness as somewhere between 0 and +1 and think its effects will show up in the long term.

Proposal 14.4.4: Involve the Potential Buyer in the Early Phases of Development

This proposal introduces a major theme of this analysis: that more coordinated arrangements could make the development process go faster. Such coordinated development could take the form of a vertically integrated system, in which the same firm was in charge of everything from exploration through delivery of power to the final users; or it could take the form of more explicit and long-term agreements between the various organizations presently involved in the development process. It should be noted that what such coordinated development is apt to do is to shift some of the cost from private developers to privately owned or publicly owned utilities.

We estimate the adoption costs of this particular method of achieving coordinated development as medium in time, medium in money, and medium to high in trouble. We estimate the changes it would bring about in the development process to be a low reduction in time, a low reduction in money, and a low reduction in trouble. We estimate the overall effectiveness of the proposal as +1, and we think that its effects will show up in the long term.

Proposal 14.4.5: Obtain Loans for Development of Geothermal Fields from Buyers

This proposal is another one in the series that stresses the benefit of more coordinated development or vertical integration of the geothermal development process. Buyers

in this case are people who are apt to produce power--for example, privately owned or publicly owned utilities.

We estimate the adoption costs of this particular proposal as high in time, low in money, and high in trouble. We estimate the changes it would bring about in the geothermal development process as a low reduction in time, a low reduction in money (once again with a shift from privately owned organizations to perhaps some publicly owned organizations), and a low reduction in trouble. This reduction will come about because bargaining presumably would be easier if the utility already had a financial stake in the developer's success. We estimate the overall effectiveness of this proposal as a +1 and we think the effects will show up in the long term.

Proposal 14.4.6: Allow Accelerated Depreciation in Geothermal Plants for Tax and Rate-Base Purposes

This proposal actually already exists. The utilities can and do take accelerated depreciation for all capital expenditures, including those for geothermal resources. The utilities can also take such accelerated depreciation for rate-base purposes, but they don't. Apparently it is more advantageous for them to keep the depreciation at a lower rate but continuing over a longer period of time than to take accelerated depreciation for rate-base purposes.

Proposal 14.4.7: Regulate Privately Owned Utilities to Encourage Investment in Geothermal Resources

This proposal could be implemented by such methods as allowing higher rates of return for geothermal capital,

listing the cost of risky technology as legitimate expenses, etc. We estimate its adoption costs as low in time, low in money, and very high in trouble, since such special treatment is very controversial. Although CPUC has the power to institute a scheme like this, it is going to be very cautious about doing so. We estimate the changes that the proposal would bring about in the process as a low reduction of the time involved, a low reduction of money, and a zero reduction of trouble. We estimate the overall effectiveness of this proposal as 0. It might have some positive effect if it made utilities more willing to take risks in the geothermal field, but there are other less controversial ways to accomplish this end. We estimate that the effects, if any, will show up in the long term.

Proposal 14.4.8: Encourage Buyers to Participate in the Federal Loan Guarantee Program

The federal government will currently guarantee loans for geothermal development, but has yet to set aside any money to pay for defaults; furthermore, the regulations surrounding the program include provisions that reduce its attractiveness--one, for example, requires the buyer to pledge all his assets to payment of the loan.[8] This proposal argues that, even though the federal loan program's provisions may be acceptable for small developers that want to finance exploration drilling from bank loans and for banks that are willing to lend for such guarantees, the program does not meet the needs of the big companies in the

system, such as major oil companies and electric utilities. Thus, this proposal calls for restructuring part of the program to make it more attractive for such entities. For example, the program could guarantee the bonds that utilities issue to finance geothermal power plants, or it could change the provision for pledging assets.

If the proposal were limited to simply encouraging buyers as well as sellers to participate in the federal loan guarantee program, we estimate that the adoption costs would be low in time, low in money, and medium in trouble. We estimate that the effects of the proposal on the process would be low reductions in time, money, and trouble involved. We feel that there is a real question as to who would be interested in this particular form of financing, given all the problems it contains; consequently, we rate the proposal's overall effectiveness as 0 to +1. The effects, if any, would occur in the short term.

Proposal 14.4.9: Have ERDA Make Loans to Geothermal Buyers in Some Cases for Demonstration of Commercially Viable Technological Options

In this case the proposal asks that ERDA go beyond guaranteeing the loans of banks and actually provide the money itself. It should first be noted that ERDA is already doing this via its program of demonstration grants, such as the one for the thermal loop testing program in the Imperial Valley.

The fact that SDG&E was willing to go ahead with its test loop and that EPRI was willing to go ahead with its

plans once they had ERDA participation and financing suggests that such a proposal could exert very positive effects.

We estimate that adoption costs for an expansion of such existing programs would be medium in time, medium in money, and high in trouble. We estimate that the proposal's effects on the process would be a low to medium reduction of time, a low to medium reduction of money, and a low to medium reduction of trouble. We estimate its overall effectiveness to be 0 to +1 and we think the effects would occur in the short term.

Proposal 14.4.10: Have State and Federal Governments Build Demonstration Plants to Assess the Viability of Hot Water Systems

In this case, ERDA (and perhaps the State of California) are asked to go beyond simply making money available to help build the plants: they are asked to build the plants to demonstrate the commercial practicality of hot water technology to investors who may feel that, despite foreign experience, the technology is risky. The premise is that utilities will be reassured only by actual operating experience, and that such experience, if successful, will lead them to invest their own money in such plants. As the discussion in Proposal 14.4.9 pointed out, ERDA has some programs of this type already under way. The principal advantage of this proposal is that it would convince utilities of the viability of the concept by means of hot water demonstration plants; it should then be unnecessary to

reconvince them through exhaustive testing, inducements, or other activities. One possible shortcoming here, as opposed to Proposal 14.4.9, is that lack of direct utility participation may reduce the power of successful demonstrations.

We estimate the adoption costs for this proposal as medium in time and high in money. The trouble would be zero at the federal level (since the federal government already has some programs of this type), but high at the state level. We estimate that the overall effects on the process could be extremely positive, with a high reduction of time, a medium to high reduction of money, and a medium to high reduction of trouble. Overall effectiveness would be +2 and would occur in the short term.

Proposal 14.4.11: Have the Geothermal Field Developer Produce Power Himself

One way to get around utilities' reluctance to face the risks of geothermal technology is for the developer to build the plant himself and sell power to the utilities.

We estimate the cost of adopting this proposal as medium in all three categories. The time, money, and trouble would be expended by the developer in order to acquire the capital and expertise needed to build and run a power plant. The developer would also face regulatory problems; these are discussed in the analysis of the next proposal. We estimate that the changes brought about in the geothermal process would be a medium reduction of the time involved, a near zero reduction of money, and a medium

reduction of trouble. We rate the overall effectiveness of this proposal at +1 to +2, and we think that the effects would occur in the long term. We also feel that the impacts of the proposal are apt to exhibit a snowball effect: that is, the first couple of projects would go very slowly and have little effect on the overall process, but their existence would encourage both utilities and other developers to get involved, with the result that future plants might spring up at a faster rate.

Proposal 14.4.12: Change Regulations for Utilities So That Potential Plant Operators Can Produce Electricity for Some Trial Period without Being Regulated as Full-Fledged Public Utilities

Under the statutes and regulations guiding CPUC, anyone who produces electric power for other than his own use may become a public utility subject to the full jurisdiction of CPUC. CPUC is already wrestling with the question of whether it wants (or must take) jurisdiction over all such power producers, and the California Legislature is considering a bill (AB 4069) that would clearly exempt from public utility jurisdiction firms producing electricity from nonconventional sources, as long as such firms used that electricity themselves or sold it only to a utility or to one industrial consumer.

We estimate that the costs of adopting this regulation would be medium in time, medium in money, and medium to high in trouble. In general, whenever a major legislative change is involved, we would rate the adoption costs as high on all

three attributes; however, since the legislation is already in process and since CPUC is already considering the issue and hasn't rejected it out of hand, we think adoption costs will be lower than usual. However, if this particular piece of legislation fails and the issue has to be reintroduced, the adoption costs would become much higher. We estimate that the overall change in the geothermal development process would be a medium reduction of the time involved, a low reduction of money, and a zero reduction of trouble involved. We estimate the reduction in trouble as zero because the factors leading to a reduction and those leading to an increase appear to cancel each other out.

On the one hand, utilities will probably resist purchasing electricity that they did not produce. On the other hand, compared to cautious utilities, risk-taking developers will probably be more willing to use uncertain technologies. We rate the overall effectiveness of this proposal as +1 and think the effects will occur in the short term.

14.5 Proposals Affecting Regulation/Regulatory Participants

Two major themes dominate proposals for improving the effectiveness (and thus the speed) of regulatory actions concerned with geothermal development. The first is institutional learning and the dissemination of needed information. The second is the development of explicit performance criteria and operating procedures for review processes.

Proposal 14.5.1: Encourage Information Flow from Experienced Regulatory Participants to Others

The intent of this proposal would be to encourage exchanges between counties and state agencies, between one state agency and another, and so forth. Agencies that currently are experienced include: Sonoma County, Lake County, Imperial County, CPUC, SLC, and the assorted APCDs and RWQCBs. Those that need to learn include: other counties, other APCDs and RWQCBs, CERCDC, and ARB.

Some of this information exchange is already occurring. In fact, CERCDC has made a serious effort to learn what it could from CPUC. More such exchanges at all levels of the regulatory system can only help. In particular, counties with expertise limited to one stage of development can learn from counties whose experience includes all stages.

We estimate the adoption costs for this proposal as low in all three categories. We think the change in the process will be a medium reduction in time, money, and trouble. We rate the overall effectiveness of the proposal as +1 to +2 and we think its effects will occur in the long term.

Proposal 14.5.2: Encourage Information Flow from One Utility to Another

Much of this information flow undoubtedly already occurs; this proposal simply suggests that federal and state governments do what they can to encourage the process. It applies particularly to information flow from PG&E to anyone else interested in building geothermal power plants.

We estimate the cost of adopting this proposal would be low in time, money, and trouble, so long as the information to be shared is not viewed as of great proprietary value. We think the changes it would bring about in the geothermal process would be a low reduction of time, money, and trouble. We rate the proposal's overall effectiveness as 0 to +1, and we think that its effects will occur in the short term.

Proposal 14.5.3: Keep All Parties Abreast of the Costs and Benefits of New Mitigation Technologies

This proposal once again suggests that federal and state governments help provide information to those who will be needing it. In this case, the proposal deals with the flow of information about technical steps that might alleviate some procedural problems. Again, information of proprietary value is not apt to be willingly shared. The premise is that developers that are able to adopt mitigation technologies (or explain why they are not adopting them) are apt to have an easier time in permit-granting hearings than developers who are not familiar with such technologies. Of course, much of this search for information goes on without state or federal involvement. The proposal merely suggests that the government agencies do what they can to speed the dissemination of the new information that emerges from their funded research programs and from other sources.

We think the costs of adopting this proposal are low in time, money and trouble, depending on the kind of information involved. We think the changes it will bring about in

the geothermal development process are low reductions of the time, money, and trouble involved. We rate the proposal's effectiveness as 0 to +1 and we think its total effects will be long term. If the proposal does lead a developer to adopt a mitigation technology, that particular effect might be short term, but the cumulative effect of encouraging the use of more mitigation technologies is apt to occur in the long term.

Proposal 14.5.4: Set Time Limits for Local Decision-Making Actions

Several sources have suggested that local government agencies that grant relevant permits should have fixed times within which they must render a decision on a given application, much as CERCDC must do on power plant applications. To the extent that this proposal would require legislation, the adoption costs would be high in all three categories. To the extent that the changes can be implemented by regulation, the adoption costs would be low in time and money, but high in trouble. In any case, setting limits to local decision making would be very controversial.

There are also problems with feasibility. One problem is that court suits and state activity outside the control of the local government could extend the decision-making process past the limits set by law. Another difficulty is that certain technical problems could demand more time than the set limits would allow. For instance, if an area were alleged to be a nesting place for an endangered species or

a resting place for a migratory species, that allegation could not be checked until the relevant time of year.

We estimate that the effects of the proposal on the geothermal development process would be a low reduction in time, money, and trouble. If the limits do serve to reduce time, they will reduce the money spent in the process, as well. However, it should be noted that any limits of this sort are hard to enforce. They also pose a trade-off between the time and the trouble involved: the developers may well find that their life is easier when local officials take more time to render favorable decisions than when they are rushed to a decision that may cause many more problems later on. A further consideration is that, as one developer noted, the setting of maximum time limits on review processes tends to convert the maximum time into the normal time.

It seems to us that at this point this proposal would create more problems than it would solve. It might also produce entirely the opposite effect from that intended. On the other hand, it could substantially speed local permit decisions. Because of the uncertainty of success, we rate its overall effectiveness as 0 to 1. We think that its effects would occur in the short term.

Proposal 14.5.5: Set Up Qualifications and Strict Procedural Rules for Testimony to Be Presented at Geothermal Power Plant Hearings

It has been noted that some hearing processes could be accelerated if all individuals presenting testimony were

required to give advance notice and testify under oath. Such requirements would hopefully reduce much of the irrelevant or unsupported testimony that presently slows the hearing processes.

We estimate that the cost of adopting this proposal would be low in time, low in money, but very high in trouble. Presumably, some qualifications, particularly those concerning notice of who will appear, the general points to be raised, and the procedures used at the hearing itself could be set up by regulation, but some may be very controversial. Because the hearings affecting geothermal development are mandated by a variety of statutes, qualifications that depend on statutory amendments are apt to be more difficult than usual. Furthermore, if the qualifications are very strict, particularly if they limit who may appear, they are apt to increase the number of court suits outside the normal hearing process; whereas, if they are very lax, they will not make any significant difference. We estimate that the change that this proposal would produce in the geothermal development process would be a low reduction of time, money, and trouble.

The research team is divided on their evaluation of overall effectiveness of this proposal: some feel that it would have little significant effect, and others feel that it would have at least some positive effect. In any event, some moves toward tightening the rules regarding testimony

appear to be in order. We do agree that the effects of the proposal would occur in the short term.

Proposal 14.5.6: Establish a Means whereby Industrial Participants May Anticipate Unusual Issues That Will Arise at Geothermal Power Plant Hearings in Time to Prepare Responses for Them

Developers and utilities have in the past raised legitimate complaints about the surprising or unusual nature of some objections to geothermal development plans to which they had to make a formal response during hearings. On the other hand, other participants appear to have some legitimate complaints about the apparent lack of preparation by individuals representing developers and utilities in hearings. This proposal argues that the entire system could operate more smoothly if the industry representatives were given adequate warning ahead of time that unusual issues would be raised. Such notification would permit them to prepare responses to those objections ahead of time. Of course, for the procedure to be effective, the hearing officials must see to it that, to the extent possible, the set agenda is followed. The combination of advance notification of unusual issues and careful control by those in charge of hearings should make a major contribution to the smoothness of the process.

We estimate the cost of adopting this proposal as low in time and money, but low to medium in trouble. With respect to changes in the geothermal process, we think that

this proposal will bring about a medium reduction of the time involved, a low reduction of money, and a medium reduction of trouble. We rate its overall effectiveness at +1 and think that its most noticeable effects will occur in the short term, although its general benefit will be long lasting.

Proposal 14.5.7: Use Experienced Consultants to Prepare EIRs

We have found that much time is spent amending EIRs in order to respond to comments from the public concerning issues that the consultant preparing the EIR should have foreseen. On the theory that consultants that are experienced will be able to anticipate at least some of these issues at the outset, we would urge use of only experienced consultants.

Of course, because the issues will vary from county to county, consultants with experience in one county will not necessarily know all of the specific issues likely to arise in another. However, consultants with experience in preparing geothermal EIRs for other counties are still apt to be better than inexperienced consultants at predicting what subjects need to be covered.

We rate the adoption costs of this proposal as low in time, money and trouble; we think the benefits it would provide to the geothermal process would be a medium reduction in time, money, and trouble. We rate its overall