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May 11, 1977

Mr. Brian Rogers
Alaska State Legislature
Legislative Affairs Agency
Pouch V
Juneau, Alaska 99811

Dear Mr. Rogers:

Gary Simon and I certainly enjoyed the opportunity to visit with you last week. We appreciate your giving us so much of your time during your obviously busy schedule.

As promised, I am enclosing some samples of our work which may be germane to your interests. I should note that we have three other major reports which are due out by the middle of June on subjects which are particularly pertinent to the discussions we had regarding implementation of programs in the state of Alaska.

Again, we appreciate the opportunity to meet with you and hope to see you in the near future.

Sincerely,

CR Schuller

C. Richard Schuller
Director
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5/4/77 Gary Simon
Richard Schuller

Coal
Oil - Gas ‖ Method Solvent Refined

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CAPITYL

Regulatory policies -
Land Use Control Bill
Bauxite Industry
pre planning ess 65/ons (Hydro) *

Market penetration
Tourism

recent
→ Legal Inst Pol't barriers to geothermal
→ Structure rgs - elect generating tech
how do you encourage this sort?
→ develop integrated geothermal - remote Idaho

Look at specific options -
are there major showstopper blocks?

Social Impact

A Research Report

Battelle
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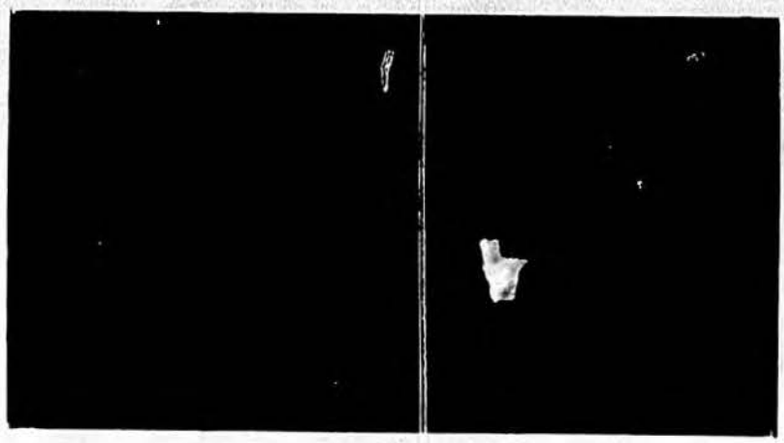

LEGAL NOTICE

FINAL REPORT

STATE AND LOCAL PLANNING PROCEDURES DEALING WITH SOCIAL AND ECONOMIC IMPACTS FROM NUCLEAR POWER PLANTS

For

The United States

Nuclear Regulatory Commission

Office of State Programs

January 1977

STATE AND LOCAL PLANNING PROCEDURES DEALING WITH SOCIAL AND ECONOMIC IMPACTS FROM NUCLEAR POWER PLANTS

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Final Report

January 1977

By

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Executive Summary

The Nuclear Regulatory Commission (NRC) is undertaking--in cooperation with other federal and state agencies--a study designed to improve procedures for federal and state review and approval of sites for proposed nuclear facilities.* As a part of that study, this report focuses on one important segment of the entire process: the roles of state and local agencies in planning for and managing social and economic impacts of nuclear power plants. In order to be effective in these roles state and local agencies must work with each other as well as the NRC. Consequently, the NRC should be aware of the problems that state and local agencies face in managing social and economic impacts if it is to better cooperate with these agencies.

We used a comparative case study approach, analyzing six sites in three West Coast states. The case studies included plants in operation, plants under construction, and plants still in the planning stages. In contrast to some states, all three of these states have moderately centralized procedures for siting power plants, and all have strong environmental laws. However, the problems facing local government, particularly in less populated regions, are typical of similar communities anywhere faced with the need to plan for the rapid changes that come about from the construction of all large industrial or commercial installations.

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*Efficiency in Federal/State Siting Actions, U.S. Nuclear Regulatory Commission, NUREG-0128, October 1976.

The major conclusions of this study encompass two types of issues: Substantive impacts such as schools, housing and public facilities, and process-oriented issues which affect the intensity and effect of the substantive impacts. The following is a summarized list of the conclusions and recommendations of this report:

1. We discovered that the following facilities and services were most commonly and most severely impacted by the influx of a construction force: schools; public services (sewer, water, police, fire, roads, hospitals); and housing. Overcrowding and overloading were the most common problems.

2. We identified several process issues which directly relate to the effective management of social and economic impacts resulting from power plant construction:

Coordination is poor among most government agencies, resulting in a poor information flow, and duplication or lack of services.

Early notification of the proposed project to all affected local governments is necessary to plan for impacts and to request outside funding. Early notification can provide adequate lead time (estimated as up to three years for the construction of certain public facilities) to construct and expand the needed facilities.

Planning capabilities are important to a local government's success in managing the identified social and economic impacts.

Additional funding is needed by most communities to expand their public facilities and services.

3. On the basis of the above conclusions we make the following recommendations:

* The NRC should require, as part of the licensing process, that the utility demonstrate that it made efforts to provide the affected communities with early and complete information regarding anticipated social and economic impacts.
* The NRC should formally examine a community's ability to manage expected social and economic impacts as part of its impact assessment process.
* Dialogue should be initiated between state and NRC officials to assure that the NRC process does not hinder state and local efforts to obtain sufficient lead time and funding to cope with power plant impacts.
* The NRC should establish an information office to direct communities impacted by nuclear power plants to the right sources of assistance. The possibilities of establishing such an office at the regional level should be investigated.

Table of Contents

Chapter I: Introduction

1.1 Overview

The Nuclear Regulatory Commission (NRC) is undertaking--in cooperation with other federal and state agencies--a study designed to improve federal, state, and local procedures for siting nuclear power facilities and dealing with their impacts.* This final report discusses one aspect of the overall study: state and local government procedures for identifying and managing the social and economic impacts that may be associated with constructing or operating a nuclear power plant. The discussion of these state and local procedures points out how they relate to the entire process.

The building of a nuclear power plant, particularly in sparsely populated areas, has significant social and economic impacts on communities close to the construction site. The influx of a large construction force into a community causes a rapid increase in demand for public services (e.g., education, fire, police) and public facilities (e.g., roads, sewers). When the power plant has been built, and the construction force departs, the demand for such facilities and services may decline very rapidly. Sometimes a community is unprepared for the rapid growth and subsequent rapid decline in population associated

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* Efficiency in Federal/State Siting Actions, U.S. Nuclear Regulatory Commission, NUREG-0128, October 1976.

with the construction of a nuclear power plant. This may lead to unplanned and even haphazard growth that can place a great strain on the community infrastructure. This strain on facilities and services can be minimized through the coordinated use of state, county, and local planning procedures. However, the community must be given sufficient "lead time"* in which to do proper planning, must have methods available to accurately assess which problems are likely to arise, and must have the resources to provide solutions.

This report contains three kinds of information.

A. It identifies the social and economic impacts which potentially can be mitigated by state and local government action.

B. It identifies the existing planning and budgetary processes that state and local governments might use in dealing with these impacts.

C. It discusses the relationships among federal, state, and local processes.

The research for this report started by identifying the range of social and economic consequences of power plant construction that can impact a community. Both adverse and beneficial impacts were identified and the analysis focused on those impacts that a community can manage or mitigate. The data sources were obtained from a literature search and from analyses previously conducted by members of the research team.

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* "Lead time" refers to the period of time between the decision to locate a plant in a specific community and when the impacts begin to occur.

We used case studies to identify the existing planning and budgetary cycles that some representative state and local governments might use in dealing with social and economic impacts. Six plants were selected for case study analysis. Two sites were selected from each of the following states: Washington, Oregon, and California. Sites were selected in consort with the NRC to provide date for a range of characteristics to be discussed later.

Data gathering consisted of interviews with state, county, and local officials in each of the three states to obtain information about their power plant siting process and the social and economic impacts that occurred or are expected to occur in the respective host communities. Interviews focused on how each community coped with (or planned to cope with) local social and economic impacts and what planning procedures the communities have set up to ensure orderly growth. In addition, in the interviews we discussed planning and budgetary cycles as well as revenue generating techniques.

We then examined the information we had obtained on state and local planning procedures to see how such planning activities might be better integrated with the federal licensing process. A portion of this work consists of a network analysis designed to illustrate relationships between the federal, state, and local processes.

1.2 Definition of Terms

In order to assure that the reader understands the terms used throughout this report, definitions of several planning-related terms are given below.

Local government refers to municipal, county and regional governments most closely involved in planning for the impacted area. However, when reference is made to both local and county governments, local refers to municipalities.

Community refers to the area within legal town boundaries and adjacent areas that are perceived by residents as making up a coherent entity.

The planning process is the sequence of steps that are undertaken to formulate goals and to implement them through specific ordinances regarding the use of land and the provision of services in a jurisdiction.

The budgeting process is the sequence of steps taken on an annual or biennial basis by various levels of government to determine the means for generating revenues and to allocate resources for the provision of government goods and services.

The permit process is one of the tools of planning. It includes specific steps that must be taken to obtain approval of proposed development projects within a particular locality, county, or state. This tool is used by government agencies to assure that developers are in compliance with governmental regulations and plans.

Process is a series of actions or operations taken to reach an end; a continuous operation.

Procedure refers to the method of carrying on in a particular course of action.

Mechanism refers to an action that is used as a means to achieve the desired goal; it is used here to refer to specific actions used to attain overall planning goals.

1.3 Case Studies

As noted above, we conducted two case studies in each of three West Coast states: Washington, Oregon, and California. We selected two nuclear power plant sites in each state. (See map on page 6) The sites were as follows:

Skagit-Sedro Woolley, Washington, proposed by Puget Sound Power and Light (PSP&L).

Washington Public Power Supply System (WPPSS-2)-Richland, Washington, being built by Washington Public Power Supply System.

Pebble Springs-Arlington, Oregon, proposed by Portland General Electric Co. (PGE).

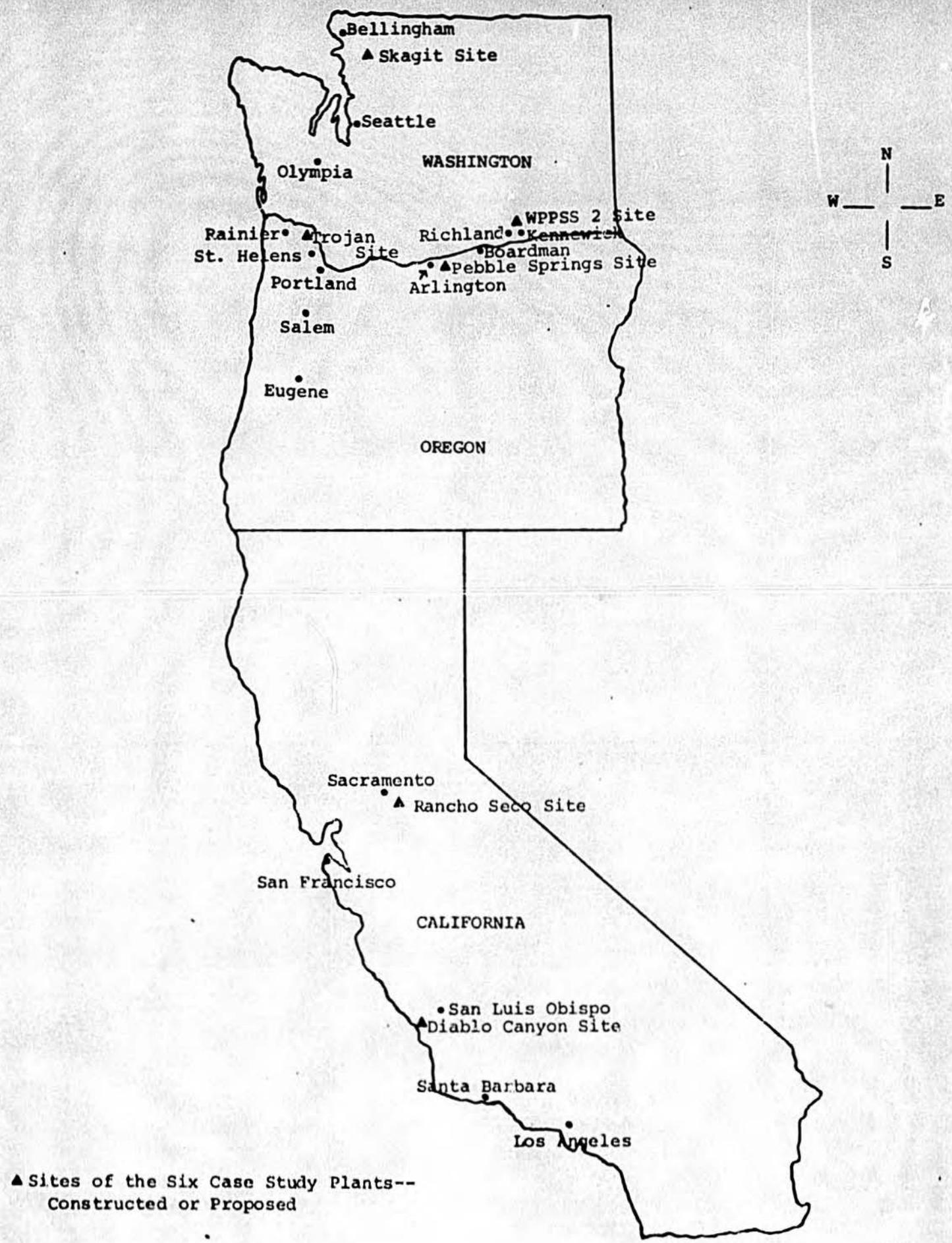
Trojan-Rainier, Oregon, built by Portland General Electric Co. (PGE)

Rancho Seco-Clay Station, California, built by Sacramento Municipal Utility District (SMUD).

Diablo Canyon I-Diablo Canyon, California, built by Pacific Gas and Electric Co. (PG&E).

Each site was selected according to a number of criteria that were defined jointly by the research team and the NRC. Major criteria were: (1) size and type of host community;

CASE STUDY SITES



(2) differing stages in completion of the construction; and (3) convenient geographical access to sites (in this case, three West Coast states).

1.3.1 Community Type and Size. The specific impacts likely to occur at any given site are dependent on unique characteristics of the host community. Social and economic impacts experienced by small isolated towns will be of a greater magnitude than if the same plant were built near a large city. As an illustration, the lack of available housing at the Skagit site just prior to the start of construction may create much pressure for building trailer parks. In contrast, the existence of sufficient vacant housing near the Diablo Canyon site minimized pressure on the local housing market during construction of that facility.*

1.3.2 Stage of Completion. We also tried to select sites having power plants in various stages of completion. In communities where the nuclear power plants were already operational, such as Rainier, Oregon (Trojan) and Clay Station, California (Rancho Seco) the social and economic impacts associated with construction have run full cycle, and a complete retrospective case study can be made. In Sedro Woolley, Washington (Skagit) and Arlington, Oregon (Pebble Springs) the impacts have not occurred yet and can only be anticipated, but the planning processes under way can be examined in detail.

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* There is some dispute about this point. See Page C-11.

1.3.3 Disadvantages of these cases. There are also certain disadvantages to the cases used. We wanted a range of plants from the beginning to completed state. However, the impacts associated with the two completed nuclear power projects in California, Rancho Seco and Diablo Canyon, were minimal. Rancho Seco was located near a large metropolitan area and there was vacant housing near the Diablo Canyon site, although the nearby communities were small to moderate in population. Two alternative sites, San Joaquin and Sun Desert, would have provided more potential information on community impacts, but were only in the planning stages of development. In addition, California has changed its siting process by creating the California Energy Resources Conservation and Development Commission (ERCDC). Rancho Seco and Diablo Canyon were built before ERCDC had jurisdiction over siting and site certification. San Joaquin and Sun Desert will be subject to the new siting regulations.

The same situation exists in Oregon where the Trojan plant was built before the Oregon Energy Facility Siting Council took jurisdiction over plant siting. The Pebble Springs site has gone through the certification and review process at the state level. State certification was recommended by the Oregon siting council but a legal suit has prevented action by the Governor.

In addition, we must remember that it is risky to generalize from the three states and six sites we examined to situations in all other states.

1.3.4 Data Gathering. We interviewed a number of key persons who were involved with each power plant project at the state, county, and local levels. Interviewees included local government officials, school district administrators and planners; representatives from the state energy office, the state siting council, and the state planning agency; and a few utility-community liaison representatives. Each was interviewed concerning the range of impacts (using as a base those identified from the literature review), their planning and budgetary cycles, and mechanisms for identifying and managing local social and economic impacts, including taxing procedures and capital investment planning. (See Appendix B for a copy of the interview schedule.)

1.4 Analysis

Finally, we analyzed information from the interviews and other information on the state and local processes and on the selected sites. We discuss state level processes and cycles in one chapter and local level processes and cycles in another. Because of the brief time allowed to generate this report and because many different state and local agencies each have their own requirements and/or responsibilities in dealing with power plants, our major focus has been upon the siting and planning processes. Less emphasis was placed upon the budgetary process and specific permit processes. The team feels that the mechanisms and cycles available to plan for impacts is one of the key elements in effective coordination of federal, state, and local

impact management efforts. Without planning and coordination mechanisms, budget and permit processes will continue to be piecemeal. However, a later step in NRC's overall study should devote more effort to budgeting and specific permits because they are two important components of local impact management.

1.5 Local and State Governmental Agency Fragmentation

One significant limitation on this study is the fragmentation of the local, county, and state governments in the three states we examined. Agencies at each governmental level often lack common objectives and are only loosely coordinated; individual agencies may have incomplete information as to what other agencies at their governmental level are doing. We found cases where county and local officials communicate very infrequently, where local and county officials both complain of little communication with various state officials, and where state agency officials are unaware of what other state officials (with similar responsibilities) are doing. This fragmentation was compounded by situations where officials involved in the siting of a power plant, or in the identification and possible management of its impacts, had long since left the agency and their replacements could only provide guesses as answers to some of our questions.

This problem of fragmentation and lack of coordination is common to most government agencies. It is not the result of

malicious or intended exclusion by one agency of another, but rather often occurs because there is neither time nor staff to pursue more coordinated and efficient goals. Thus, tasks such as the identification of all permits which may be required at the state, county, or local levels to cope with social and economic impacts become a monumental sorting-out of government functions and agencies--it would involve contact with every division within every agency which might potentially be involved with such social and economic impacts. Given the time constraints of this project, such a task did not prove realistic. Thus we chose to focus on community development and planning, and energy agencies.

A final limitation imposed by a lack of coordination and communication is that information does not always flow easily among government agencies. Thus, although there are several well-done studies on impact management (see especially Williams, 1976) many local officials are not aware of their availability. It is more likely (although not a certainty) that state officials will be aware of the studies; however they have no formal mandate and little staff time to pass such information on to affected counties and communities.

1.6 Major Conclusions

The major conclusions of this study focus on two types of issues: substantive impacts such as schools, housing and public facilities; and process-oriented issues which affect the intensity and effect of the substantive impacts.

Substantive Issues

1. Schools are a public facility often impacted by the influx of the construction force (children of construction workers). The impact is complicated by its temporary duration and suddenness and can have detrimental effects on the quality of education and on relationships between existing residents and newcomers. Potential amelioration strategies include impact payments by the utility to the school districts.

2. Public services (sewers, water, roads, hospitals, fire protection and law enforcement) also can be significantly overloaded by the construction of a power plant. To manage these impacts most successfully communities need lead time to plan for expanding the facilities and additional funding to accomplish the expansion.

3. Housing is another community facility, usually controlled by the private sector, which is impacted by the influx of a construction force into a community. Subsidized housing, mobile homes, modular homes and zoning that allows for higher densities are techniques available to communities to cope with

with this impact. However additional funding and sufficient lead time are both necessary to a community's successful mitigation of these impacts.

Process Issues

1. There has been, and in some cases continue to be, poor coordination among state agencies, local agencies, state and local governments and utilities in the states we examined. This lack of coordination results in a poor information flow; accurate and timely information is necessary for state and local agencies to effectively plan for the above mentioned social and economic impacts.

2. Early notification of the proposed project to all affected local governments did not always take place at the sites we examined. Lack of early notification means communities do not have adequate lead time to plan for social and economic impacts and to request funding from outside sources. For large capital projects communities may require up to thirty-six months from the time they begin planning to the time the facilities will be ready for use. This issue is complicated, however, by the fact that in some cases communities are uncertain as to if the plant will be built or not. By the time it is certain that a plant will be constructed, it is too late for the community to develop plans to cope with the impacts.

3. A local government's capabilities for planning for needs related to rapid growth will determine in large part how successfully local impacts are managed in the nuclear power plant development process.

4. Most communities need outside funding to expand their public facilities and services to meet the demand imposed by an influx of construction workers. Such additional funding may come from the utility in the form of prepayment of taxes, or the federal government.

Our recommendations, based on the above findings, are as follows:

* The NRC should require, as part of the licensing process, that the utility demonstrate that it made efforts to provide the affected communities with early and complete information regarding anticipated social and economic impacts.
* The NRC should formally examine a community's ability to manage expected social and economic impacts as part of its impact assessment process.
* Dialogue should be initiated between state and NRC officials to assure that the NRC process does not hinder state and local efforts to obtain sufficient lead time and funding to cope with power plant impacts.
* The NRC should establish an information office to direct communities impacted by nuclear power plants to the right sources of assistance. The possibilities of establishing such an office at the regional level should be investigated.

Chapter II: The Identification of Social and Economic Impacts

2.1 Overview and Definitions

Social and economic impacts which affect a community due to the construction and operation of a nuclear power plant are principally related to changes in the demographic and economic characteristics of the community. Shifts in size and composition of the population will affect local economic activity, the tax base, public services and quality of community life. Usually, for a rural siting, the smaller the neighboring host communities, the greater the net impact produced by plant construction.

The increase in population and its composition is due to an influx of a construction, management, and engineering work force, and their families. Population increase does not occur at once, but rather proceeds incrementally for the first one or two years of plant construction, peaks in the third to fifth year of construction, and declines rapidly thereafter. For example, for a single-unit, 1200 megawatt station, the work force peaks at approximately 1475 workers in the fourth year of construction.*

It is not the growth in population of inmigrating construction workers alone which has ramifications for a community.

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* Schulte, Steven C. "Overview of Population Requirements - Analysis of Sectors Affecting Socioeconomic Impacts of Nuclear Power Plants." Richland, Washington: Battelle Pacific Northwest Laboratory, October 1976.

Some members of the work force bring their families with them to communities near the site.* Social and economic impacts occur because this new population places demands on a community's infrastructure. It requires many facilities and services, which a community may or may not be able to initially supply. In addition, these new demands on services require the addition of a secondary work force to provide those services. In turn, the secondary workers relocate their families to the host communities and are an additional source of population growth.

This population growth has consequences on a community's population composition. Many construction workers have school age children. The composition of a rural community with an aging population is therefore radically altered and may be caught unprepared to house the new children in presently available school facilities.

The problems are further complicated by the fact that this is not a permanent population growth. Rather, it is very intense for a reasonably short term, usually five to seven years. Unless other industries are prepared at the end of this cycle to provide employment opportunities for continuing high levels of population, the community will experience a rapid population decline as residents leave to work elsewhere. The community

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* For estimates of typical population effects, see page D-12 of this report and Recht and Greene (1977).

may then be saddled with excess housing, retail, sewer, water, and school facilities, if these have all been provided. The planning problem which is most critical to communities facing such a "boom and bust"* future, therefore, is providing the optimum mix of temporary and permanent facilities, or use of other alternatives.

The problems discussed above - rapid, temporary population growth, strains on existing community facilities and services, changes in the community's economic structure, etc. - are generic to power plant siting or the construction of any large industrial or commercial installation. However, although these problems will occur, they will vary in magnitude, depending on the size of the communities near the site. The problems will be more severe in relatively isolated rural communities, than in communities located near a metropolitan area. In the latter case, the work force will more than likely commute, as opposed to relocate, and therefore not require as many services.

2.2 Dimensions of Social and Economic Impacts

Social and economic impacts are multi-dimensional, and thus present an array of problems to federal, state, and local

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* "Boom and Bust" is a term applied to areas experiencing large and rapid population changes - first increasing, then rapidly decreasing. It is usually associated with a deterioration in the quality of life, as community services are strained during the "boom" to accommodate the new population. When the "bust" occurs and the population leaves, those facilities which were provided to accommodate the increased demand are left idle.

officials attempting to cope with them. Some principal dimensions of these impacts which affect the problems of planning for their amelioration are:

1. Magnitude or intensity, such as the size of the incoming construction force relative to the existing population.

2. Reversibility, or whether conditions are retrievable after construction is over. The acquisition of land for the plant is an example of an irreversible impact whereas the provision of portable classrooms is reversible.

3. Primary versus secondary, meaning whether the impact is direct or indirect. The influx of construction workers is direct, while the demands placed on community services are direct or secondary.

4. Beneficial or adverse. These impacts are self-explanatory. Some impacts, such as enlarging the tax base, are positive while others, such as overcrowding in the schools, are negative impacts.

5. Length of occurrence. Some impacts are short-term while others are long-term. Congestion on roads or highways will subside when the construction workers leave the community, but vacant, permanent housing remains.

6. Synergism. Some impacts, taken alone, do not appear to present serious problems to community officials. However, when the impacts are aggregated they can present difficult planning and coordination problems to the community.

If not planned for properly, such as planning the correct mix of temporary as opposed to permanent services and facilities, a "boom and bust" phenomenon can occur, leaving the community in a worse situation than originally existed. Local government is often placed in an intractable position regarding the provision

of new facilities and services because it must wait until the population is projected with a high level of certainty to reach a certain level and density before it can justify building new facilities and providing new or expanded services. Yet, if the local government's planning is to assure orderly growth, and the growth transition is to be smooth, it must have adequate lead time to construct new facilities before the population influx occurs.

2.3 Specific Impacts Potentially Occurring with the Construction of a Nuclear Power Plant

A number of specific social and economic impacts associated with the construction of nuclear power plants were identified through a review of the pertinent literature and previous research experiences of some study team members.*

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* Olsen, Marvin and Donna J. Merwin. "Toward a Methodology for Conducting Social Impact Assessments Using Quality of Social Life Indicators." Richland, Washington: Battelle Pacific Northwest Laboratory for U. S. ERDA, 1976.

Curry, Martha and Marjorie Greene. "A Program Plan for Performing Social Impact Assessment: A Case Study of Coal Development in the Powder River Region." Richland, Washington: Battelle Pacific Northwest Laboratory for U. S. ERDA, 1976.

Curry, Martha, Jill Goodnight and Marjorie Greene (contributors). Identification and Management of Economic and Social Impacts of Nuclear Energy Centers: A Preliminary Analysis. Seattle, Washington: Battelle Human Affairs Research Centers, 1975.

The literature consisted of environmental impact statements, scholarly works, and handbooks describing community impacts. (The most useful works included Battelle Human Affairs Research Centers, 1975; Olsen and Merwin, 1976; Reiff, 1976; Williams, 1976; and Brenner, 1976.)

A listing of the potential range of social and economic impacts which could occur in a community impacted by a power plant are shown in Table 1. Not all of these impacts occur in every community where a plant is being built. The items in this table show the range and variety of changes possible with construction and operation of a nuclear facility. The magnitude, and nature of each category of impact will vary substantially from one site to another.

All of the impact categories in Table 1 are attributable to a large construction labor force and secondary employment force, plus their families moving into an area of sparse population. Construction workers and their families may add a large increment to demands for public facilities and services. The new residents may also provide new sources of tax revenue for the community, but how much revenue a community will get is dependent on how local taxes are collected and distributed. (They are not necessarily collected by the agency which uses them.)

TABLE 2.1

Major Social and Economic Impacts Associated with Nuclear Power Plants

The main headings describe the major sectors of social and community life which could potentially be impacted; the subheadings describe the types of changes which might take place in each sector.

1. Relocation Impacts
   - A. Displacement of residents from the site area (These people could be confronted with a new housing market of escalating prices--prices may be higher than what residents were compensated for their property)
2. Demographic Impacts
   - A. Rapid population growth caused by in-migration of the construction force workers employed in service or support jobs and those seeking employment who may remain unemployed
   - B. Change in the ethnic composition of the population
   - C. Change in the sex ratio of the population
   - D. Change in the age structure of the population
   - E. Change in the educational status of the population
   - F. Change in the population density of the area
   - G. Change in the urbanization rate of the area
3. Local Economic Impacts and Taxes
   - A. New job opportunities in the community
   - B. Change in the total median family income in the area

C. Change in the employment rate in the area

D. Change in the retail prices in the area

E. Demand increases for retail services

F. Change in the assessed value of property in the area

G. Change in prevailing real estate prices

H. Change in the cost of living in the area

I. Change in the budget and property tax levy review

J. Increased revenues from the sales tax

K. Change in the community's gross product

L. Change in the business and industrial composition of the community

M. Change in rates of business starts and failures

N. Change in economic base

O. Increased economic planning required

4. Public Works and Transportation Impacts

A. Water

1. Demand increases for major transmission and distribution system for water supply

2. Need increases to develop new drinking water sources

3. Need to provide more technology to protect water quality

4. Need to provide storm run-off systems as urbanization increases

5. Change in the demand for water

B. Sewage Impacts

1. Increased demand for sewer collection treatment facilities
2. Increased need for facilities for sludge disposal and recycling
3. Failure of subsurface sewage system

C. Solid Waste Impacts

1. Increased demand on collection and storage of solid waste
2. Increased demand on disposal and recycling facilities
3. Increased inspection of handling and disposal facilities
4. If land disposal, is there adequate land and suitable conditions?

D. Air Pollution Impacts

1. Increased need for air pollution control policies
2. Increased need to enforce existing policies
3. Increase in dust and air matter from trucks going to the site

E. Noise Pollution

1. Increased need for policies to control disruptive construction and traffic noise
2. Increased need to enforce existing noise ordinances

F. Transportation Impacts

1. Increased de and for a variety of services
   a. highways and expressways
   b. principal, minor arterials and collectors
   c. public parking facilities
   d. traffic control and safety
   e. public transit
   f. airport, land and harbor facilities
   g. bikeways
   h. rail transport
2. Increased need to maintain highways, roads, and major arterials
3. Increased demand for special transportation services, e.g. construction workers
4. Increased need for transportation planning

5. Land Use Impacts--Agricultural/Residential/Commercial/Industrial/Forest/Recreational

A. Ch nge in existing land use patterns (from agricultural to more urbanized uses)

B. Increased demand on services provided by planning and engineering departments: zoning, subdivision regulations, comprehensive planning, building permits and inspections, and code enforcement

C. Interference with present land use activity nodes

D. More sophisticated management tools required

6. Housing Impacts

A. Changes in residency duration and mobility

B. Increased demand for housing of various types: rental units, mobile homes, rooms in houses, single family dwellings

C. Increase in housing values and rental costs

D. Changes in ethnic and social class segregation in housing

E. Increased alterations from existing housing market structure--new units, size, price range

F. Increased possibility of outmigration of existing residents

G. Increased demand for low income housing

7. Recreation/Culture Impacts

A. Increased demand for a variety of recreational facilities and services, public/private, indoor/outdoor

1. Ballparks and playgrounds
2. Tennis courts
3. Swimming pools
4. Parks
5. Taverns
6. Theaters

B. Increased demand for the community to plan, acquire or construct, maintain, or operate recreational facilities

C. Increased need to organize and direct recreational programs

D. Increased demand on cultural facilities

1. museums
2. libraries
3. cultural centers (coliseums, auditoriums, historical sites, fairgrounds)

E. Increased demand for neighborhood centers and programs

8. Public Safety Impacts

A. Increased demand/need for basic police and fire services --apprehension and detection, crime prevention, fire protection

B. Increased demand on police enforcement and fire protection support systems--communications, equipment maintenance, training

C. Increased demand/need for legal and judicial services

D. Extent and quality of corrections facilities and services (drug, alcohol, delinquency, criminal)

E. Inadequate jail facilities

9. Educational Impacts
   A. Increased demand and need for facilities and personnel in primary and secondary education
   B. Increased strains on the budget and quality of the educational system
10. Physical and Mental Health Service Impacts
   A. Increased demand for professional services and facilities
   B. Increased strains on the budgets and quality of physical and mental health care services
   C. Increased demands on laboratory services
   D. Increased demands on a variety of services
      1. Family planning
      2. Prenatal care
      3. Chronic diseases
      4. Home health care
      5. Emergency services, e.g. ambulances
11. Public Health Impacts
   A. Increased demands on sanitation inspections--restaurants, school buildings, water sampling, day care, foster homes, etc.
   B. Increased demand for public health programs

C. Rise in ethnic organizations and activities

D. Increased demand on local mass media--newspapers, radio, television stations

E. Replacement of traditional rural community values and preferences by urban values and preferences, e.g., dramatic increase in fast food and apartment-oriented services

15. Organizational

A. Changes in family living patterns, (singles, couples, families, etc.)

B. Changes in informal social interaction

C. Changes in the number and types of churches

D. Changes in the socioeconomic class structure

16. Political Impacts

A. Changes in the strengths of local political parties

B. Changes in citizen participation in politics--voting, communicating, acting

C. Changes in the strength and structure of informal community power systems

D. Changes in relationships between local, state, and federal governments

E. Increased demands on local government budget

12. Social Services Impacts

A. Increased demand on government agencies for various types of social service payments: welfare, unemployment, food stamps

B. Increased demand/need for various services:

1. Alcohol abuse programs
2. Interpersonal counseling
3. Drug abuse programs
4. Child welfare services
5. Manpower employment-job training, work experience programs

13. Social and Psychological Wellbeing Impacts

A. Change in the type and number of crimes in the community

B. Change in types and numbers of social problems--divorce, alcoholism, suicide

C. Change in perceived quality of life

D. Change in life styles as a result of urbanization-accelerated way of life

E. Possible conflicts between newcomers and oldtimers

14. Community Structure Impacts

A. Changes in the number, types of community organizations

B. Changes in the participation rates in community organizations

2.3 Impacts in the Case Sites

Table 2.2 illustrates the major impacts experienced or anticipated at each of the six sites we studied. For each impact category at each site, the general impact which occurred or may occur is described. It should be noted that the impacts described in the table do not entirely encompass those identified in Table 2.1. Presently, measurement techniques do not exist to monitor all the impacts listed in Table 2.1.

TABLE 2.2: IMPACTS IDENTIFIED AT THE CASE STUDY SITES

CASE STUDIES / IMPACT CATEGORY	WPPSS-2	SKAGIT	TROJAN	PEBBLE SPRINGS	DIABLO CANYON	RANCHO SECO
Relocation	N/A *	Displacement of residents from site area	N/A	N/A	No impact	No impact
Demographic	Rapid population growth	Anticipated moderate population growth	Moderate population growth	Anticipated rapid population growth	Moderate population growth	Minimal population growth
Economic/ Taxes	New job opportunities in community. Change in employment rate. Increased demand for retail services	New job opportunities anticipated. Anticipated change in employment rate. Expected increase in retail services	N/A	Same as for Skagit	Increased sales tax receipts in affected communities. Increased prop. tax receipts in one school district, tax hardship in another	Public utility: minimal prop. tax impact. Sales tax receipts up.
Water	Eventual shortage without new facilities (in Richland)	Increased demand anticipated	Increased demand--available facilities	Increased demand anticipated. Shortage without new facilities	Increased demand facilities available	No impact
Sewer	Eventual shortage without new facilities (in Richland)	Increased demand anticipated	Increased demand--facilities available	Increased demand anticipated--shortage w/o new facilities	Increased demand--facilities available	No impact

* Not Available

TABLE 2.2: IMPACTS IDENTIFIED AT THE CASE STUDY SITES

CASE STUDIES / IMPACT CATEGORY	WPPSS-2	SKAGIT	TROJAN	PEBBLE SPRINGS	DIABLO CANYON	RANCHO SECO
Solid Waste	N/A	Increased demand anticipated--facilities available	No impact	Increased demand shortage anticipated	N/A	N/A
Air Pollution	N/A	No impact anticipated	N/A	N/A	N/A	N/A
Noise Pollution	N/A	No impact anticipated	N/A	No impact anticipated	N/A	N/A
Transportation	Congestion on streets and at intersections	Major congestion anticipated. Increased demand for traffic control anticipated	Moderate congestion on roads. Increased demand for traffic control	N/A	Some rush hour congestion at highway 101 turnoff	No impact
Land Use	Increased demand on planning services	Increased demand on planning services	Development of all available land in St. Helens for housing, some commercial	Increased demand on planning services	N/A	N/A

TABLE 2.2: IMPACTS IDENTIFIED AT THE CASE STUDY SITES

CASE STUDIES / IMPACT CATEGORY	WPPSS-2	SKAGIT	TROJAN	PEBBLE SPRINGS	DIABLO CANYON	RANCHO SECO
Housing	Housing shortage	Tight housing market anticipated. Shortage of low income housing	Housing shortage in St. Helens. Impact on low income elderly	Housing shortage	Moderate impact-difficult to separate from other growth pressures	No impact
Recreation/ Culture	Shortage of recreation facilities--ball fields	No impact anticipated	Shortage of recreation facilities (ball fields, parks)	Increased demand anticipated	No impact	New Park constructed
Public Safety	Increased demand with budget cutbacks required	Increased demand anticipated. Provisions for new personnel and equipment	Increased demand. New facilities and personnel	Increased demand anticipated	No impact found	No impact found
Educational	Shortage of facilities. Required portable classrooms	Increased demand anticipated--provisions for portable classrooms & school campuses	Shortage of facilities--required portable classrooms	Shortage after excess capacity filled-require portables, new construction. (no excess at Boardman)	One school district grew 7%--had financial strain	No impact
Physical/ Mental Health Services	Increased demand-facilities available	No impact anticipated	Increased demand for professional services & facilities	Increased demand for facilities and professional services	No impact found	No impact found

TABLE 2.2: IMPACTS IDENTIFIED AT THE CASE STUDY SITES

CASE STUDIES / IMPACT CATEGORY	WPPSS-2	SKAGIT	TROJAN	PEBBLE SPRINGS	DIABLO CANYON	RANCHO SECO
Public Health	N/A	N/A	Increased demand but not enough to preclude budget cuts	N/A	N/A	N/A
Social Services	N/A	N/A	Increased demand for juvenile services began during Trojan impact	N/A	N/A	N/A
Social/ Psychological Well-being	N/A	Some conflicts anticipated	Change in life styles	Retain younger population with new job opportunities	N/A	N/A
Community Structure/ Organization	N/A	N/A	N/A	N/A	N/A	N/A
Political	N/A	N/A	Some expansion of government structure; especially of emergency services division	N/A	N/A	N/A

Chapter III: The State Role

3.1 Overview

The purpose of this chapter is to describe and analyze the state planning processes and cycles that are involved in nuclear power plant siting. The chapter focuses on the use of these mechanisms to deal with social and economic impacts. First, it compares the state energy facility siting processes of Washington, Oregon and California as to their responsibility for social and economic impacts. Second, it compares the state planning and community development agencies that have responsibility for state involvement with local communities in social and economic impact assessment and management. Lastly, it presents a general discussion of the potentially most useful features in each of the state processes.

3.2 State Energy Facility Siting Review Processes

3.2.1 State Energy Authorities. An increasing number of states have adopted energy facility siting laws which require state approval of the location for proposed energy facilities. This approval may supercede any approval granted in the federal licensing process. Such siting reviews provide states with some influence on the location and development of energy facilities. Of particular concern here is how state facility siting review procedures take social and economic impacts into consideration.

Washington, Oregon and California have state energy agencies which are legally responsible for planning and coordinating energy development in the state. The California (Cal. Pub. Res. Code §§ 25200 et seq. Supp. 1976) Energy Resources Conservation Development Commission (ERCDC) has the strongest mandate of the

three to develop and implement a plan for electrical energy needs in the state; the Oregon legislation creating the Department of Energy (Ore. Rev. Stat. §§ 469.120; 1975) and the Washington legislation creating the State Energy Office (Wash., Ch. 108, Laws of 1975-76 (44th Leg. Session, 2nd Ex. Session), §§ 5) have a more limited scope in planning for future energy needs. The Oregon and Washington laws place major emphasis on centralizing information about energy supply and development and on effecting coordination among state agencies.

In all three states the energy planning process includes as a primary function the evaluation and approval of all proposed energy facility sites. In California the five commissioners of the ERCDC act as the site evaluation hearing body which is staffed by the Facility Siting Division of that agency. In Oregon a site evaluation council is attached to the Energy Office; in Washington a site evaluation council has been set up as an independent agency. Oregon's council is made up of members appointed from the public; Washington's consists of members from 15 state agencies. In Washington, representatives from county legislative bodies from counties with sites under consideration become temporary members of the council when it considers the facility and site in their county. In Oregon, it is also the county legislators from the potentially affected community who serve as an advisory committee to the Energy Council. Although these arrangements assure some local input, they do not guarantee that other local governments and citizens receive adequate representation.

3.2.2 State Certification Processes. The energy facility site certification process is similar but not identical in all three states. Oregon and Washington have gone through the site certification process,* and have formally specified the steps that must be taken in the process. While California has not yet implemented the site certification process, the ERCDC has developed administrative regulations which provide specific guidelines for the procedure. Listed below is the general outline of sequential steps in the site certification process in the three states, with special note of the requirements for considering social and economic impacts.

1. Utility files notice of intent (NOI) to file an application for site certification to the appropriate Commission, or Council (hereafter called "agency"). Social and economic effects must be discussed in the NOI in California. The NOI process does not exist in Washington.

2. Agency distributes NOI to interested parties and solicits comments from state and local agencies (Washington omits this step; California requires publishing NOI summary in newspapers of local areas affected).

3. If NOI is determined acceptable by agency, utility proceeds to prepare and file an application for certification accompanied by a filing fee.

4. The application for certification provides the major basis for evaluating the proposed facility site(s) and usually follows a general EIS format (collect baseline data on existing conditions, identify effects of alternative plans on various physical, biological, environmental, land use and social and economic elements of the area and region, and identify ways to mitigate adverse

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*For the Skagit, Satsop and WPPSS sites in Washington, and the Pebble Springs site in Oregon.

impacts). It also includes a justification of need, a discussion of emergency systems and safety precautions, waste transport and disposal plans. This step is one point where pertinent information on social and economic impacts is required in all three states.

5. Hearings: Following the receipt of the application for certification, the agency distributes copies to state and local agencies, performs its own staff evaluation of the application's sufficiency (a state-required EIS in Washington and California) and conducts a series of hearings near the proposed site to obtain public responses to the proposed development. Again, social and economic considerations may be raised here. (The applicant is responsible for distribution in Washington.)

6. Agency evaluation may warrant further studies of problems which are found to be inadequately evaluated in the application for certification. Among these, of course, could be social and economic impact evaluations.

7. The agency integrates comments and criticisms obtained from public, state and local agencies and the agency uses this information to formulate its own report with recommendations for approval or disapproval of the application.

8. Agency reports to the Governor its recommendations; Governor has final voice in the approval process. In Washington the recommendation must be based on hearing records.

The three states vary significantly in the timing of this site certification process.

In Washington this process may be completed in a minimum of 12 months, which may be extended; in Oregon it may take 26 to 30 months; and in California it may take 36 months or more. California has the most complex process since it requires the applicant to analyze three alternative sites in detail in the NOI process, then to provide more detailed analyses of the

preferred site in the certification process. In constrast, the NOI has a much more limited function in the Oregon process and does not exist in the Washington process. In all cases, the actual state site evaluation process usually is preceded by considerable utility planning and sometimes by utility contact with relevant local and state agencies. This contact takes place during the utility's own planning process; the utility provides information to government agencies about its plans. Financial assistance arrangements between the utility and the impacted community can be made before the utility approaches the state or during the state site evaluation process.

Each of the states has tried to move toward a more simplified permit process in an effort to reduce the number of permitting delays facing energy facility developers and to facilitiate better siting decisions. However, the consolidation of permit processes has not been entirely successful. Other state agencies (e.g., California Coastal Zone Commission) and local agencies (e.g., zoning commissions and building departments) still require separate permits over and above the site certificate. In addition to permits required for the site, permits are also required for many of the expanded and new public facilities needed to cope with the population influx. Efforts have been made to coordinate all these permits with regard to timing and sequence in the overall site certification process to reduce unnecessary delays.

At first glance, the normal cycle appears long enough to allow sufficient lead time (two to three years) for both local and state agencies and the utility to plan for the impacts ensuing from plant construction and operation. Problems that occur in timing are discussed later in this section.

3.2.3 Social and Economic Considerations in the Siting Process. The energy facility siting processes in all three states acknowledge the need to include social and economic concerns in the application for certification. However, the level of detail with which this element must be treated varies considerably.

In all three states, social and economic impacts must be identified by the utility early in the siting process--they must be contained in both the Notice of Intent and Application for Certification in California and in the Application for Certification in Oregon and Washington. In all three states, specific administrative regulations spell out in detail the elements that must be included in the application, and all include a fairly comprehensive list of social and economic factors. In addition the California and Oregon regulations include the identification of available resources to mitigate social problems (Washington regulations are not yet published). California's Energy Commission has the power to undertake further investigation of social and economic impacts and associated mitigation measures if an initial evaluation

determines that the utility's analysis is insufficient. In Oregon the utility must conduct any additional studies considered necessary by the siting council. Washington uses its $25,000 permit fee to hire a consultant only to analyze the application. The siting agencies may also perform their own assessments, although in Washington they are not funded for this.

The environmental impact statement (EIS) has also become a major tool, particularly for state and federal levels of government, for performing these assessments. Twenty-four states (Council on Environmental Quality, 1975, p. 659) including California (California Environmental Quality Act, CEQA) and Washington (State Environmental Policy Act, SEPA) now have state environmental quality laws which require an environmental impact analysis for some private and all public projects which have any signficant environmental impact. In Washington and California the energy facility siting agency is responsible for the preparation of environmental analyses that indentify social and economic impacts and procedures for mitigating these impacts. In the preparation and evaluation of these reports, state agencies can become actively involved in social and economic impact assessment as well as mitigation measures.

Including county legislators on the siting body and holding public hearings on proposed projects also helps to assure that social and economic impacts, as they are perceived locally,

will be identified. However, as mentioned earlier, county legislators may have a different perception of local needs and impacts than local community planners, officials and citizens, and may not communicate with them. The California ERCDC does not include any local representatives during deliberations on siting issues. However, it uses three specific mechanisms early in the siting process (in the NOI phase) that assure the opportunity for local involvement and input. The ERCDC (1) must publish a summary of the NOI in local newspapers, (2) must distribute an information packet to local governments once they receive word from a utility that a site is being considered in the NOI process, and (3) must reimburse local governments for their review and input to the application procedure. Additionally the Commission has a Public Advisor who assists people wishing to participate in Commission proceedings and who can suggest ways to make that participation most effective.* (ERCDC, p 1-2) Thus several aids are provided to local governments and the public to help them comment on the Environmental Impact Report (California's term for Environmental Impact Statement) and for participating in the certification process for facilities affecting them.

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*However, one person interviewed in this state expressed the view that the Public Advisor has not really been that helpful to citizens.

3.2.4 Involvement of State Planning Agencies. State agencies which assist or coordinate local land use planning and community development efforts comprise a second channel for considering social and economic impacts in developing power plants. The state agencies involved and the nature of their involvement vary substantially among the three states. Rather than try to identify each state agency that might be involved in providing services to local areas, we chose to focus primarily on the state planning and community development agency or its equivalent. We chose this agency because it is the agency most likely to be involved in dealing with local governments in comprehensive community planning and it is usually the state dispenser of at least some federal funds for local planning. Planning seems to be a key factor and a prerequisite to effective impact management, particularly in communities that are impacted by large nuclear and other energy facilities.

3.2.4.1 Planning Assistance Agencies. Washington, Oregon and California each have agencies that are responsible for the state coordination or assistance role in local comprehensive planning and community development efforts. This agency is the Office of Planning and Research (OP&R) in California, and the Planning and Community Affairs Agency in Washington. These agencies administer HUD 701 funds to local governments and are responsible for assisting local communities with comprehensive planning efforts and with impact management efforts. In Oregon, two agencies are involved. The Department of Land Conservation and Development administers the State Land Use Planning Act, financially assists local governments

in completing them and coordinates certain state agency plans. The Intergovernmental Relations Division (IRD) administers HUD 701 funds and represents the Governor's office in coordinating impact management efforts. IRD has allocated field staff to specific geographic regions in the state. The field staff are assigned to work with communities in coping with problems that require intergovernmental coordination. California and Washington's agencies have a more fragmented system of assistance to local governments. State agency staff are assigned to functional programs and work with communities involved in those specific programs. While spokespeople for both the California and Washington agencies have expressed concern and interest in assisting communities impacted by power plant construction, their program-oriented organizations make comprehensive assistance less likely than in Oregon. However, all three states have established mechanisms for providing technical assistance (field staff) as advisors or facilitators to local communities.

Generally, in California and Washington these planning agencies do not provide financial assistance to local communities, although the state does select and disperse federal funds to applicants and grantees. However, they play a key role in helping communities to obtain federal or other state grants or loans for a variety of services and facilities. The state agencies do not have much money in their budgets for community impact management. In fact, Washington provides no state money for comprehensive land use planning; it disperses

federal money only. Oregon, however, is the leader in the area of financial assistance with $4 million allocated to assisting local governments develop land use plans to achieve compliance with the State Land Use Planning Act.

3.2.4.2 Other State Agencies. Although we investigated only the state agencies most directly involved in relating to communities' comprehensive planning efforts, there are numerous other state agencies that may provide limited impact assistance in specific areas. These include agencies responsible for public health, social services, housing assistance, and transportation. Federal agencies are also relevant because although some state grants are available for community projects and programs, much of the available financial assistance flows through state agencies from federal agencies such as EPA and HUD. We did not investigate all of these various agencies because time for this project was short. Many of these agencies have differing objectives and roles which at times overlap or are not consistent with one another. This makes identification of all potential forms of state and federal assistance a time-consuming task. To the extent that state and federal agencies take responsibility for assisting or monitoring local impact management efforts, it will be important to examine thoroughly these various agencies and programs and how they relate to one another. Such knowledge will help in identifying the range of impact management tools and in identifying how the relevant levels of government can best work together to manage these impacts.

3.3 Conclusions

All three states included in this study have developed formal mechanisms within state government for coordinating energy facility siting with state planning. While the structure of these mechanisms differs in these states, they have some basic features which could be used by other states which have yet to develop a site evaluation process.

The three states all include local governments formally in the site evaluation process. Temporary membership or advisory status on the site evaluation council; early notification of the community; and reimbursement of local governments for their review of the facility site application seem to be particularly useful ways of assuring local government involvement. However, there have been some problems in identifying and including all of the impacted governments and in assuring that the local representatives actually represent their area. Also, the California ERCDC's Public Advisor to potential intervenors is a unique service which potentially helps to assure that the public has adequate access to the decision making process and the relevant information. Finally, the practice of holding hearings in the local area affected by the proposed site, which is done in the three states, helps all parties involved to see more clearly and be more aware of the local situation.

The state planning and community development agencies tend not to have well defined or comprehensive roles in assisting local governments to manage impacts from energy or other developments. Oregon is undertaking its first state

effort to provide comprehensive impact management assistance through the IRD's coordinating function in the Pebble Springs case. This is potentially an innovative state role in social and economic impact management. With the exception of this one experimental mechanism, however, the three states' planning and community development agencies are not organized so as to play a major role in coordinating federal, state, and local efforts to deal with the local social and economic impacts associated with nuclear and other energy developments.

Generally, the states have little money budgeted for assistance to local governments facing or experiencing major social and economic impacts. Although Oregon does have money budgeted to assist local governments develop local land use plans, there is a fragmented approach to state programs for other local needs. This is true also in California and Washington because they all rely upon HUD 701 money for local comprehensive planning assistance (with no state financial assistance). Oregon and Washington cannot respond quickly to financial needs due to the lag associated with a biennial budget (the lag is sometimes up to 30 months). Although each has developed some mechanism for providing emergency funds, these are limited and are probably inadequate to cover a wide range of needs in impacted communities. The developer, however, can be asked, and under Washington law, required to make impact payments to communities. (See Chapter IV for further discussion of the utility's role in impact management.)

Much of the potential financial assistance to local governments currently lies within federal programs, making the federal planning and budgeting cycles at least as important as those at the state and local levels. This tends to complicate impact management efforts by local governments since they need to plan some facets of their annual budget and programs so they coincide with both the federal and state fiscal years (which often are not consistent). Additionally, federal funding may be negotiated directly with local governments or through state agencies who then administer and monitor funds to local governments. This varies from program to program and is an inconsistency which makes it difficult for either local or state agencies to develop a comprehensive impact management scheme. This situation particularly hinders state efforts to provide a coordinating function to local impact management efforts.*

In summary the state site evaluation and planning agencies show a growing interest and concern in playing a major role in identifying and evaluating social and economic impacts and in the provision of technical and financial assistance to impacted communities. Although only Oregon has formal mechanisms in place for playing such a role, several staff in the state agencies in California and Washington are attempting to

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*This view was expressed specifically by people in Oregon's IRD, which does have a mandate to coordinate state and local programs.

monitor informally communities anticipating impacts, and provide planning advice. The fragmentation of roles among the state agencies makes it difficult for the planning and community development agencies involved to provide information to local governments in locating and using state assistance and to comply with state requirements from various agencies. Another factor which limits the state's role is its inability to provide substantial financial assistance to local governments (except for Oregon's land use planning assistance). Finally, because of these two limitations, state agencies may not have developed the expertise necessary to provide comprehensive information and technical assistance that local governments need to manage effectively the social and economic impacts with which they are faced.

Chapter IV: Local Government Actions

4.1 Introduction

This chapter is composed of three sections: (1) an examination of local government's role in the siting process; (2) a discussion of the function of local comprehensive planning in the assessment and management of social and economic impacts resulting from nuclear power plants; and (3) a discussion of local government's problems and successes in providing the additional public services required by the construction and operation of a nuclear power plant.

This chapter is written to reflect the process as it now exists in Washington, Oregon, and California. Since the time frames of the six sites studied vary considerably, no statements about state processes would apply accurately to the experiences of each utility and community faced at the time their plant was approved and constructed. Consequently we decided to describe the approval, coordination, and financing processes which now exist, even though the experiences of the earlier projects (Rancho Seco, Trojan, and Diablo Canyon) were rather different.

4.1.1 Local Involvement in the Siting Process. Basically there are two ways in which local public officials may be involved in the process. The first is as temporary members of the state siting council. The second is as planners who organize efforts, perhaps with state help, to deal with anticipated local impacts. In the State of Washington local

officials also may be intervenors in the contested case process of site evaluation.

4.2 The Local Officials' Participation in Siting Decision Making

The precise nature of local governmental involvement in the siting decision varies in Washington, Oregon and California, although there are several generally consistent practices. (See Appendices B, C, and D for a detailed description of the role of local governments in each of the three state processes.) County governments in Washington and Oregon, and all local governments in California are notified at about the time the state and utility begin to have formal interaction. In Washington and Oregon representatives of county legislative authorities from the affected counties sit on or are advisors to the respective Energy Facility Siting Councils for the duration of the siting decision affecting them County legislators may not always be the most appropriate local representatives to put on the siting councils. In some counties, the local governments and county government do not communicate regularly, thus one cannot represent the other very well.* This causes a problem particularly in cases where local governments (cities and towns) feel most of the impacts, but are not represented directly in the decision making and in the alloca-

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*Washington State officials gave the example of a county commissioner on the Energy Council who never even talked with town, school district and other local officials about potential impacts.

tion of resources for planning and impact management. In California the local governments are asked for their comments on the Notice of Intent and the Application for Certification and are reimbursed for their planning, study and review efforts associated with the power plant. The reimbursement comes from either the Energy Commission or the utility. To date, approximately 30 communities have been reimbursed for their review efforts with regard to two energy facilities. The reimbursements have been billed to the utility.*

California's recognition of both the importance of having all the local governments review applications, and of the necessity to assist these governments financially in carrying out this function, is an important step toward ensuring full local participation. Many local governments, particularly those in sparsely populated towns and counties have very limited staff and funding for day-to-day planning responsibilities. The siting of a power plant in such a community will clearly be of critical interest to its residents and public officials. Yet without financial assistance to hire consultants or additional planning staff, government officials may find it impossible to adequately review and assess the implications of such a large development on their community.

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*Information gained in phone conversation with R. Richard Recht, Consultant, Palo Alto, California.

Although the issue of how to get fair local representation has not been resolved completely, all three states do involve local governments in the siting process in some way. One Washington state official suggested a potential solution to this issue. All affected local, county and regional governments and citizens groups would be asked to form a coalition. That coalition would then select a representative to the siting council to represent the concerns and to report back to all the member governments and groups. A mechanism such as this merits consideration by the state siting councils.

In addition to the question of which local governments should be and are involved, is the issue of how much consideration should be given to the local government perspective in the siting decision. It appears that local governments may have some limited powers that they can use to influence this decision. For example, in the Skagit County case, changes in the zoning ordinance were required before the site could be certified. However this power is not used at all extensively. After the Skagit County commissioners received the request for an unclassified use permit from the utility, they initiated a research effort to determine what other counties with power plants had done. After extensive inquiry they were unable to elicit a single reply from a local jurisdiction that had ever attempted to regulate the siting of a nuclear power plant.*

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*Memo from Fred Clagett, staff, to Richard Hemstad, then Director of the Washington State Office of Community Development, December 1, 1975.

In addition to zoning there may be other local permits which the local governments can require of a utility. However, we did not explore these permits within the time constraints for this project for two reasons. First, local permit systems are fragmented, thus it is difficult to obtain information on the range of permits required for a development. Secondly, such permits appeared not to be an issue for the six specific sites we examined.

It is also important to note that the siting agencies in all three states have some preemption powers over local zoning and land use plans, although the limits of each power are unclear. It should be noted that the first chairman of the Washington State Thermal Power Plant Site Evaluation Council (the predecessor to EFSEC) stated in testimony before Congress that Washington's siting law requires compliance with local zoning before the utility can approach the siting council (Joint Committee on Atomic Energy, 1974). This was also the situation with the Skagit plant, where the utility had to obtain a rezone. State officials point out, however, that because of an amendment to the law in 1975 and a recent Attorney General's ruling, the state evidently does have preemption powers. Nonetheless, the state officials whom we interviewed appear to be making serious efforts to take local concerns into account (although some local officials are skeptical about this judgment). Local governments can help assure this serious consideration through their input as advisors and reviewers

of the utility's application.

A final point regarding the local role in the siting process concerns the issue of coordination among the various governmental bodies. As mentioned in the Introduction, coordination and communication are critical issues for local and state governments, particularly those impacted by some type of energy development. If one local agency is informed by the utility or by the state of a potential power plant development, this does not guarantee that all the other affected local agencies will subsequently be informed. In addition, there is no guarantee that the utility will inform the local agencies of its plans directly. In fact the literature documents that historically communities have not been informed of plans to construct nuclear power plants (Campbell, 1976). Such a lack of communication results in less time for local agencies to plan and establish programs, and it can exclude them from decisions which ultimately affect the community way of life. Perhaps further documentation of the increased difficulties caused by such a lack of communication can encourage some of the local and state agencies to take a closer look at their working relationships with each other in the area of siting of energy facilities.

In conclusion, the local role in the siting process is not as clearly defined as the state role in the nuclear power plant siting process. While adequate local and citizen representation is not guaranteed in the Oregon and Washington processes, the local and state governments we examined show serious concerns

about the local social and economic issues surrounding a nuclear power plant. In our assessment, if local governments make concerted efforts to provide effective input regarding their assessment of potential social and economic impacts and their own requirements to effectively manage such impacts during the state siting process, the states, in turn, will try to address these impacts.

4.3 Local Planning in the Assessment and Management of Social and Economic Impacts

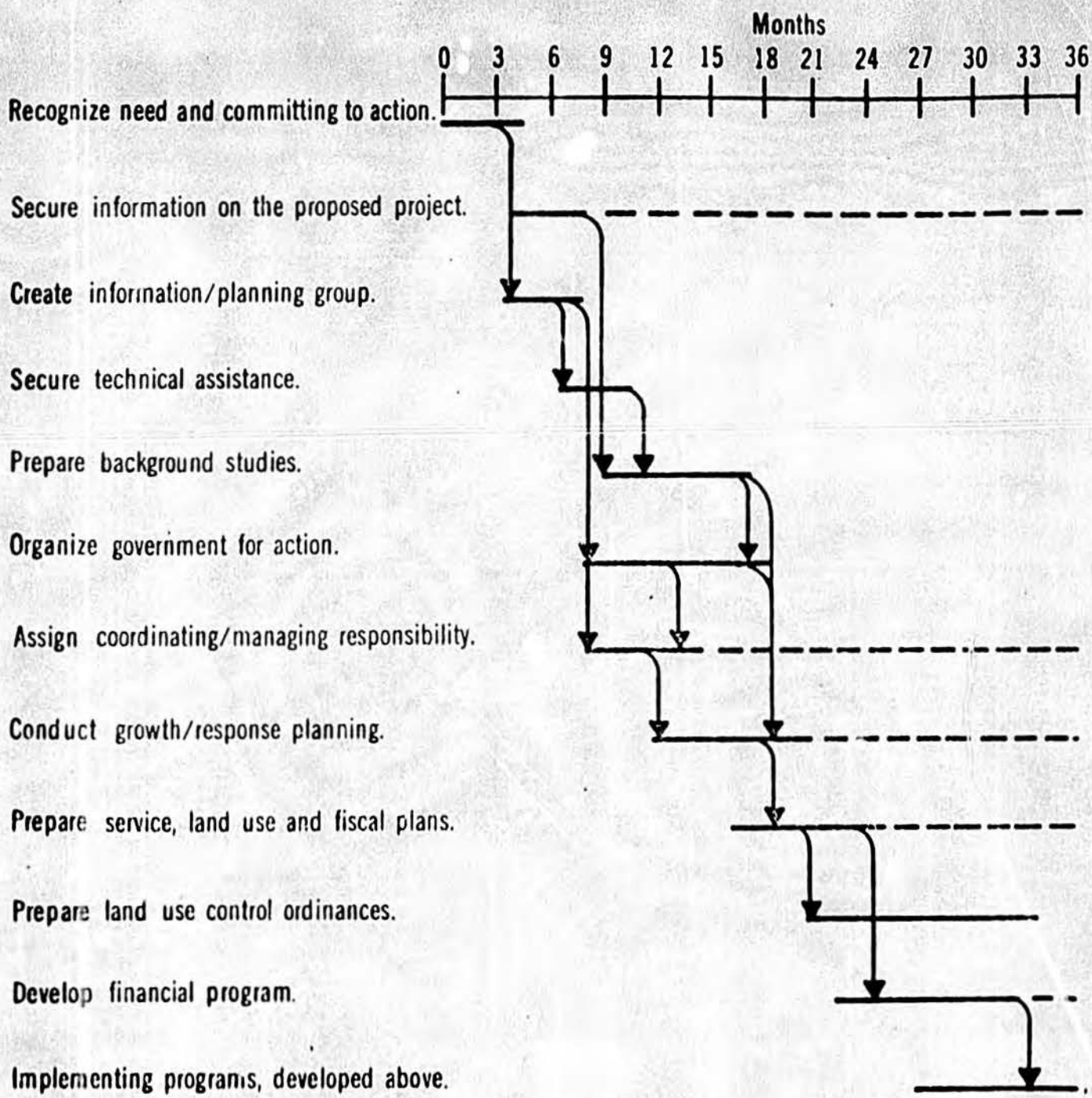
It is of critical importance that local governments are notified early about a contemplated development to insure effective planning for the expected impacts. The length of time needed depends on the anticipated size of the work force and the existing carrying capacity (ability to absorb new growth) of the community, such notice usually should take place two to three years before the construction force is expected to appear (Williams, 1976; Briscoe, et. al., 1974). The notice should include information on the magnitude, timing and duration of the expected labor force buildup; accurate information is essential in those areas where a large population influx could require provision of additional major public services. If local governments can get sufficient funding, early notification also allows them time for several important planning and governmental activities: (1) to prepare or update comprehensive plans, (2) to commission feasibility and impact studies on local capital improvement programs (sewers, water, roads, schools), (3) to estimate personnel requirements that will result from

increased demand on local government services, and (4) to incorporate public opinion into development decisions and impact management plans. In addition, lead time is necessary for capital improvement programs and special planning programs which require state or federal funding, particularly because applications for funding often are delayed or denied. The Pebble Springs and Skagit county sites are examples where the counties have had over two years for precisely this type of planning. (See Diagram 4.1 on page 58 for a summary of the general types and timing of planning activities required of local communities impacted by energy development). In almost all the sites we examined we learned that, in addition to early notification, a reciprocal information flow between local officials and the utility facilitated a smoother planning, construction, and in some cases, operating phase for the plant. Recognition by both the utility and community of legitimate needs on the part of the other can hasten public acceptance and minimize the disruption of local government services if large numbers of workers are brought in. In areas where the labor force is drawn from nearby populations, the need for early and continuing flow of information between the utility and the local government is less critical, although still important for smooth community relations.

DIAGRAM 4.1

TIMELINE FOR ACTION

Response to Energy Projects



(From Williams, David. "Rapid Growth from Energy Projects: Ideas for State and Local Action. A Program Guide." Department of Housing and Urban Development, 1976.)

Notification to local communities of project plans two to three years prior to construction, and a reciprocal information flow between utility and community help create an environment conducive to effective planning. Pre-certification impact studies, dictated by the state and local governments, can also encourage local communities to begin early planning for the rapid growth that may follow.

An additional incentive to early planning in local communities are state and federal requirements for comprehensive planning. At the federal level, comprehensive land use planning has been encouraged by several federal programs. The Department of Housing and Urban Development's (HUD) 701 Planning Assistance program, and the Environmental Protection Agency's 208 water quality planning program, both require and provide financial assistance for comprehensive plans and area-wide water-basin plans. Most local governments engage in the planning activities required by these programs for they cannot afford to reject a major source of local governmental funding. In addition, requirements in the Coastal Zone Management Act and the Federal Clean Air Act encourage communities to practice sound land use planning and energy facility planning. State and local governments are in some cases frustrated by the federal piecemeal approach to comprehensive land use planning which requires them to incorporate different types of information into their planning process in order to tap different sources of federal aid.

At the state level, Washington, Oregon and California all have programs requiring or advising local community comprehen-

sive planning. Oregon has what appears to be the most developed state land-use planning effort: it requires localities to prepare comprehensive plans with substantial input from their citizens, based on statewide goals and guidelines. The state also provides substantial funding assistance for this development. (See Appendix B for a detailed discussion.) California and Washington have not developed comprehensive state land-use planning requirements or an attendant administrative structure to oversee the process.

Below the state level, regional councils of government have responsibility for some types of comprehensive planning and interfaces extensively with local government. Most of the counties and/or localities we visited are members of regional councils of government of varying responsibilities and effectiveness. Several councils of government (COGs), particularly those in metropolitan areas, perform the A-95 review function, reviewing all federal projects for consistency with the regional perspective.* If federal funding is received by localities for various impact management programs, these programs would be examined by the designated A-95 review body, in some cases the COG. In the more rural counties, such as those in eastern Oregon and Washington the COGs perform some of the planning functions for localities

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*A-95 Review, legislated through the Office of Management and Budget. A-95 Circular, requires that federal funds to a local government must be reviewed and approved by a designated regional or state body for consistency with regional needs and plans.

too small to have their own planning staff, such as reviewing environmental analyses and preparing comprehensive plans.

Comprehensive planning was often mentioned as an integral part of the response to growth by localities facing population pressures and a changed community profile resulting from power plant construction. The current experiences of Rocky Mountain coal towns have increased the awareness by citizens, officials, and utility representatives of the tremendous problems which can be expected in small towns heavily impacted by new developments. (See Briscoe, et al., 1974; Lindauer, 1975; Williams, 1976.) Although many rural communities have traditionally been resistant to and suspicious of planning, the severity of the problems in the coal boom towns present few alternatives. In fact, community representatives from both the Pebble Springs and Sun Desert sites visited the Wyoming and Colorado boom towns, as guests of their respective utilities, and discussed planning problems with local officials.

Fiscal planning is another type of planning critical to a local government's ability to manage the social and economic impacts of a power plant. There are three primary sources of money to a local government to use for impact management. The first of these is the tax revenues generated by the plant itself. Many power plants ultimately will bring huge tax revenues to the counties in which they are located.*

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*One respondent pointed out that the utility's tax payments may not result in an increase in tax revenues. In Columbia County the impact of Trojan has been to decrease the cost per $1000

And, in fact, most power plants pay increasing property taxes as the assessed valuation of the plant steadily increases during construction. However, communities that must increase their public services capabilities for the construction force usually need additional outside sources of funding one to three years before plant construction begins. Also, the plant may not be in the jurisdiction facing most of the impacts. In the Diablo Canyon case, for example, many of the construction workers did not live in the school district in which the plant was located. The school district with a large proportion of the workers and their children was required to absorb much of the educational impact, while receiving little immediate or eventual benefit. (For more detail, see pages C-16 and C-17.) The jurisdictional problem is illustrated even more dramatically by the Sun Desert case in California. The plant is located outside the taxing jurisdictions of the two towns which will absorb the work force, as well as one or two adjacent counties. The towns that are expected to provide a range of services and facilities for the workers will not receive any of the benefit of the taxes generated by its plant.

(Continuation from footnote on previous page:)

assessed valuation to the tax payer/property owner. The reason for this is that the amount the county can levy in taxes is based on its tax base, which can be increased only 6% each fiscal year. Any increase of the tax base beyond 6% has to be approved by the voters of the County.

Oregon has a program which helps resolve this jurisdictional problem in the area of educational impacts. The state instituted Intermediate Education Districts (IED) in order to partially allocate industrial revenue among member districts. Such reallocation of revenue is only available for payment of operating budget expenses, however. In the case of the Trojan plant the two-county IED provides additional assistance in the form of central purchasing for local governments and member school districts as well as performing its equalization function.

For those communities and counties that can expect increased revenues from the power plant taxes, there is also the question of how to spend the increased wealth that will eventually be available to them. Local tax rates could remain unchanged and additional governmental services could be provided to serve new populations and new needs, or local rates could be lowered to the individual taxpayers as the new industry steps in to fill the revenue gap.

The second source of funding is from state and federal programs. Federal agencies could reinterpret eligibility requirements for grants and loans in order to acknowledge the special conditions and the sense of urgency associated with rapid and severe growth pressures, but may resist doing so. Such resistance stems from federal agencies' reluctance to fund projects where the rapid growth is not assured. Thus, state and federal funds also may come too late to help the local governments prepare for future needs due to the plant construction. This problem also has been identified in the Rocky

Mountain region where federal approval is often required for every project. As an Exxon official described,

> "Delays in approval leave the cities with no control over their future. No public official can propose the building of public facilities which may not be used. When federal approvals are given it is too late to design and build public facilities. Also, the number of applications have usually been caught in a logjam which compounds the local impacts." (Lindauer, 1975, p. 66.)

Local officials in the Arlington, Oregon (Pebble Springs) area perceive this to be a problem in their current attempt to get federal funds to expand their sewer system. (See Appendix C for more detail.)

Finally, a third source of funding for local impact management is the developer. In some cases utilities have recognized, or been forced to recognize, the severity of the problems outlined above, and have worked with communities to provide partial assistance. In Skagit County the utility and the county devised a constract rezone agreement: the utility promises prepayment of some of its taxes to help finance additional schools and law enforcement.

In Arlington, Oregon, near the Pebble Springs site, PGE has agreed to assist the city with their airport improvement plans in exchange for 25 years of landing fee waivers for themselves, their contractors and consultants. The utility has entered into an agreement with Gilliam County to assist with funds for improvement of the county road, by the county, which will be the main access road to the Pebble Springs plant.

site. In Boardman, Oregon, PGE has purchased sewer and water hookups in advance of need by it or others with the expectation of credit or reimbursement when these hookups are used by it or other developers. At Sun Desert in California, the utility, in conjunction with local unions and a community college, is training local residents for construction jobs.

This discussion illustrates that adequate planning by local government is important to successful impact management. Several conditions contribute to the satisfactory management of local impacts due to power plant construction: (1) planning should already play a role in the management of growth of the community, (2) the community should have two to three years for their planning efforts, and (3) adequate and timely funding must be secured for any additional public services required. If these conditions are not met, then undesirable disruptions of one variety or another may occur. It is important to note local problems would not be solved simply by more money. The timing of the flow of revenues and funding is equally important. See Chapter 5 for a detailed discussion of fiscal issues.

4.4 The Provision of Additional Community Services Required by the Construction and Operation of a Nuclear Power Plant

The mix of public and private services that a community provides is determined by the size of the population base (and consequently the size of the government organization), by local traditions and state laws. In general, larger communities

become more involved in providing or regulating traditionally private services, such as sewer and water facilities; hospitals; public transit; professional public safety departments; and public parks and recreation programs.

The ability of local government to provide the additional community services required by plant construction activities depends primarily on several factors: (1) the availability of unused or underused services existing in the community prior to the work force entering the area; (2) the numbers of new residents; and (3) the availability of revenues to pay for new or expanded services.

These factors tend to vary from one locality to another. Thus we found the range of services that caused problems to be site specific. The most common problems, however, seemed to center on services related to housing development, sewer and water systems, and education. Law enforcement and recreation were less of an obstacle to community response, but still of major importance.

Housing, for some communities, was a major problem brought by the development of the plant. Where vacancy rates and the number of available units are high (as they were at the time of the Diablo Canyon plant construction*) or where the labor force commutes from nearby population centers and does not require new housing services (as at Rancho Seco), housing shortages and associated services are not a significant problem. Where

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*There is some disagreement about this point. See page C-11.

a large proportion of the work force must move to the impacted community, the difficulties become more severe for public officials, even though most of the actual provision of housing remains in the private sector. The need for housing and its related services most severely impacts the work load of the planning and building departments, which issue permits only after ensuring conformity with zoning plans, building codes, shoreline controls, and any existing environmental review.

An increased need for sewage treatment and water supply is also closely linked to the housing demands made by new populations. Some of the case sites investigated benefited from Economic Development Administration grants in the early 1970's to build treatment plants with a capacity many times their existing population. Other communities, however, have found treatment plants to be a limiting factor in their expansion plans. Local officials in the Arlington-Boardman area near Pebble Springs feel sewage treatment has been a problem for them. Rapid growth from both power plants and food processing plants has already brought demands on water and sewer services to near capacity, an estimated two years before the work force is expected to peak. The Economic Development Administration and the Environmental Protection Agency have strict requirements on the ability to show need for new treatment facilities. Because the fate of the Pebble Springs plant is still unclear, the need for new services is unclear, making it difficult for community officials to ask for federal aid

and to plan for community impacts.

The provision of additional educational services and facilities also can cause problems for a local government. The need for such services depends on the family composition of incoming workers. Primary and secondary education are the most typically required needs, although at one site we examined (the WPPSS-2 plant in the Tri-Cities in Washington) there is a growing need for higher education. Classroom overcrowding has been or is expected to be a problem at all sites faced with a construction force temporarily relocating in their area.

The primary problem surrounding provision of education facilities, including classrooms, appears to be ensuring equal distribution of power plant tax revenues among impacted districts and dealing with surplus facilities after the construction force has left. The Skagit rezone contract with Puget Power has required prepayment of utility taxes as far as six months in advance for each school child of a family employed at the power plant site. According to a WPPSS-2 official, Washington codes (RCW 54.36 and RCW 54.28.070) provide a mechanism for placing some revenues from WPPSS-2 where the school impacts will occur.

Traffic control, expanded police patrol routes, and extended fire coverage also were mentioned in interviews as additional services communities were required to provide due to increased population. In very small towns these problems did not appear to be large: present services were usually provided by volunteers, with growth plans calling for one department of public

safety utilizing staff trained both in policy and fire protection. However, in the more highly populated areas additional police and fire stations were required. Where funding for staff and new facilities was unavailable, service effectiveness has been impeded. Both the county and municipal governments provide these services, and their services are shared as needed.

Recreational facilities also were listed by local officials as an area where expansion might be needed. Generally the planning for such expenditures seemed to be a moderate priority item, and the provision of such services was shared by several layers of government--school districts, cities and counties. Regional parks are often provided by state and federal funds and sometimes the utility (Trojan and Rancho Seco). The Corps of Engineers has provided several waterfront parks and docking facilities in the areas abutting the Columbia River (Pebble Springs and WPPSS-2). It should be noted that in the case of Richland, the Corps provided the land and the city is required to participate 50 percent in the cost of development. Maintenance cost is also picked up 100 percent by the city. The power plant sites themselves sometimes serve as park facilities after plant construction is completed. At Rancho Seco and at Trojan the utility donated park land and opened their reservoirs to swimming and boating, with the utility at Trojan also contributing and maintaining a visitor's center.

The need to provide additional community services for population brought by the power plant varies with each specific

plant site. For those sites where services may be required, the major problems that can arise involve funding the additional services. There are also problems in timing the requests for funding from the accelerated local planning process with the more slow moving federal budgetary cycle, which is the source of most funds for special public service programs and impact management.

4.5 Two Unique Management Strategies

During the course of this study we identified two strategies used to try to cope with the social and economic impacts resulting from power plants which we felt were of special significance. The Skagit County-Puget Sound Power and Light Company arrangement is a unique contract rezone agreement which requires Puget Power to make impact payments in the areas of schools and law enforcement. Portland General Electric has created an in-house corporation to provide financial assistance to communities impacted by its projects. Each is described in more detail below.

4.5.1 Skagit County-Puget Sound Power and Light Company Contract Rezone Agreement

In order to obtain the appropriate zoning permit from Skagit County and, at the same time, assist the county in the mitigation of adverse community impacts associated with the construction of its 2-unit, 2300 MWe nuclear project, Puget Sound Power and Light Company (hereafter called Puget Power) entered into an innovative contract rezone agreement with

Skagit County. Puget Power recognized the possibility that the implementation of its project would have adverse impacts, in the form of financial hardship, on the communities near the site. In general, Puget Power agreed to make "impact" payments for schools and law enforcement services to cover the additional costs involved in providing those services during the construction of the Skagit plants. A fixed amount (determined by a formula to be discussed below) is paid to each school district that experiences a rise in enrollment due to the influx of children of construction workers. Costs incurred to law enforcement agencies are determined by a 3-member commission established in the agreement. All impact payments are considered prepayments of taxes.

The purpose of this section is to discuss the background and details of the impact payments section of the contract rezone agreement, although the agreement is not limited to impact payments. It has additional provisions to cover environmental effects, design, construction and land use, investigations and reports, and a fish rearing facility. In addition, the agreement stipulates that there is to be no reprocessing of spent fuel or permanent storage of radioactive waste on site. Puget Power must submit each radiological monitoring program plan and an evacuation plan to the Skagit County Planning Department for review and approval. Lastly, if Puget Power transfers ownership interest to any municipality, public utility district or other third party and, as a result of that transfer, the amount received by the county from property

taxes, privilege taxes and payments in lieu of taxes is less for any given year than the amount paid had Puget Power retained sole ownership, Puget Power must pay or require the third party to pay the deficit. These provisions will not be explored since the discussion focuses upon impact payments as a unique mechanism for helping the management of impacts on communities.

4.5.1.1 Background In 1973, Puget Power filed a petition to rezone 260 acres of a 1500 acre site it had purchased near Sedro Woolley, Washington in order to construct and operate two nuclear power plants. The site was zoned forestry/recreational and residential at that time. There was neither an industrial zone nor provisions for a nuclear power plant for that area in the comprehensive zoning plan. An unclassified use permit was requested by Puget Power and denied by the Skagit County Commissioners on the grounds that classification was too similar to spot zoning and could be challenged in court (Myhra, 1976).

The county planning commission implemented a program to update the comprehensive zoning plan. A new plan was developed dated November 1973, which included an industrial zone coincident with a portion of the nuclear plant site and it was adopted in December 1973. However, prior to granting the permit, the county commissioners requested Puget Power to prepare and submit an Environmental Impact Statement (EIS). After discussions with county planners and the legal counsel to an environmental group,

Puget Power submitted an EIS and an application for a contract rezone on November 20, 1973. Puget Power requested that 260 acres of the 1500 acre site be classified industrial and the remainder stay in its original forestry/recreation classification. The zoning was granted with the execution of the contract rezone on March 26, 1974.

4.5.1.2 Payments to School Districts. Under the contract zoning agreement Puget Power will make payments to the Skagit County Treasurer who will, in turn, disburse the monies to the local school districts. Payments cover the additional costs associated with providing an education for "construction impact" students. These students are the children of "non-resident" construction workers. "Non-resident" construction workers are defined as any construction worker who (1) resides in the county, (2) is working directly on the project as an employee of a construction contractor or subcontractors, and (3) did not reside in the county for more than 30 days during the six months immediately preceding the month during which he first started work on the project. (Skagit County-Puget Sound Power and Light Contract Rezone Agreement. March 26, 1974, pp. 5-2.) Monthly payments are made for each "construction impact" student who is enrolled in a public school on the first school day of any regular school month during the construction period. The construction period is defined in the agreement to be the first month during which the number of construction workers

on the project exceeds 50 and every month thereafter during which the number of construction workers on the project exceeds 50.

These payments are intended to cover additional maintenance and operation costs of each school district. Puget Power agreed to pay the "reasonable" cost of using portable classrooms, if necessary, including the cost of leasing or purchasing the classrooms, transporting the classrooms to campuses, removing the classrooms from campuses, and restoring the campus sites to their original condition after the construction period. Puget Power will also pay the "reasonable" cost of constructing a portable school campus including portable school buildings, administration offices, physical education facilities, and all other buildings and facilities "usually" and "normally" associated with portable school campuses.

If transporting students from over-crowded schools to schools with space available is necessary, the costs associated with transporting the students, including leasing or purchasing buses, will be paid by Puget Power. In addition, Puget Power will pay the "reasonable" costs involved with reopening closed schools, such as necessary remodeling and/or construction to meet state and federal standards.

As mentioned earlier, Puget Power will make monthly payments, within 30 days after receiving itemized invoices from the school districts. The monthly payment for each student is equal to the school district's monthly rate for the fiscal year involved (July 1 - June 30) multiplied by a secondary impact

factor of 1.5. The secondary impact factor of 1.5 is an agreed adjustment to assist each district in meeting whatever additional maintenance and operation costs or other costs it may incur in accommodating additional students who may enroll during the construction period. Such students include, but are not limited to, children of persons who may move to the county as a result of the construction of the project but not be employed directly on such construction (Skagit County-Puget Sound Power and Light Contract Rezone Agreement. March 26, 1974, pp. 5-4). Provision for a cost escalation/de-escalation fraction is included. A school district may apply for advance payments, with documentation, up to six months in advance. Disputes lasting over 60 days are handled by a panel of three arbitrators. The arbitrators represent Puget Power, the Board of County Commissioners, and the respective school district.

Impact payments are considered to be prepayment of taxes and are credited against future special levies or other property taxes. However, the amount credited in one year is not to exceed 20% of the amount levied on the project in that same year. Credits in excess of 20% are carried forward for credit in subsequent years.

4.5.1.3 Payments for Law Enforcement. Puget Power agreed to provide financial assistance to the Skagit County Sheriff and all police departments within incorporated

municipalities of Skagit County during the construction period. Payments are made beginning the first month in which the number of construction workers exceeds 50 and continues until the number of such workers falls below 50.

Financial impact in this area is determined by a 3-member commission comprised of the Skagit County Sheriff, the Sedro Woolley Chief of Police, and the presiding judge of the Skagit County Superior Court.

Costs subject to impact payments include maintenance and operation, personnel, acquisition of equipment, and all other costs directly associated with adding staff members, such as employee benefits.

As in the case of impact payments to school districts, payments for law enforcement are considered prepayment of future taxes.

4.5.1.4 Conclusions. The Skagit County-Puget Sound Power and Light contract rezone agreement appears to be an innovative impact management tool. The ease with which the agreement will be implemented remains a question, since construction has not begun. A problem may arise with determining "reasonable" cost or what comprises a "usual" and "normal" portable school campus. These terms were not defined in the agreement. However, the arbitration mechanism incorporated in the rezone contract may prove an effective tool for settling disputes.

A final note of caution should be included here. Although

contract zoning is acceptable in the state of Washington, based on the precedent established in Myhre v. City of Spokane (70 Wash. 2d 207, 422 P.2d 790 (1967)), its legality is less clear in some other states. Other communities interested in the concept should carefully investigate the legal implications before proceeding. (See Scott, 1973.)

4.5.2 PGE Energy Projects Housing and Community Development Corporation*

Another unique impact management mechanism available to local communities has been developed by Portland General Electric Company (PGE) of Portland, Oregon. In 1976, PGE created an in-house subsidiary, the Energy Projects Housing and Community Development Corporation, with a $1.1 million budget to provide financial assistance to communities impacted by the construction and operation of its 2-unit nuclear power site (Pebble Springs) near Arlington, Oregon and its 522 MWe coal fired plant near Boardman, Oregon. The corporation funds housing and community facilities development, including water, sewer, fire and police protection, education and recreation facilities and services. In 1976, the corporation advanced $42,000 to Boardman, Oregon for sewer development and $120,000 for water facility development. In addition, the corporation bought land near Boardman which has been subdivided and is presently being developed into single family and multi-family dwelling units by the private

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* All information contained herein is from telephone interviews with Mr. Doug Heider, PGE; Mr. Monte Montgomery, PGE, consultant; and Electrical Weekly, February 1976.

sector. Most recently, it provided funds to the community of Irrigon, Oregon so that the Irrigon community could hire its first city manager/administrator for two years in order to develop plans to cope with future growth and its consequences.

A number of factors contributed to the development of the corporation. An impact study done for PGE by Skidmore, Owings and Merrill recommended the hiring of a development coordinator to attend to impact problems in the Boardman-Arlington area. Secondly, PGE learned that $50 million of a $100 million overrun at the Jim Bridger coal fired plant in Wyoming was in large part attributed to excessively high worker turnover. After surveying the Bridger project employees it was determined that the lack of adequate housing, schools and recreation facilities contributed to the high turnover. To prevent this problem at the Boardman and Arlington sites, PGE recognized the need for "pleasant" communities in which the construction workers would live. PGE also recognized that the host communities would need some aid in providing the needed services and facilities. Lastly, to expedite decision making and coordination, the creation of a subsidiary was concluded to be the best strategy. Hence, the corporation was created.

An outside consultant has been hired by PGE to coordinate the corporation's activities and the corporation is governed by three Board of Director members and several officers. The consultant submits the applications for funds to the Board of Directors who make the final decision on whether or not to

fund the request. Communities may solicit funds from the corporation, or as is often the case, PGE may recognize a problem area and contact the appropriate community official or agency to discuss solutions. The corporation then provides funds to implement a solution strategy, ranging from hiring personnel to a specific study of the problem. Any public or private group may submit funding requests to PGE; however, so far PGE has not favored requests from private citizen groups. One request from a private group, for example, was for funding to construct lights for a football field. PGE felt this was beyond the scope of the Energy Projects Housing and Community Development Corporation.

The scope of the Energy Projects Housing and Community Development Corporation is very inclusive in impact categories for which it will provide funds--water, sewer, police and fire protection, education and recreation services and facilities. All communities impacted by the influx of the construction and operation work force associated with the Pebble Springs nuclear project and Boardman coal fired project are eligible to apply for funds. A feature of the corporation is the short time required to process and decide upon an application.

Need is the major criterion in determining level of funding as well as what to fund. There are no pre-established priorities for what will be funded and what will not. In general, there is no obligation to pay back the corporation for funds received. In the case of the aforementioned monies given to Boardman for

water and sewer hook-ups, the funds are considered prepayments for the costs to PGE of hooking up the services in the future when the houses are built. In most instances, funding will come in the form of grants from the corporation. In applications to federal agencies for funds, the Energy Projects Housing and Community Facilities Corporation will provide the percent required as community matching funds.

Chapter V: Fiscal Issues

5.1 Overview

Scattered throughout this report have been discussions of fiscal issues--the financial needs of communities, and the revenues from nuclear power plants which may meet those needs. In order to clarify those issues, this chapter summarizes important fiscal aspects of social and economic impacts.

5.2 Who Pays Taxes?

5.2.1 Property Taxes. The most important source of new taxes is the power plant itself. In general, both the plant and the land on which it sits are real property. Any portion of real property privately owned is subject to the property tax. Private plants on private land pay tax on their entire holdings. Private plants on public land pay tax on the improvements to the property (the plant itself) and perhaps on the value of their leasehold (depending on the state.) Publicly owned plants are exempt from property taxation.

The sum of the property taxes paid by one nuclear unit will be substantial. One way of estimating this tax load is to take a typical real property effective tax rate of 1.6% (Musgrave and Musgrave, 1976, p.351) and apply it to an estimate of the cost of a 1000 megawatt nuclear reactor -- from $500 million to $1 billion, producing an annual tax yield of

$8 million to $16 million, or $16 to $32 million for the common two reactor nuclear plant. At tax rates of 1%, the yield would be $5 million to $20 million.

In contrast, the tax liability of a publicly owned plant is substantially less (and varies considerably by state). During operation of WPPSS-2 at Hanford, the Washington Public Power Supply System will pay no property taxes, but will pay a special privilege tax levied by the state of about $1.5 million per year (Revised Code of Washington 54.28). Ninety-six percent of the proceeds of this tax will be distributed to various local governments in the Tri-Cities area (RCW 54.28.050).

During construction, WPPSS pays sales and use taxes on materials, equipment, and contract labor. We do not know whether publicly owned utilities are subject to sales and use taxes in other states, but it is certainly the case that privately owned utilities would pay such taxes. In addition, construction workers will pay sales and use taxes, and will contribute to increased residential property tax collection. Most of the sales and use taxes go to the state, although many states now allow municipalities to levy an additional increment of sales tax.

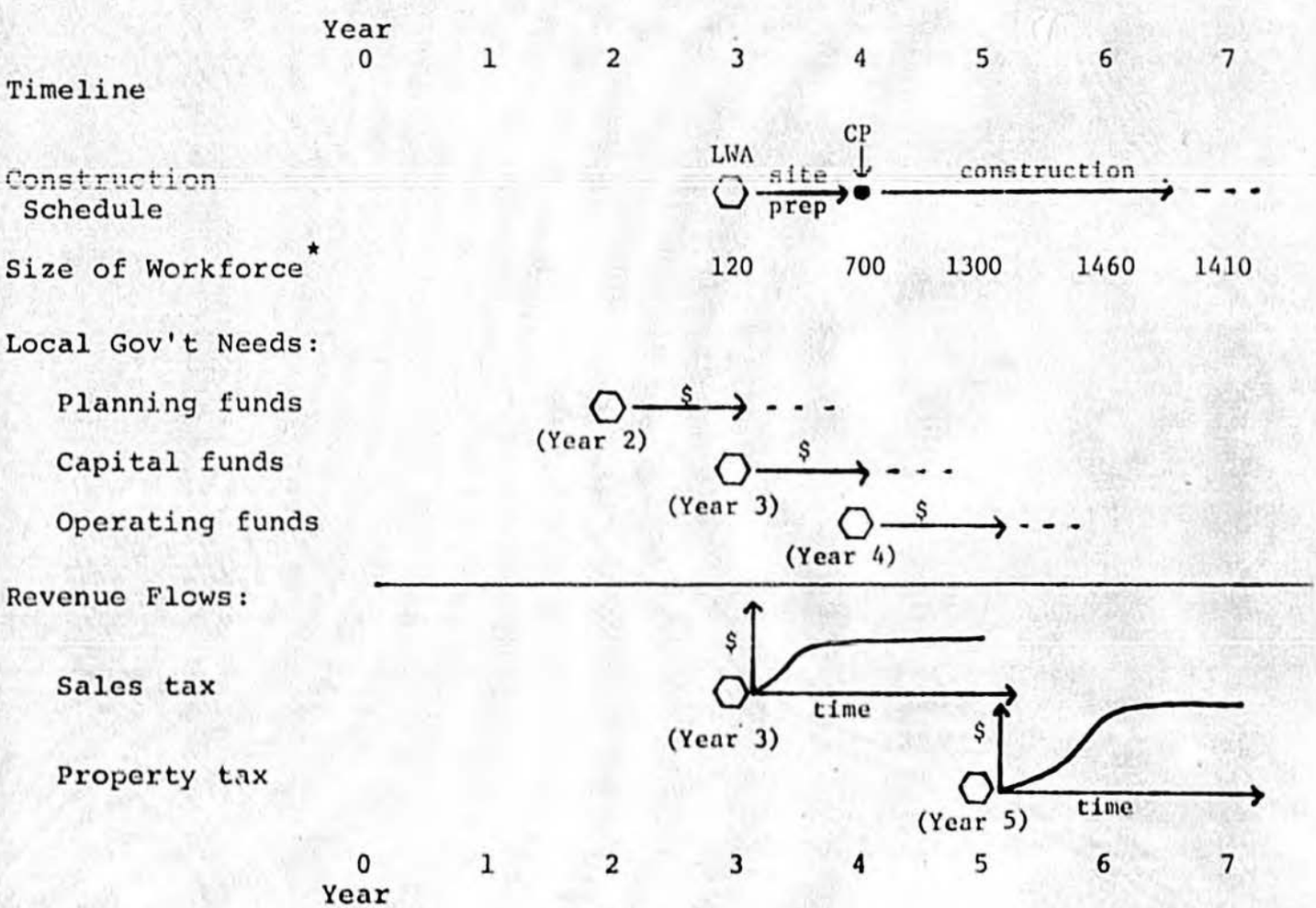
The importance to localities of the sales and use taxes lies not in the total amounts paid by utilities, but in the timing of the payments. Property taxes are payable annually in the year following the assessment of the property. It is possible that the taxing jurisdiction may not receive any tax benefits from an improvement to a piece of property for as much as two years after

the improvement is made. Sales and use taxes, in contrast, are paid periodically by merchants based on their most recent sales, and so new revenues are available to local governments much closer to the time that the existence of a construction workforce requires local government action.

5.3 Timing Problems

A rough explanation of the timing problems faced by a local jurisdiction can be seen in diagram 5.1.

DIAGRAM 5.1: TIMING PROBLEMS



*Based on Table 1 from Appendix D, this paper.

The timeline in this diagram allows approximately three years for the utility to do its internal planning, site acquisition, and receive a Limited Work Authorization from the NRC. The diagram shows that the workforce begins in year 3, has reached half its peak within a year, and has about 90% of the peak workforce on hand by year 5. The sales tax receipts track construction activity quite closely (since they are based on purchases of construction materials for the project and on spending by workers). The property tax receipts lag considerably--only growing after improvements to the property have been added to the tax rolls by the assessor. Yet the local governments need some funds for planning 2 to 3 years before the construction begins. If capital projects are needed, those funds will also be needed before either the workers or the plant itself will be generating revenue. Operating funds for increased local government services will track actual workforce growth more closely, but may still outrun available revenues for those services (e.g., school financed primarily by the property tax).

The bond market is the way local governments ordinarily finance capital projects. However most states limit the amount of debt a municipality can incur to some fraction of the taxable base. If a community is already near its debt limit, it may be prohibited from borrowing additional funds until the new plant is on the tax rolls. A community could then find itself caught--unable to prepare for the construction work force until well after their job is done.

Even if a community has room within its debt limit, it may still be reluctant to borrow. Since property taxes from the power plant will not flow for some time, existing taxpayers would have to shoulder the burden of debt service initially. The Rainer (Oregon) School District solved this problem by issuing bonds containing a special provision that allowed them to defer repayment for two years. At the beginning of the third year, increased property taxes from the Trojan plant were used to begin repayment of the debt. Other taxpayers in the district were unaffected. (For more detail, see page B-13.)

Planning funds could not ordinarily be borrowed by municipalities. As part of their operating budget, they would have to be paid for by current revenues. A small town would not ordinarily have money available to support a substantial planning effort.

The most likely source of planning funds is the utility. In California, utilities are required to provide funds to the Energy Commission, which then disburses them to localities to pay for their planning and review of utility plans. In Washington, state law permits (but does not require) public utilities to pay claims to taxing districts who claim construction impacts (Revised Code of Washington 54.36). In Skagit County, the Contract Rezone Agreement provides for financial assistance to schools and law enforcement agencies, as discussed in 4.5.1.

Assuming that the utility pays for planning costs, another issue arises. Should those costs become a part of the total

project cost, should they be deducted from current utility profits, or should they be credited against future taxes due? We did not investigate current practice of utility rate setters in our three states. However, it is worth noting that the case is strong that these advance payments should be credited against later taxes due. Then the community that will receive the stream of property tax revenue will also bear the cost of planning for the plant. Those communities that do not get any tax benefits will not have to subsidize the other communities by virtue of paying higher electric rates. Note that if the planning costs are included in total project costs, that may expand the capital base of the utility, which will increase its permissible profits. If that approach is taken, the utility's customers will both finance another community's planning and then pay the utility a return on that money.

5.4 Boundary Problems

The foregoing discussion of timing assumed that the affected community would eventually receive the property tax benefits of the plant. For almost any plant, only some affected communities are so lucky. The plant itself is ordinarily located in a rural area, well outside the boundaries of any town. It will fall within the boundaries of the county and of some school district, but those districts will not necessarily be the ones on whom construction workers will depend for services. (See the discussion of the Diablo Canyon school district problem on page C-17 for an example.)

Oregon has attempted to solve this problem (for education only) by the use of tax equalization districts, which distribute

some property tax receipts evenly throughout each county (Oregon Revised Statutes 334). The Oregon approach reduces severe education boundary problems to cases in which plants and nearby towns are located in separate counties. Moderate inequities among school districts within counties still persist, however, and other governmental services are unaffected by the law.

5.5 Summary

Communities that receive the principal social and economic impacts can have fiscal problems for a variety of reasons.

Some receive no property tax from the plant:

a) in states with no property tax equalization mechanisms, any community not encompassing the plant itself;

b) in states with equalization, any impacted community outside the equalization district containing the plant; and

c) communities near publicly owned plants.

Most communities near a plant will receive some increased revenues from sales and use taxes or from privilege taxes, although the amount of revenue from these sources is smaller than the potential property taxes paid by a plant. A community able to levy property taxes on the plant will surely find its increase in tax revenues more than adequate to cover all possible costs of coping with its social and economic impacts. Other communities may or may not find that their revenue growth meets plant induced needs.

Those communities that do look forward to adequate revenue may still have difficulty in getting funds early enough to permit them to mitigate construction workforce impacts as they arise.

Any of these circumstances will mean that either community needs go unmet as power plant construction proceeds, or that plant construction may be delayed until the community can cope with the workforce.

Chapter VI: Analysis of Interrelationships

6.1 Estimates of Lead Times

A major goal for this project was to determine the amount of time required to deal with different social and economic impacts. The six sites we studied provided single estimates of the amount of time provided for certain impacts, but our sample was not large enough to provide information on all impacts, nor to provide several estimates of the time needed to cope with any one type of impact. The most comprehensive set of estimates we have found are those shown in Table 6.1. Information gained from the six sites we studied is presented in the rightmost column of this table. Readers will note that all our cases fell at or above the highend estimates of the Colorado study cited in the table. We are in no position to judge the accuracy of either set of estimates. However, it is our judgment that these estimates can be only rough guides at best. State governments affect the minimum lead times considerably by the extent to which they require permits, environmental reviews, and technical reviews of plans for public projects. States also vary in the amount of time necessary and the ease of achieving long-term financing for public projects. Even within one state, different circumstances, such as the activity of intervenors, or the ease in acquiring property, will cause the time necessary to complete one project

TABLE 6.1: LEAD TIME REQUIREMENTS

URBAN SERVICES	LEAD TIME EXPANSION REQUIREMENTS	PRIORITIES FOR ACTION*	LEAD TIME ESTIMATES FROM BATTELLE INTERVIEWS
Schools	18 - 30 mo.	2	33 mo. (Lucia Mar District, CA)
Police	12 - 18 mo.	2	
Fire	12 - 24 mo.	2	28 mo. (Rainier, OR)
Hospitals	24 - 42 mo.	3	44 mo. (St. Helen's, OR)
Health Services	12 - 18 mo.	2	
Ambulance Service	9 mo.	3	
Transportation:			
County Roads	12 mo.	2	
City Streets:			
Local	9 mo.	2	
Major Thoroughfare	18 mo.	1	
Public Transit	12 mo.	2	
Airport	18 - 24 mo.	3	
Electricity	12 - 18 mo.	2	
Gas	12 - 18 mo.	2	
Telephone	12 - 18 mo.	2	
Water	18 - 24 mo.	1	
Sewer	18 - 24 mo.	1	48 mo. (Boardman, OR)
Flood Protection:			
Major Tributaries	24 mo.	2	
Local Drainage Systems	9 mo.	3	
Solid Waste:			
Collection	6 - 12 mo.	3	
Disposal	9 - 12 mo.	2	
Parks:			
Neighborhood	6 - 12 mo.	3	
Community	12 - 18 mo.	3	
Recreation	9 - 18 mo.	3	
Housing	24 - 30 mo.	1	
Welfare/Human Resources	3 - 6 mo.	3	
Library	12 - 27 mo.	3	
General Administrative Service	3 - 6 mo.	1	
Cultural Facilities	18 - 24 mo.	3	
Governmental Bldgs.	6 - 12 mo.	3	

*Priorities for Action: (1) Plan and design immediately--before new people arrive
(2) Plan but start when people arrive
(3) Plan in general--detail and development after people arrive

Information adapted from Briscoe, Maphis, Murray, and Lamont, Inc., Oil Shale Tax Lead Time Study: The Colorado Oil Shale Region. Prepared for Regional Development and Land Use Planning Subcommittee of the Governor's Committee on Oil Shale Environmental Problems, Denver, Colorado, 1974.

to differ substantially from the experiences of a similar project.*

Diagram 1: Detailed Process for Construction of a School

The process for constructing a school is shown as an example of the activities and time requirements which together add up to the lengthy lead times required for the construction of most capital facilities. The process shown and times given were based on the experience of the Lucia Mar School District near Diablo Canyon. The times shown are estimates only; the district was unable to follow through on the project when voters failed to approve the bonds.

6.2 The Relationship of Impacts to the Timing of Construction

6.2.1 When will impacts occur? There is no set date within the timetable for construction of a nuclear power plant when

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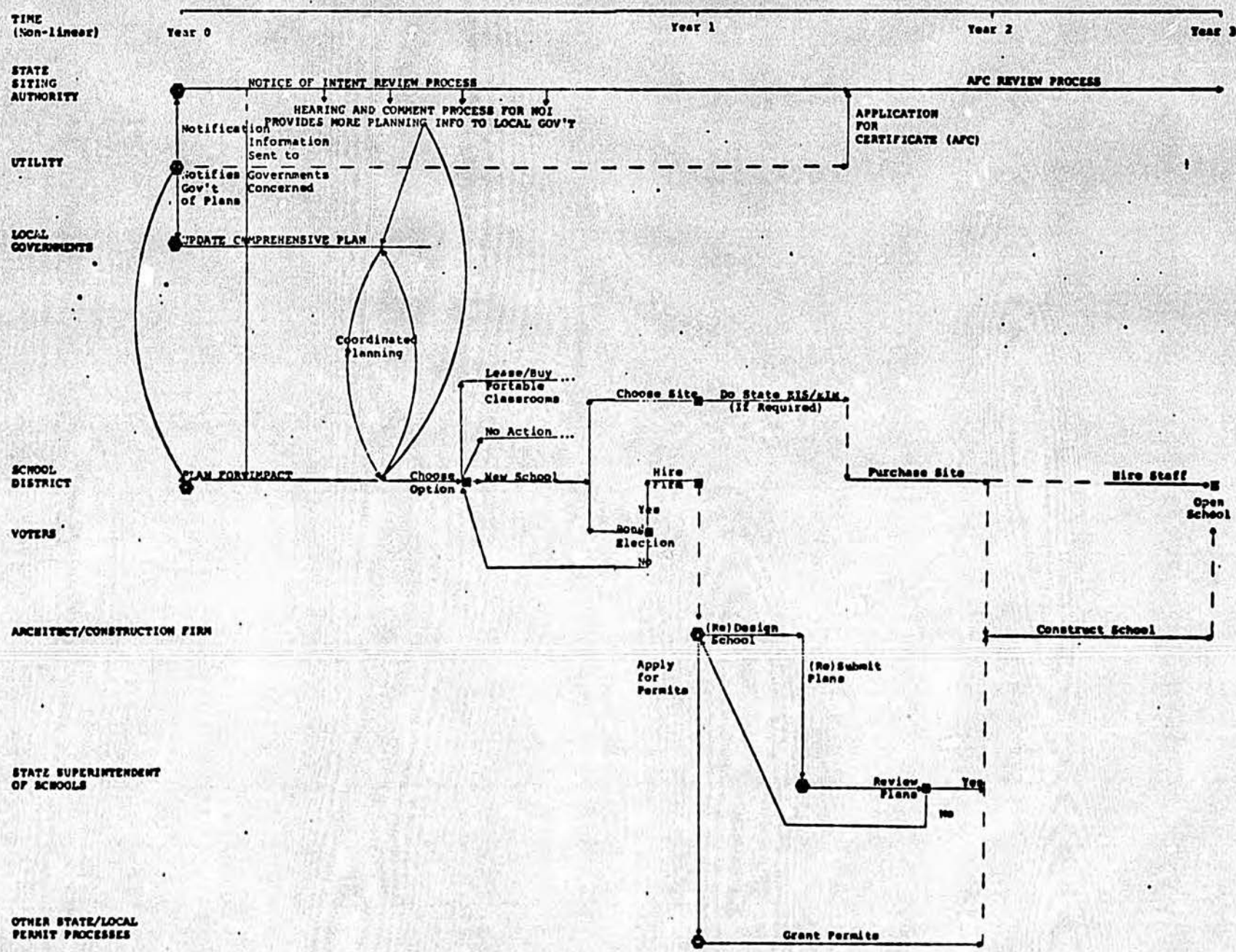
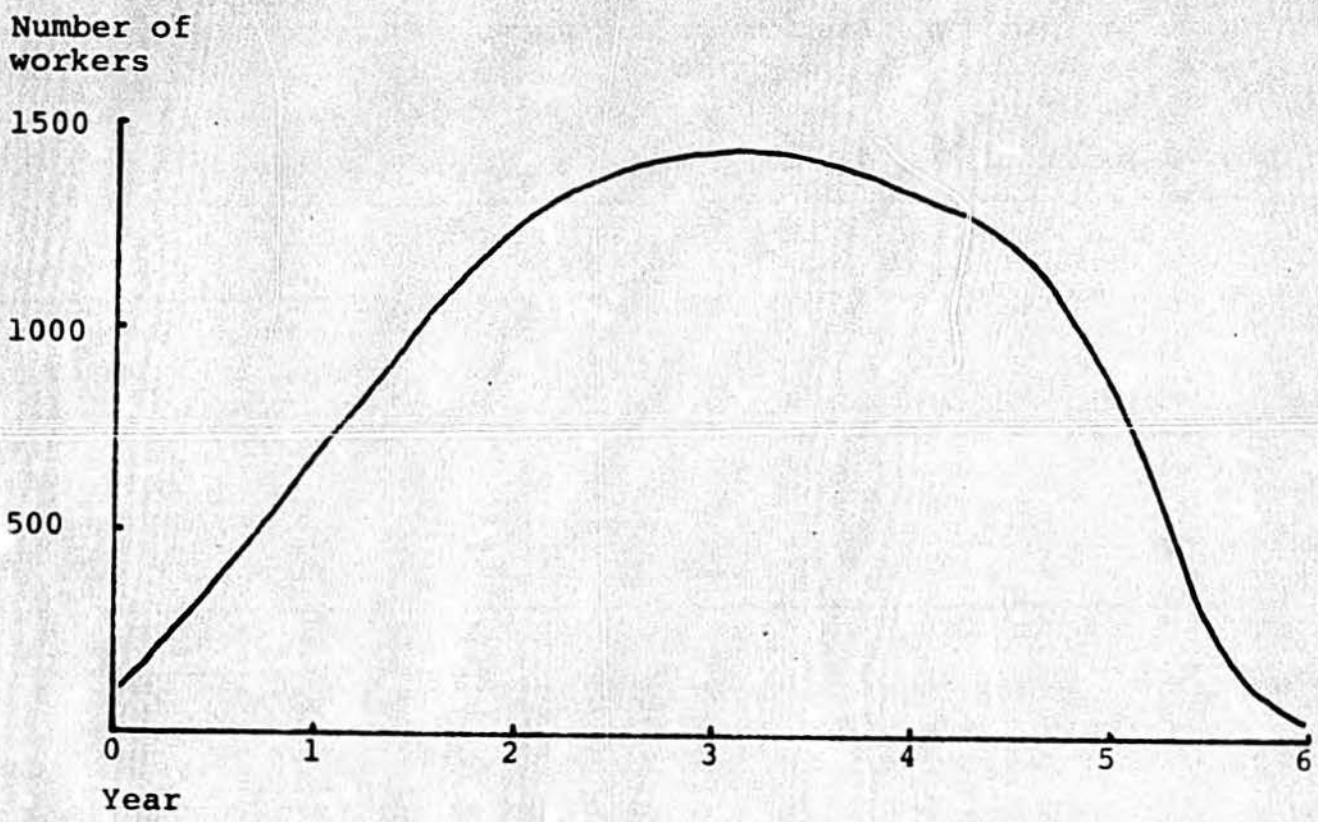
*Readers familiar with statistics might have recognized here an attempt to describe variability in layman's language. Our position is that the Colorado study's estimates may be good estimates of means; we have no way of knowing whether they are biased. However, we are confident that a measure of variability (such as the standard deviation of a sample of lead times) would be high relative to the mean. If the sample was national, part of the variability would be systematic by state, because of the differences among state laws which set the permit, environmental review, and bonding procedures mentioned above. We think that a sample of towns within one state would show less variability than the national sample, because state law sets the general framework for all municipalities. But there would remain substantial variability among projects--due to differences in activity levels of intervenors, competence of local officials, and so forth.

DIAGRAM 6.1: DETAILED PROCESS FOR CONSTRUCTION OF A SCHOOL (Based on California example)



the number of workers on site suddenly increases sharply. One estimate for the number of workers on site is that given in Appendix D, page D-6, shown here in graph form:

DIAGRAM 6.2 WORK FORCE FOR CONSTRUCTION OF ONE 1200 MWe UNIT



It is clear that the work force will be near its peak after two years of construction. The impacts to the community will roughly parallel the growth in the work force. (We are taking a shortcut by using work force growth as a proxy for population growth. For a detailed explanation of how population growth can be predicted, see Appendix D as well as Recht and Greene, 1977.)

For purposes of later discussion we chose the end of year one as a representative target date for the time when a community would have to increase the capacity of a number of its facilities and services. Note that strained capacity is more of a problem with some services than with others. The Colorado Tax Lead Time Study ranked governmental services by their priority, as shown in the excerpt in Table 6.1. They judged that sewers, water, housing, major city thoroughfares, and general administrative services all needed to be ready when people arrived. Other services could be added by doing planning ahead of time, but waiting for population growth before actually beginning the projects.

So the start date for a project to add capacity to a governmental service is actually a function of three factors: the time when capacity will be strained, the length of time it takes to add more capacity, and the importance of having the new capacity ready before any strain occurs.

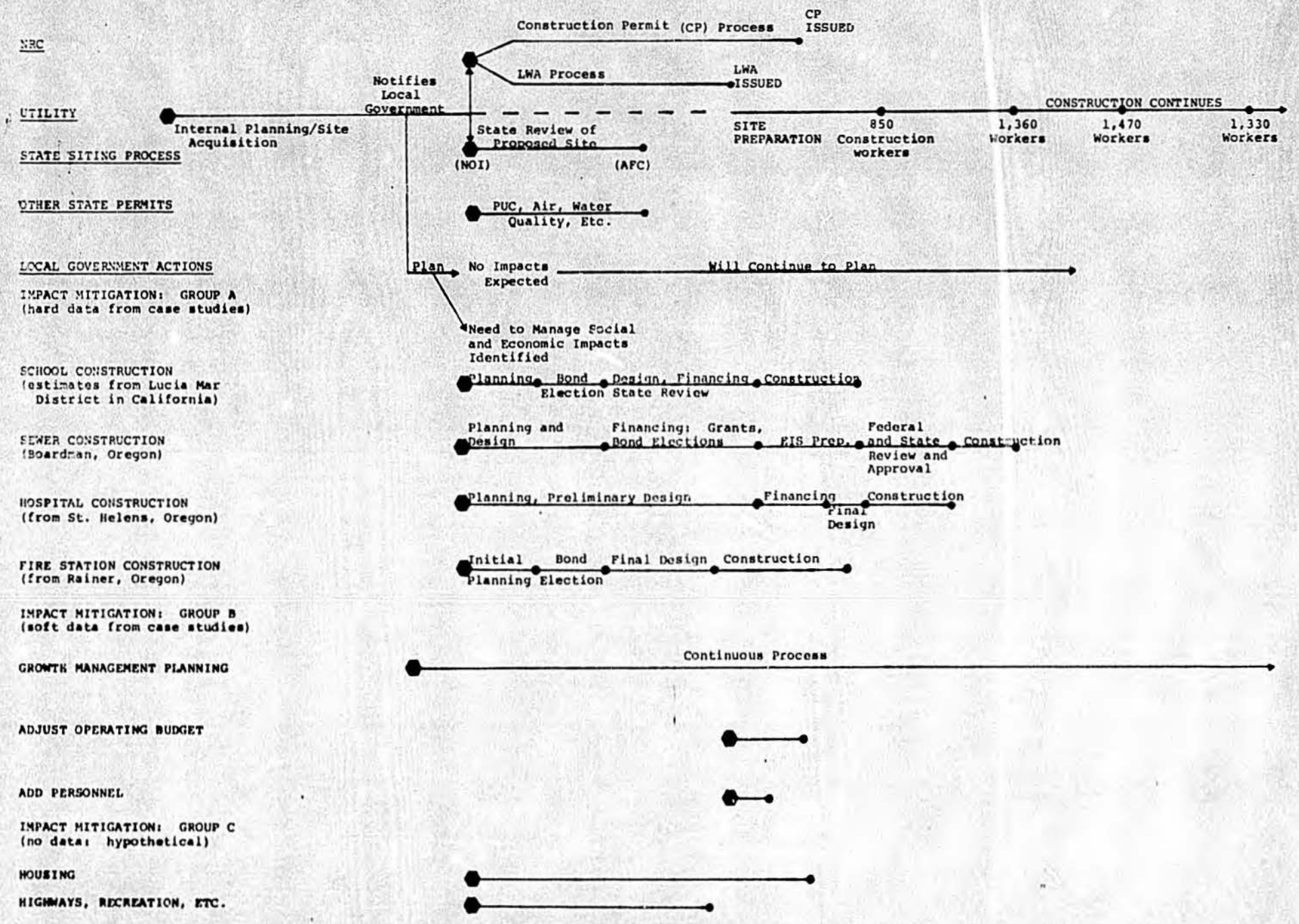
6.2.2 Network Diagrams. A further explanation of the way the timing of impact management actions is related to the schedule for plant construction can be seen in Diagram 6.3. Before examining this diagram and the one following, the reader should be clear as to their applicability. In all our interviews at the six sites studies, we found no instance in

which lack of time was the cause of local governments' difficulties in coping with construction work force impacts. We also found no instance in which plant construction was delayed solely because local governments could not cope with the incoming work force. But the evidence we found did make it clear to us that a combination of plausible circumstances--a short (less than 18 months) state licensing process, a Nuclear Regulatory Commission Construction Permit process of about the same length, and a plant site in a sparsely populated area with limited governmental services--could produce a situation in which the communities would not be ready for the work force when the utility was ready to begin construction. It is this hypothetical but plausible situation which is described in our diagrams.

Diagram 6.3 Impact Management and the Power Plant Construction Process

Diagram 6.3 shows a simplified version of the process for planning, siting, licensing, and constructing a commercial nuclear power reactor. This process is shown at the top of the diagram in the activities performed by NRC, the utility, the state siting process, and other permit granting agencies. We recognize that the amounts of time needed and the relation-

DIAGRAM 6.3: IMPACT MANAGEMENT AND THE POWER PLANT CONSTRUCTION PROCESS



ship of the state siting process to other activities vary from state to state and from time to time as the procedures of NRC and other agencies evolve. The time and relationships shown in Diagram 6.3 are our estimate of a process which includes a state siting procedure similar to that of the state of Washington (proceeding without unusual delays).*

The assumptions implicit in Diagram 6.3 are:

(1) Plant construction will begin when the NRC grants a construction permit, and will not be delayed if the communities are not prepared for the work force.

(2) Local governments will begin planning when notified by the utility of its plans.

(3) Local governments will commit funds for capital projects when their planning shows it necessary, and will not wait until the utility's plans are more certain (such as the date the CP is granted).

(4) Local governments will not suffer delays due to lack of funds.

Under these favorable assumptions, it is apparent that communities can have a substantial construction work force on hand for as much as sixteen months before facilities can handle the growth. But the last

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* The overall schedule generally conforms to that shown for a Two Unit Nuclear Plant, Tennessee Valley Authority, Division of Engineering Design, April 15, 1976. (Cited in Steven C. Schulte, "Overview of Population Requirements--Analysis of Factors Affecting Socioeconomic Impacts of Nuclear Power Plants" (Battelle Pacific Northwest Laboratories, October 1, 1976. This paper is included as Appendix D to this report.)

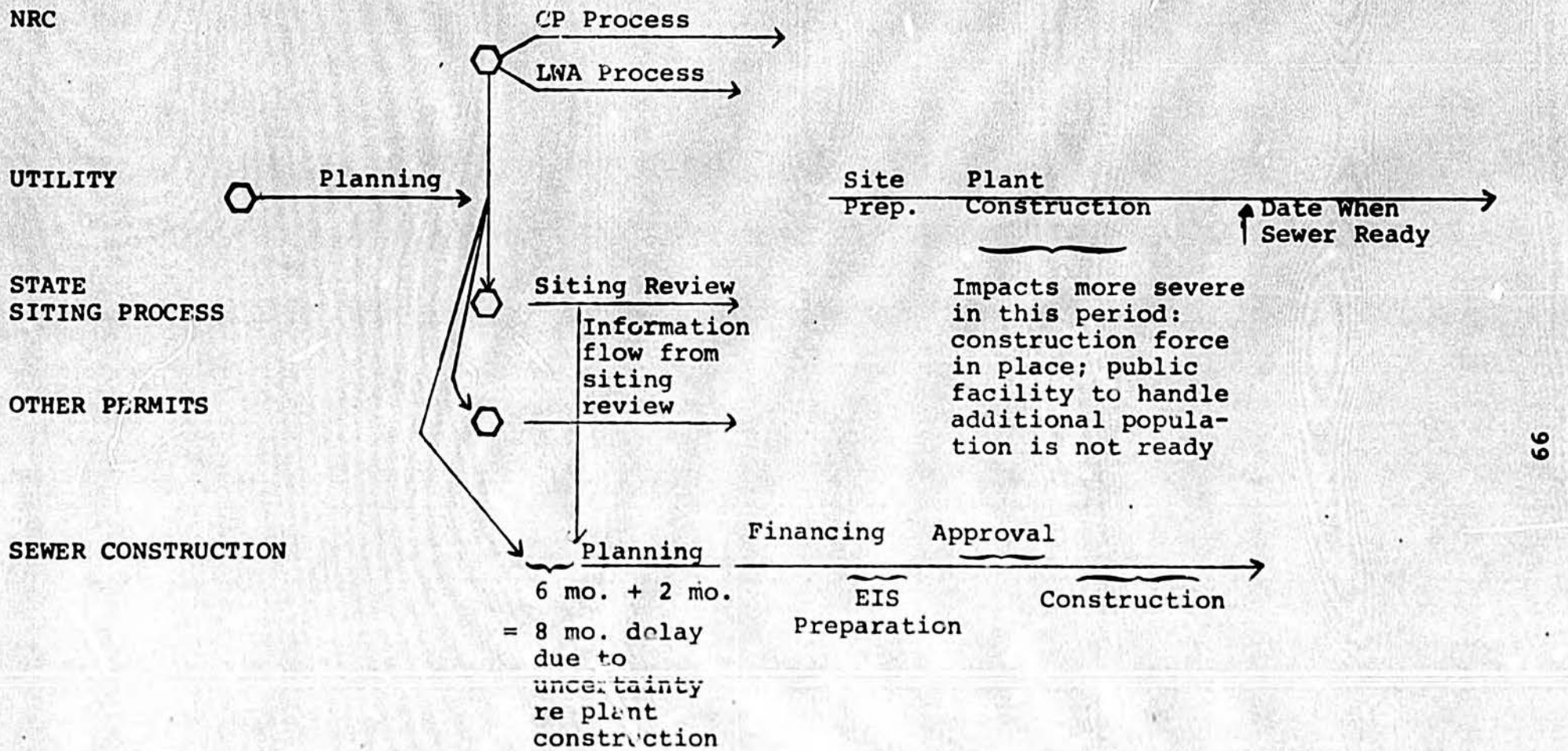
three assumptions are problematical. A local government is unlikely to begin to act when it first receives notice of the utility's intent to construct a plant. Since the utility still must receive a series of government approvals, it will not be clear to the local government that the plant is a certainty. They may naturally resist planning for an uncertain work force. It is likely they will refuse to commit local funds before the plant is certain. If they delay action, there will be additional delays in the overall schedule of the plant.

If the local government begins its planning only after it has received additional information from the state siting authority during the state siting review process, the overall schedule will require an additional six months (as well as the sixteen mentioned earlier).

If the local government refuses to take any steps beyond planning prior to the certain commitment of the utility to the site by state and NRC approval, the overall schedule will require about eight months more (as well as the sixteen months mentioned earlier). Diagram 6.4 illustrates this situation.

6.2.3 What Happens if Communities are not Ready for the Work Force? The judgment of the study team is that the most likely outcome is that the power plant construction will proceed on schedule, and the communities that must accommodate the workers will simply suffer the ill effects of strained facilities

DIAGRAM 6.4: ADDITIONAL IMPACTS DUE TO "UNCERTAINTY" LAG IN PUBLIC FACILITY BUILD-UP



until such time as their capacity can be expanded or throughout the life of the project for those services never expanded. This judgment is based in part on the lack of any examples where communities have been successful in delaying power plant construction because of their inability to cope with the work force. And in part it is based on a belief that the communities lack the leverage necessary to delay plant construction.

One exceptional circumstance may be the community with inadequate sewer or water capacity. The ability to block new construction for these reasons is perhaps the only legally powerful tool available to communities. Sewer inadequacies have been used as a basis for moratoria on housing starts in 226 jurisdictions across the United States, according to a 1973 HUD study (Rivkin, 1975). However such moratoria have several undesirable effects, including sharp rises in housing prices (and rents) within the community, resulting pressure on low income residents, and a transfer of growth pressure to nearby communities without a sewer moratorium or to unincorporated areas (if the county grants the necessary permits) (Hirst, 1975). Only the simultaneous application of a sewer moratoria by all jurisdictions within commuting distance of a plant site could

effectively keep a construction work force away; that prospect seems possible in theory, but unlikely in practice.

6.3 The Relationships of Governmental Processes and Social and Economic Impacts

A simple framework for discussing the role of governments in coping with social and economic impacts takes three steps.

First, the impacts must be predicted. Whoever predicts the impacts produces information.

Second, ways of mitigating the predicted impacts must be devised; the output of this step is a plan.

Third, government organizations must take the actions specified in the plan; this step is commonly called implementation.

The state and local government processes dealing with these impacts were described in chapters three and four. Some state and local processes cause the impacts to be predicted: California and Washirgton's environmental protection acts require sections on social and economic impacts; all three states' energy facility siting procedures require predictions of impacts to be made before a site is approved. There are no formal requirements in state law for plans for mitigating impacts prior to site approval in any of the three states. Skagit County used its zoning powers to require Puget Power to provide information on expected impacts and to agree to prepay taxes to the County so that the County could implement its actions. Washington's energy facility siting law provides a way for impacted communities to petition for payments from the utility to aid in their adjustment.

Federal government processes relate to power plant impacts in two ways. One way is that several federal agencies are potential sources of funds for communities, as was described in Chapter Five. The other major way is that the Nuclear Regulatory Commission requires utilities to prepare environmental reports, which then serve as the basis for NRC prepared Draft Environmental Statements and Final Environmental Statements. Social and economic impacts of the proposed plants form part of each of these documents.

We examined Final Environmental Statements for the three most recent plants in our sample--Pebble Springs, Skagit, and WPPSS-2 at Hanford. The treatment of social and economic impacts differed considerably from one statement to the next.

WPPSS-2. The FES quoted the applicant's estimate of the construction work force, accompanied by the statement that many of those to be employed were already living nearby. (WPPSS-2 FES, p. IV-4). The FES also estimated the number of permanent employees and their impact. (FES, p. V-5). Both the discussion of construction work force and permanent work force are brief assurances that the plant will present no problems for the surrounding communities.

Pebble Springs. The FES found that "the influx of construction workers into the community will place a stress on the housing and community services in the area." (Pebble Springs FES, p. i.) Section 4.4 of the FES presents estimates of social and economic impacts in considerable detail, including economic benefits, changes in population and housing demand,

and effects on capacity of schools, water supply, sewage treatment, hospitals, police, fire, and roads. Section 4.5, "Measures and Controls to Limit Adverse Effects During Construction," contains no detailed information on any actions to be taken to mitigate the impacts described in the previous section. In Section 4.5.2, "Staff Evaluation," a reference is made to plans presented by the applicant "to mitigate the potential impacts on the community arising from the influx of the large work force." (FES, p. 4-9.) The staff (NRC's) then suggests that "cooperative and comprehensive planning" among all concerned will minimize potential problems. The comment procedure on the draft ES resulted in some additional questions. HUD, for example, noted that the DES contained no information on how housing needs would be met. The response of the NRC in the Final ES was that this problem would be addressed by a special study of the applicant.

Skagit. This FES contains a detailed description of predicted social and economic impacts (similar to that in the Pebble Springs FES). The comment process provided a forum for a debate over the magnitude of some of those impacts. The FES does not itself contain a plan for mitigating the impacts, but it does describe briefly the features of the Rezoning Agreement between Puget Power and Skagit County.

Summary. Two of the three FES's estimated social and economic impacts and served as forums for discussing those problems. None of the FES's contained either plans for mitigating impacts, or methods for assuring that plans would be carried out. The only case in which an impact mitigation

strategy appears to be well worked out is the Skagit case in which the utility and the county planned and negotiated an agreement for nearly a year prior to the involvement of either the state or the NRC.

Conclusions on the basis of two or three examples are hazardous. But the evidence points to the idea that the NRC's role ought to be one of insuring that utility/community negotiation like that in Skagit has taken place prior to approval of Limited Work Authorizations or Construction Permits. If a utility can secure the agreement of all the affected communities and taxing districts, that agreement would be more assurance that problems will be taken care of than any existing procedure can give. If utilities know that obtaining this agreement is a precondition for starting construction, they will have to begin negotiating with communities sufficiently early that the communities will have the lead time needed to be ready for the work force. The utilities will also have to help solve the financial problems they create prior to securing agreement.

Chapter VII: Conclusions

7.1 Summary

The construction of a nuclear power plant is a complex process which involves all levels of government at various points. This report has focused on one important segment of the entire process. the role of the state and local governments in the siting process and in planning for and managing associated social and economic impacts.

The major conclusions of this study encompass two types of issues: substantive impacts such as schools, housing and public facilities, and process-oriented issues which affect the intensity and effect of the substantive impacts. The following is a summarized list of the conclusions and recommendations of this report:

1. We discovered that the following facilities and services were most commonly and most severely impacted by the influx of a construction force: schools; public services (sewer, water, police, fire, roads, hospitals); and housing. Overcrowding and overloading were the most common problems.

2. We identified several process issues which directly relate to the effective management of social and economic impacts resulting from power plant construction:

   Coordination is poor among most government agencies, resulting in a poor information flow, and duplication or lack of services.

Early notification of the proposed project to all affected local governments is necessary to plan for impacts and to request outside funding. Early notification can provide adequate lead time (estimated as up to three years for the construction of certain public facilities) to provide the needed additional facilities.

Planning capabilities are important to a local government's success in managing the identified social and economic impacts.

Additional funding is needed by most communities to expand their public facilities and services.

3. On the basis of the above conclusions, we make the following recommendations:

* The NRC should require, as part of the licensing process, that the utility demonstrate that it made efforts to provide the affected communities with early and complete information regarding anticipated social and economic impacts.
* The NRC should formally examine a community's ability to manage expected social and economic impacts as part of its impact assessment process.
* Dialogue should be initiated between state and NRC officials to assure that the NRC process does not hinder state and local efforts to obtain sufficient lead time and funding to cope with power plant impacts.
* The NRC should establish an information office to direct communities impacted by nuclear power plants to the right sources of assistance. The possibilities of establishing such an office at the regional level should be investigated.

7.2 Overview

The major objectives of a state siting process are to improve siting decisions by reducing delay and waste or duplication in the process, and to assure that all impacts are identified and mitigated with minimal disruption to local communities and to the developer's activities. Trying to balance local needs with developer needs and social and economic concerns with energy needs poses difficult and sometimes conflicting tasks. In our examination of state and local efforts to deal with the local effects of nuclear power plant siting, we identified the two types of major issues--substantive and process oriented--summarized above. In the following paragraphs, we present these issues in more detail. The final section consists of recommendations to the NRC.

7.3 Substantive Issues

From the analysis of the case studies, we found fewer dramatic substantive impacts than we anticipated. Although all of the communities experienced some impact related problems as a result of the development of nuclear power plants, none of them perceived their situation as one of unmanageable proportions. This is not to say that such situations are not possible, but that they do not seem likely in the kinds of circumstances experienced by the case studies.

We did identify recurring significant problems in three substantive areas: schools, public services, and housing.

7.3.1 Schools. Schools are impacted by the sudden rise in numbers of students (children of construction workers) during the construction phase of plant development. The temporary duration and suddenness of this impact complicates impact mitigation by local governments. Lack of planning lead time often is due to lack of communication among the developer, local government and school officials. This factor and limited sources of revenue (in the short run, at least) create the problems faced by the local schools. The consequences of this problem are inadequate staffing and facilities, curtailment of extracurricular and some more basic programs and sometimes staggered school hours. While this is usually a temporary problem, its existence can have detrimental effects on the quality of education and on relationships between existing residents and newcomers. This does not seem to be an issue that the NRC would deal with directly, except to require that the utility demonstrate that they have made arrangements to assist in managing this impact if necessary (e.g., through impact payments to school districts as in the Skagit case).

7.3.2 Public Services. The case-study communities experienced problems in managing the impacts on several public services, most notably sewers (Pebble Springs), hospitals and the fire department (Trojan), roads (Skagit and Diablo Canyon) and law enforcement (Skagit). The systems for delivering these services are likely to be overloaded by a sudden influx of population;

it requires time (one to three years) and substantial capital outlays to increase capacity. Particularly in small communities such services may be minimal and planning capabilities for them inadequate. In these cases additional time or technical assistance is needed to plan quickly for needs, before they become critical. In the cases cited above, most of the public service needs were met, but with lag time of six months to one year during which some people received substandard service (e.g., using a small, distant hospital; traveling on inadequate roads and having to cope with greatly increased traffic congestion). Local and state governments have the primary responsibility to assure that impacts on these public services are mitigated in communities affected by nuclear power plants. The NRC, within the context of its current licensing process, can only reinforce state requirements.

7.3.3 Housing. While housing is sometimes considered a public service, it is controlled largely by the private sector. Therefore, management of housing impacts is more difficult to achieve through government actions. In only one community, St. Helens (Trojan) was there a severe housing shortage during the plant construction. Eventually the county was able to obtain federal assistance for subsidized housing which helped to ease the pressure on the housing situation; also, zoning changes helped to allow higher densities in some areas. During the lag time, however, people had to commute long distances or accept substandard housing conditions (particularly

overcrowding). Again, housing is an issue where the utility and local government are the primary parties involved in impact mitigation.

The identification of these substantive areas as ones in which problems tend to occur is verified by experiences outside of these three states. One notable example is the Calvert Cliffs case where three major negative impacts occurred--labor force dislocation, housing and traffic. According to an analysis of this case, these impacts would have been less severe if the county had been better informed and prepared for the potential impacts. (See Howard Needles Tammen & Bergendoff, 1975)

7.4 Process-Related Issues

The problems that have occurred in the management of community impacts related to nuclear power plant development are caused by several common problems in the planning-impact management processes. We discuss these in the following paragraphs.

7.4.1 Coordination. One of the principal findings of this study is the fact that there is little coordination of planning cycles among and within the various levels of government involved in social and economic impacts. Several aspects of the coordination issue include:

1. In the three states examined, there are few formal channels for coordinating actions among various state agencies involved in the siting and impact management processes. Only Oregon is developing a comprehensive list of permits to aid

developers as well as agencies involved. In a more typical case in California our interviews revealed a situation in which two state agencies had recognized the same problem (jurisdictional disparity between the districts receiving revenues and those experiencing adverse impacts) and each was thinking independently about writing and introducing legislation to resolve the problem. This lack of formal channels to provide needed coordination exists between states as well as between agencies in a single state. Problems currently are arising regarding air rights along the Columbia River Basin as a result of power plant and industrial development along the river in Oregon and Washington. Only with the appearance of a problem are efforts being initiated to coordinate planning between the two states.

2. We found also that there is little coordination and communication among small town governments and among local, county and regional agencies even though each is providing services to the same area. This situation may seriously impede the development and implementation of some social impact management efforts. In addition, lack of communication means that not all local officials will have their interests adequately represented to the state and the utility. That is, if there is no communication among local officials, then county representation on the state siting body does <u>not</u> assure that the affected local governments or regional bodies are also represented. One possible

solution to this problem, as described earlier, is to have the state require that a coalition of interested parties be formed. This coalition would be composed of representatives of all local governments and all interested citizens groups. This coalition would then send a representative to the siting council to speak more broadly to local concerns.

3. A major problem in managing local impacts in several of the cases studies has been due, in part, to the timing and nature of coordination between the utility and local governments. In both the Trojan and Rancho Seco cases, the utility did not inform local governments until it was acquiring land and seeking necessary local permits. This failure to inform gave the local governments little opportunity to influence the siting decision or to plan effectively for community impacts. In more recent cases, developers have made earlier contact with the local governments, particularly county governments, as in Skagit and Pebble Springs. Thus the trend toward better public information and coordination between local governments and the utility may be improving. However, as stated in 2, above, there is still a need to identify local contacts more comprehensively to assure that <u>all</u> relevant governments are informed even if they do not communicate among themselves.

Clearly it is not within the purview of the NRC's responsibilities to affect directly state and local coordination issues.

It can, however, play an important supportive role in encouraging utilities and states to coordinate the particular planning cycles involved in the siting and social impact management processes.

7.4.2 Early Notification to Provide Adequate Lead Time. Communities need early notification to allow them sufficient lead time to develop capabilities needed for managing impacts and to plan for anticipated public service needs. The community needs to be informed at least two to three years before the construction force appears in order to plan and develop such facilities as sewer and water systems, roads and temporary housing and school facilities. (See Briscoe, et. al., 1974; Williams, 1976)

The state siting process now provides a vehicle for assuring early notification of local governments. Within the context of these state processes, localities have from twelve months to three years advance warning of an impending impact upon their community. However, the extent of information given to communities is less than sufficient in some cases or is not in a form easily understood and used (e.g., lengthy and technical EIS's). In some cases the developer has initiated contact with the community in its own early power plant planning, providing extensive information on anticipated labor force needs and impacts and plant impacts on physical requirements. However, this early notification still occurs all too infrequently

and most often at the request of the state siting council. More often the state provides this type of information to the communities in the notice of intent or application for certification document--after twelve to eighteen months or more into the developer's planning schedule.

There are some potential costs to early notification; it may cause erroneous expectations of impacts that fail to occur because the site is changed or the impacts are not of the magnitude originally projected. The uncertainty of the project during the siting and licensing processes may keep local governments from actually planning until they know the impacts will, in fact, occur. In this situation, much of the lead time needed to plan is thus foregone. Further work needs to be done to develop mechanisms which can assign the risk associated with early planning to the appropriate parties.

7.4.3 Impact Management. How successfully local impacts are managed in the nuclear power plant development process depends, to a large degree, upon the local government's capabilities for planning for needs related to rapid growth. Small communities, as we found in several case studies (Trojan, Skagit, Pebble Springs) often do not have such capabilities and thus have more difficulty with preparing for impacts even given several years advance notice. In fact, the total range of problems caused by social and economic impacts are influenced significantly not only by the lead time available for planning but also by a community's ability to manage the impacts.

The state siting processes examined generally do not formally recognize the local government's impact management capability as a formal criterion for plant approval. Only Oregon's site evaluation guidelines include this factor as a criterion in the siting decision-making process. The formalization of this factor as a criterion for certification would certainly help to assure that affected communities would receive the necessary assistance (particularly technical) for planning and meeting anticipated needs in such a way as to avoid unnecessary problems and costs to the local area.

7.4.4 Funding. Lack of adequate funding is one of the most serious impediments to the smooth incorporation of a power plant into a community; additional funding may be required for services provided directly to the plant and for any additional community services required by the influx of construction workers. Funding is also necessary for the expanded planning effort in impacted communities; local governments need funds to evaluate the technical information from the project, and to plan for anticipated impacts. All impacted communities share one problem: they will need funds for impact management earlier than those funds would be routinely available. The cause of their problems differ, however.

(1) Jurisdictions that will receive property tax from privately owned power plants face a temporary problem: they need to pay for impact management before taxes begin to flow to

them from the plant. Agreements between the utility and the affected community to prepay property taxes (like the Skagit agreement) seem the best way to solve this problem.

(2) Some jurisdictions do not have the power plant within their boundary. They need money to pay for impacts, but cannot negotiate with the utility for prepayment. There are two solutions. The state can attempt to equalize the distribution of property tax from industrial property--including power plants--as Oregon has done with its Tax Equalization Districts. Then jurisdictions that do not include the plant will still have a future tax claim against the plant, against which prepayments can be made. The other solution is for the utility to make impact payments to all affected communities where prepayment agreements are not possible. Either the states or the NRC might be able to require such payments as a condition of granting permits for construction.

(3) Publicly owned power plants pay substantially fewer taxes; jurisdictions near them receive reduced revenue flows. One solution is to require impact payments by the utility (as discussed above). Another solution is to require the publicly owned plant to make special payments--in lieu of property taxes. Washington uses both approaches: it requires a "privilege tax" to be payed the county and school districts by the Washington Public Power Supply System, and also permits impact payments to be made.

An additional important source of funds for communities is

the federal government. Many communities now rely on federal funds for aid in constructing sewer facilities, roads, and health facilities (to name a few examples). Obtaining federal funds takes time, however (often twelve to eighteen months), even if local government officials know how to identify and apply for such aid. In small communities, officials usually lack this expertise. Although guides to using federal funds are being published (See Williams, 1976), we think lack of information in the communities will continue to cause additional delays. The federal and state agencies concerned with the impact areas (e.g., HUD, possibly NRC, HEW, state planning agencies) should assure that their information is available in understandable and usable form to local governments.

7.5 Recommendations

1. As part of its own licensing process the NRC should require the utility to demonstrate that it has made efforts to provide each of the affected communities and districts with early and complete information regarding anticipated social and economic impacts. Additionally, the NRC should open its own process to the extent practicable in order to provide local governments and the public in general with access to information used in the federal licensing process. Efforts should be made to provide lay interpretations of technical information, so that at least the public gets a general understanding of the nature of the complexities in nuclear power plant development.

2. In its assessment of the environmental, social and economic impacts of a proposed facility, the NRC should formally examine a community's ability to manage the identified social and economic impacts.

3. The NRC should work with the states to determine and implement a consistent timing relationship between the state siting and federal licensing process. While the most recent case studies reveal that state certification is occurring before NRC approval, this has not always been the case. It is not clear if this sequence is established formally. If not, the recommended dialogue should be initiated in order to assure that the NRC process is not hindering state and local efforts to obtain sufficient lead time to cope with power plant impacts.

4. The NRC should establish a local and state government information office which can dispense information to affected governments on impact management strategies, sources of additional funding for communities faced with the need to provide additional facilities to the work force, and other communities' experiences with power plant development. The NRC should also investigate the possibility of establishing such an office at the regional level. NRC representatives at the regional level could facilitate better communication among NRC, the states and impacted communities.

Communities need information, time and resources if they are to be able to cope with social and economic impacts associated with nuclear power plant development. Although the

problem of providing additional resources will ultimately be solved by others, we hope the NRC, through the above recommendations, can work with communities and states to provide the needed information and time. Such cooperation can help insure that construction of a nuclear power plant proceeds in a timely and safe fashion.

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INTRODUCTION TO APPENDICES A, B, AND C

The following three appendices (A, B, and C) contain detailed discussions of the state siting processes in Washington, Oregon and California, and also include detailed descriptions of the six sites we investigated for this study. These appendices have been standardized in terms of format and information to the extent possible; however, extensive differences in some of the sites precluded complete standardization. For example, the Tri-Cities area, near the WPPSS-2 site, is experiencing rapid growth from several large projects. This growth made it impossible to isolate impacts from the WPPSS-2 plant; rather, the Tri-Cities officials presented a more general discussion of how they cope with growth. At the other end of the spectrum, the Rancho Seco site in California (near Sacramento) caused minimal social and economic impacts.

APPENDIX A: THE STATE OF WASHINGTON

Part I: The State of Washington

Part II: The Two Case Studies

Part I: The State of Washington

To determine the state's role in the siting process and in the identification and management of social and economic impacts associated with nuclear power plant construction the following people were interviewed:

Mr. Keith Sherman, Director, Siting Energy Office

Mr. Roger Polzin, Executive Secretary of the Washington Energy Facility Site Evaluation Council (EFSEC)

Mr. Fred Clagett, Senior Policy Advisor, Office of Community Development

Mr. Fred Adair, Director, Office of Nuclear Development, Washington Department of Commerce and Economic Development

A. Siting

The major role of the State Energy Office is to plan for and coordinate energy needs in the state, with primary emphasis on centralizing information necessary for the state to develop and implement energy policies and energy conservation. The state does not get into the business of energy demand forecasting, as do Oregon and California. Rather, Washington's State Energy Office collects available information (from utilities, etc.) and critiques these attempts to forecast demand for the state. The state also does not get into advance site selection for nuclear power plants. The Energy Facility Site Evaluation Council (EFSEC), the designated state body which makes siting decisions, is a recent (1976) outgrowth of the original Thermal Power Plant Site Evaluation Council which was established in 1970. The EFSEC is basically a reactive body in that its

purpose is to react to specific proposals for siting energy facilities in the state. Its scope was broadened to include all new energy facility siting and major modifications of existing facilities at the same time that the State Energy Office was formed in 1976.

Normal functional laws are superseded by RCW80.50, including local laws. While the status of local zoning ordinances is yet to be determined, at present zoning must be appropriate in a proposed site before an applicant may proceed with development plans.

EFSEC is composed of members from 15 state agencies, but there is no formal interaction with these agencies outside of their participation on the council. Likewise the EFSEC's relationship with local government is limited to the local county commission's participation on EFSEC.

The applicant is required to submit an application for site certification which includes social and economic concerns. The EFSEC, upon receiving the application, may contract for independent studies to be conducted when necessary (using the $25,000 permit fee). The Council conducts hearings on the proposed location of the plant; then prepares a written report to the governor stating the application's compliance, criteria specific to the site and transmission line routing (conditions) and recommendation as to disposition. Nuclear power plant site applications must comply with SEPA (State Environmental Policy Act), and thus must discuss the need for power and must present and consider alternatives within their proposal. EFSEC considers need and the alternatives in its evaluation and these

constraints also are considered in the Governors' final approval or disapproval of the site certification. In addition, according to law, the Council must prescribe the means for monitoring effects arising from construction and operation of facilities to assure compliance with the terms of certification. This mandate potentially is a useful tool in spelling out the specifics of impact management. However, the Council will soon have its first opportunity to deal with a specific impact mitigation case regarding a fish-kill incident on the Coumbia River. In this case the utility (WPPSS) was testing the lowering of a dam level and caused the death of thousands of fish accidentally. EFSEC must determine responsibility and reparation for the damages.

Washington law requires that the Council must complete the site certification process within 12 months of receipt of an application, or later as agreed upon between the Council and the applicant. Then the Governor has sixty (60) days to approve, modify or veto the Council's recommendation. The Washington siting process replaces the Notice of Intent process with an initial certification application step, which consolidates and thus shortens the process.

The Council has just set up specific guidelines or criteria for evaluating applications for certification. (WAC Order No. 112, to be published January, 1977.) The Council members give their own individual judgment as to the sufficiency of the application, based on these guidelines, presumably looking most critically at areas with which their agency is most concerned. EFSEC acts as a hearing body, but state agencies

do not contribute to the identification of impacts. (However state agencies could participate as interested parties in the decision.) The EFSEC staff provides the Council with any additional information that is needed, although their initial source of information is data collected by the applicant. The final certification report, when approved, is to be used by state and local agencies as a basis for dealing with impacts and with the local area affected. This points to the importance of the certification; it guides actions to mitigate social, economic, and other impacts and thus must be comprehensive to assure that all impacts are dealt with adequately. This assurance depends on the evaluation by the Council and by intervenors in the hearing process.

The 12-month state siting certification process can begin simultaneously with the NRC licensing process. (Or in some cases the utility may choose to start the NRC process first, or to wait until the state process is well under way.) The NRC relies upon data collected by the utility, independent consultants, communities and counties and the state in its certification process. The EFSEC may interact with NRC in that it is accepted as a party to the NRC licensing proceedings. To date, EFSEC has not actually entered NRC proceedings. Both agencies keep each other informed of their respective hearings. Essentially the state has jurisdiction over land use and public acceptance of the plant; the NRC has jurisdiction over plant design and radiation standards. Local government has jurisdiction only over zoning and this is a questionable power right now.

B. Planning

The state agency which would be primarily concerned with social and economic impacts is the Office of Community Development (OCD). The overall purpose of this agency (located within the Office of the Governor) is to work with state and local governments "to meet both state and local community needs in cooperative planning and development efforts." The OCD works specifically in the areas of (1) community planning; (2) human resources, and (3) management services. However, there are few legal mechanisms for effectuating state and local relationships and coordination. The 1935 local enabling legislation encourages local planning but does not make it obligatory. The state requirement for planning is drawn upon functional lines by agency. While the Office of Program Planning and Fiscal Management (OPPFM) has fiscal planning and coordinating responsibilities for state line agencies, there is no agency which coordinates actual program planning. There is no overall plan (e.g., land-use or development plan) at the state level although work is currently underway to develop a statewide land-use plan. There is no state money for comprehensive planning at local levels; but OCD does administer and monitor HUD 701 planning grants to local governments. This source of money, however, is increasingly limited to land-use and housing elements.

The Office of Community Development (OCD) has field representatives for different programs (e.g., 701 planning, Washington Partnership Forum, transportation planning) who work

with specific communities in the state which ask for assistance or must be monitored for federal funding purposes. Therefore, assistance to local communities tends to be fragmented; field representatives must divide their time among many communities and are concerned with only one area of planning or problem solving. OCD has gotten involved in assisting a few communities that have been impacted by federal projects--most recently in connection with the relocation of North Bonneville and in the Trident-impacted area (currently there is a Trident coordinator in OCD). However, this is the exception rather than the rule.

Because there is no coordinating function at the program level, such coordination seems to happen only when communities are so severely impacted they obviously require substantial state involvement. Where and when OCD assists communities is largely affected by the political process; priorities for this and other agencies are set through the political process (executive and legislative priorities) and are not necessarily coordinated.

OCD's involvement in the energy facility siting process is through its membership (one representative) on the Energy Facility Site Evaluation Council. This person acts as an independent individual bringing the agency's general perspective into the process but not formally representing an agency viewpoint. The OCD representative reviews site applications from social and economic impacts and community development perspectives, determining whether there are deficiencies regarding these issues in the application. Since there have been no guidelines for judging the adequacy of the application in the

past, requirements in the site certification for identifying, monitoring and mitigating social and economic impacts have been dealt with on a site-specific basis, resulting in some inconsistencies. The OCD staff pointed out several needs for local government--a better understanding of land-use planning as a process not a blueprint and the availability of legal assistance to help in dealing with large scale developments and their impacts.

In summary, OCD does provide assistance to impacted local communities, but only as need arises or upon request. This assistance does not include financial aid from the state since no state appropriations have been made for this purpose. (OCD has requested local assistance funds from the legislature but without success.) Lacking a coordinating role, OCD is limited to providing assistance for specific problems which creates a fragmented approach to impact management.

An additional state agency with some involvement in the coordination among the federal, state and local roles in the siting process is the Office of Nuclear Energy Development in the Department of Commerce and Economic Development. This office was formed in the late 1960s (1965 legislation) in order to provide state assistance in the Hanford area's transition from a totally federal to a federal/civil economic base. While the office does not actively promote nuclear energy development, it does represent this state's nuclear development interests. It is a one person office and currently the Director does three things: (1) problem solving particularly focusing upon improving coordination in federal and state siting processes; (2) information

generation from the state on nuclear development and (3) participation on EFSEC as the Department of Commerce and Economic Development's representative.

In the first role, the Director is a member of the Western Interstate Nuclear Board, a group of Western states, under a statutory compact, that work to cooperate with each other in providing state input and influence to the federal nuclear development process. Their primary task is to promote state concerns to the NRC. Currently, they are negotiating with the NRC regarding joint federal-state hearings for site certification and agreement on the division of responsibilities for discharges into the water and air caused by nuclear power plants. Also, the Board lobbies the federal government to accelerate and improve the management of the waste management program.

The Office of Nuclear Energy Development is not involved in the siting process except through its participation on the Energy Facility Site Evaluation Council. This office, however, does get involved with problem solving in the nuclear power area and can bring this expertise to the EFSEC.

Basically the state has three mechanisms through which social and economic impacts are addressed. The first is the county zoning process which determines the suitability of the plant in the specific location (with regard to land use criteria). The second is the Energy Facility Site Evaluation Council which requires in the site certification application that social and economic impacts be identified and techniques to handle them spelled out. In the two most recently approved certifications, the Council has included in the conditions

that any impact cost attributed to the construction and operation of the nuclear power plant must be borne by the utility. The utility may either pay such costs when they are presented to them by the local community (with proper proof) or may take the issue to EFSEC which will decide if the utility is responsible for paying for the management of that particular impact. The site certification document is more than a permit; rather it is a license signed by both the utility and the state, in which both parties have specific responsibilities. The state attorneys make an issue over the fact that the certification is a license rather than a contract. This identification has arisen particularly with argument over the Columbia River fish kill.

The third mechanism is the action(s) of the Office of Community Development which has the responsibility to work with communities in planning and coping with growth and related problems. While this agency is more directly concerned with community development related problems, neither it nor the energy siting council have tried to plan proactively for the social and economic impacts associated with nuclear or other types of energy development. The Council and OCD have both--because of lack of funds and staff--had to take the position of attempting to require the utility to perform long range impact planning.

Part II: The Two Case Studies

Information presented in the following descriptions of the two case studies was gathered from interviews with the following people:

Skagit County:

Mr. Nat Moore, Superintendent, Burlington School District

Mr. Thomas J. Pollino, Superintendent, Mt. Vernon School District

Mr. Robert Schofield, Director, Skagit County Planning Department

Mr. Robert Warnecke, Superintendent, Sedro Woolley School District

WPPSS-2:

Mr. Donald Anderson, Superintendent, Kennewick School District

Mr. Larry Coons, City Manager, City of Richland

Ms. Mary Davis, Community Services Director, Benton-Franklin Governmental Conference

Mr. Robert Eiler, Superintendent, Richland School District

Mr. Bill Gilbert, Physical Development, City of Richland

Mr. Bill Kennedy, Director, Planning Department, City of Kennewick

Mr. George Kloeppel, Executive Director, Benton-Franklin Governmental Conference

Mr. Bob Leedy, Director, Planning Department, City of Richland

Mr. Don Morton, Community Development Director, Benton-Franklin Governmental Conference

Mr. Dan Smolen, Community Services, City of Richland

Mr. J. B. Vetrano, Supervisor, Technical Studies, Washington Public Power Supply System written comments

The Skagit Nuclear Power Plant

A. Background

Puget Sound Power and Light Company currently is planning a nuclear power plant at a site in Skagit County. The first word of the proposed plant came to people in Skagit County in the newspapers in 1973. Puget Power did not notify the County prior to announcing the plant, thus causing relations between Puget Power and Skagit County to get off to a poor start. Relations were at their worst after Puget Power applied for its first permit and was rejected by the Skagit County Commissioners. Puget Power wanted an "unclassified use" permit which was not specifically authorized in local ordinances, but which is often used in King County. The Skagit County Planning Commission approved the "Special Use" permit, but the county commissioners then rejected it. This rejection caused a large negative response from the utility. However, relations improved when Puget Power and the Skagit County Planning Department, under the auspices of the planning director, Mr. Robert Schofield, started negotiating the contract rezone agreement. Since that effort, there has been a great deal of cooperation between the two entities.

Skagit County implemented the rezone agreement with Puget Power which requires impact payments by the utility for education and law enforcement. In addition, it places a number of constraints on Puget Power. For example, no fuel reprocessing plants will be allowed on the site nor will permanent radioactive waste storage be allowed. The impact payments are

actually prepayments on property taxes to be assessed after the plant becomes operational. Once operational, Puget Power will be paying Skagit County $12 million a year in property taxes.

B. Planning and Impact Management Processes

Skagit County has a comprehensive plan and the small cities within the county are all updating their plans now with help from the Skagit County planners. The Planning Department along with the Skagit Regional Council (a one-county council of government) are responsible for the planning and projections made for the county. Skagit County is also a member of the ten county Puget Sound Health System Agency which does health planning.

The Skagit County Planning Department has taken some preliminary steps in the identification of social and economic impacts associated with the plant. Besides updating all of the local small towns' comprehensive plans, the Department is collecting baseline social data to document changes that are presently occurring in the county. The Planning Department is also submitting a number of grant applications to the Economic Development Administration (EDA) for funding to study potential impacts on the water and sewer systems in the area. The county has also just finished an economic feasibility study and a housing assistance plan for Skagit County, which take into account the expected social and economic impacts of the plant.

All the work that is presently being done has required extra resources, and the Department has added two planners and an intern. So far the state has played a minimal role in identifying and managing the projected social and economic

impacts. In fact, the local planner feels he has had difficulty in getting the state agencies to inform him regarding their role in the management of impacts. His difficulty with the state highway department is a case in point. It is anticipated that roads are going to be heavily impacted, with up to 20,000 daily trips on a two-lane state route. Mr. Schofield, as planning director, has been trying to receive some assistance from the state highway department to cope with this impact; however the state did not include such large projections of need for Skagit County in their six-year capital improvement plan, and aid does not appear to be forthcoming.

Puget Power needs two permits from Skagit County. It has already obtained its zoning permit; the other permit which it must obtain is a building permit. There is some dispute over the issuance of this building permit. Puget Power maintains that once it receives the site certification from the EFSEC, it needs no permit arguing that the building permit is part of the site certification. However, according to the Uniform Building Code, Skagit County must require a building permit. This permit will cost Puget Power $3/4 million, a substantial contribution to impact management in the county. The zoning permit has been approved through the contract rezone agreement.

A third type of permit, a "public use" permit, is required by Skagit County for all capital projects such as the type that might be built to accommodate additional population associated with the power plant. This permit takes 30 days to obtain, in addition to the time necessary to prepare any required EIS. An EIS is necessary for all major developments (revised Code of

Washington, 43.21C.030). A shoreline permit requires an additional 30 days for review by the Department of Ecology (revised Code of Washington 90.58).

The process for issuing the public use permit is as follows: (1) an application is made with the Planning Department, (2) a public hearing is scheduled at the time of the next Planning Commission meeting, (3) upon approval by the Planning Commission the request is sent to the County Commissioners who either accept or reject the request. A public hearing is required of the county commissioners if they want to alter the request.

The county budget operates on a calendar year. A preliminary budget is required by July of the previous year.

Three types of bonds can be used in Skagit County: (1) General obligation, (2) Revenue (not used for the last 30 years) and (3) Commissioner's Bonds (bonds that can be floated by the County Commissioner). The county presently is not in debt, but uses money from two sources--Current Expense Funds and General Revenue Sharing.

C. Local Service Impacts

Housing presently is in short supply in the county. Puget Power offered to build houses, but the local developers reacted negatively to this. There is an agreement, however, that Puget Power will provide land if needed for future development. There are places for mobile home parks in the county and in fact the county would prefer to have temporary as opposed to permanent housing because this would prevent excess vacancies when the construction force leaves. The existing mobile home ordinance has been revised and standards tightened. Mobile

home parks are now treated like planned unit developments and require plan approval by the County Planning Department. There is a five to six home/acre density limit and storage facilities must be provided. A new 50-unit motel also has been approved in Sedro Woolley.

Transportation impacts are limited to increased traffic congestion on local roads. There will be a sizable impact on SR 20 which is presently the only road servicing the site. Plans are being made currently to improve the capacity of this road, which is already congested almost to capacity.

There will be no significant impact on outdoor recreational facilities, because of an abundance of local and state parks and the existence of a national forest in or near Skagit County.

County planners do not expect appreciable impacts on health care services. The county presently has three accredited hospitals and a number of physicians and is close to Seattle's more specialized services.

A small impact is anticipated on sewers and water. There are three city sewer districts, and the Skagit County Public Utilities District provides water. All will be running at capacity but Skagit County planners say they do not anticipate the need for and have no plans for new facilities. The present systems can readily serve the 100-150 new residents who will operate the plants.

One control Skagit County has placed on growth is that new construction must first occur within the cities' limits where water and sewer hookups are already present. After the cities are full, construction will be allowed in the outlying areas.

The main force sewer line for the plant will hook up with the Sedro Woolley system, which will bring the system up to capacity. Puget Power already has a limited work authorization for this.

The demand for county services has already been felt in the processing of development related applications. As a result some personnel have been added in planning and related departments of government administration.

There will be an impact on public safety in terms of an increased demand for police and fire services. The provision of additional services are covered by impact payments in the rezone contract.

There is some speculation that the plant may attract unskilled workers who may remain in the county and unable to find work, an event which could increase the number of people seeking welfare assistance. However, welfare is a state function, and the county would not be financially impacted by such a situation.

There are already impacts on land use with increasing demand for housing and shopping developments. The farmers have a strong voice in the county because of the large agricultural economic base in the Skagit Valley. Thus many want the present agriculture-based land use plan to remain as it is. Conflicts could arise between farmers and others if there are substantial pressures to take agricultural lands out of production for housing and other urban development.

The three school districts that are expected to share in the Skagit-related impacts from the construction force buildup

are the Sedro Woolley (3,000 student enrollment), Burlington (2,700), and Mt. Vernon (3,200) School Districts. Because Sedro Woolley are closest to the Skagit plant site, they are anticipating slightly more than one-third of the new student enrollment to come into their district. A range between 300 and 500 students, divided among 12 grades, is the base planning figure for which the district is preparing. This projection is derived from both the utility's impact study and the independent county planning department's analysis of the expected number of new families with school-age children that would locate in the Sedro Woolley area.

A long-range school forecast was made for the district in 1972, but with the advent of the Skagit development, this is now an obsolete document. The district is hoping that Puget Power will update the study when it receives its limited work authorization from the NRC, because of the importance for planning purposes of knowing details such as the age groups of incoming students that can be expected. The Puget Power community representative, in the meantime, is located in Sedro Woolley and is keeping the school district as well as other interested government agencies well informed of utility plans. It is anticipated that as construction begins this ongoing contact with an update of construction force figures will be continued for the benefit of district and other local planners.

The influx of new students upon the Sedro Woolley School District is expected to require minimal new construction. The district at present has excess capacity at the secondary level, and temporary buildings will be used to accommodate the overflow.

Classrooms may need to be expanded at the elementary level, in addition to the use of temporary facilities. Because the Skagit County rezone agreement has provided for utility provision of temporary structures and of operating expenses related to children of the utility's construction force, the Sedro Woolley administrators feel fairly comfortable about their financial ability to manage the increasing enrollment that will arrive with the construction force. What does concern them somewhat, however, is the possibility that the projections may be wrong and that new construction may in fact be required as many more families settle into the district nearest the plant site.

The Burlington School District administration is far less confident of the projections given in the impact studies to date. They are taking a wait-and-see approach to impacts for which they are not willing to make projections. Their response to new students will be to request temporary structures and operating funds from Puget Power when needed, as per the rezone agreement. The district is nearly full to capacity at present but not knowing what to expect for the coming school year, they are making no special preparations for increased enrollment at this time.

The Mt. Vernon administration is concerned that recent speculative housing developments in their area may shift a portion of the family housing demand away from the expected growth in the Sedro Woolley and Burlington areas. In the past few months, for example, over 64 homes have been completed and are awaiting sale, 95 more have been recently sold, and 117 housing starts have been made, all in the three- and four-bedroom

housing market. One major factor in such concentrated new developments is the expanding retail facilities in Mt. Vernon (three shopping malls are presently in operation, with two more under construction). If the Skagit construction does bring families looking for homes into the area, it is likely that they will live in whichever community has housing most readily available, rather than wait for openings in that community which is closest to the site.

Such burgeoning growth will create definite overcrowding conditions in Mt. Vernon's elementary classrooms. At present there is excess capacity at the secondary level, so they feel that an increase at that level will be manageable. But in the elementary grades there are only a few excess classrooms; the use of these would require their withdrawal from uses for other student services. Unlike the Sedro Woolley experience, which has had school levies consistently turned down over the past years, the Mt. Vernon voters have expressed strong approval of the education system in the annual levies which have passed with a 90 percent and 84 percent vote in the last two years. The district is presently planning for new elementary classrooms and a high school gymnasium construction bond, but the issue has not yet gone before the voters. Support for a long-term debt is not expected to be as strong as for the annual levies.

State construction aid will not be forthcoming unless a much larger growth appears than even Mt. Vernon's revised estimates are anticipating. These funds are available only when an annual growth of three percent is demonstrated, and the district expects to come close but probably not to meet that

level. Any new construction must therefore be completely financed by local property taxation.

The natural growth increases are expected to be managed with the upcoming bond levy. Utility provision of portable classrooms will be relied upon to meet the needs of the Skagit-related new student populations which are expected to be short-term in nature. The greatest concern that the school district has is that the facilities to be provided by Puget Power will be delayed because of inadequate preparation for the transfer of funds. They would like to see the funds put into escrow soon, so that they will be available to them as soon as they are needed. As long as they are available and on time, the impact of the Skagit construction force upon the Mt. Vernon School District is expected to be manageable.

The district will receive no monies from the Skagit plant once it is operational. Any operating personnel who settle in Mt. Vernon with school-age children will have to be serviced from general district revenues. By that time, however, the housing boom in Mt. Vernon may have leveled off or even reversed itself, as both the taxing and distance advantage of Sedro Woolley property becomes apparent to long-term residents employed by the plant. Because the numbers of permanent employees will be small, the school district planners do not find it that difficult to work within some uncertainty regarding their residential patterns.

There may be some clashes between newcomers and old timers in the county. However, the Planning Director felt county

residents were a "hearty breed" who could withstand any potential clashes.

Skagit County, through its Planning Department and the Skagit Regional Council, is making progress in the management of social and economic impacts associated with the construction of the power plant. They are assisting local communities in updating their comprehensive plans; they are collecting a great deal of baseline social data to determine natural growth and change from that associated with the plant; they are submitting a number of EDA grants for further studies; and they have also updated their mobile home ordinance. In addition, there is concern that county residents understand the implications of growth in the county, and participate in decisions affecting this growth.

The Washington Public Power Supply System Plant #2

A. Background

Construction began on the Washington Public Power Supply System's first unit at Hanford in August of 1972, immediately after receipt of a Limited Work Authorization from the NRC. Simultaneously, construction started on a Fast Flux Test Facility and a new population nearly equal in number to that of the WPPSS-2 construction force arrived for which planning and services had to be provided. In addition, there was a 1975 mid-summer construction start on two other nuclear power plants, the WPPSS-1 and -4 units, also immediately upon receipt of the Limited Work Authorization. The discussion which follows focuses on the response mechanisms and processes of the area's local

governments to generalized rapid growth pressures, rather than on the identification and management of social and economic impacts associated solely with the single nuclear power unit.

Based upon previous location decisions by Hanford employees in the Tri Cities area, local planners anticipate that over 52 percent of the new population will locate within the three cities of Richland, Kennewick, and Pasco (Management Consulting Services, 1976). Another 19 percent are expected to find homes in the fringe area around the three cities; and the remainder is expected to locate in four neighboring but smaller incorporated towns and unincorporated county land. The interviews, therefore, centered on the experience of the two larger city governments and the regional planning agency (the Benton-Franklin Governmental Conference) in meeting the demands of rapid growth.

The cities had varying experiences learning of the power plant plans from the utility. The city of Richland is itself in the utility business and sits on the WPPSS board, so the city was involved in the siting decision. The Benton-Franklin Governmental Conference was asked by the utility to comment at the WPPSS-2 public hearing and did so, although it was not asked by the utility to participate in later hearings on the WPPSS-1 and -4 units and it did not enter as an intervenor. Although the present Kennewick planning director was not employed during the planning stage of the WPPSS-2 project, he feels that given the state of present communications between the utility and the city, it is likely that Kennewick officials were not informed of the pending development and the impact that it would place on their community. However, according to a WPPSS official, the

Tri-Cities Nuclear and Industrial Council, the Benton-Franklin Governmental Conference, and the Tri-Cities Chamber of Commerce solicited WPPSS to locate the plant at Hanford instead of the Roosevelt Beach site originally contemplated. The spokesperson felt that Kennewick could not have remained in the dark about these activities. No social and economic impact study of the unit was required before site certification was given to WPPSS-2. The Energy Facility Site Evaluation Council has since required that, prior to certification, such studies be made. Thus the cities and regional planning agency are now at least indirectly informed of future projects through inquiries from EIS consultants seeking data.

B. Planning and Impact Management

The basic variable affecting all planning and management strategies in the Tri-Cities area is the large numbers of new population that must be accommodated within the area over a short span of time. Unlike some other areas, the "boom" which is bringing much trouble to local governments at the present is not expected to "boom" in the future in this area. The planning task has been somewhat simplified in the Tri-Cities region because of the widely accepted assumption that the additional capacity in the governmental organizations will be filled by natural population growth when the construction force leaves. The main difficulty has been, therefore, the timely provision of needed services during a period when revenues have not been increasing as rapidly as the population.

A major problem facing the WPPSS-impacted region is planning on a regional basis for long-term growth. A second problem is the short-term planning requirements of small towns throughout the area which are unfamiliar with and fiscally unable to perform the planning functions themselves. The Benton-Franklin Governmental Conference is providing useful services to fill both needs, but one concern expressed by the staff is that the organization is not integrated into the official system for processing applications and therefore is not informed of potential developments that will require further area-wide adjustments in community service deliveries. It is heavily involved in developing planning guidelines and setting standards to assist localities in solving problems in such inter-city areas as transportation, health care, land use, and housing. However, a good portion of its staff time is also spent dealing with immediate problems that arise because early information was not available either to the impacted community or to itself.

The WPPSS plant will provide several different sources of revenue to the local governments. One source of revenue to the local area during construction of WPPSS-2 is the sales and use tax paid by WPPSS on materials, equipment, and contract labor. (RCW 82.08, RCW 82.12, RCW 82.14, and WAC 458-20-145.) They will result in the payment by WPPSS of about $33,115,000 in sales and use taxes. Of this, about $29.8 million goes to the state of Washington, $3.3 million to Benton County, and relatively minor amounts to Richland, Kennewick and Pasco. WPPSS will pay a privilege tax during operation of the plant as specified by RCW 54.28. It is estimated that this

will be about $1.5 million per year. The state of Washington receives 4 percent of this amount with the remainder being split 65 percent to Benton County and 35 percent (minimum) to Richland, Prosser, Burbank, Kennewick, Finley and Kiona-Benton school districts. WPPSS is further required to make payments during the construction period to any school district demonstrating an enrollment of pupils of construction workers (RCW 54.36). After allowing for a normal growth in base year enrollment of 3 percent, WPPSS pays one third of the average annual per pupil cost to the district for all construction pupils of the plant. RCW 54.36 also permits WPPSS to make voluntary payments to other taxing districts experiencing a demonstrated impact during construction of WPPSS projects. Twelve taxing districts have asked for funds under this provision for construction impacts and the claim is currently under review.*

Despite these potential revenue sources, officials from the city of Richland, indicated that the city remains a "bedroom community" lacking in any industrial tax base. Although its boundaries lie closer to the plant site than any other, it is faced with a severe budget shortage. Due to time lags in revenue generation, the Richland Council has had to make budget cuts in 1972, 1974, and 1975 by reducing services which seemed to be the most expendable. Among these was a fire station (leaving one remaining, and a reduction in the fire force of 14 persons). The budget constraint has forced government

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*Information from Mr. J. B. Vetrano, Supervisor, Technical Studies, Washington Public Power Supply System, letter of December 23, 1976.

planning activities into a reactive posture--they "managed" by "scrambling"--and by giving priority only to those services where a well-defined need was recognized. Their water and sewer capacity has been reached, and the city council has defined a short-term policy of limited growth by authorizing no zoning changes or annexations in certain areas until new facilities are available.

The fiscal situation of Kennewick, by contrast, is more stable, primarily due to the presence of the area's large regional shopping center within its jurisdiction. Although their water supply is strained during the summer watering season, their sewer treatment plant is expected to handle growth for another five to ten years. The city does, however, have some problems related to its rapid growth; its aggressive annexation policy left enclaves of undeveloped county land scattered at the perimeter of the city land. Because of lower county standards, the quality of services and facilities (particularly roads) varies greatly throughout the city. An annexation of the entire fringe area was to have been voted upon in the November 1976 election, although it has now been rescheduled in September 1977. Anticipation of its passage is leading the city officials toward preparation of standardized service planning.

The budget process throughout all Washington local general purpose government is by law on an annual calendar year basis. Budget preparation in medium-sized cities usually begins in June or July with submission to the city manager's office by early September. It is presented to the Council in early November, and adoption follows in December. The long-term capital

budgeting is done in Kennewick and Richland under a six-year Capital Improvement Program. In Kennewick spending priorities are adopted by the Planning Commission after public hearings and the recommendation of the Planning Department, which receives and prioritizes department requests. It is updated each year, with the first year's priorities becoming part of the current year's capital budget and new projects being added to the end year. General obligation (GO), revenue, and local improvement district (LID) bonding is used almost exclusively in the area, although Kennewick has used the councilmatic form without yet reaching its debt limit. GO bonds require approval by 60 percent of the voters in Richland; in Kennewick GO bond issues also require a 60 percent voter approval, while councilmatic bonds can be sold, within prescribed limits, with the majority approval of a City Council.

Provision of housing and its related services are the most severe impact of the rapid population influx upon the local public resources in the Tri-Cities. As boundaries and development expand, roads, sewers, water, electricity, police patrol and fire coverage must also be extended. Building permits have doubled in each of the past five years, and the administration of both the process and the follow up (building inspection) has placed great loads upon the city itself. In Kennewick this staff has grown substantially and Richland has expanded building inspection staff from two persons to five persons during the five year period. In the seller's housing market that exists, the consumer can expect only that the minimum health and safety standards of the Uniform Building Code are

met. Even then overworked building inspectors on occasion miss violations in the health and safety standards.

The permit process varies slightly between jurisdictions, depending on the resources and organization of each. When rezones are required (Benton County does not require a zoning change for residential use in an agriculture district), the process generally takes 60-70 days. The applicant applies to the Planning Commission of the relevant jurisdiction (city or county), and a public hearing can be held within two weeks, (three weeks in Richland) although it usually takes longer. At the same time the applicant should be filing for subdivision approval from the planning department if residential structures are involved, for site plan approval if applicable, and for a shoreline permit from the State Department of Ecology. In Kennewick the site plan permit must be reviewed by the city engineer, the police and fire chiefs, and the public works director, in addition to planning department approval. In Richland a utilities connections permit also must be approved by the Utilities Director for all industrial applications, a temporary requirement resulting from their shortage in water and sewage treatment facilities.

The state of Washington requires that for most publicly processed development permits, a threshold determination be made. State law establishes certain applications which are exempt from environmental review. In Kennewick the threshold determination is made by an Environmental Assessment Committee comprised of the city manager, the directors of public works, parks and recreation, and planning, and the city engineer.

In Richland the threshold determination is made by the Planning Supervisor, and the process has an appeal procedure. If a declaration of significance is found, the process would probably take 65 days to complete: 30 days to prepare the draft; 36 days to review the draft and complete the final review. In assessing plans that included major subdivisions and shopping centers, Kennewick has never declared a development significant. If a finding of significance is made, the EIS drafts would be passed to the Department of Ecology after review and comment by the Governmental Conference.

Only after the EIS determination has been made can the Planning Commission hear testimony on rezone, subdivision, shoreline, and amendments to the comprehensive plan. Its recommendations are sent to the City Council (the applicant is given 30 days to appeal a denial), where a public hearing is again held and the first reading given. Two weeks later, at a second city council meeting, the second reading will be made and the ordinances adopted. The Council will approve the shoreline permit and send it on to DOE for a 30-day review. A building permit will not be issued until DOE approval is received. Once approved, a building permit may be given in as little as a day (for single residences) or as long as two weeks (for large apartment complexes or commercial/industry structures).

Transportation problems exist, but are really serious only at intersections and on major arteries where bypasses would be effective. Hanford employers have scheduled shift changes,

carpooling, and flex time to stagger the ingression peak loading of the roadways through Richland.

Although each city felt the need for more parks or park facilities (tennis courts, swimming pools, boat ramps or docks), none expressed a serious concern over a lack of park space.

Health facilities and service planning are by statute the responsibility of the Central Washington Health Systems Agency and its Benton-Franklin component. The Benton-Franklin Governmental Conference supplies support services.

Education facilities have also been impacted, not only by the WPPSS-2 plant, but also the other nuclear-related growth industries, the expansion of the agriculture-related job market, and secondary growth, particularly in the construction industry. The Kennewick School District has expanded from a 7,500 to 3,000 student enrollment in the last three and a half years, an increase of 20 percent. Under present, newly-revised state standards (measured by square feet per student), its facilities in 1973 were designed for 7,000 capacity. Since then a $2.4 million bond levy was passed in September 1975 to build a nine-room addition to an elementary school (presently under construction) and a new 800-student junior high school (construction about to begin). In September 1976 a second bond levy was passed for $1 million to construct two additional elementary schools. In the meantime, the district is presently using portables and double shifting to handle the large overloads.

Funding for the new construction is from a combination of local, state, and utility revenues. State matching monies (in Kennewick's case amounting to nearly $6 1/2 million) are

available from state education construction funds for areas qualifying with ratios of high growth to relatively low assessed valuations per student. State law (RCW 54.36) requires Washington public utilities to pay (1) operating costs of one third of the annual cost per student from utility-employed families if a threshold growth of three percent is proven; and (2) construction costs if negotiated by the taxing district (although this latter payment is not mandatory by law). WPPSS payments to Kennewick school construction funds equaled $510,000, about half of which was spent in the outright purchase of portable classrooms. Negotiations over the amount of payment delayed their purchase, however, until 1976, because the utility maintained that until WPPSS construction-family students were actually counted in school enrollments they were not to be held responsible for school district demands for new capital construction.

Completion of all planned school facilities financed by the recent bond levies will bring the Kennewick School District to a 1976 equilibrium (faciliites for 9,000 students). By then, however, it will be nearly 1979 and enrollment will be well on its way toward its projected 1981 peak of 12,000. It can be expected, therefore, that students in the district over the next half decade will experience continuing conditions of physical overcrowding, while their parents are asked to approve bond levies for new facilities that are needed just to be able to catch up with existing enrollment.

The Richland School District got off to a comfortable start when it acted early upon WPPSS' population projections

and added six-room additions to two elementary schools and brought three rooms in an old wing of the high school up to code with District funds. Until recently these additions were sufficient to house the student growth experienced from the nuclear- and non-nuclear-related developments over the past three years. The present enrollment of 8,200 students has moderately overcrowded their facilities, and the district, however, has begun raising class size averages from 25-30 or 32 pupils per teacher. Certain neighborhood schools are being especially heavily impacted as developers open large new subdivisions in close proximity to one another.

Two new elementary schools are planned to open in September 1978, with a new junior high following a year later. Local and utility funding is available for this new construction, but state construction funds have not been forthcoming due to its eligibility formula of "unhoused students" and a recent prolonged labor strike which has idled all construction workers at the plant and stopped the anticipated growth of new student enrollment in the school district. Until the new student populations actually arrive, therefore, the state cannot release additional construction funds, and the familiar cycle of overcrowd-improvise-catch up begins for this community as well as Kennewick. A minimum of one and one half years is required from design to final construction on elementary school structures. Two and a half years are required for secondary facilities (junior or senior highs), which include several more specialized areas and are generally much larger structures. Thus, the timing is getting very tight for the Richland district

staff if they are to realize a September 1978 opening of their capital projects. For the time being, however, the strike has brought a temporary halt to their anticipated five to six percent annual growth rate.

The increased capacity from the three new schools, in addition to the portables which will be installed with the utility's construction funds, are expected to suffice through the peak years of the WPPSS construction projects.

In sum, the financial situation for the school districts in the Hanford area being impacted by publicly-owned power plants constructed on tax-exempt land is as follows:

(1) Both plant and land are excluded from the tax rolls; therefore the valuation of the district does not increase as a result of the plant's presence. This lowers the assessed valuation per student ratio for the district if new students are enrolled as a result of plant construction. Without outside assistance, this presents a burden to district taxpayers who attempt to maintain the former quality of education for a larger number of students.

(2) State construction funds are available to areas which demonstrate rapid growth, on a sliding scale determined by the assessed valuation per student ratio. Some relief to district taxpayers is therefore available, as the state picks up an extra share of the capital cost needed for new construction projects.

(3) Utility construction funds also may be provided after negotiating with the school district. Usually these funds are spent on the purchase of portable classrooms, which are used to

house the overflow brought by new students enrolled from families of construction workers.

(4) Operating expenses during the time of plant construction are paid to the school district by the utility at the rate of one third the annual cost per student from a construction worker family. This means that the district taxpayers absorb two thirds of the operating costs to educate each utility-related student, plus 100 percent of the cost for all students enrolled as a result of secondary employment arising out of plant construction.

(5) Once plant construction is complete, a generating tax ("special privilege tax") will be levied and returned to local governmental agencies. It is expected that in the Richland School District this will amount to $100,000 to $150,000 annually out of a $12.7 million operating budget. Therefore the operating costs to the school district accrued from students of the power plant operating force should be covered, but little will remain to cover other expenses.

On balance and from this admittedly non-specific review, it would seem that the financial advantage to the school districts from the plant presence would be slightly negative. The districts will probably "break even" in most expenditure and revenue areas except during the construction phase, when school district operating costs will remain only partially covered by incoming utility impact payments.

APPENDIX B: THE STATE OF OREGON

Part I: The State of Oregon

Part II: The Two Case Studies

Part I: The State of Oregon

To determine the state's role in the identification of and planning for the social and economic impacts associated with nuclear power plants, and to get a general sense of the state facility siting process, members of the team talked to the following people at the state level:

Mr. Dave Hupp, Coordinator, Oregon State Intergovernmental Relations Division

Mr. Walter Pollock, Energy Systems Program Supervisor, Oregon Department of Energy

Dr. Kelly Woods, Energy Facility Siting Coordinator, Oregon Department of Energy

Mr. Bill Young, Director, Oregon State Intergovernmental Relations Division

The following summary is based on those interviews:

A. Siting

The state agency involved in the siting process for nuclear power plants is the Energy Facility Siting Council. The state requires the utility to obtain a site certificate for construction and operation of a power plant; it is in this context that the state can exercise any direct control over the impacts resulting from such developments.

A Nuclear and Thermal Energy Council (1971) preceded the establishment of the Energy Facility Siting Council and the State Department of Energy in 1975. The Department of Energy (DOE) generally has responsibility for state energy planning and coordination, including mandates to develop forecasts for state demand for energy and to regulate the siting, construction and operation of nuclear and coal facilities. Much of the emphasis

in this department is on developing information on state energy needs and supplies and upon energy conservation planning and implementation. The Energy Facility Siting Council consists of seven public members appointed by the Governor with Senate approval. The local governing body of the affected area is designated as a special advisory group to the Council during specific site certification processes. A major task of this Council is to preside over and coordinate the site certification process, making recommendations to the Governor regarding the approval of applications for site certifications. The Department of Energy is responsible for providing staff support to the Council. The Energy Facility Siting Coordinator is a staff member of DOE and is responsible for liaison between the DOE and the Council. Also, other DOE staff members contribute to the ongoing staff support of this body.

The Siting Council has the power to preempt local zoning or land-use plans, but this is seen as a little used tool (i.e., going against local concerns). Additionally, the Siting Council has the power to require special conditions of the utility, including specific identification of social and economic impacts as well as measures to mitigate adverse impacts. However, while the Siting Council makes site certificates conditional, it does not have clear enforcement powers for managing or monitoring community impacts beyond the site certification process.

There are no specific criteria for what types or degrees of impacts are of sufficient significance to require action by

the utility. Decisions as to what is significant is up to the Siting Council and their staff (using information from the applicant, from other state agencies and from public or private intervenors in hearings). Current rules deal primarily with land-use compatibility; the ability of the area to absorb growth and to cope with social and economic impacts are only a small part of this. Proposed new rules would place more emphasis on social and economic impacts. These include primary and secondary labor force, impact on the private sector, on the housing market, on commercial facilities, on private health care; also impacts on present community living patterns and community character, impacts on the region's economy, on public services and facilities, on public finances and tax revenues. Additionally this impact assessment should include an examination of the ability of the region's present planning process to cope with the plant's related impacts and an identification of sources of funding for districts that may have insufficient revenues to provide needed governmental services.

In Oregon, the siting process takes 26 to 30 months to complete from the initial Notice of Intent (NOI) to approval of the Application for Certification (AFC). A substantial portion of this time is accounted for in the waiting period of 12 months between the approval of the NOI and the filing of the application for certification.

The state siting process includes the following steps:

1. Utility files Notice of Intent to Council;
2. Notice distributed to state agencies for comments--comments go to utility;

3. Utility files Application for Certification;

4. Application sent to state agencies, local governments--comments go to utility (here the Council can require conditions);

5. Utility files amendment to Application with response to agency comments;

6. If need for special studies found by the Council, will authorize and award contracts;

7. Series of six monthly workshops--each deals with separate section of Application--public and expert input;

8. Final amendments to Application; the Council formulates and approves draft site certificate, if indicated.

After certification, the application goes to state and local agencies for necessary permits. These agencies may attach conditions to permits to assure impact mitigation. The Council has the power to revoke a certification if conditions and rules are violated, or if the public's health and safety is endangered.

Thus, the Council's involvement is limited but it can assist in assuring that social and economic impacts are actually mitigated by the utility.

B. Planning

The Oregon State Intergovernmental Relations Division (IRD) is responsible for various local government coordinating functions. This Division was formed in 1968, and has a staff of 11 professionals. The director is directly responsible to the governor and the agency has a strong interdependent relationship with the Governor's office. The scope of this agency includes review of all local and state applications for federal funding (A-95 review) and disbursement of HUD 701 funds except for funds

channeled directly to central cities and to regionals COGs. However, actual program planning and implementation occurs in functional departments in the state. This agency's authority does not include budget review other than that involved in the A-95 clearinghouse function. ORS197, the State Land Use Planning Bill, requires coordination between strong local comprehensive land-use plans and an overall state comprehensive land-use plan. The Land Conservation and Development Commission (LCDC) was created by the bill and has created state-wide goals (14 of them) for land-use planning. The overall goal is for each local area to have a comprehensive land-use plan reflecting various specific elements and integrated with the capital improvement cycle. A recent court case (Baker) has ruled that the comprehensive plan is binding and that it preempts zoning and subdivision ordinances. ORS197 is primarily a process document, setting guidelines for land-use planning as a continuous process that involves coordination between local governments and relevant state and local agencies and involvement of the public.

Although many communities are behind in the original compliance schedule, they do have a process for planning and preparing to manage growth and impacts caused by large developments.

The Intergovernmental Relations Division is concerned specifically about areas experiencing rapid growth and development since such communities frequently need state and federal assistance and get involved in a variety of funding and permit application processes. This agency has divided the state into

geographic regions and has assigned staff to each region to provide technical assistance and coordination with state and local planning programs. Thus they have a key role in assisting local governments in identifying, planning for impacts and particularly in coordinating local, state and federal efforts to plan for and mitigate impacts.

Under new legislation (SB903) this agency will have responsibility for coordinating state permits related to community development. These permits relate to the provision of social services as well as physical development. (Currently they have compiled a list of 186 state permits.) They will seek to coordinate permits on all three levels of government and are encouraging local governments to simplify their permit processes. Also, the Federal Regional Council is making a list of federal permits. The purpose of this legislation and function is not to aid people in getting permits, but to do away with unnecessary bureaucracy--to assure full due process. Permits here are not limited to physical development, but include use permits also. Under this function, the IRD is empowered upon request of the applicant to bring together all required hearings into a single hearing. However, the nuclear power plant siting process is specifically excluded from this legislation. Currently many permits issued at the state level also can be issued by the local government if they choose. Thus, in some cases the state issues building permits, septic tank permits, etc.

The persons interviewed expressed concern about federal influence in disbursements and expenditures of money. In some

cases direct federal-local grant programs create adverse impacts since they bypass the state and thus circumvent the state's coordination efforts.

In the mitigation of community impacts, the state fiscal system is a potential obstacle. Currently there is no adequate working system for equalizing benefits from large developments in order to pay for mitigation of impacts (e.g., tax revenues often go to local jurisdictions other than those which may bear impacts). One problem in the case of energy facility siting is the uncertainty during the licensing process; this uncertainty prevents fiscal planning.

Since the state is on a biennial budget, it is difficult for it to respond to sudden needs; however the state site certification process would seem to assure sufficient lead time to plan and budget for community impact mitigation programs. The state does have an emergency fund that can provide small amounts of "quick" money to deal with immediate needs. This can be allocated outside of the regular legislative process since it is administered by a special committee when the legislature is not in session. Finally Oregon has budgeted $4 million in the current biennium to help local planning efforts. While this is aimed at local compliance with the State Land Use Planning Act, it can provide timely financial assistance for planning in impacted communities.

The IRD, in short, is the primary state agency concerned about the community impacts associated with nuclear power plants. While they do not administer programs in all areas,

they have the key role of assisting local governments (through field coordinators) in identifying, planning for impacts and particularly in coordinating local, state, and federal efforts to plan for and mitigate impacts.

A final point should be noted regarding a problem that Intergovernmental Relations' staff frequently encounter in working with impacted communities. This problem is one related to the conflicts between old and new residents. Conflicts over differing values and lifestyles can have a significant impact upon efforts to plan and to mitigate impacts (e.g., loss of bond levies, tax base changes, etc.). This is a problem that must be handled at the local level but which also places a constraint on what the state and federal government can do to assist the community.

Part II: The Two Case Studies

Information presented in the following description of the two case studies was gathered from interviews with these individuals:

The Trojan Nuclear Power Plant:

Mr. John Cermack, Superintendent, Rainer Unified School District

Mr. John DeFrance, Director, Emergency Services, Columbia County, Oregon

Mr. Brian DeLashmutt, Planning Administrator, Columbia County, Oregon

Mr. Fred Fashaug, Commissioner, Columbia County, Oregon

Mr. Bill Wilson, Director of Instruction and Transportation, St. Helens School District

The Pebble Springs Nuclear Power Plant:

Mr. Bus Clough, Portland General Electric Community Liaison

Mr. Matthew Dougherty, Superintendent, Morrow County School District

Mr. John Edmondson, Assistant Superintendent, Morrow County School District

Mr. Lawrence Jones, Superintendent, Arlington School District

Mr. Foster Odum, Mayor of Arlington, Oregon

Mr. Jim Thompson, City Manager, Boardman, Oregon

The Trojan Nuclear Power Plant

A. Background

Columbia County (population: 29,000) is typical of many rural counties; little planning has been done in the past and

there is a general antipathy toward the restrictiveness of planning. When the Trojan plant was first proposed for this area, the county planning department did not exist. The planning commission was the only planning body in the county prior to 1969. The county has a comprehensive plan, but a very weak one which provides only the most general guidance with no specific land use or housing elements. In addition, much of the undeveloped parts of the county have remained unzoned. A new comprehensive plan currently is being developed to be in compliance with ORS197--the Oregon State Land Use Act.

At the time of the development of Trojan, the county did not participate in the impact assessment for the project, nor did the county rule on the zoning compatibility of the plant because the proposed site was in an unzoned area of the county. As a result of these factors, Columbia county residents and their local governments had little voice in the decisions related to the siting of the Trojan plant or in preparing for the impacts on the community created by the plant.

B. Planning and Impact Management Processes

In general, the social and economic impacts felt in Columbia County during the construction of the Trojan power plant were somewhat scattered. St. Helens, the county seat, was one of the most significantly affected communities since it is the major town in the area. The discussion below outlines the impacts in specific sectors of community life and how they were managed.

Most of the impacts from the nuclear power plant centered around St. Helens, the county seat and largest town in the

county (population: 6,212). However, the town of Rainier has received most of the tax revenues since the plant is located in the Rainier School Taxing District (60 percent of local taxes go to schools). (See discussion below on schools.) The major impact and the impact which first surfaced was a housing shortage in St. Helens. During the construction of the plant, most of the 1,000 construction workers sought housing in the county seat because of its proximity to both the plant site and Portland. Vacancy rates were down to 1.5 percent, with no rental houses and only some apartments available. The Columbia County Housing Authority was formed about this time and conducted a study (funded by HUD) to identify the area's housing problems. The major problems centered around the low vacancy rate and the lack of low-income housing; HUD funds were generated to build subsidized housing within the city. These houses were scattered around the city; now all lots in the city are filled. Part of the reason for this compact development is due to the lack of services outside the city limits of St. Helens. Also, development outside of established towns is constrained by two factors: (1) topography (hilly) and (2) timber lands--81 percent of land is owned by timber companies or the county.

The permit process for housing and building construction is still relatively simple in Columbia County. Building permits are issued through the local planning department; usually a two to three day process. Criteria for these permits include consistency between lot size and the zoning for the parcel. There is no specific lot size in unzoned areas, but is determined by the water and septic tank evaluation. Zone changes and

conditional uses are required only in zoned areas. These require approval by the planning commission followed by resolution of the Board of Commissioners, thus the timing of these permits are determined by planning commission meeting schedules. It is of interest to note here that recently the District Court of Appeals ruled (in Columbia County) that mobile homes over a certain size (oversized) are allowed outright on lots, and are considered as legitimate single family dwellings although they are taxed as personal property.

Both the Planning Department and the Roads Department are involved in planning, construction and maintenance of roads. Until recently little transportation planning has been done by these agencies. During the construction phase of the Trojan plant, there were only moderate impacts on the transportation system. The impact was not on the roads themselves, but on the availability of gasoline. Columbia County was one of the areas harder hit by the gasoline shortage, in part due to the traffic generated by commuters (especially from Portland) to the Trojan plant site. More recently there has been an increasing impact on the local transportation system because of current growth of the area as an exurb of Portland.

St. Helens felt some impact on its recreational facilities, particularly ball fields, during the Trojan construction period. In response to the increased demand for these facilities, the city of St. Helens and the County Fair Board each built some new ball fields. There was no perceptible impact on hunting and fishing recreation, possibly because there is such a large capacity for these sports. There are only three small county

parks in Columbia County. The planner pointed out that there are unmet needs for parks, such as a lineal park for hiking, in the county, which at present has no state or regional parks.

A substantial impact was felt by the educational system during the construction of the Trojan plant. The school district almost exclusively impacted by the Trojan power plant was in the Rainier area, which has the plant located within its boundaries. Prior to construction, it was one of the poorest districts in the state, having a very low assessed valuation per student. After construction was completed, it became one of the wealthiest. When news of the siting decision came, the surrounding school districts consolidated from separate elementary and high school districts into a unified system. They quickly made plans for a long-range capital construction program, and on the strength of future revenue issued 17-year bonds to finance the building of an $8 million community complex. Included in this center will be the elementary, high school, and continuing education facilities, as well as an auditorium, swimming pool, banquet facilities, and playfields. It will be a center for all community activities as well as school functions, as none has been available for civic meetings prior to this time.

Enrollment has increased in the district from 1,200 to 1,700 in the past six years, with a burst of growth in the second and third years of construction. The district was forced to add 13 portable classrooms which it purchased through long-lease contracts with local district funds. The bonds for the new construction were sold in 1973 with the uncommon provision that payments would begin two years after purchase--that is, when the

plant was scheduled for completion and the first full revenues would be received. Such financing arrangements, of course, gave the district a two-year headstart on actual construction schedules, with a commensurate reduction in the time spent by students in portable facilities. With the increased revenue now on hand, the district has been able to add major new program areas to its course offerings. For example, special education programs and a variety of other student services are being handled by ten newly hired staff members. A community school awarding accredited two-year college degrees has been established under the district's management, wholly financed by local area residents and therefore outside the community college system offered through the state education office.

The school district has indirectly benefited from the general growth that is occurring the the community as new people and industry are drawn to the area by its reduced tax rates. Though nearly all families associated with the construction force had left the area by late 1976, the district experienced no permanent drop in enrollment figures. New construction and new families have replaced the old, and a steady growth is expected in the future. A oil refinery is persently under construction in the district, which will provide further revenue, and it is assumed that the primary siting determinant was the low rate levied by the school district.

Other school districts within the county are benefiting to a certain extent by the presence of the plant through the equalization function of the Intermediate Education District (IED). This agency has the authority to levy taxes on all

property within the county, pro-rated for each county according to its assessed valuation per student ratio, in order to pay a certain percentage (approximately 50) of the member districts' operating expenses. Taxpayers in the Rainier School District equalization process find themselves paying approximately $1.50 for every $1.00 that is returned to them from the IED funds. It must be remembered, however, that most of the taxes paid in the Rainier District come from Trojan. The obvious problem with this "equalization" scheme is that the remaining one-half of all operating costs plus all capital construction funds must be provided by each individual school district.

The administration staff at the St. Helens School District identified no enrollment pressures at all resulting from the Trojan construction. Two factors accounted for this situation: (1) Trojan contractors were primarily from nearby large population centers (metropolitan Portland, Vancouver-Longview, Olympia) and drew their workers from the union hiring halls located in those areas rather than from the local labor pools. (2) A housing shortage in St. Helens precluded many new residents from moving into the area. The only minor impact being felt during the operating phase is that portion of their budget which is being assisted with IED "equalization" funds. (See above.)

Trojan-related growth created a relatively moderate impact on local health care services. The primary effect was to shock the country into realizing that they were not ahead of growth in the area, particularly with regard to hospitals and retirement homes. As a result the hospital districts sought federal funding (which was refused) and additional taxes in the form of

local bonds to expand the hospital facilities. There is now a new hospital near St. Helens.

At the time of Trojan construction the County Health Department provided various health services such as home nursing visits and innoculations which were able to absorb the additional demands. The state has taken over the provision of limited services; now there are only innoculation and alcohol programs.

There was an increased need for police services as a result of Trojan-related growth in the area. This need was primarily for traffic control and LEAA and CETA funds were used to increase personnel. The staff has since been cut back as the federal funds were available only for a limited amount of time.

Partly due to the potential increased demand on fire services (service to the plant site itself is contracted to the Rainier fire district) fire stations and staff have been expanded. Bonds were passed by the voters; there are now three stations and over 20 full-time staff.

An additional facet of the history of Trojan is the Emergency Services plan. In the state of Oregon, each county is required by law to have implementation plans for the state civil defense plan. Civil defense has been replaced by Emergency Services; the plan deals with various types of disasters, including war, nature, and man-caused disasters. Columbia County employs John DeFrance on a full-time basis to develop and coordinate plans for an incident caused by Trojan. Upon request by the local government, the utility contributed funds to set up this full-time position; currently the office is funded by

50 percent local funds and 50 percent federal funds received through the state Defense Civil Preparedness Agency.

An emergency plan has been written regarding what types of incidents could occur, using information provided by the utility and the State Department of Health. The utility is responsible for dealing with onsite incidents; the state is responsible for dealing with onsite and offsite incidents; and the locals are responsible for offsite incidents. The local plans contain: (1) potential incidents; (2) methods of notifying residents; (3) methods for sealing off the area (e.g., road blocks); (4) methods for determining whether to evacuate residents adjacent to the plant; (5) evacuation procedures, including identification of reception areas.

These plans have been coordinated with local police, fire, roads departments and hospitals. These agencies have copies of the plan. Also county commissioners are kept apprised of the plans.

The Emergency Services' director has been trained by the NRC in emergency services for nuclear facilities, as have some of the fire and police department personnel. Such training has included radiological monitoring. The primary emergency plans instruct the fire and police personnel to set up road blocks and to evacuate or confine people from the affected area.

The county has incurred an increased cost of $10,000 per year for this office. However, the director feels that a positive benefit of this cost and service is that it forces the county to deal with emergency services planning and that it has

made equipment available at no cost to the general county government.

There were no impacts in the area of community solid waste disposal that were related to Trojan. During Trojan construction, this service was under the Sanitation and Health Department. Now the Planning Department handles it. Private collectors operate the collection service and a private landfill site. The County Solid Waste Franchise Committee, with staff support from the Planning Department, oversees and has control over rate changes and provision of adequate services and facilities.

In the town of St. Helens, water and sewer are two basic public services provided by local government. St. Helens has a new sewage treatment facility which has the capacity for a population of 32,000. This was built in 1970 under an EPA grant (an EIS was required by the state for this facility). In areas that are not served by sewers, the State Department of Environmental Quality (DEQ) requires a permit for septic tanks. The state evaluation costs the applicant $75 which covers a soil evaluation (approximately three days for soil analysis); the county must sign off on this permit and then the state charges $25 for this permit (the sign off is the responsibility of the planning department and it takes two days). Water supplies must be tested and approved by the State Health Department.

The water problems in the county are not due to Trojan, but rather are caused by outdated water systems in some of the smaller towns.

The development of planning and local government is an evolving process, but one that was sped up by Trojan as well as by ORS197. The impacts of Trojan probably did help to establish the Columbia County Housing Authority since it gave them a clear justification and purpose. However local government has experienced cutbacks since the early 1970's because of decreased revenues from timber sales. (Taxes in Columbia County are lower than average due to revenues received from these timber sales on private and county owned, but state managed, lands. These sales have dropped off, because of the building slump.)

The immediate impact of Trojan in the area of welfare was to take people off unemployment and welfare since it did provide some unskilled and skilled jobs. However, after the construction phase, unemployment rose to even higher levels, possibly due in part to people brought to the area by Trojan but unable to find jobs. Welfare and unemployment are state functions, so there has been only an indirect impact on local government.

There was no impact resulting from noise at the plant. Noise considerations, if they had existed, would have been handled through zoning on the local level. The State Department of Environmental Quality sets standards and noise levels for specific types of land uses.

There was little change during the construction of Trojan in retail services. Since growth was perceived as temporary, Portland served as the market for most specialized goods and services. There is some growth occurring now; the general growth of the area is recognized as permanent. Thus there is more incentive to develop more varied retail trade.

No Trojan-related impact was perceived in the area of juvenile affairs. The staff of this county agency has been expanded, but as a result of normal growth.

There appears to be a definite impact on general psychological well-being which started with Trojan and is now continuing with the general growth of the area. People are discontented with growth and the resulting change in their small town lifestyle. In their discontent many people blame local government; however local government is somewhat limited in helping to ameliorate the problems since many residents do not feel land-use planning can prevent growth. In fact many county residents perceive planning only as a tool for growth.

Summary. As one can see in the foregoing discussion, neither the state nor Columbia County developed a comprehensive impact management strategy to deal with impacts associated with the construction of the Trojan nuclear power plant. The lack of a formalized impact management strategy was due to several factors. First, at the time, Oregon had not yet formulated the state siting mechanism. Second, neither the county nor the communities had much planning capability. Since the impacts from the plant were somewhat diffused by its proximity to Portland and the Longview-Kelso, Washington areas, there was not as much perceived need for a comprehensive approach to managing the impacts. However, the problems related to provision of housing and hospital services might have been circumvented had there been a more coordinated effort to manage impacts. Thus, Trojan presents a typical example of the fragmented approach to impact management that has characterized, prior to

the state siting laws, state and local responses to impacts caused by the construction of energy facilities.

The Pebble Springs Nuclear Power Plant

A. Background

To date only geologic and tectonic excavations have been made at the site of Portland General Electric's (PGE) Pebble Springs nuclear power plant. A site certificate has been recommended by the Oregon Energy Facility Siting Council but needs the governor's signature. Intervenors have appealed the Council's recommendation to the courts, and the governor cannot act until this litigation has been completed. The communities in the meantime have assumed a "go ahead" stance and have updated city and county comprehensive plans to accommodate the new populations.

Word of the proposed sites did not "filter down" to the local communities--the reversal was in fact true. It was local action which brought PGE's attention to the possibility of building a nuclear power plant at the original Carty site. When the state siting council refused certification for a nuclear power plant near the Boardman Bombing Range and issued a permit only for a fossil-fueled plant, PGE consultants identified the Pebble Springs site as a promising alternative for the nuclear plant. According to the PGE field representative, Arlington officials at that time encouraged PGE to give serious consideration to locating the plant near their community.

B. Planning and Impact Management Processes

Boardman and Arlington are unusual small towns in that they have been involved in the planning process for a long period. Completion of the John Day Dam downriver from their townsites brought floodwaters which permanently covered their original towns. The Corps of Engineers, as a result, completely relocated the two towns on higher ground. Corps financial assistance was given only on the condition that the newly-sited towns prepare comprehensive land-use plans to guide development. Thus comprehensive planning came to Arlington and Boardman in the early 1960s; and the results were well liked by the townspeople.

Another event which stimulated planning was the 1973 passage of the Land Conservation and Development Commission Act (ORS197). This act required all Oregon units of government to prepare comprehensive plans, incorporating 14 statewide goals and planning guidelines and coordinating these plans with neighboring jurisdictions and other levels of government. Thus Morrow and Gilliam Counties have already developed an integrated growth policy with the cities of Boardman and Arlington, respectively, as well as with other towns throughout the two counties. Although their comprehensive plans have not yet been approved by LCDC, their basic tools of zoning, permit issuance, and utility service extensions are now guided by an overall growth policy apparently accepted by most of the local units of government.

Another advantage that both Boardman and Arlington have in preparing for the social and economic impact resulting from

the plant is the service of a state liaison field officer from the Office of Intergovernmental Relations. His knowledge of growth management problems and of solutions found in other regions, and the services of his office with its one-stop state permit processing system make his assistance very valuable to these communities. His familiarity with the resources of the various state agencies available to meet the region's service and capital needs have also been useful to the local administrators of the two towns.

A further technique being used to smooth the development process at the Pebble Springs site is the use of a lifetime resident of Arlington, who is well respected, very active in community affairs, and knowledgeable about local concerns and government operations throughout the region, as a PGE field representative and liaison between the community and the power company. Because of this liaison and the rural nature of the area it was possible for all affected communities to have an effective local voice present their concerns to PGE and for PGE's position in turn to be expressed to the local communities by someone they knew and trusted. Company-community relations appear to have greatly benefited as a result of this liaison arrangement.

A final help to the communities in preparing for the impact at the local level has been the strong planning assistance provided by the five-county regional planning agency, East Central Oregon Association of Counties. The Council of Governments allocates federal funds throughout the area and at present, under new leadership, is doing a good job of setting

reasonable priorities among development needs. The populations among the counties view the growth as bringing regional benefits, and consequently have expressed no competitive ill will over the allocation decisions. Although state assistance has been valuable, federal financial aid is required to assure that good growth management actually occurs. To this end the COG's role in processing grant applications for small communities like Boardman and Arlington is a vital function.

Although the construction phase has not started at the Pebble Springs plant, growth is already occurring from nearby agricultural and power plant developments. Thus impacts associated with the nuclear power plant are difficult to separate from the general growth pressures of the area.

The two communities most affected by the neighboring PGE power plants (a coal-fired plant at Carty, in Morrow County, is presently under construction) are Arlington and Boardman, which are expected to draw 52 percent of the new population. Another 22 percent are expected to move into more distant communitites within the two-county arc of Gilliam and Morrow counties (Skidmore, Owings and Merrill, 1975). The peak of the labor force is expected in late 1978. Construction force decline in the two plants is expected to be countered by additional power plant construction projects in the area and/or by development of new employment opportunities in non-power related industries (primarily agriculture). The scenario may shift if either legislation or capital financing problems restrict the development of nuclear power, although the growth-based industries are sufficiently diversified, and the potential for coal-fired

plants is good enough so that the communities are not likely to experience any abrupt decline in their growth.

The provision of housing and its related water and sewer services is the most immediate problem confronting the local governments in the Pebble Springs-Carty impact area. The opening of new employment opportunities in a food processing complex in Boardman has accelerated the growth pressure that is just beginning from the Carty construction force. Thus, at present the vacancy rates in both Arlington and Boardman are approaching zero and most of the new housing demand is being supplied by Hermiston, a bedroom community whose tax base is finding it difficult to support the influx of new families and service requirements. The housing plans for Arlington and Boardman are expected, however, to considerably ease the current pressure on their more distant neighbors. The plans include a firm reliance upon the private market to provide the majority of housing units. In addition PGE has provided 100 singles quarters, 50 trailer pads and is in the process of subdividing land for 40 single family units and an apartment complex for its employees' purchase. (See the discussion in Chapter IV on PGE's Energy Projects Housing and Community Development Corporation.) An entire "new town" has been planned by a private developer that will triple the area within the city limits of Boardman. The city will provide the roads, sewers, and water when new facilities have been built. PGE has contributed the cost of sewer hookups for its subdivision lots as matching money for the city's application for EDA funds, with the agreement that the loan will be gradually returned upon sales of the

lots. Yet, present expansion of the new town is limited by the maximum capacity at which both sewer and water facilities are operating. (The design capacity is for 1,000, and the population is now there.) The grant process has been delayed for over a year and a half due to a challenge on the environmental impact assessment. According to the city manager, the challenge was unfounded and could have been settled early had the process allowed for direct refutation on a factual basis. Bonds have been passed for expansion to 7,000 of both the sewer and water systems, but further developments in the Boardman housing market must now wait until the systems can be constructed. The delay has been costly to the surrounding communities that have had to absorb the overflow from the Boardman housing shortage.

In Arlington much of the growth in the last two years (from 490 to 740) can be traced to the Boardman housing shortage. With a water and sewer design capacity of 1,200, there is still room for expansion. Housing is short, but a definite increase in supply from the private market has been observed over the past year. Although mobile home parks are being developed, the concern of local citizens is that an optimal blend of temporary and permanent housing be found. At present a comprehensive plan which includes statements on the proper housing mix is being developed by a consultant based upon detailed and well-thought-out city council objectives. Their growth policy is to provide services for a population of 3,400 people and no more. It is felt that at such a size the town would be able to support a few of the retail services which it now lacks and

a medical professional, while retaining the basic small town characteristics and amenities which it posses.

The county development policy in both Morrow and Gilliam counties is to locate all new developments around already existing urban areas. But in doing so it has accommodated the preference of the urban areas to regulate themselves by negotiating an Urban Growth Boundary Agreement with the town governments. This is an agreement, entered into by both Arlington and Boardman, that gives each city absolute jurisdiction over land use within a certain number of feet of its boundary. Beyond that point, up to a mile and a half radius encircling the city, the development permits are to be negotiable between the city and county governments. If Gilliam County adheres to its urban center focused growth policy and Arlington clings to its 3,400 population limit, the future may bring a clash between the two governmental units. Such a situation would then be mediated, under present law, by LCDC. Total anticipated population growth resulting from the Carty and Pebble Springs work force in the city of Arlington in the peak year of 1978 is 2,200. Thus the city would be only 500 residents short of its sewer capacity just two years after setting its growth limits.

In the very near term, if the population grows as expected, the water and sewer capacity of Arlington will be reached. A sewer study is underway as a requisite for federal funding to expand the system, but the Economic Development Administration has taken the position that grant applications will not be processed until demonstrable need is shown. With only two-thirds

capacity demanded at present, federal administrators have been reluctant to process Arlington's request. The current uncertainty surrounding the future of the Pebble Springs plant further complicates the issue of demonstrable need. Lead time for project construction is three and one-half years, so the future of Arlington's sewer and water systems is likely to parallel the bottleneck presently existing in Boardman's development timetable.

Zoning amendments and building permits are very easy to attain in the two cities. The process usually requires two to three days, or a week at the most. The conditional use permits which were required for the two power plants took, however, about two months to process. Because the cities are already platted and zoned, the only check on a building permit application is for proper setbacks. Under regulations drawn up to implement a recent act (ORS197), mobile home park standards are set and enforced by the state; the local governments, therefore, only need check for proper zoning of the development. Questions were raised by the local officials, however, concerning the legality of state usurpation of home rule powers, as well as whether adequate enforcement of the ruling would be available. After one week without moving the mobile homes, inspection by the state is required to insure proper lot size and utility connections.

Health and public safety services in the two-county area are limited. Good volunteer fire department help is available, and Arlington has a police force. Boardman and Arlington also rely on the state troopers and the county sheriff's patrol force, both of whom regularly patrol through each area. A problem, however, in areas like this during the construction period

is the lack of adequate detention facilities. Arlington is purchasing an ambulance and has a part-time nurse available for emergencies, but both towns must rely on hospital services at either the Dalles or Hermiston when a doctor's treatment is necessary. The COG has worked together with the service area in actively seeking grant funds for a Morrow County health clinic serving three counties and located in Boardman.

The school district in the immediate area of the Pebble Springs plant is the Arlington School District, which finds itself in the enviable position of having not only excess capacity but also an existing capital improvement fund large enough to enable the financing of new classrooms or portable structures if (and when) the need arises, without requiring passage of a special levy or bond issue. If a free-standing new school structure were demanded, however, the superintendent anticipates no reluctance on the part of the district residents to approve the issue. Schools have been traditionally well supported in the area, with the latest two levies passing with 71 percent and 76 majorities.

Existing enrollment in the high school is 57 students, with 116 in the elementary school. The district could double the enrollment at both schools without too much strain, as has already been demonstrated during the construction of the John Day Dam in the early 1960s when the high school served 110 students. The slack presently existing in the system is therefore expected to provide enough of a "time buffer" to prepare for the planning and construction of new facilities if permanent growth is anticipated. Portable classrooms or

additional classroom wings are expected to be easily provided. The district encompasses the Pebble Springs plant within its boundaries and is already receiving inventory taxes from its stored equipment, even though the site preparation has not yet begun. Additional revenue is received from the rich agricultural lands which lie within its taxing jurisdiction.

Planning for the Pebble Springs construction force was completed several years ago, with the PGE impact study estimating the projections for student increases. Actual impacts have been delayed, as the construction start-date has been repeatedly postponed. The residents and school board are no longer poised for imminent action, but are now simply waiting to see when and if the PGE plant activity will begin, thus signalling to them that their updated plans can be put into motion. In the meantime, 24 children have been absorbed into the school system in the 1976-77 school year from the Carty power plant labor force (which has 288 construction workers at present).

The situation of the school district serving the Boardman residents is far different from that of Arlington. The Morrow County School District is coterminous with the county line and therefore encompasses the southern town of Hepner and Ione as well as the north residents of Boardman and Irrigon. The district has a total enrollment of nearly 1,500 students, with approximately 270 students in the high school (grades 7-12) at Boardman and 350 students at the elementary school (grades K-6) 12 miles away in Irrigon. All facilities at the two north end schools are heavily overcrowded, with team teachers loading up classrooms and spilling into hallways, the gymnasium, auditorium,

and lunchroom. Eight new classrooms at the elementary school are under construction, with four new high school rooms just recently completed. In the fall of 1977, 115 new students are expected from the Carty plant families, and these will immediately fill all excess capacity brought by the recent additions.

By the spring of 1978 more ove crowding is expected, and approval of a bond issue will be sought from Morrow County residents. This is not expected to be easy, for the last bond levy passed by only a five vote margin, even though that issue contained new facilities for every school in the district. It is hoped that the new tax base revenues generated by the Carty construction will soften the impact of a new bond levy enough so that the idea of new facilities for the north end schools can be sold to other county residents. Capital improvement plans call for construction of an elementary school in Boardman, then a junior high school somewhere in the north end, and an addition to the high school. In the meantime the students will be taught in overcrowded facilities (although the student/teacher ratio is still low, as they are able to hire adequate numbers of new staff) and in temporary structures, which can be purchased if necessary (after advertising a supplemental budget) with surplus reserves at the end of each year. Double shifting has not yet been scheduled as it increases the transportation costs to the district, although it is a likely arrangement for the future.

The reluctance of Morrow County residents to approve new school construction bonds is in part a result of a conservative fiscal philosophy which approves expenditures only upon actual

evidence of need. Therefore the overcrowding of the schools must occur before voters are willing to approve new construction bonds. With a one to one and a half year lead time required for elementary construction and two and a half years required for completion of a secondary facility, the interim inconvenience occasioned by such a philosophy is considerable. However, to a limited extent such caution may be understandable. The PGE study had forecast a very large surge in school population in the Boardman area, brought about by rapid home construction. Two factors, however, have split the growth away from the area: (1) the inability of Boardman's water and sewer treatment facilities to service new households and (2) the decision on the part of area contractors to place new housing subdivisions in the areas where shopping facilities were available. As a consequence the majority of workers on the Carty site are commuting from Hermiston, Umatilla, and even the Tri-Cities in Washington. With new water and sewer treatment plants now under construction, however, and the price of gasoline continuing to increase, the anticipated growth may yet occur, particularly as Pebble Springs construction begins. School planners, however, are estimating that the Boardman population in the next decade will increase to 4,000-5,000 rather than the PGE estimate of 10,000. Whichever prediction is borne out, it is apparent that the Morrow County School District will continue to operate on an overcrowded and improvised basis until population "boom" levels off.

The fiscal condition of Morrow and Gilliam counties, and of each of the towns within them, is solid. The two counties

have the lowest tax rate in the state. Industry is being attracted to the area for this reason, as well as for the developing infrastructure and amenities. The school districts are county-wide. Since 65 percent of the average Arlington taxpayer's share is earmarked for schools, the large amounts contributed by the two plants to their respecti.e school districts decrease all county tax bills substantially. Although increases in the tax base have been thought necessary (Arlington voters approved in November a change from $25,000 to $50,000), the increase in actual dollars is nominal and will decrease as construction on the plants continue. Early generation of revenues has also resulted from the Oregon inventory tax, a law that is being phased out, but that is in the interim of considerable importance to this area. Although construction has not begun at Pebble Springs, Gilliam County already has $23 million on the tax rolls because of equipment and plant pieces stored at the plant site.

Revenue and General Obligation bonds are used exclusively by the two cities; a simple majority is required to pass a bond. The voters have not been reluctant to pass bond levies when a need is perceived, and recent Park, School, and Sewer and Water bonds are examples of identified needs.

APPENDIX C: THE STATE OF CALIFORNIA

Part I: The State of California

Part II: The Two Case Studies

Part I: The State of California

The following people were interviewed concerning the state siting process and planning for the social and economic impacts associated with nuclear plant construction:

Mr. Gary Heath, Staff Member, State Clearinghouse, Office of Planning and Research

Mr. William Kirkham, Management Systems Officer, State Clearinghouse, Office of Planning and Research

Ms. Kathryn Matthews, Environmental Planner, Energy Resources Conservation and Development Commission

Mr. Clare Poe, Staff Member, Energy Resources Conservation and Development Commission

Mr. Richard Recht, Consultant, Palo Alto, California

A. Siting

The California Energy Resources Conservation and Development Commission (ERCDC) or the Energy Commission is the state energy planning and regulatory agency. This commission is responsible for planning for electrical energy needs within the state and for certifying all new thermal energy generation facilities. Additionally, it has exclusive authority to set forth and administer standards applicable to new generating facilities (except air and water quality standards).

The permit process has been consolidated so that the Energy Commission conducts the hearing proceedings for all aspects of the state site location, design and performance standards. Unlike the other state energy functions, the California Energy Commission is given a strong mandate and attendant power to plan and implement a state electrical energy plan. The Commission itself, made up of five members appointed by the Governor, presides over the Energy Facility Siting Council.

The following describes the legislative intent of the Act setting up the Commission:

> The basic intention of the Act is to centralize into one state agency most of the responsibility for assessing future electricity demands, evolving a plan to meet those demands and to reduce them where they are the product of waste and inefficiencies, to make appropriate tradeoffs between environmental and energy values; and to administer a single certification process in order to lessen the time between application and certification. In these quests, the new state commission is granted exclusive authority to set forth and administer standards applicable to new generation facilities (except air and water quality standards). The Commission thus has the authority to preempt all other standards applied heretofore by other state agencies and by local governments (including local general plans and zoning ordinances) except, presumably, standards contained in air implementation plans and water quality effluent limitations. Moreover, to a large extent, multiple proceedings before such agencies as local planning commissions, local legislatives and the Public Utilities Commission (which dealt with site location, design and performance standards) have been consolidated into a single proceeding before the new Commission (SEDWAY/COOKE, 1975, p. 55).

The Energy Commission has four main responsibilities: (1) forecasting and planning, (2) certification of facility sites, (3) research and development, and (4) contingency planning for periods of energy shortage. Within the defined scope of this project, we focused on the certification process. The steps in the NOI (Notice of Intent) and AFC (Application for Certification) processes are being revised, and it appears that the place of social and economic impacts in the processes is still unclear. The Sun Desert power plant is the first plant which will go through the process and is not far along at this point. In fact, Jones and Stokes, a local Sacramento consulting firm, is preparing the framework of an EIR "cookbook" for thermal power plants--describing what types of information should be included. By the middle of January 1977, the Energy Commission is anticipating having their EIR guidelines prepared. (They are the lead agency in preparing the EIR for each power plant sited and licensed under their process--they must ensure that the plant is sited and constructed in compliance with the California Environmental Quality Act (Cal. Pub. Res. Code $^{ss}_{ss}$ 21000 et seq. Supp. 1976).

California's siting process is lengthy, requiring 36 months from the filing of the Notice of Intent to approval of the Application for Certification (18 months for each of these two steps). California also requires that three alternative sites be presented for consideration in the Notice of Intent and that Application for Certification focus specifically on one of these three sites.

The Energy Commission appears very interested in the consideration of social and economic impacts and local governmental concerns, but as mentioned earlier, is still gearing up its whole

process, and its staff members have few specific answers to how considerations for such impacts will be included in the EIR guidelines. In the meantime, several staff members in the Siting Division are tracking the impact analysis and planning efforts of the communities around the Sun Desert site as they prepare for the major social and economic impacts which are anticipated.

Relating to the local planning process, there are several important points in the certification process, mandated by the law, which should be discussed. First, in both the NOI and AFC processes, as soon as the Commission decides they have sufficient information from the utility, they must publish a summary of the notice or application in "a newspaper of general circulation in each county in which the sites and related facilities, or any part thereof, designated in the notice are proposed to be located. The Commission shall also transmit a copy of the notice to the Public Utilities Commission, for sites and related facilities requiring a certificate of public convencience and necessity, and to other federal, state, regional and local agencies having an interest in matters pertinent to the proposed facilities at any of the alternative sites."

The Commission then requests comments from the appropriate local, regional, state and federal agencies, the Public Utility Commission (PUC) (if a certificate of public convenience and necessity is required), and the Coastal Zone Conservation Commission if a permit is required from them (at present, however, they are giving no permits--arguing that no coastal site is suitable for power plant location).

After the appropriate agencies are notified, the Commission holds public information hearings in the county of the proposed site. These hearings must be held no later than 90 days from receipt of an NOI.

One specific point to note, which has been implemented, is that local governmental agencies are reimbursed for reviewing and providing input to the Notice of Intent and AFC. The agency must submit an estimated budget before they begin reviewing, and then formally request the funds after they have been reviewed. The Commission reimburses the local planning agency directly out of their funds and then bills the utility. To date 30 local government agencies have been reimbursed by the Commission for review of plans for the Sun Desert nuclear plant and a Pacific Gas and Electric combined cycle plant in the Bay area. The Commission has billed the utilities for those costs. The Commission also has an information packet which they distribute to local communities once they receive word from the utility that a site is being considered. In addition, the law establishing the Energy Commission mandates the Commission to consider local plans and ordinances when reviewing the suitability of a proposed site.

An observer of the Energy Commission in California commented that the procedures of the Energy Commission were not working out as well as he hoped. He explained that the Energy Commission originally structured its siting procedures in two stages, the NOI and AFC steps. The first step was to allow for public involvement before decisions were set, at an estimated cost of $250,000 (per Notice of Intent) to the utility. The process

has evolved, however, to a point where utilities are submitting 2,000 page Notices of Intent at an estimated cost of $7 million. He thought that ERCDC will ask for $250,000 from the utility just to study the NOI. The problem, it appears, is that every division of ERCDC asks for information and massive lists of data get assembled. This listing approach means that ERCDC is not setting priorities for what types of information are most useful to its decision-making process. A further problem resulting from the massive amounts of funds and time going into the NOI is that the process and the decisions are actually becoming formalized at a very early point in the siting procedure. Data are less accurate because the point in time which the data estimate is further and further into the future; the amounts of money spent early in this process to collect such data more or less lock the information into the process. Finally, there is a requirement in the NOI that the utility submit three alternative sites for its plant. Each of these communities are of course informed and conflict arises in the community between those who support the project and those opposed to it. Much energy is spent by each of those communities to resolve a conflict which may never occur.

The other standards or regulations which must be met in the siting process are air and water standards. In fact, it is possible a utility can apply for other permits before going to the Energy Commission. Water is obviously a very crucial issue in California, and the water permit is critical. (Also, it is one over which the Commission has no control.) The air quality permits are issued by regional air quality boards.

B. Planning

In California, the Office of Planning and Research (OPR), located in the Governor's office, monitors local government attempts to cope with power plants and is interested in providing assistance to localities. This agency is responsible for comprehensive land use and environmental policy planning for the state but as yet has not developed actual statewide plans. It is empowered to coordinate local and state functional planning as they affect state development and environmental quality. A third responsibility of the agency is to monitor local governments for the consistency between their zoning laws and general plans although currently the enforcement of the zoning consistency law is not carried out. This power potentially provides a mechanism for the state and local government to influence the site certification process and for the state to monitor the growth management planning associated with energy developments.

Currently there is no formal structure within the OPR for providing specific types of technical or financial assistance or services to impacted communities, although such services are being provided to sites currently under construction on an ad hoc basis. At the San Joaquin site, for example, the OPR recently commissioned an impact analysis from several towns to be affected by the four nuclear units. This assistance is to encourage the towns to begin the planning and coordination process.

Another area of impact management which concerns the OPR staff is that of fiscal inequities in the distribution of community costs and benefits attributable to plant construction.

Both San Joaquin and Sun Desert are expected to face considerable difficulties in providing services to workers and their families who must locate outside the taxing jurisdiction of the plant. In response to similar experience in other areas and to the pending difficulties that are bound to occur in these two cases, the OPR is presently drafting an Industrial Siting Bill designed to require tax sharing among impacted jurisdictions. They plan to introduce this bill to the California State Assembly in January 1977.

Since the site certification process is lengthy in the state of California, there does not appear to have been any problem in coordinating planning and budgeting cycles at state and local levels with the siting process. The state learns of the proposed plant from the Energy Commission when it sends the NOI to state and local agencies for comment, early in the 36-month process. This allows the state OPR ample opportunity to assist communities in identifying needs or to respond to community requests for financial assistance for specific services or projects (that would be provided by other agencies). Although the potential exists, the OPR and other state agencies have not yet developed or administered any formal mechanisms for providing technical or financial assistance to local communities impacted by energy developments.

Part II: The Two Case Studies

Interviews were conducted with the following local officials to determine the local role in the siting process; local interaction with state and utility officials; and the local role in the assessment and management of social and economic impacts associated with nuclear power plants.

Rancho Seco

Mr. Earl Fraser, Special Assistant for Planning, Sacramento County

Mr. Bernard Guerin, Senior Analyst, Administration and Finance Agency, Sacramento County

Mr. Melvin S. Hing, Finance Administrator, Administration and Finance Agency, Sacramento County

Mr. Glenn Houde, Superintendent, Elk Grove Unified School District

Mr. C. Tobias Johnson, Superintendent, Archoe Union Elementary School District

Mr. Paul Shaad, Former General Manager, Sacramento Municipal Utility District

Mr. Walt Veda, Chief of Park Planning and Development; Department of Parks and Recreation, Sacramento County

Diablo Canyon

Mr. Thomas M. Butch, City Administrator, Arroyo Grande

Mr. Dave Harrow, Environmental Coordinator, San Luis Obispo County

Mr. Warren Hoag, City Planner, Grover City

Dr. Robert Hoagland, Superintendent, Lucia Mar Unified School District

Mr. Fred Kimball, Former Member, Board of Supervisors, San Luis Obispo County

Mr. Norman D. Rich, Principal Appraiser, San Luis Obispo County

Mr. Ned Rogoway, Planning Director, San Luis Obispo County

Mr. Terry Sanville, Planning Associate, City of San Luis Obispo

Mr. A. C. Smith, Community Relations Representative, Pacific Gas and Electric Company

The Diablo Canyon Plant

A. Background

Diablo Canyon is a nuclear power plant complex consisting of two units, each approximately 1,100 megawatts. The plant is owned by Pacific Gas and Electric Company (PG&E) a private utility. The utility began planning the plant in about 1965, did geologic surveys in 1966, and began some construction in 1968, according to their public relations man. Construction of Unit 1 is basically complete, while Unit 2 is being completed. The NRC held hearings in San Luis Obispo County in December, preparatory to their decision on an operating license for Diablo Canyon.

Diablo Canyon is located in San Luis Obispo County, in an isolated area of the Pacific Coast. It is about eight miles from the nearest entrance to Highway 101. The nearest population centers are about five miles south of the Highway 101 turnoff; they are the towns of Pismo Beach (population 4,850), Grover City (population 7,325), and Arroyo Grande (population 8,525). The city of San Luis Obispo (population 34,550) is located about eight miles to the north of the Highway 101 exit. The principal governments which had to cope with social and economic impacts from Diablo Canyon were Pismo Beach, Grover

City and Arroyo Grande (the three incorporated areas in the "South County" region); Lucia Mar School District (a consolidated school district serving the South County area); and San Luis Obispo County.

The impacts of the construction work force on the surrounding communities were moderated by a number of factors.

First, construction began at a time when the South County area was somewhat depressed. In the early 1960s, the area had boomed as a result of the space program at Vandenberg Air Force Base (about 30 miles to the south). When that program slackened, South County towns saw vacancy rates climb to ten percent. In Arroyo Grande, total assessed valuation in the town declined ten percent from the previous year. The San Luis Obispo county planning director disagrees with this assessment, however. He feels that other officials' memory of the timing of housing recovery is hazy. His own data showed a sharp increase in mobile home park permits during the time Diablo Canyon construction was underway.

Second, the influx of construction workers was gradual, taking perhaps four years to hit the peak work force, and a similar period of time to decline.

Third, the county was growing due to other factors. In the city of San Luis Obispo, California Polytechnic University was growing fast enough to make the housing situation in that town quite tight, and this growth was having some effects on the more distant towns in the South County area. The South County itself was growing due to rapid increases in the number of people buying retirement homes there and moving in from Los Angeles.

Thus the towns were prepared to cope with the initial population growth due to Diablo Canyon. In later years they did experience some of the problems of rapid growth, but it is clear that Diablo Canyon made only a partial contribution to those problems. The one jurisdiction clearly impacted by Diablo Canyon was the Lucia Mar School District. In 1975 Lucia Mar had 542 students from the families of Diablo Canyon workers (7.6 percent of the enrollment of 7,100). About ten percent of those students were from families who were permanent residents of the district. So the district actually gained about seven percent enrollment due to the plant. The district's difficulty comes not from the additional enrollment as much as from a series of events related to school district financing, which are described below. Its problem is that it cannot tax the plant itself, which is located in an adjacent school district. As a result, Lucia Mar had a substantially lower tax base than its neighboring districts, and has difficulty getting adequate revenue from district residents to cover its needs.

B. Planning and Impact Management Processes

The people we interviewed associated with the county were not aware of substantial impacts on county planning. One aspect of long-range planning which we did find to be affected was the Safety Element of the county and city general plan. The state of California mandates long-range planning by local governments, and is quite specific about what must be done. The Safety Element is one part of the general plan for each jurisdiction. It covers radiation hazard and response to emergencies, among other topics. The San Luis Obispo County Safety Element makes some

attempt to deal with problems created by Diablo Canyon, but the level of detail appears to be only sufficient to comply with requirements for discussion, and is not sufficient to instruct local officials as to their responsibilities.

Pacific Gas and Electric did not have to get a zoning variance for the plant. The site was zoned in a "hold category" and could be used without additional permission. According to a former member of the Board of Supervisors, the plant did require a building permit, which was issued by the County Board of Supervisors following open hearings and investigations into the seismic safety of the site. The routing of transmission lines to the site was discussed at the hearings, but the county had no formal control over where they went. Mr. Smith of PG&E said that the utility did coordinate the routing with the county planning director in order to minimize community unhappiness, even though they were not required to do so.

Officials we spoke to were rather vague about the dates and amount of time involved in the county permitting process. Their experience would be much different now because the State Environmental Quality Act would apply, requiring a full Environmental Impact Report on the plant before the permit could be granted.

Local governmental services to the plant were few. An existing road leading from Highway 101 toward the plant was reinforced and a bridge on that road was replaced. Both actions were needed in order to accommodate construction equipment, and were paid for by the utility. Most heavy equipment was moved by rail to Pismo Beach and trucked from there over the reinforced

road and then over a new road on the site constructed by PG&E. The heaviest equipment was brought directly to the site by barge.

In the future, the county may get involved in the regulation of transport of waste materials. A planner for the city of San Luis Obispo is concerned that the rail route out of Pismo Beach goes over a particularly steep and hazardous mountain pass, and is the scene of derailments about twice a year in his estimate. He is hopeful that the county will intervene in order to insure that the durability of spent fuel casks is not tested by a derailment within the county watershed. This transportation regulation will be a problem for the county during the operational phase, but there is nothing in the process to affect the siting and construction phases for the plant.

The city manager of Arroyo Grande reported to us that an informal count of work force traffic emerging onto Highway 101 at the end of the day showed that 70 to 80 percent of the workers headed south--toward Pismo Beach, Arroyo Grande, and Grover City. We interviewed officials in the two larger cities, Arroyo Grande and Grover City. In both cases we found that the cities were in the fortunate position of having already provided for sewer and water capacity well in excess of their current size. When workers from Diablo Canyon and immigrating retirees caused population growth, neither city had any problem in extending sewer and water service as new construction occurred. Fire and police service were not strained: fire service is done by volunteers, while police forces grew slightly.

As mentioned earlier, schools were the one service which were strained by the additional demands. That strain was not the

should be clear that the more rapid the growth, the more delay there will be in changing assessments, and the more the county, town and special district revenues will lag the demand on their budgets.

The town of Arroyo Grande found its revenues increasing in one other way: As employment at Diablo Canyon went up, citizens paid user charges (such as their water bill) much more promptly.

It is important to note that the county does not have the task of assessing the value of the power plant itself. In California, the State Board of Equalization has the responsibility for determining the value of the real property held by public utilities, and then distributing that value in proportion to the assets which are physically within each taxing jurisdiction. The construction of the Diablo Canyon plant meant that several jurisdictions received taxes, due to the location of the plant itself, assorted equipment, rail yards, or transmission lines within the various districts. But the California system of requiring the state experts to make the assessments sped up the process of collecting those taxes.

The system of financing schools in California is complex; in the case of the Lucia Mar School District, the impact of Diablo Canyon has been exacerbated by the particular provisions of the California financing system, and by the time at which those provisions went into effect.

For many years in California, the level of expenditures in each school district was a function of the wealth of the district (its property tax base) and the level at which the population was willing to tax itself. The wealth of districts varied

result of the timing of processes needed to add capacity classroom, however. If the Lucia Mar School District had had the funds, it would have had enough time to build the schools. The entire process would take about three years, according to the district superintendent.

In California there are two important sources of revenue for local governments--the property tax and the sales tax. The property tax is the only revenue source for schools, and is a major revenue source for counties, cities and towns. The sales tax is less important; of the total rate of six percent, five percent goes to the state while the city or town receives one percent. The sales tax collection process responds relatively well to growth. For example, as the town of Arroyo Grande grew due to Diablo Canyon construction, town sales picked up and so sales tax receipts increased automatically.

The process of property tax collection is a bit more complicated. There is more time lag in between the growth in a town and the increase in tax receipts to reflect that growth. When property values change, the county assessor must review the assessed value of each piece of property. The San Luis Obispo county assessor has a regular review program with a goal of reviewing (on an area-by-area basis) all property at least every five years. When an area is undergoing rapid growth or decline, the assessor tries to update assessments more often, but is constrained by lack of manpower. The assessor does manage to assess new construction and property which has changed hands on a fairly regular basis, so some of the South County property would have paid increased taxes as a result of sales. But it

widely. If large industrial facilities were located within district boundaries, the district could ordinarily afford high per pupil expenditures and low tax rates on its citizens. In an effort to equalize the resources of school districts (and make the districts more efficient), the state encouraged many small school districts to unify in such a way that the unified districts would be approximately equal in wealth. The unification process in San Luis Obispo county took place during the early planning stages for the PG&E nuclear plant. The original site picked by PG&E was at Nipomo Dunes, a coastal site south of the Pismo Beach/Grover City/Arroyo Grande area. Opposition from the local Sierra Club in the mid-60s forced PG&E to change its plan to the Diablo Canyon site. But school planners had drawn up the boundaries for the unified districts in San Luis Obispo county after the Nipomo Beach site was announced. They drew the boundaries in such a way that the Lucia Mar district and the San Luis Coastal district would have approximately equal tax bases. Voters approved the boundaries in a unification election. When PG&E shifted its plant, Lucia Mar district was left with no industrial tax base, while San Luis Coastal had twice the base it expected. In 1976-1977, PG&E will pay $4.4 million to San Luis Coastal and $80,000 to Lucia Mar.

The California Legislature later passed a reform in the method of financing schools (S.B. 90) which guaranteed state aid to some school districts. But the level of per pupil expenditure was frozen at the existing levels, which in effect froze the existing disparities. Even if a new plant were now to locate in Lucia Mar district, the school system could not spend

more than $996 per pupil, the rate established by law, without a vote of the people. In contrast, the San Luis Coastal district is permitted to continue to spend $1,500 per pupil.

So Lucia Mar School District's difficulties with the Diablo Canyon plant stems from its sense that it ought to have had the property tax base of the plant for its entire district--not just for the impact of the construction work force.

The financing system described above is certain to be changed as a result of a recent California Supreme Court decision in Serrano v. Priest.* The court found that the current system violates provisions of the California Constitution. A lower court judge found that it did, and that judgment has been appealed to and argued before the State Supreme Court. The California legislature is now required to revise the school financing system. Their reforms are not certain but it is likely that the new system will mean that the property taxes paid by the Diablo Canyon plant will be distributed evenly across all school districts in the state. The boundary problem will remain for other local government services besides schools, but it appears that in California the other governmental functions are not as dependent on the property tax.

Aside from the school district, we did not find anyone at any level of government who felt that their operating budgets were significantly affected by Diablo Canyon.

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*Serrano v. Priest, ---- California Reporter ----, (Decided by California Supreme Court on December 30, 1976).

The only information we found about capital projects is that discovered about the Lucia Mar School District. Note that their planning and decision process is informal. Capital projects come along only occasionally, and each is considered separately. It may be that there is a reasonable generalization here: Communities small enough to need capital projects to cope with construction work forces are apt to be small enough that there are not formal processes for deciding on those projects. Communities large enough to be constrained by capital budget processes (witn their pre-existing priorities for each department) are apt to be too large to need to expand capital facilities.

Rancho Seco

A. Background

The official announcement of plans for a nuclear power plant for Sacramento was contained in Sacramento Municipal Utility District's (SMUD) Annual Report for 1964. That year marked the beginning of a 10-year program to build the plant.

The first two years were devoted to location and purchase of the site. The SMUD siting group found a suitable site in the southeastern section in Sacramento County. The site offered the advantage of proximity to the planned Folsom South Canal, as it was necessary that it be located adjacent to a canal in the Delta for its cooling water. (There were alternate plans which called for transporting the water by pipeline.) The utility had to build a storage reservoir to hold at least 2-3 weeks water so that the plant would not be susceptible to fluctuations in levels

of canal water--in particular, drainage of the canals for maintenance. They also had to locate the site near a heavy rail line to bring in the heavy (500 tons +) equipment.

The site finally selected was a 2,100-acre ranch which was part of an estate in the process of liquidation. This eliminated the worry of purchase from numerous landowners, and the general manager of SMUD personally negotiated the transaction. During consideration of alternative sites the utility was in touch with a state siting committee, which existed before the Energy Commission. The state committee operated only in an advisory capacity, but SMUD felt it was good public relations to maintain contact with the state. SMUD received a formal letter of approval for the Rancho Seco site from the state committee.

The utility also reasoned that if they contacted the county during consideration of alternative sites, and sought its approval, that the county people would think they had some jurisdiction over SMUD. In fact, SMUD is a state entity under the State Municipal Utility District Act, and the county has no formal jurisdiction over its actions.

In the third year of the 10-year plan (1967) SMUD contracted with Bechtel for the design and construction supervision of a nuclear-fueled plant for the steam generation of electricity. In November 1967, the application for construction was filed with the Atomic Energy Commission; the permit was issued in October 1968. Construction started in 1969. "Original estimates indicated that the plant would cost $180 million and would require five years to build. Inflation, design modification and a one-year

extension of the construction schedule were expected to increase the cost to approximately $350 million with completion in late 1974" (Ward, 1973, p. 79). Since 1974, there have been numerous technical problems, so that the plant has actually been down most of the time. According to the Special Assistant for Planning for Sacramento County, estimates range from a $25,000 to $500,000/ day loss for each day the plant is down.

The construction work force came primarily from Lodi, Sacramento and Stockton. They commuted and therefore did not require much in the way of services.

The planning department of Sacramento County was in the process of revising its general plan for the southeastern section of the county, and holding public hearings, when they first learned of the proposed Rancho Seco plant. According to one interviewee they would have known of the plant at least one year earlier if it had been built by a private utility, since they did review private utility plans. However, because SMUD was public and its own governmental entity they did not have any negotiations with the county prior to announcing the plant at the public hearing.

The county had no objections to the siting of the plant, however they were "embarassed" at the way they were treated by another public agency. The only costs to them were in terms of the additional writing and drafting necessary to amend the plan.

B. Planning and Impact Management Processes

In general, the lead time for planning was adequate for county purposes. There were at least two years from the time

of the public announcement to the beginning of the construction phase. (and there was very little the county had to do in terms of providing services, etc.). Under the present EIR process there would also be adequate lead time of at least two years.

There were evidently no local communities or governments involved--the site is in an isolated, agricultural section of Sacramento County.

Our information indicates that there were no zoning or building permits required for the Rancho Seco site. An amendment was made to the general plan, as mentioned, although most likely more as a formality than as a significant administrative procedure. Essentially the county had no control over the Rancho Seco site. The state apparently didn't have much control either, although they did issue the formal letter of approval.

The Southern Pacific Railroad was required to strengthen its rail line into the site so SMUD could move the heavy equipment on it. The general manager of SMUD at the time felt that the utility probably paid for those improvements "in one manner or another." There were evidently minimal road problems, and none that involved the county.

The county was required to develop an Emergency Services Plan, including in part, provisions for an accident at the Rancho Seco plant.

Discussions with the school districts surrounding the Rancho Seco site and with the suburban Sacramento district closest to it disclosed no direct impacts upon their staffs or facilities. The two school districts nearest the site are the Arcnoe Union

Elementary School District (enrollment 250, one school) and the Galt Joint Union High School District (student population 950, two schools). Both districts bus all students to their respective schools, and it was on their transport systems that the only minor impact came. Busses were rerouted onto side roads during the construction years so as to avoid the heavy truck and commuter traffic on the main east-west highway (104) that runs through the districts and past the plant, then up into the Sierra foothills. Enrollment fluctuated by no more than 25 students throughout the construction years, as the labor force commuted from Sacramento and other populated areas within driving distance.

Because the plant is a public utility, the only indirect impact it had upon the two districts is its withdrawal of 2,000 acres from their tax rolls. State law requires that all public utilities pay local taxes at the rates which are assessed at the time of purchase. The original use of the area was for light cattle grazing, so SMUD is paying between $300 and $400 each year to the districts. Anticipated future revenue loss is the main problem associated with the new land use that the district has encountered. Among the 2,000 acres of "frozen" tax revenue lands is a large grove of eucalyptus trees which had good potential for residential development. The foothill location of the area has made it a future growth area for the nearby metropolitan area.

Before plant construction began, the Archoe District annual operating budget was $190,000. It is presently $370,000 because of the state's passage of AB1641, an equalization act,

which reallocates a portion of school district revenue area-wide (usually county-wide). (Chap. 323 of California Statutes of 1976.) The minimal revenue generated from the Rancho Seco plant has played no role in boosting the district revenue, of course.

Student enrollment did not change in the Elk Grove Unified School District, a suburb of Sacramento, as a result of plant construction force dynamics. Again, the reason lay in the commuting practices of the construction force. The only noticeable change in the school district's activity came with active participation on the school board and in other district activities of two operating executives from SMUD.

Parks and Recreation was one impact area where the county was involved. As mentioned earlier, it was necessary for SMUD to build a storage reservoir to hold 2-3 weeks of cooling water, and to keep the reservoir constantly full. The utility decided that to increase public acceptance of the plant and to make people feel welcome there, they would investigate the feasibility of building a park around the reservoir. They had to purchase additional property from a rancher to have sufficient land for recreational purposes. They also knew that state funds were available for the development of parks around reservoirs; and although they did not want to be in the recreation business, they made an agreement with the county that if the county would agree to operate the park, SMUD would build it.

SMUD applied for the state funds (authorized by the Davis-Grunsky Act) and received them. The county government agreed

to operate the facility. SMUD hired a private firm to design and build the park; the county had no real control over the project in its construction phase. The county did hire an inspector to oversee the project in an informal way.

The county did have to make some revisions when they took over the park from SMUD, such as the reinforcement of some park buildings, for example. Walt Veda, Chief of Park Planning and Development, thinks that they did collect some money from SMUD to pay these costs. Funds for the maintenance of the park have been very small, and have not been a problem for the county Parks and Recreation Department.

Because the work force commuted from Lodi, Stockton and Sacramento, there were no problems with housing, health facilities, additional water and sewer systems, etc. Because Stockton and Sacramento are fairly large metropolitan areas, if there was unemployment resulting from the winddown of the construction phase, it would probably have been absorbed by the general economic conditions in those areas.

The county does not assess the Rancho Seco plant nor collect taxes from SMUD because it is a public utility. The county assessor looked at his 1970 and 1971 budgets and saw no material impact there resulting from the plant. He thought it might have had an impact on the Herald Fire District but because the county and the fire districts are separate, he could not measure the impact.

APPENDIX D: OVERVIEW OF POPULATION REQUIREMENTS--SOCIOECONOMIC IMPACTS OF NUCLEAR POWER PLANTS

By Steven C. Shulte

Overview of Population Requirements - Analysis of Factors Affecting Socioeconomic Impacts of Nuclear Power Plants

by

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October 1, 1976

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CONSTRUCTION SCHEDULE AND CONSTRUCTION MANPOWER

A typical key date construction schedule for a 1200 MWe nuclear reactor is shown in Figure 1. Planning and contracting activities from preliminary nuclear unit request to commercial operation of the unit are included on the schedule.

The actual construction (contracting) activity schedule for the same reactor is shown in Figure 2. Contracting activities from initial site excavation to owner acceptance of the unit are included on the schedule.

The construction work force required for this 1200 MWe unit is shown in Table 1.[1] Worker build up on the jobsite is shown by quarter over the six year construction period. The manpower requirement peaks at 1500 workers about 3 years into the construction schedule. An additional 180-200 personnel are required at the jobsite for management and engineering. Thus, total jobsite personnel during the peak manpower period will number 1700 employees. The number of workers required is site dependent and varies as a function of unit design, availability of labor, and worker productivity.

A 1600 MWe nuclear reactor requires 2250 construction workers during the peak manpower period.[2] An additional 250-270 management and engineering personnel are required at the peak. Construction of the unit requires 7-1/2 to 8 years.

The occupational distribution by craft of jobsite employees is shown in Table 2. This distribution is taken at the peak manpower period.

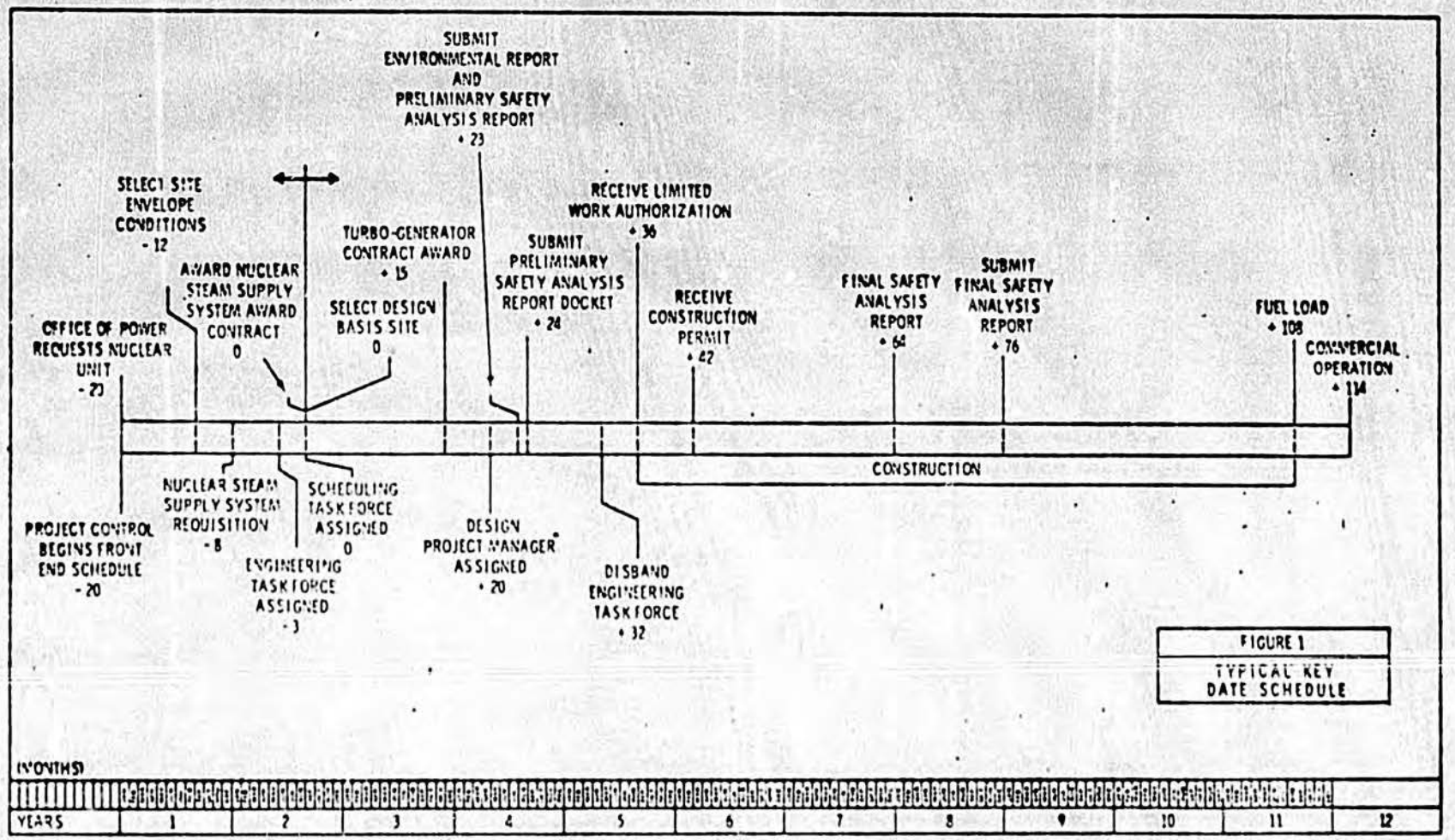

FIGURE 1
TYPICAL KEY DATE SCHEDULE

SOURCE: Two Unit Nuclear Plant, Tennessee Valley Authority, Division of Engineering Design, April 15, 1975

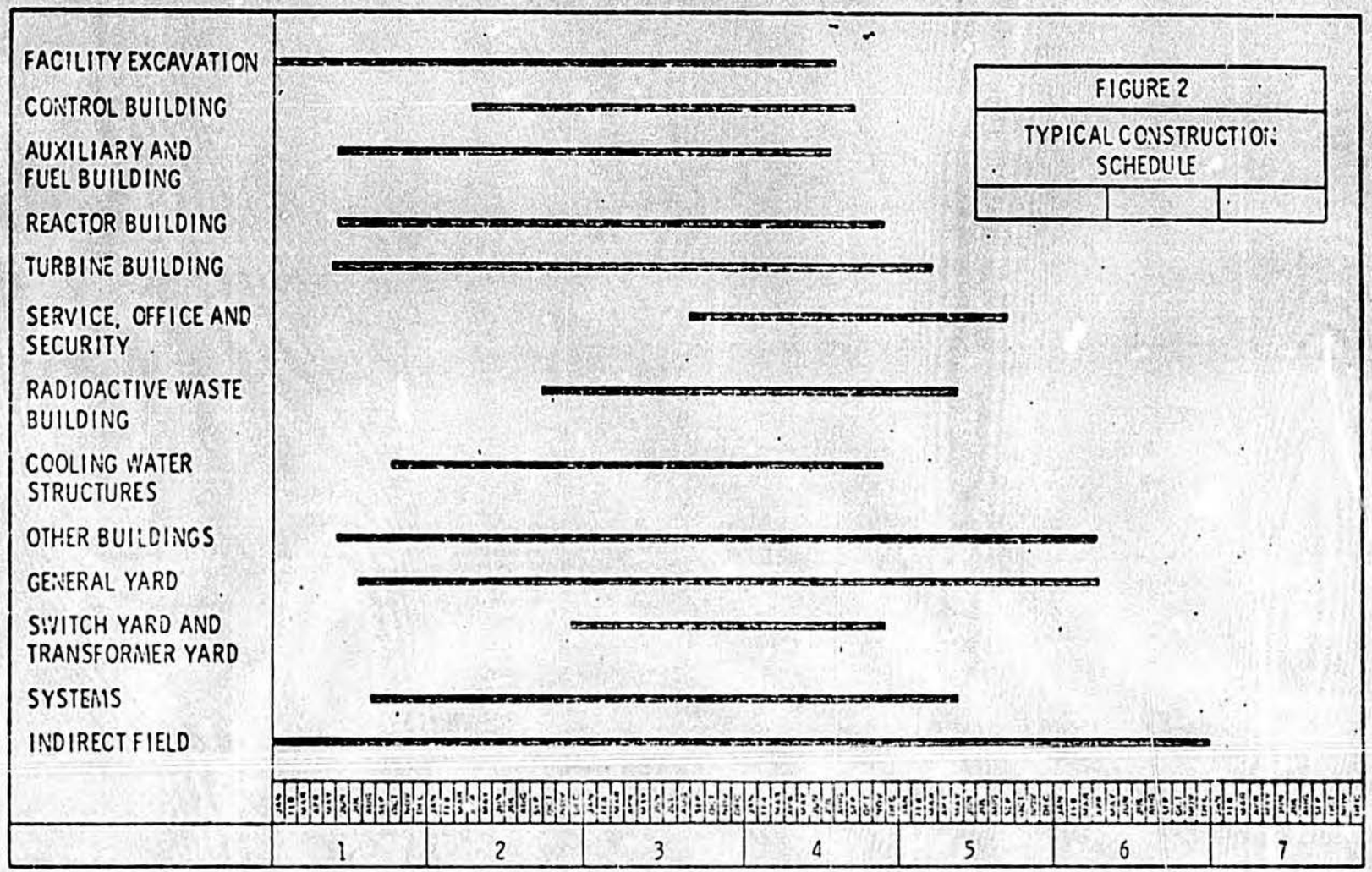

FIGURE 2

TYPICAL CONSTRUCTION SCHEDULE

SOURCE: Manpower Progress Schedule, Hartsville Nuclear Plant, Tennessee Valley Authority, November 7, 1975.

TABLE 1. Construction Work Force by Quarter Over a 6 Year Construction Schedule 1200 MWe Nuclear Power Plant

Quarter	Manpower (Beginning of Quarter)
1	120
2	245
3	370
4	540
5	700
6	850
7	1000
8	1150
9	1300
10	1360
11	1410
12	1440
13	1460
14	1470
15	1475
16	1440
17	1410
18	1330
19	1250
20	1080
21	910
22	630
23	350
24	180
25	25

Source: Hanford Nuclear Energy Center, Socioeconomic Impacts, K. E. Yandon, 1976.

TABLE 2. Occupational Distribution by Craft of Manpower Requirements 1200 MWe Nuclear Power Plant (peak manpower period)

Occupation	Manpower	Percent of Total
Management	180	10.7
Craftsmen	1244	74.1
Pipe/Steam Fitters	409	24.3
Electricians	185	11.0
Carpenters	135	8.1
Ironworkers	125	7.4
Operating Engineers	123	7.3
Boilermakers	99	5.9
Teamsters	51	3.0
Asbestos Workers	40	2.4
Millwrights	33	2.1
Painters	21	1.2
Sheetmetal Workers	13	0.8
Concrete Finishers	10	0.6
Laborers	256	15.2
Total	1680	100%

Sources: Projections of Labor Requirements for Electrical Power Plant Construction, 1974-2000. U.S. Atomic Energy Commission, August 1974, p. 5.

Construction Work Profile. A Study for the Old West Regional Commission, Mountain West Research Incorporated, December 1975, Table 3-16.

Project Independence. Federal Energy Administration Project Independence Blueprint Final Task Force Report, November 1974.

NEW POPULATION ADDED TO AREA

The number of construction workers available to the jobsite who are initially local residents is entirely site dependent and varies widely. Every project site must be individually assessed to determine the number of workers with required skills that are locally available. A worker is considered locally available if initially his residence is within daily commuting distance of the jobsite. For example, the WYODAK power plant in Wyoming when constructed found only 3.3% of the required labor force locally available. However, the SAN JUAN 1 power plant in New Mexico when constructed found 78.6% of the required labor force locally available.(3)

Local construction worker availability for a specific jobsite can be unexpectedly high because of worker acceptance to commute long distances. Nearly all construction workers will commute to a distance of 50 miles and consider the inconvenience as a requirement of their occupation. A comment from a local labor leader(4) concerning this subject seems especially pertinent:

> "For one thing there is great mobility among construction workers, with many of them owning and maintaining their own homes, but also possessing mobile homes which they can and do move to a project, providing it is one of sufficient duration to warrant doing so. However, the numbers given as 'daily or weekly' commuters, represent workers of that particular craft who actually reside within a sixty mile radius of the project location, and who would normally elect to commute. Some of those who have specified 'weekly' commuters are indicative of men who may live as much as 200 to 300 miles away, but who would elect to obtain bachelor facilities, and return home on week-ends. There is a substantial number of members who have worked for considerable periods of time at places such as Wichita Falls, Texas, or Wichita, or Topeka, Kansas, and yet they would not think of moving their families, preferring instead to return home on week-ends.
>
> In my honest opinion, however, by far the majority of the men counted as daily, or weekly commuters can be drawn from towns within the sixty - eighty mile radius."

Non-locals or travelers make up the remainder of the work force required by the jobsite. Only after the number of local workers available has been determined can the number of non-locals required be determined. Non-locals moving into the area and establishing residences are the primary cause of the adverse socioeconomic impacts. Local and non-local worker and family profiles are assumed to be identical, unless specified otherwise, in this report. There are always slight differences between locals and non-locals, but in many instances these differences cannot be adequately quantified and must be neglected.

The thirteen most recent TVA construction projects have averaged 73% of the required labor force initially locally available. The project with the least local labor available had 53% locally available and the project with the most local labor available had 83% locally available.[5] It is estimated that a Hanford Nuclear Energy Center would have 50% of the required labor locally available.[1] It is critical in any impact study that the initial phase of the study be an evaluation of the amount of local labor available to the jobsite.

The assessment of worker family size is important in determining new population added to an area. Construction workers who are single or who are married with family absent are considered as single workers. Workers bringing at least one dependent into the area with them are considered as family workers. The percentage of single workers in the total work force is partially site dependent but not nearly as variable among sites as the percentage of non-local workers in the total jobsite work force. Table 3 reviews typical values for single worker-family worker mix found totay for non-local construction workers.

The assessment of worker family size also involves determining the accompanying number of family members given the worker is not single. Again, the determination is partially site dependent. Table 4 shows typical family size for family construction workers.

TABLE 3. Single Worker–Family Worker Construction Worker Mix (non-local workers)

Source	% Single Workers	% Family Workers
2250 MWe Coal-Fired Electric Generating Plant	40%	60%
Camp Gruber Energy Center	25%	75%
Construction Worker Profile	51%	49%
Hanford Nuclear Energy Center	20-25%	75-80%
Unit High-Btu Gasification Plant	33%	67%
Major TVA Construction Projects	31%	69%

TABLE 4. Family Size for Construction Family Workers

Source	Average Family Size (includes construction worker)
Portland General Electric Co. Pebble Springs and Carty Sites	3.17
Construction Worker Profile	3.61
Unit High Btu Gasification Plant	3.5
Camp Gruber Energy Center	3.3
2250 MW Coal-Fired Electric Generating Plant	3.7

Nationally, there are 1.46 workers per family.(4) Therefore, in addition to the construction (primary) worker, each non-local family h s an additional 0.46 worker to offer the area work force. In other words, for every two non-local workers with families, approximately one new secondary worker is made available to the area's support work force.

A determination of the number of support workers required for every construction worker is also partially site dependent. Table 5 contains values for the number of support workers required for each primary (construction) worker.

TABLE 5. Support Workers Required (per construction worker)

Source	Number of Support Workers
Camp Gruber Energy Center	1.5
Hanford Nuclear Energy Center	0.5
2250 MW Coal-Fired Electric Generating Plant	0.3-0.9

One factor that often is not accounted for in the support worker/primary construction worker ratio is the additional support workers required to locally produce materials used on the construction jobsite. This factor when included should slightly increase the values found in Table 5.

Figure 3 is a population scenario which might occur during construction of a nuclear power plant. Total population added to the area is site dependent based on the assumptions shown in Figure 3.

Table 6 shows the age profile of local construction workers, non-local construction workers, non-local support workers, and national average age profile. Table 7 shows the education status of workers in the same four categories.

ASSUMPTIONS:

1. 60% OF CONSTRUCTION WORKERS ARE NON-LOCAL
2. 35% OF CONSTRUCTION WORKERS ARE SINGLE WORKERS
3. FAMILY SIZE OF FAMILY CONSTRUCTION WORKERS = 3.4
4. SUPPORT WORKERS REQUIRED / CONSTRUCTION WORKER = 0.6
5. PEAK CONSTRUCTION EMPLOYMENT = 1700
6. SUPPORT WORKERS / FAMILY = 0.46
7. SUPPORT WORK FORCE: 20% NON-LOCAL WITH FAMILY
   30% NON-LOCAL AND SINGLE
   50% LOCAL RESIDENT .

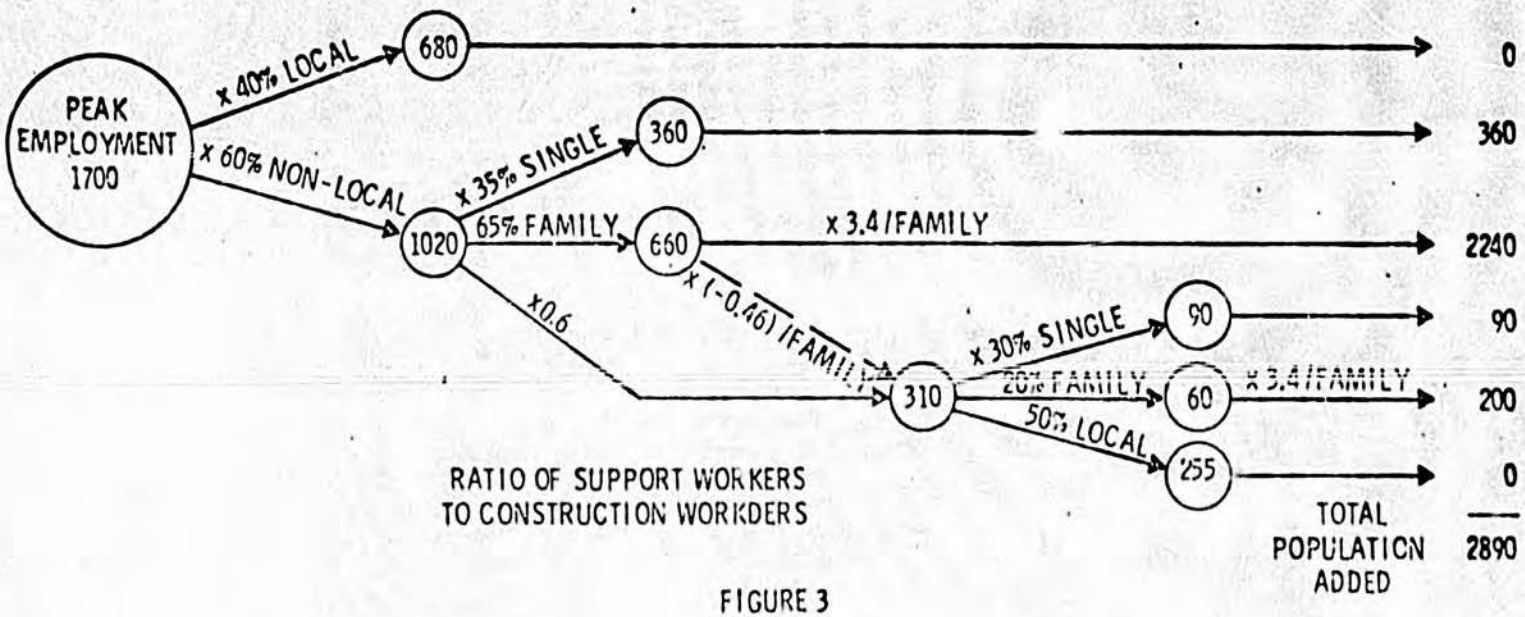

FIGURE 3

TABLE 6. Age Profile of Construction Workers

Age Categories	Local Construction Worker	Non-Local Construction Worker	Non-Local Support Worker	United States
14-24	7.0	24.0	19.6	8.4
25-34	23.7	40.6	52.6	20.5
35-44	23.1	15.9	16.7	16.8
45-64	29.9	18.9	10.1	34.5
65 or over	16.3	0.8	1.0	19.9
Total[1]	100.0	100.0	100.0	100.0

(1) Totals may not add to 100.0 percent because of rounding

(2) Source: U.S. Bureau of the Census, Consumer Income: Household Money Income in 1973 and Selected Social and Economic Characteristics of Households (Washington D.C.: U.S. Government Printing Office, 1974), p. 2.

Source: Construction Worker Profile, A Study for the Old West Regional Commission. Mountain West Research Incorporated. December 1975.

TABLE 7. Educational Status of Construction Workers

Highest Educational Level Completed	Local Construction Worker	Non-Local Construction Worker	Non-Local Support Worker	United States
Less than High School Graduation	28.4	13.5	11.0	39.1
High School Graduate	42.7	43.8	29.5	32.7
Some College	12.9	23.0	26.9	13.1
College Graduate	7.9	7.2	19.2	
Some Graduate School	2.2	2.0	4.5	15.1
Advanced Degree	3.4	1.2	5.8	
Vo-Tech School	2.5	9.2	2.9	--
Total(1)	100.0	100.0	100.0	100.0

(1) Totals may not add to 100.0 percent because or rounding.

(2) Source: U.S. Bureau of the Cenus, Consumer Income: Household Money Income in 1973 and Selected Social and Economic Characteristics of Households (Washington D.C.: U.S. Government Printing Office, 1974), p. 2.

Source: Construction Worker Profile, A Study for the Old West Regional Commission. Mountain West Research Incorporated. December 1975.

ADDITIONAL POPULATION HOUSING PREFERENCES

Additional population or non-locals establishing residences in the area require permanent housing. Housing preferences will be partially site specific and dependent upon existing housing inventories. Table 8 contains data on actual housing type, preferences, and actual housing demand.

TABLE 8. Community Housing Profile

Type of Unit	Percentage		
	Actual	Preferred	Demanded
	Local Construction Worker		
Single Family	0.76	0.87	0.81
Duplex, Townhouse	0.01	0.01	0.01
Apartment	0.04	0.03	0.04
Mobile Home	0.18	0.09	0.13
Other	0.01	0.01	0.01
	Non-local Construction Worker		
Single Family	0.19	0.46	0.34
Duplex, Townhouse	0.02	0.01	0.02
Apartment	0.10	0.08	0.09
Mobile Home	0.53	0.38	0.46
Other	0.16	0.08	0.10
	Non-local Support Worker		
Single Family	0.44	0.70	0.55
Duplex, Townhouse	0.05	0.04	0.04
Apartment	0.16	0.07	0.13
Mobile Home	0.32	0.17	0.25
Other	0.03	0.01	0.02

Note: Actual indicates respondent's present housing type, preferred is respondent's indicated preference, and demanded is type respondent indicates would be purchased if it were available.

Source: Construction Workers Profile, A Study for the Old West Regional Commission. Mountain West Research Incorporated. December 1975.

SOCIOECONOMIC REQUIREMENTS OF NEW POPULATION

A. Educational Facilities

The age distribution of non-local construction worker children is shown in Table 9.

TABLE 9. Age Distribution of Non-Local Construction Worker Children

Age	Total Percentage of Children
less than 5	35.7
5-11	36.3
12-14	11.3
15-17	10.6
18-19	3.5
20-24	1.9
24-29	0.6

Source: Construction Worker Profile, A Study for the Old West Regional Commission. Mountain West Research Incorporated. December 1975.

The number of children per non-local construction worker family is partially dependent upon the length of the worker's stay in the area. One study showed a majority of workers resident 0-6 months in the area were accompanied by 1.6 children and a majority of workers residence of 6-18 months were accompanied by 2.0 children.(6)

Currently accepted multipliers for educational facility requirements are listed in Table 10.

C. Water Supply Requirements

Water supply requirements multipliers are shown in Table 12.

TABLE 12. Water Supply Requirements

Item	Units	Multiplier
Peak Water Consumption	gallons/person/day	250
Yearly Water Consumption	gallons/person/day	180
Water Distribution Cost	cost/acre	$2,000

Source:
(1) Camp Gruber
(2) Fort Union Coal Study

D. Sewage Treatment Requirements

Requirements for waste treatment and waste disposal are shown in Table 13.

TABLE 13. Sewage Treatment Requirements

Item	Unit	Multiplier
Water Treatment	gallons/person/day	520
Sewage Treatment	gallons/person/day	160
Solid Waste Disposal (landfill)	acres/person/year	0.00027
Sewer Collection System Cost	cost/acre	$2000

Source:
(1) Camp Gruber
(2) Fort Union Coal Study
(3) Synthetic Fuels Commercialization Program

TABLE 10. Educational Requirement Multipliers

Item	Units	Multiplier
Elementary Teachers	Students/Teacher	18
Junior High Teachers	Students/Teacher	18
High School Teachers	Students/Teacher	18
School Administrators	Students/Administrator	200
Elementary School Space	Square Feet/Student	95
Junior High School Space	Square Feet/Student	110
High School Space	Square Feet/Student	115
Administrative Office Space	Square Feet/Administrator	150
Elementary School Cost	Cost/Square Foot	$35
Junior High School Cost	Cost/Square Foot	$35
High School Cost	Cost/Square Foot	$90
Administrative Office Cost	Cost/Square Foot	$40

Source: J. R. Young and K. E. Yandon. The Social and Economic Impact of a Camp Gruber Energy Center, BNWL, June 1975.

Anticipated Effects of Major Coal Development on Public Services, Cost and Revenues in Six Selected Counties, Final Report for the Northern Great Plains Resources Program, Montana State University, Bozeman, April 1975.

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B. Health Care Requirements

Health care requirements multipliers are shown in Table 11.

TABLE 11. Health Care Multipliers

Item	Units	Multiplier
Primary Care	Population/Doctor	1220
Speciality Care	Population/Doctor	1510
Dentist Care	Population/Dentist	2000
Hospital Beds	Population/Bed	250

Source: University of Denver Research Institute, The Social Economic, and Land Use Impacts of a Fort Union Coal Processing Complex, Final Report for ERDA Fossil Fuels, August 1975.

Synthetic Fuels Commercialization Program, Draft Environmental Statement, Energy Research and Development Administration, December 1975.

E. Recreational Facility Requirements

Table 14 contains recreational facility requirements for additional population in the area.

TABLE 14. Recreational Facility Requirements

Item	Unit	Multiplier
Community Park (100 acres)	Population/park	28,000
Neighborhood Park (10 acres)	Population/park	5,000
Playfields (15 acres)	Population/playfield	10,000
Playgrounds (4 acres)	Population/playground	2,700
Swimming Pools	Population/pool	10,000
Tennis Courts	Population/court	2,000
Community Building (5,000 sq ft)	Population/building	30,000
Library (700 sq ft)	Population/library	1,000

Source: University of Denver Research Institute, The Social, Economic, and Land Use Impacts of a Fort Union Coal Processing Complex, Final Report for ERDA Fossil Fuels, August 1975.

F. Local Facility and Employee Requirement

Municipal, county and state, facility and employee requirements are shown in Table 15.

TABLE 15. Local Facility and Employee Requirements

Item	Units	Multiplier
Municipal Administrative Employees	Employees/1,000 population	1.1
County Administrative Employees	Employees/1,000 population	3.9
State Administrative Employees	Employees/1,000 population	12.5
Municipal Administrative Space	Square feet/employee	150
County Administrative Space	Square feet/employee	150
State Administrative Space	Square feet/employee	150
Law Officiers	Officers/1,000 population	2
Police Station	Population/station	12,500
Police Vehicles	Population/vehicle	2,500
Firemen	Firemen/1,000 population	1
Fire Station	Population/station	10,000
Fire Equipment	Trucks/station	2

Source: University of Denver Research Institute, The Social, Economic, and Land Use Impacts of a Fort Union Coal Processing Complex, Final Report for ERDA Fossil Fuels, August 1975.

Synthetic Fuels Commercialization Program, Draft Environmental Statement, Energy Research and Development Administration, December 1975.

Conclusion

Many requirements of the additional population were not included in the previous tables. Additional capacity required on roads, public works, and recreational facilities are too site specific to develop a multiplier. Social problems that are especially prevelant among construction workers were not discussed. Alcohol and drug abuse, family disruption, employment difficulties and environmental degradation are difficult to quantify but do accompany construction projects.

As emphasized in the report it is important to have a site-specific evaluation for each project. The application of these multipliers cannot be considered relevant unless a thorough inventory of existing conditions in the area has been properly conducted. Once an inventory has been completed, multipliers can only be applied when non-local worker characteristics are known. A complete regional analysis is required to establish these characterizations. Only after these analyses are completed, can results be considered applicable in planning purposes.

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APPENDIX E: INTERVIEW SCHEDULE

Appendix E. Interview Schedule

Included in this appendix are the interview schedules for the state and local interviews conducted in Washington, Oregon and California by the research team. It should be noted that the questions in the interview schedules were used as general guidelines for the conversations and, in some cases, not adhered to strictly. The questions provided an orientation and direction to the interview; however, time limitations and the unique characteristics of a site which might make some questions irrelevant, had to be taken into account. In some instances relevant information not anticipated in the interview schedule surfaced during the conversation and the interviewers deemed it worthy to pursue, recognizing the trade-off between completing the questions and gathering new information.

Interview Schedule

Introduction

The purpose of our interviews with respect to this project is to obtain information from state and local officials regarding the mechanisms and processes used for dealing with social and economic impacts associated with the construction and operation of nuclear power plants. This project is funded by the U.S. Nuclear Regulatory Commission which is concerned that the development of nuclear power plants be better coordinated with state and local planning and budgetary cycles. Basically, we would like to discuss what your community experienced in the of social and economic impacts when a nuclear power plant was constructed here. Or, if the plant is not built yet, what impacts you are anticipating and how you are planning for and intending to manage those social and economic impacts. We are particularly interested in your planning, permitting and budgetary cycles.

While this project does not get into the actual development of improved systems for dealing with social and economic impacts in specific locations, it will provide recommendations regarding change in the NRC process so as to be more compatible with state and local planning cycles and processes.

All of the information obtained in these interviews will be kept strictly confidential. The information that you provide will be used to prepare a draft report. We will send

you a copy of our report dealing with how states and local governments deal with social and economic impacts for review to ensure our information is accurate. We strongly urge you to read and make comments on this draft. We want this report to reflect accurately what you have told us and to provide information that is useful to you in social and economic impact analysis and management.

Interview Schedule for Local Officials

We would like to talk a little more specifically about your experience with the _____ nuclear power plant.

1. How was the local community informed about the proposed nuclear power plant?

   -- by whom
   -- form and kinds of information
   -- nature of the contact

   If contacted by the developer (utility), has this contact been ongoing? How much cooperation has there been on plans and information between utility and local government?

2. Has the state had a role in the identification and management of socio-economic impacts (e.g. within site evaluation process). Are there any state requirements of local government? (e.g., submission of plans for housing/servicing new population, etc)

3. What steps has the local government taken to identify how the proposed plant would affect the local community--housing, transportation, public services, schools, etc.

   How does this fit into the existing planning framework;
   Has it required additional resources?

4. What county or local approvals must be obtained for licensing the facility? Were any special conditions placed on the utility or facility before giving these approvals?

5. How has the local government proceeded in addressing the prevention or management of socio-economic impacts? Specifically--(go into questions on particular impact categories)

6. What planning permits are required for capital projects

   a. Zoning
   b. Construction/building
   c. Water and sewer

   How much time is involved in obtaining each/and for the series of permits?

7. Does community have comprehensive plan?

   --check for land use/housing plans, etc.
   --How long does it take to make amendments to plan?

   What is the process involved in making amendments? Are service districts or areas used as a method of directing growth and provision of services?

8. Is a state or local EIS required for capital projects?

   --What steps are involved
   --How long does it take to complete EIS process (through approval)?

9. Local government structure

   --departments/responsibilities/number of professional staff
   --who is responsible (and what role) for planning for expected growth? Who is responsible for projecting employment, personal income, population, etc.

10. Annual budget cycle

    A. What is the decision process for county budget? Description
    B. How much time is involved in going through this cycle?

11. Capital budget cycle

    A. What is decision process for capital projects (e.g., is it done according to special districts, or for all)
    B. What is the time frame--how much time (years, 6 months) etc.)

12. Bonding

A. What kinds of bonding are used by local government to finance specific capital projects? (G.O., revenue)
B. What is the approval process for:

1. G.O.
2. Other bonds (e.g., revenue, councilmanic)
3. Voter approval required

Impact Categories -- What types of impacts occurred or are expected to occur due to construction of the nuclear power plant

Housing
- -- Provision of public housing (especially note need for it based on increasing rents for existing tenants as demand increases; workers may not need it, elderly and others on fixed income may)
- -- Regulation of housing--mobile home standards, building and housing development process

Transportation
- -- Who plans?
- -- Who pays?
- -- What are the impacts or needs resulting from plant construction? (e.g., congestion, increased accidents, need to upgrade old roads, put in new roads, demands on police, on need for transit development or expansion)

Recreation
- -- What problems are encountered in terms of increased demands on facilities and programs (indoor and outdoor recreation)
- -- What has been done or is planned for meeting increased demand?

Education
- -- What are the planning cycles for new school facilities (additions or new buildings) and for additional staff
- -- Were there any substantial impacts on direct classroom teaching or on other school services (e.g., special education, library, lunchroom,medical care, etc.)?

Health Care
- -- Who minitors this and plans for it?
- -- What is the timing of planning for health care facilities?

Police and Fire (Public Safety)
- -- What are projected (or actual) demands on police services; on fire services
- -- If more capacity is needed, is the problem personnel (or other operating costs) or capital facilities (buildings, equipment)?
- -- What are the planning, budgeting, and purchasing cycles for these services?

Solid Waste
- --Is the existing system capable of handling the increase in demand?
- --What can (or was) done to handle the increase? What time frame for planning, what procedure for budgeting; how long to construct, purchase, etc?
- --Were any temporary facilities used to cover lag time between demand and provision of additional services/ facilities?

Water Supply
- --Is there enough water to meet demands of both plant/workers and current residents and businesses?
- --If not, what needs to be done for planning, budgeting--what are the procedures involved (and time frame)?

Sewage Treatment
- --Similar to water supply

Government Administration
- --Are there any significant general burdens on government as a result of development? (e.g., need for more staff, or for restructuring/expanding the organization of local government, problems with revenue flow being too late to allow services?
- --What is/was projected fiscal impact of the facility? Especially timing of revenues, impact of increased demand (or provision of services in response to demands) on tax limits, debt limits, etc.

Welfare
- --Any problems with increased burden on welfare load resulting from workers flowing to area without jobs or being laid off from temporary jobs connected with plant construction? Who pays for welfare costs--state or local jurisdiction? (If sharing, how much for each, and what difference does that make? Could be that in-state migration of workers who are unemployed does not burden the local area in state where state picks up the full tab).

Noise
- --Who handles problems associated with noise "pollution"?
- --What regulations, how enforced?

Land Use
--What are/were the impacts on the overall development of the area; conflict with comprehensive plan
--How were such problems dealt with? by whom? What regulatory mechanisms?

Retail
--Impact of development on retail services--demand for more variety; shortage of goods
--Does local government have any role in meeting this need (This may be out of the purview of government)

Social Problems
--What are/were the problems in the areas of juvenile delinquency, alcoholism, crime, etc., that could be attributed to the development of the plant?
--Is/was there a strain on social service organizations as a result of growth? How do they cope with it?
--What (if any) role does the local government have in this area?

Psychological Problems
--What are/were the problems due to the change in way of life and possible perceived decline in quality of life by residents?
--Conflicts among old and new residents?
--What is the role of local government?
--What informal or social mechanisms are there for dealing with such problems?

Interview Schedule for State Officials

1. How does the state licensing process fit into the overall development process of nuclear power plants?

   --At what point in the plant development/planning must the state be notified of the proposed development? (what department or office is involved)?
   --Who is responsible for notifying state?

2. To what extent is the state involved in identifying and managing social and economic impacts resulting from nuclear power plant development? What kind of information on socio-economic impacts is submitted to state: who supplies such information? Do local/county officials provide any information to state on anticipated socio-economic impacts? If so, at what point in licensing process is such information incorporated?

3. Role of state: Does the state have a process/office that has responsibility for ongoing coordination, assistance or monitoring of social and econimic impact assessment and management? What is the specific role of the state in social and economic impact assessment--technical/financial assistance, financial responsibility (bonding, etc.), advisory to local government, liaison between locals and utility or liaison between locals and federal government in obtaining assistance, information generation--neutral role.

4. What requirements are imposed by the state on local government or the developer regarding the identification, prevention and management of social and economic impacts as part of the energy facility siting process? Specify.

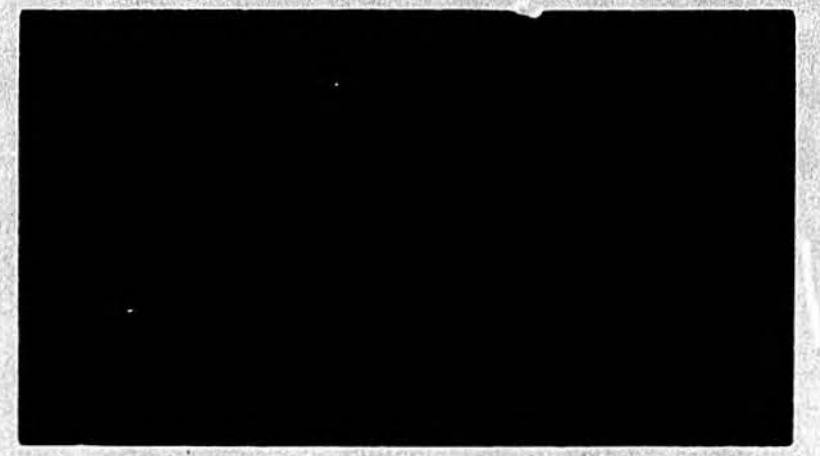
5. How does the state role fit into local planning cycles?

6. Has the state identified a set of social and economic impacts which are commonly associated with nuclear or other power plants--any guidelines for managing social and economic impacts.

A Research Report

LEGAL, INSTITUTIONAL, AND POLITICAL PROBLEMS IN PRODUCING ELECTRIC POWER FROM GEOTHERMAL RESOURCES IN CALIFORNIA

Battelle
Human Affairs Research Centers



LEGAL NOTICE

LEGAL, INSTITUTIONAL, AND POLITICAL PROBLEMS IN PRODUCING ELECTRIC POWER FROM GEOTHERMAL RESOURCES IN CALIFORNIA

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Submitted to:

ERDA--San Francisco Operations Office
EPA--Region 9
FEA--Region 9

Under Contract No. E(04-3)-1163

August 2, 1976

ABBREVIATIONS

AFC	Application for Certification
APCD	Air Pollution Control District
APCO	Air Pollution Control Officer
ARB	Air Resources Board
BLM	Bureau of Land Management
CAC	California Administration Code
CEQA	California Environmental Quality Act
CERCDC	California Energy Resources Conservation and Development Commission
CPUC	California Public Utilities Commission
CZCC	Coastal Zone Conservation Commission
DOG	Division of Oil and Gas
DWR	Department of Water Resources
EA	Environmental Analysis
EAR	Environmental Analysis Report
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
ERDA	Energy Research and Development Administration
FEA	Federal Energy Administration
FPC	Federal Power Commission
IID	Imperial Irrigation District
JPL	Jet Propulsion Laboratory
KGRA	Known Geothermal Resource Area

LADWP	Los Angeles Department of Water and Power
NCPA	Northern California Power Agency
NEPA	National Environmental Policy Act
NOI	Notice of Intent
PG&E	Pacific Gas and Electric
PP&L	Pacific Power and Light
PRC	Public Resources Code
RFL	Resource Funding Limited
RWQCB	Regional Water Quality Control Board
SCE	Southern California Edison
SDG&E	San Diego Gas and Electric
SEC	Securities and Exchange Commission
SLC	State Lands Commission
SMUD	Sacramento Municipal Utility District
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey

CONTENTS

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CHAPTER 1

SUMMARY

1.1 Introduction

1.1.1 Scope

Geothermal energy constitutes a small but increasingly significant resource for generating electricity in California, but a host of technical and nontechnical problems hamper its full utilization. Although the total potential in California has been estimated to be from 20,000 to 100,000 MWe, planned additions to geothermal electricity-generating capacity total only 3,356 MWe.

Producing electricity from geothermal resources has several major advantages for the general public:

- It has few adverse environmental impacts.
- It demands relatively simple technology to exploit.
- It is a domestic resource, and thus is not subject to foreign embargo.
- It is, at least potentially, renewable through reinjection.

Until recently, however, the lack of a suitable technology for producing power from geothermal resources, other than at The Geysers, meant that geothermal technology was not

competitive with coal, oil, gas, hydro, or nuclear generating technologies.

The major purpose of this report is to identify and analyze the nontechnical problems hampering the production of electricity from geothermal resources and to evaluate possible solutions to these problems. (Other uses of geothermal resources, even though important, are outside the scope of this study.) The nontechnical problems usually occur when one participant in the geothermal process has to deal with another. In its analysis of these problems, the report includes an examination of the participants, their interactions, and the laws that help shape those interactions.

1.1.2 Organization of the Report

The present chapter summarizes the conclusions reached in each of the succeeding chapters, without repeating either the data or the analyses leading to them. Chapter 2 presents an overview of the report and the geothermal development process. Chapters 3 through 7 identify and analyze problems surrounding five technical stages of geothermal development, and Chapters 8 through 12 identify and analyze major problem areas affecting more than one stage. Chapter 13 discusses the major themes guiding the evaluation of proposals, and Chapter 14 evaluates individual proposals for change.

1.2 Chapter 2: Overview

A variety of utilities, government agencies, and others have plans to produce electricity from geothermal resources; the success or expansion of these plans depends on the resolution of nontechnical, as well as technical, problems.

The nontechnical problems surrounding geothermal development fall into 10 major groups: leasing, exploration, reaching agreement for utilization, power plant construction, transmission, financing, environmental reporting, the role of the California Energy Commission, proposed air pollution regulations, and the political economies of individual counties.

Resolving these nontechnical problems requires two related sets of measures. One set would improve the operation of the geothermal development process itself, through streamlining regulatory requirements, developing new ways to meet existing requirements, and ensuring that all the participants understand the requirements and the methods of meeting them. The other set of measures would increase the attractiveness of the geothermal process over other possibilities for investment and for generating electricity.

1.3 Chapter 3: Obtaining Geothermal Leases for Development

Current leasing procedures for federal, state, and privately owned land are by no means perfect and could go

faster; at present, however, they do not constitute the most serious bottleneck to increased production of electricity from geothermal resources. In fact, the procedures appear to be working more smoothly as the participants gain experience in dealing with them. Therefore, although marginal improvements are probably worth making, any major overhaul of the leasing procedures should probably wait until after resolution of problems in other areas.

1.4 Chapter 4: Exploration

The nontechnical problems surrounding exploration activities, particularly the drilling of exploratory wells, varies by geographical location. At The Geysers, the parties involved have learned the procedural requirements and are continuing to learn new ways (both technical and nontechnical) to adapt to them. Nonetheless, the procedures will probably never run as smoothly as in some other areas of the state because the exploratory activities exert impacts that some local residents and environmentalist groups want to avoid. In the Imperial Valley, the process runs very smoothly, both because the exploratory activities exert fewer impacts and because the resistance to the impacts that do occur is less. In addition, a large number of wells already have been drilled, and permits for still more have been granted; thus, the exploration stage is not the source of the major geothermal development problems in the Imperial Valley.

Elsewhere in the state, however, the exploration stage may be a significant bottleneck. There are two reasons for this situation. First, technical and nontechnical problems vary from area to area, so that it is difficult for the parties involved to gain an understanding of procedural requirements and how to adapt to them. Second, some areas are starting to exert strong pressure to protect themselves from the impacts of geothermal development--or at least are taking time in deciding how to react to exploration activity.

1.5 Chapter 5: Selling and Utilizing the Resource

Arranging to sell or use a discovered resource can be a significant bottleneck in the process, but it is less so in some areas of the state than in others. In The Geysers, and presumably in future dry-steam fields, utilities and other users are generally willing to build power plants. The Northern California Power Agency (NCPA) and the Department of Water Resources (DWR) have now joined Pacific Gas & Electric (PG&E) as entities eager to generate electricity from geothermal steam.

In the Imperial Valley, and presumably in future hot-water fields, finding a user for a discovered resource is more of a problem because of the greater uncertainty surrounding both the reservoir and the technology involved. A combination of three basic strategies will probably be necessary in order to make such a resource attractive to

potential users: demonstration projects (probably with at least some government financing) to reduce uncertainty; insurance and regulatory schemes to spread the risk; and organizational integration and regulatory changes to allow power production by entities willing to take risks.

1.6 Chapter 6: Power Plants and Production Fields

Government regulation of power plant siting has been the bottleneck to geothermal development in the Geysers area. Two strategies will help to reduce this bottleneck.

First, key participants should be given as much information as possible about the procedures and how to adapt to them. Most of the participants in The Geysers have a great deal of experience at this point, but neither the California Energy Resources Conservation and Development Commission (CERCDC) (soon to be the major regulator of power plant siting) nor NCPA and DWR (apt to be power plant builders in the near future) have much experience in this area. These entities need to continue their efforts to learn all they can.

The second strategy is to continue research on new ways to minimize both the costs of regulatory procedures and the impacts of geothermal development that create opposition. An example of a cost reduction measure would be state or federal government support of baseline environment studies;

an example of a measure to mitigate impacts would be the development of improved emission and noise control devices.

Beyond these two strategies, the participants have to recognize that basic conflicts do exist, and have to learn how best to resolve the attendant controversies.

Other areas of the state (outside The Geysers) have yet to deal with applications for geothermal power plants. At the present time, these areas should give their attention to the problems identified at previous stages of development. However, the one step they could take now is to begin learning from experiences in The Geysers.

1.7 Chapter 7: Transmission Issues

Transmission problems may become the major bottleneck in geothermal development in the future. The need to transmit power to consumers from a (usually) remote geothermal field increases both the number of participants in the process and the interactions among them. It may seriously affect the financial feasibility of at least the first few plants in a given field. There is some excess capacity in the present system that will allow small plants to transmit power over existing lines, but this excess does not exist for all areas of high geothermal potential. In addition, the excess is small enough that even the first few full-size plants will require an increase in the capacity of the existing transmission system.

Compounding the technical and economic problems is the necessity of achieving agreement between the owners of existing transmission facilities and potential plant builders. Historically, such agreements have been difficult to reach, and both sides have avoided the necessity of making them whenever possible. Because a great deal of uncertainty exists both about the legal, institutional, and political aspects of transmission and about the future of geothermal development the evaluation of proposals at this time is very difficult. The only recommendation that can be made at present is that the area be given very careful attention now, before it becomes a major bottleneck.

1.8 Chapter 8: Financial Aspects of Geothermal Development

While geothermal development has to be a competitive investment to attract resources, it does not require such significant amounts of capital as to strain the capital market. In places like The Geysers, the capital market can function normally, although there may be a need for special tax provisions to reflect the public's interest in geothermal development--for example, in its ability to reduce the country's dependence on foreign sources of energy.

In areas with a resource other than dry steam, the status quo will produce very slow development. Substantial uncertainty surrounds both the resource and the technology

it requires. Investor response, therefore, is to proceed cautiously. The problem is particularly severe because the principal investors in this market--the utilities--are quite cautious in nature. Investors such as developers, who would be less averse to risks, feel that existing law keeps them from building power plants and selling power.

The basic response to this problem will be the approach outlined in Chapter 6: demonstration programs to reduce uncertainty, insurance schemes to spread risk, and regulatory changes to allow the more risk-taking entities to build power plants.

1.9 Chapter 9: Environmental Impact Reporting

Environmental reporting procedures, like any new process, need time to smooth out. Initially, the process will move very slowly, but as the participants learn about the process and develop ways to adapt to it, the procedure should run more smoothly. Therefore, what is needed most at this point are techniques for giving the participants information about the process and for helping them develop new methods for adapting to it. These techniques include baseline environmental studies, careful preparation for public hearings, and project planning that takes into account procedural time requirements. However, there may be some basic conflicts among the participants in the environmental reporting process; in such cases, the best one can

hope for is that the procedures would allow the conflict to be resolved as quickly as possible.

1.10 Chapter 10: The California Energy Resources Conservation and Development Commission

CERCDC, a significant new participant in the geothermal development process, has already taken some steps to help geothermal development. Additional steps that it can take include:

- Acting as a disseminator of knowledge (its ongoing efforts to give its siting staff as much advance preparation as possible represent a start in this direction).

- Moving carefully in asserting its new responsibilities so that it achieves political accommodations with the other parties in the geothermal development process, particularly the county planning commissions.

- Acting as a promoter of geothermal development through its research and demonstration activities and its ability to persuade the federal Energy Research and Development Administration (ERDA) to undertake particular research and demonstration activities.

- Conducting its regulatory activities with a favorable view towards geothermal development.

Of course, CERCDC has a large number of responsibilities besides geothermal development, including such matters as environmental protection; how it resolves conflicts among these matters in discharging its responsibilities will have significant impacts. Nevertheless, CERCDC still has some power to make tradeoffs in favor of geothermal development.

1.11 Chapter 11: Reviewing New Stationary Sources of Air Pollution

The proposed new source review rules, as originally written by the Air Resources Board (ARB), could have posed substantial problems for the granting of permits both to construct and to operate geothermal facilities, particularly in The Geysers. Currently, the Air Basin Coordinating Councils and the Air Pollution Control Districts (APCDs) are reviewing those proposed rules, and the careful reshaping of the rules should eliminate most, if not all, of these problems. In The Geysers, the development and use of mitigation measures such as new emission control devices--often with government encouragement and sometimes with government financial support--will also help to solve some of these problems.

1.12 Chapter 12: The Political Economies of Counties

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's probable impacts would interact with a given county's political economy--i.e., its citizens' attitudes, social and economic activities, and political procedures. Because impacts that occur in one place might not occur in another, and those that are acceptable in one place might not be acceptable elsewhere, analysis is required to predict both the interactions and the development of responses to them.

The state government should not attempt to respond to the variations in issues by shutting the local officials and residents out of the process. Local concerns need consideration because geothermal development exerts its most immediate impacts at the local level, and these impacts can best be controlled locally. However, geothermal development also has impacts beyond the local level, and thus state concerns also need to be included in decisions about the resource.

1.13 Chapter 13: The Analytical Context

Several themes should guide the analysis of proposals for changing the geothermal development process:

1. In general, streamlining an existing process will work better than instituting a new one, because the participants need time to learn how to operate within any process.

2. Notwithstanding the above, two kinds of major changes have a very good chance to improve the geothermal process:

   a. Attempts to increase the attractiveness of the geothermal development process (particularly as a means of generating electricity) over other investment opportunities. (Of course, many of the factors affecting its relative attractiveness are outside the geothermal process itself--and hence outside the scope of this report.)

   b. Attempts to bring about more organizational integration in the development process, to reduce the number of times that one participant has to deal with others.

3. Any analysis of geothermal development has to recognize that geothermal resources are different from other energy sources in two ways:

   a. More uncertainty surrounds both the discovery and measurement of the resource and the power generation technology.

b. The efficient plant size is much smaller.

4. The analysis of proposals for change should attempt to assess two factors:

   a. The time, money, and trouble required to bring them about.

   b. The differences they will make, once adopted, in the time, money, and trouble involved in the geothermal development process.

1.14 Chapter 14: Evaluation of Individual Proposals

There are three major types of proposals that merit the time, money, and trouble required to adopt them:

1. Proposals designed to streamline the existing procedures and improve the ways in which individual participants adapt to them. Proposals in this category include:

   a. Improving the flow of information--particularly from institutions with substantial experience to those without.

   b. Giving areas targeted for geothermal development outside help in assembling baseline data useful for later environmental documents.

c. Placing the major research and development emphasis on problems whose solution would have an immediate impact (e.g., noise and emission control in The Geysers, and scaling and corrosion control for hot water resources).

2. Proposals designed to improve the attractiveness of geothermal development--particularly as a means of generating electricity--over alternative investments. Proposals in this category include:

   a. Allowing the deduction of intangible expenses as a current expense and the deduction of a fixed percentage of income as a depletion allowance.

   b. Providing governmental financial participation through grants, loans, and loan guarantees, particularly for demonstration projects.

   c. Establishing regulatory or insurance schemes that will help spread the risks involved.

3. Proposals designed to reduce the number of participants that must deal with each other for a given power plant. Proposals in this category include:

a. Encouraging exploratory and development work by utilities and major consumers.

b. Allowing developers to build power plants and sell power without drastically changing their regulatory status.

c. Supporting research and development to facilitate transmission of power once generated.

There are also proposals that should be avoided, at least at present. These include:

1. Proposals that add more steps in the regulatory process--for example, proposals for environmental appeals boards.

2. Proposals aimed at removing geothermal development from local control or the environmental review process.

3. Proposals involving major overhauls of the existing leasing system.

4. Proposals involving significant changes in normal patterns of property taxation.

5. Proposals using federal or state "expediters" to resolve conflicts or to provide information.

1.15 Acknowledgments

The authors are indebted to the many people who provided input for this report. They include individuals in the geothermal industry; in state, local, and federal government agencies that deal with geothermal development; members of environmental interest groups; individuals involved in research on geothermal problems; and private citizens. Many of these individuals reviewed an earlier draft of this report and offered valuable criticisms and suggestions. They did not, however, review the final revision. The authors, therefore, obviously take full responsibility for any errors of omission or commission that appear in this report.

CHAPTER 2

OVERVIEW

2.1 Objectives and Scope

The major purpose of this study is to suggest ways to increase the rate at which electricity is produced from geothermal resources in California. Geothermal resources obviously have other uses--for instance, in space heating and agricultural processing--but these are beyond the scope of the present report, even though they have great potential value. Increasing the production of electricity from geothermal resources involves solving both technical and nontechnical problems. This report focuses on the non-technical problems related to geothermal development.

It should be noted that some changes in the competitive position of other electricity-generating technologies may exert far more effect on the rate of geothermal development than any changes in the process itself. For example, if the final costs of producing electricity from nuclear and oil-fired power plants were to rise significantly, geothermal power's competitive position would improve dramatically. Such a rise in costs could come from either economic conditions or political factors (e.g., stronger air pollution laws or nuclear safety requirements). In such circumstances, geothermal development might accelerate without changes in

the regulatory situation. However, such changes vis à vis other technologies are not within the scope of this report.

The report highlights situations in the present geothermal development process where legal, institutional, or political conditions create impediments to development or are apt to do so in the future; it does not give a complete description of the process, since such a description appears elsewhere.[1] The conclusion examines proposals for changes in laws, administrative procedures, business operations, research activities, and direct government action. Some technical proposals for change are also discussed, but only in terms of how they might help resolve a nontechnical problem.

Geothermal energy constitutes a small, but significant, resource for generating electric power in California. Locations of California's major Known Geothermal Resource Areas (KGRAs) are shown in Figure 1. As of May 1, 1976, geothermal energy accounted for 502 MWe of net electric power generating capacity out of a total generating capacity of 39,607 MWe sited in the state.[2] However, as of May 1976, California utilities had announced plans for 3,356 MWe of new geothermal power plant capacity by 1995.[3] See Figure 2 for a summary of utility plans. By comparison, the total potential for power production from California geothermal resources has been estimated to be anywhere from 20,000 to 100,000 MWe.[4]

The reasons for the disparity between the potential and the actual plans are to be found not only in numerous technical problems, but also in a variety of nontechnical areas

Fig. 1. Locations of California's major Known Geothermal Resource Areas (KGRAs).

Fig. 2. Planned installed capacities of California utilities. Note that planned additions to capacity occur fastest in nuclear plants (16.8%/yr), second fastest in geothermal plants (10.7%/yr), and third fastest in coal plants (6.9%/yr).

	Capacity (MWe)		
	1975	1985	1995
Nuclear	1,379	7,823	30,762
Geothermal	502	2,078	3,858
Oil and gas	22,707	27,462	27,348
Coal	2,287	5,719	8,653
Transfers	2,951	2,305	1,976
Hydropower	9,781	11,544	14,432
Solar, wind, and fuel cell	0	120	680
Total	39,607	57,051	87,709

Planned Installed Capacities of California Utilities

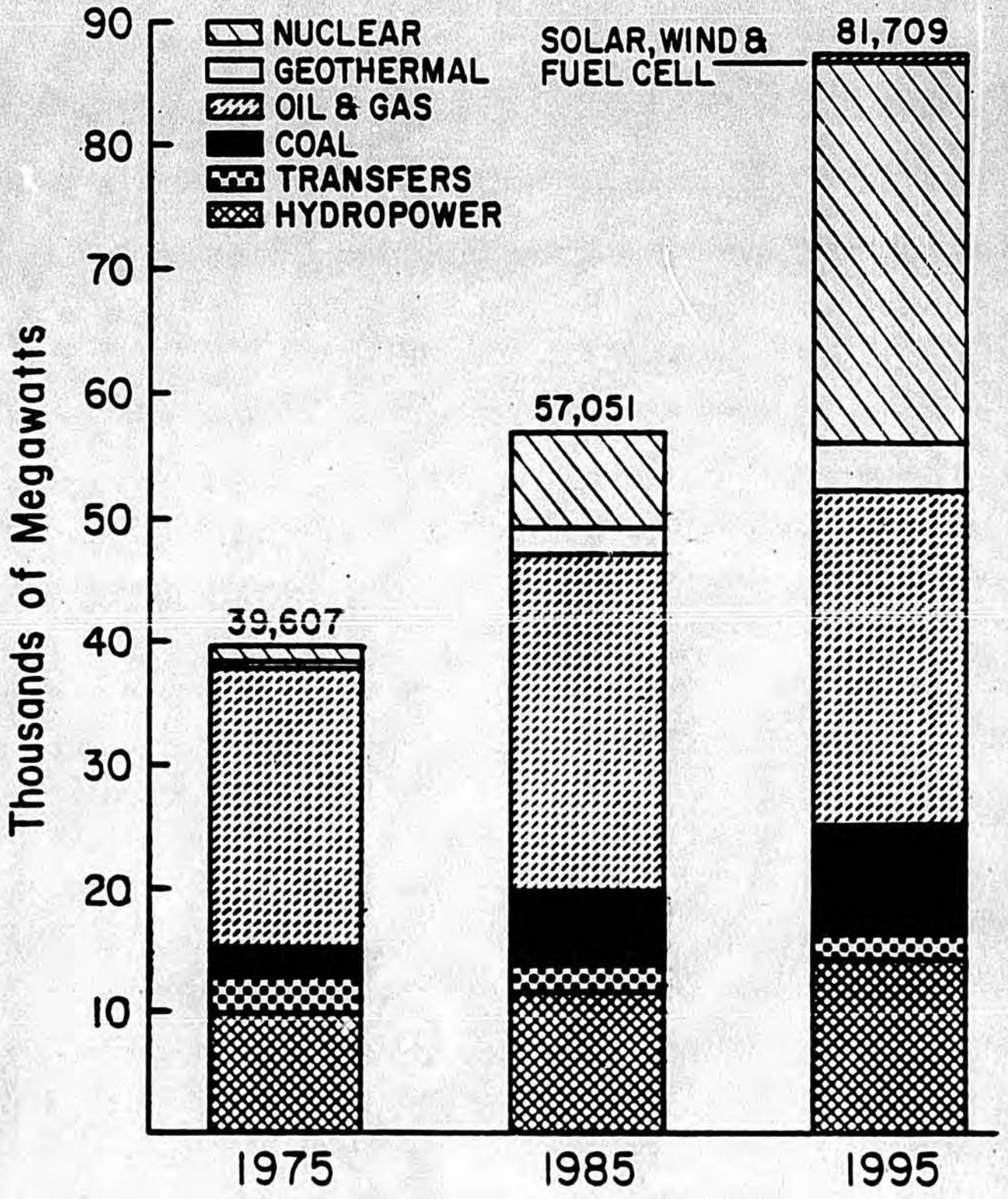

Fig. 2

such as financing the plants; obtaining licenses or permits for exploration, development, and operation; environmental impact review; and a host of other matters. While most attention has been directed to producing novel technology to enhance geothermal development, the nontechnical problems of leasing, licensing, and permitting also appear to be a reason for significant and costly delays in geothermal development.

2.2 Legal, Institutional, and Political Analysis

Legal, institutional, and political analysis involves a comprehensive examination of the operating milieu of the participants in the geothermal development process. The subject matter of this analysis includes relevant laws, the interactions which occur among participants, and the characteristics of the agencies, businesses, and interests involved in geothermal development. By focusing attention on the behavior of the significant parties in the development process and the constraints under which they operate, it is possible to identify major problems in the system and specify practices or reforms which may help the development process function more effectively.

Legal analysis focuses on applicable federal, state, and local laws (court decisions, statutes, and regulations). Laws state basic rules under which the process of geothermal development occurs. For example, they specify environmental impact limitations, leasing procedures, responsibilities

of companies to the public, tax burdens, and acceptable business practices.

Institutional analysis focuses on the participants in the process: firms involved with geothermal energy, public agencies which regulate it, private groups which seek to control development, and others. The principal participants in geothermal resource development are: (1) lessors, (2) investors, (3) production field developers and operators, (4) electric power producers, (5) regulators, (6) environmental and other public interest groups whose interests are not geographically limited, and (7) citizens of communities affected by geothermal development projects. Institutional analysis examines the objectives of these participants, their operating procedures, their defined tasks and responsibilities, their organizational structure, and pertinent behavior. The analysis also studies changes in behavior that come about as a result of learning, modification of objectives, or actions taken by other participants.

The third focus of study is political. In the present context, this is the analysis of interactions that take place among participants. This component of the study is concerned primarily with negotiation, litigation, competition, cooperation, and other forms of interaction.

Conducting the comprehensive legal, institutional, and political analysis makes it possible to provide at least tentative answers to such practical questions as:

1. What existing legal requirements act as major retardants at the various technical stages in the development process?

2. Where in the development process do major jurisdictional ambiguities occur?

3. What factors make geothermal investors reluctant to embark on various courses of action? How are their reasons related to such problems as financial risk, uncertainty about regulatory agency response, unfavorable tax conditions, the state of the economy, expected rate of return, and technological considerations?

4. What "problems" or present impediments to geothermal development are essentially self-correcting or will work themselves out without governmental assistance?

5. Are the principal causes for various development delays to be resolved by changing particular laws, by subsidizing various research and development activities, or by clarifying the meaning of existing requirements?

6. What technological innovations might, on balance, alleviate existing procedural problems?

7. What technological innovations might make geothermal electric power generation a more financially attractive venture?

8. How might the experience and knowledge gained by one regulator be effectively passed on to another regulator who is inexperienced in the problems surrounding geothermal development activities?

9. How might government agencies assist private geothermal developers in a manner agreeable to both, while protecting the interests of the general public?

10. What proposals for increasing geothermal development might actually produce an opposite reaction from that which is desired, or an even more undesirable set of side effects?

2.3 Structure of the Geothermal Industry

To suggest nontechnical reforms that might speed utilization of geothermal resources, it is necessary to understand the present organization of the geothermal industry. Problems that develop in one segment of this industry can have substantial impact on operations of other parts of it, although the link between the cause of the difficulty and the consequence may not be direct. Similarly, problems may

have solutions that are indirect or are located in a different stage of the geothermal development process. Thus, the most appropriate or effective solutions may not always be the most obvious or direct.

Geothermal development activities can be examined in two different ways: as a set of technical development stages, or alternatively as a set of business arrangements. Both technical and business activities are regulated to varying degrees by federal, state, and local governments.

There are five major technical stages in the geothermal development process: (1) the leasing of potentially productive lands; (2) geotechnical exploration of leaseholds to identify the quality and quantity of geothermal resources; (3) the development and operation of commercial-scale geothermal production fields; (4) construction and operation of power plants; and (5) transmission of electricity to end users, whether they are industrial users located at the production site or residential users located at a distance from the site.

Entrepreneurs[5] in the geothermal business can become involved in one or more of the technical development stages. A single organization can undertake activities in all the technical phases of the development process. For example, the city of Burbank is beginning ventures in which it would lease its own steam field, operate its own power plant, and transmit power to its own customers. In contrast, the

business arrangements at the Geysers steam field are more specialized. For existing plants, three companies (Magma, Union, and Thermal) own the steam field leases, production wells, and steam delivery lines, while PG&E owns the power plants and the transmission lines.[6] Other variations in business arrangements will doubtless emerge in producing fields elsewhere in California. However, at present, the most likely arrangement appears to be the specialized form, in which one group of entities develops the geothermal production field while a different set generates electricity.[7]

Whether one or a number of organizations develop the resource at a given site, their activities will be subject to a variety of regulations. Thus, the goals and objectives of the regulatory bodies are also very significant in determining how geothermal resource development actually takes place.

Entrepreneurs and regulators often find that, in pursuing their separate objectives, they come into conflict with each other. Entrepreneurs want to obtain the required permits and licenses with the minimum feasible loss of time and money. Regulators, however, have the objective of ensuring adequate compliance with various licensing and permitting requirements. In discharging this responsibility, regulators may often proceed far more slowly or cautiously than the entrepreneurs would like, or may, in

fact, prohibit some actions. Similarly, entrepreneurs may, in the view of regulators and intervenors, attenpt to avoid full compliance with regulatory requirements.

The mandates of various regulators vary substantially. Some governmental agencies have specialized objectives. For example, the local agencies that must grant conditional use permits for exploratory wells are principally concerned with surface environmental impacts. The California Public Utilities Commission (CPUC), in contrast, must consider broader questions, such as the need for additional electric power generating capacity, costs to the public, and a wide range of environmental impacts. Discrepancies and overlaps in the mandates of the various regulators lead to conflicts not only between regulators and entrepreneurs but also among regulators.

This study examines points in the process where the participants must deal with each other, and focuses on the interactions that create significant difficulties. Interactions in this sense include everything from contracts between private parties to litigation between business and regulatory interests.

2.4 Development Sequence

Generalization about problems retarding geothermal development is difficult because there is electric power production at only one site in California. Also, no operating power plant, either at The Geysers or elsewhere, has

been subjected to review by CERCDC.[8] However, substantial experience has been gained in leasing and exploration in several areas of the state. Also, CPUC has processed three applications for a total of four power plants under guidelines laid down pursuant to the California Environmental Quality Act (CEQA). Thus, any discussion of a "typical" set of difficulties in the sequence of development is based on industry experience to date and on predictions about situations most likely to occur in the future. Given these caveats, the general development sequence is as follows:

1. Land for geothermal development is leased from three principal sources:
   a. The federal government, generally through the Bureau of Land Management (BLM). Other agencies, such as the Forest Service and the Navy, are also involved.
   b. The California state government, primarily through the State Lands Commission (SLC).
   c. Private firms and individual landowners.

2. Leasing of state and federal government land is conducted according to statutory requirements and involves coordination among a number of agencies.

a. For federal lands, BLM generally has leasing responsibility, but land in the control of another agency (e.g., the U.S. Forest Service) requires the permission of that agency. Assessment work is done by the United States Geological Survey (USGS) and the Bureau of Reclamation.

b. For state lands, SLC has primary responsibility, but, as in the case of the federal government, other agencies must give permission when they have control of the land in question. So far, SLC has done its own assessment work.

3. Lessees include, or may include:

a. Oil companies, particularly Union, Burmah, Natomas (Thermal), Chevron, Phillips, McCulloch, Shell, and Pacific Energy.

b. Purely geothermal companies, including the Magma companies (Magma Power, Imperial Magma, Magma Energy), Geothermal Kinetics, Republic Geothermal, Earth Power, and Cal-Energy Company.

c. Electric utilities, such as San Diego Gas and Electric (SDG&E) and Southern California Edison (SCE).

d. Federal, state, and local government agencies, including the Bureau of Reclamation (federal), DWR (state), and the city of Burbank (local).

e. Heavy users of electricity, such as Dow Chemical and AMAX Incorporated.

f. Geothermal investors, such as Diablo Exploration Company.

4. Exploration and evaluation of the production potential of leaseholds require geotechnical survey work. This work involves geological and geophysical evaluation of a site and drilling of test wells to prove up a production field. Up to two years of time may be involved in the assay work prior to drilling test wells. The major expense, however, is in the actual drilling.

a. Financial backing for exploration and evaluation work comes from various combinations of the following: the developers' own resources, lenders, outside investors, and other sources of venture capital.

b. Survey activities may be conducted by independent drilling companies, geothermal divisions of oil companies, and a few specialized survey firms, such as Geonomics, Phoenix Geophysics, and a number of others.

c. Exploratory drilling activities are usually conducted by contract drilling companies in close consort with the geothermal operator. However, Republic Geothermal and Geothermal Kinetics have their own drilling rigs and do their own drilling.

d. Evaluation activities are done both by the lessees and by the potential buyers in order to confirm the feasibility of using the resource.

5. Once the decision has been made to develop a geothermal field, the construction of a power plant and the drilling of production wells will normally proceed simultaneously.

   a. At a given site, the production wells are usually drilled by the same people who drilled the exploratory wells; indeed, successful exploratory wells are used as production wells.

   b. Power plant construction is done by engineering firms hired by the power producer--whether a heavy industrial user, an electric utility, or a government agency.

6. To date, transmission of electricity to end users has been accomplished by building short connecting

lines to the major preexisting transmission grid. PG&E's 23-mile Fulton line (230 kv) was built in 1972 to tie its Units 5 through 15 with the interconnected system. It appears that the cost of building transmission lines could be a retarding factor for the development of geothermal fields that cannot be conveniently linked to the large interconnected power lines.

7. Major problem points, where actors in the process either have to obtain government permission to proceed or must negotiate an agreement with another party in the process, include but are not limited to the following:

   a. When explorers try to obtain leases on potentially valuable land.

   b. When explorers try to obtain permission to conduct geotechnical assay work or to drill on leased land.

   c. When developers try to negotiate contracts to sell their potential geothermal resources to power producers.

   d. When power producers try to obtain permission to construct and operate power plants and

developers try to obtain permission to drill a complete set of production wells and construct pipelines.

e. When power producers try to negotiate for necessary transmission facilities and new transmission lines.

2.5 Current Development Plans

The most immediate plans to develop additional electricity-generating capacity from geothermal resources are those of PG&E.[9] By 1995 PG&E has indicated it hopes to add 1,796 MWe to its existing 502 MWe of capacity at The Geysers in Northern California.[10] Three other organizations are also investigating the possibility of generating power at The Geysers. Other companies have planned to add geothermal generating capacity sometime in the future. The technical feasibility of producing electric power from geothermal sources has been demonstrated in Mexico, New Zealand, Italy, Iceland, and Japan as well as at the Geysers area. However, at present all plans to develop the hot water resources in California are somewhat tentative. Summarized below are some of the formal and informal expressions of intent to develop geothermal resources at The Geysers and elsewhere.

Pacific Gas and Electric Company. PG&E is still unsure of the total resources available at The Geysers and is basing its current planning on those resources whose existence has been established to their satisfaction. As noted,

these plans call for a total of 2,298 MWe by 1995. However, a number of other estimates of the total potential of the Geysers area have placed the potential installed capacity at a maximum of 4,800 MWe. PG&E agrees that, if the steam resource is indeed that large, they will be happy to develop to that limit.

Northern California Power Agency (NCPA). NCPA, an agency exercising the joint powers of 11 public power cities and one rural cooperative, has for a number of years been attempting to build a 220 MWe facility in the Geysers area. It recently contracted with Resource Funding Limited (RFL) for the development and purchase of steam resources in the Geysers area.[11] It plans for a total of 165 MWe under this arrangement, with at least 33 MWe by 1981, and is seeking to contract for even more steam.[12] However, at this writing, it has not yet completed negotiations for transmission of electricity output to its customers nor obtained a site for its proposed generating facility.

California Department of Water Resources. By 1978, DWR must renegotiate the rates and charges in a power supply contract with the four major utilities in the state for electricity to operate the pumping plants of the State Water Project. The revised rates and charges will become effective in 1983. DWR is exploring the possibility of building its own generating plants as an alternative to purchasing all its power, and geothermal power is one of the options it is considering, along with partial ownership of a

large coal or nuclear plant. Related activities include some discussions with SLC about leasing state land at The Geysers and preliminary negotiations with private steam suppliers in the same area.[13] Present plans are for 200 MWe by 1986, in increments of 50 MWe per year, starting in 1982.[14]

San Diego Gas and Electric Company. SDG&E, with the partial financial backing of the U.S. Energy Research and Development Administration (ERDA), has constructed a demonstration plant using a binary cycle, thermal test loop at Niland in the Imperial Valley. If test results are favorable after 12 to 18 months of operation, a 10 MWe turbine generator set will be installed. If the unit operates successfully for at least one year, the company intends to begin construction of a 50-95 MWe unit. In 20 years, SDG&E could conceivably have as much as 300-500 MWe installed capacity. However, SDG&E's submission to CERCDC shows no geothermal capacity before 1995.[15]

Southern California Edison. SCE presently lists 650 MWe of geothermal capacity to be added to its system by 1995.[16] Through its Mono Power subsidiary, SCE is investigating areas in the Imperial Valley, the Randsberg KGRA, and the Mono Lake-Long Valley KGRA.[17] However, SCE has had trouble in obtaining leases on federal lands.

Electric Power Research Institute (EPRI). EPRI, a research and development organization funded by the nation's

utilities, plans to install a 50 MWe geothermal demonstration project in the Heber area of the Imperial Valley.[18] This may be done with the participation of SDG&E or SCE. EPRI is looking for at least some financial help from ERDA on this project.

Sacramento Municipal Utility District (SMUD). SMUD plans to develop 100 MWe of geothermal capacity by 1985 and a total of 300 MWe by 1995.[19]

City of Burbank. Burbank, through its Public Service Department, owns and operates a municipal utility and now holds leases on federal KGRAs in Imperial Valley and Long Valley. They also have made noncompetitive lease applications on lands in California and Oregon. Through a joint venture with Republic Geothermal, Burbank plans to develop 200 MWe of capacity in these geothermal areas by 1995.[20]

Imperial Irrigation District (IID). IID plans to build 50 MWe of geothermal capcity by 1980, 50 more by 1983, and a total of 200 MWe by 1995.[21]

Dow Chemical Company. Dow is a minority holder in the Magma Power Company and is represented on the Magma Board of Directors. Through an arrangement with Magma, Dow is attempting to develop geothermal resources discovered by Magma in the Geysers area and in Surprise Valley, Modoc County, to supply electricity exclusively for use at its chemical plant in Pittsburg, California. Dow hopes to

produce at least 50 MWe and perhaps 100 MWe from these geothermal projects. Dow is also involved in research projects to curb H_2S emissions.[22]

City of Santa Clara. Santa Clara, a member of the NCPA, has shown interest in building a 50 MWe facility near Gilroy Hot Springs.[23] At this writing, the city's plans are very speculative.

Los Angeles Department of Water and Power (LADWP). LADWP owns land in and near the Mono Lake-Long Valley KGRA and is conducting geologic investigations to determine the feasibility of geothermal plants in the area. It has contributed $25,000 to the drilling program of the city of Burbank in the same region in return for information obtained by that program. It is also looking at Roosevelt Hot Springs in Utah and sites in The Geysers.[24]

Others. This list is not intended to be exhaustive. For instance, at least some outside observers believe that Pacific Power and Light (a privately owned utility in Oregon) is interested in geothermal resources in the Glass Mountain and Surprise Valley KGRAs.

2.6 Speeding Development: Influence Strategies

There appear to be two major types of strategies that would be useful for accelerating utilization of geothermal resources. One is to streamline the set of regulatory activities; the second is to enhance the relative attractiveness

of geothermal power. To some extent these two strategies are interrelated, as delays in the regulatory process can act as deterrents to involvement in geothermal development. Consequently, streamlining of the regulatory process might make the development of geothermal resources somewhat more attractive than at present. However, streamlining alone will not make geothermal power an attractive power source. What will be needed is a set of reforms that address all the legal, institutional, and political problems that limit the attractiveness of the geothermal industry to investors.

Producing electric power from geothermal resources is a relatively new process in California. With the exception of The Geysers, U.S. utilities have little experience with the use of geothermal resources to produce electric power. Thus, when a utility decides to produce electricity with geothermal resources, a host of relatively new problems are presented both to the utility and to regulators.

The National Environmental Policy Act (NEPA) and CEQA require that comprehensive reviews be conducted of the potential environmental impact of large-scale developments. In California this means that private entrepreneurs cannot obtain permits to conduct exploratory drilling and licenses to construct power plants until very detailed environmental studies have been prepared.[25] Public entrepreneurs can take no action until such studies are completed.

Environmental reporting requirements highlight one of the principal difficulties that face any new technology in regulated areas. Both utilities and regulators must learn how to deal with the specific problems related to that technology. Time is required for the principal business and governmental actors to learn what is required of them, which issues they have to settle, which rules they have to learn, and, in general, how they are to conduct their business. New regulators, new business firms, and new groups of the public become involved when new technological processes and regulatory schemes are introduced. To an important extent, the two occurred simultaneously in the geothermal industry. The learning process takes time, both to define the new information and procedures required and then to deal with the backlog caused by the first delays.

Some of the institutional learning necessary in the geothermal licensing process has already taken place, and more will come in the future. Therefore, many of the problems presently besetting geothermal development are self-correcting, in the sense that they require no change in regulatory policy. For example, as regulators and entrepreneurs build up experience with CEQA, they should be able to produce and certify Environmental Impact Reports (EIRs) and complete the permitting processes in less time. It should not be presumed, however, that this self-correcting tendency will automatically emerge. Individuals involved in the process must actively seek resolution of the problems that face them.

Many suggestions for accelerating the geothermal development process require major overhauls of substantive and procedural requirements. Given the lag introduced when the institutional participants must learn new standards and procedures, such actions have the potential to produce even greater delays than exist at present. Implementing a new statute or regulation or bringing a new government agency into the review process necessarily involves a period of learning--in some cases a long one. Litigation is also an ever-present possibility. Therefore, major overhauls may engender even greater delay than now exists. Short of resolving the basic conflicts involved, the most expedient way to accelerate the development process may be to streamline the existing system or to accelerate institutional learning.

2.7 Evaluating Proposals for Change

The major purpose of all proposals in this report is to help increase the rate of geothermal development. To that end, each proposal will be examined according to the following general criteria:

1. What would be its effect on the time involved in geothermal development (e.g., could the change accelerate the process)?

2. What would be its effect on the money (both costs and returns) involved in geothermal development?

3. What would be its effect on the trouble involved in geothermal development (e.g., litigation or institutional learning)?

While time and trouble could often be expressed in monetary terms, there is at least some value in discussing them separately for purposes of illustrating different kinds of delays or impediments. Time and money are relatively self-explanatory. Trouble includes a variety of factors that do not have common monetary equivalents. Examples would be objections by intervenors on various grounds, adverse environmental impacts, or jurisdictional disputes. The time, money, and trouble estimates will include all the problems associated with putting the proposed change into effect and the problems that might arise once the recommendation is in force.

2.8 Organization of the Report

Because the regulatory system is organized to deal with particular steps in the technical process, this report discusses legal, institutional, and political problems as they occur at each stage of the technical development sequence. In addition, the report devotes separate chapters to a discussion of special factors that have impacts at more than one technical stage of development. These special factors are: (1) financial aspects of geothermal development; (2) the environmental reporting process; (3) the emerging

involvement of CERCDC; (4) the impacts of proposed rules for reviewing new sources of air pollution; and (5) the political economies of counties with geothermal resources.

The purpose of this organizational scheme is to highlight both the major areas in which problems exist and the changes that may accelerate the development process. Having outlined these areas of both difficulties and opportunities, the report goes on to discuss, in its final chapters, the impacts of new and existing proposals for change.

Chapter 2

FOOTNOTES

1. A comprehensive report, entitled Report on the Status of Development of Geothermal Energy Resources in California, has been prepared by the Jet Propulsion Laboratory of the California Institute of Technology for CERCDC (JPL Document 5040-25, March 31, 1976). (Hereinafter cited as JPL Report.)

2. Compiled from plans submitted to CERCDC. Docket #75-FOR-3.

3. Ibid. In March 1975, plans submitted to the CPUC under General Order 131A indicated only 1900 MWe planned for 1995.

4. JPL report, op. cit.

5. The term "entrepreneur" includes all individuals, corporations, or public agencies that do at least one of the following: acquire leases, explore for and develop resources, generate electricity, or transmit electricity.

6. Other companies (Burmah, Shell, and Pacific Energy) also hold leases within what may generally be considered the known productive steam area at The Geysers. Burmah and Pacific Energy will soon have their fields connected to power plants.

7. Some controversy exists on this point. Some industry observers feel that an arrangement likely to emerge in new fields will be the production of electricity by the developer with sale to utilities. Another possibility is that power would be produced by an operator such as Dow or AMAX for use in its own industrial plants.

8. CERCDC must provide siting approval for all thermal power plants greater than 50 MWe in size for which application was made after January 1, 1977. See the Warren-Alquist Act, Public Resources Code, Section 25000, et. seq.

9. A detailed discussion of resource estimates, leaseholdings, and development plans is available in JPL report, op. cit. Figures are also available from plans submitted to CERCDC.

10. PG&E submission to CERCDC: Docket #75-FOR-3.

11. NCPA-RFL Contract, dated April 13, 1976.

12. Discussion with NCPA.

13. Discussion with DWR.

14. Ibid.

15. Submission to CERCDC.

16. Ibid.

17. Discussion with M. D. Whyte, Manager, Electric Systems Planning, SCE.

18. Discussion with EPRI.

19. Submission to CERCDC.

20. Ibid.

21. Ibid.

22. Discussion with Dow.

23. Discussion with NCPA.

24. Discussion with Jerry Matosec, LADWP.

25. CEQA requires an Environmental Impact Report (EIR); NEPA requires an Environmental Impact Statement (EIS). Both allow less formal documents in some cases.

CHAPTER 3

OBTAINING GEOTHERMAL LEASES FOR DEVELOPMENT

3.1 Overview

Geothermal leasing programs of both the federal and state governments have been the subject of considerable controversy and analysis. Substantial debate has occurred over whether the leasing stage provides a major influence point for increasing the rate of development. The situation is by no means clear-cut. There are several reasons for this:

1. A great deal of land is already leased, presumably enough to allow much more development than has yet occurred--roughly 271,000 acres, of which some 7,000 are used for production at The Geysers. Many people in the industry insist, however, that the figures are somewhat misleading, since the critical factor appears to be the quality of the leased acreage rather than the amount. Much of the acreage presently leased is of low potential. Withholding land that has high geothermal potential can at least slow down discovery of additional useful resources.

2. Another argument is made that leasing land faster may actually slow further development by taking resources away from other stages. But others insist that increasing the rate of leasing activities, particularly in areas of high potential, can permit preliminary geotechnical exploration to proceed at a much more rapid rate. Low-potential leases can thus be prospected and the leases thrown back if early exploration shows little promise of finding high-quality resources.

3. Some critics maintain that rapid leasing may provide windfall profits to a few at the expense of the general public. The counterargument is that the geothermal business is a high-risk undertaking, and most of the firms involved have to guarantee investors a high rate of return on successful ventures in order to raise needed capital.

4. Given that each procedural or regulatory change requires substantial amounts of institutional learning, any major changes that might be introduced run the risk of not producing a net increase in the speed of leasing in the immediate future. Again, the counterargument is that in agencies which have leased a good deal of land, more streamlined procedures are emerging.

Increasing the speed at which land is leased, especially land of high quality, could result in a more rapid proving up of the total resources available. In the short run (5 to 10 years) it appears that such action is not likely to enhance the net rate of utilization. However, as proving a resource is the first step toward ultimate utilization, changes or improvements in leasing procedures should be seen as improving the long-term (10 to 30 years) potential for utilization.

Some major issues need to be resolved to make geothermal development a highly attractive investment. These include changes in state and federal regulations on the amount of land any one developer can lease and on the amount of time he can hold any one lease under various performance stipulations. However, since both the federal and state systems are now operating and are beginning to reduce the backlogs of lease applications, major changes in the leasing process should probably wait until more critical problems at other stages of geothermal development are resolved.

3.2 Role of This Stage in the Development Process

As of May 1976, the federal government had leased 36,900 acres of the approximately 1.4 million acres in federal KGRAs.[1] The other acres are still awaiting competitive lease sales, which have been scheduled at intervals

over the next several years. Of the federal acreage that has not yet been declared part of any KGRA, some 2 million acres have pending lease applications.[2] Only 6,300 acres of non-KGRA land has been leased.[3] Of the approximately 500,000 acres of state land with geothermal potential, only about 36,000 acres are under lease or prospecting permit.[4]

Those acres still to be leased do exert some pressure on the overall process of geothermal development. On the one hand, some are potentially valuable. If these are leased, they are apt to receive more rapid development than some of the areas with lower potential that have already been leased. Those contemplating development activities may want to delay development on their lower-potential areas until someone has exploited these higher-potential areas.

The acres yet to be leased also have a strategic implication. Both the state and federal governments have laws about the operation of geothermal fields as units, a method that allows one leaseholder to cooperate with another. However, since rental rates for unleased land can be increased when geothermal discoveries are made on nearby parcels, a developer may want to delay exploiting fields containing unleased land until all the land is leased, so that discoveries do not simply lead to higher rental rates for the rest of the field.

3.3 Procedural Problems

Four major procedural problems have hampered the geothermal leasing process. These are: (1) lack of a clear legal definition of geothermal resources; (2) cash payment requirements at the time of lease sales; (3) the time required to obtain a lease; and (4) conflicting objectives of lessee and lessor.

With respect to the first problem, determining ownership of a particular geothermal resource may be difficult. The federal government, the state government, and private landowners have occasionally separated ownership of the surface of a piece of property from the ownership of the "minerals" under that property. Whether mineral ownership includes geothermal ownership has been a subject of controversy. Since the controversy concerns the construction of past documents and legislation, these issues will have to be resolved by the courts. One case, United States v. Union Oil Company, has already held that the mineral reservation in the Stock Raising Homestead Act did not include a reservation of the rights to geothermal resources. This case is now before the Ninth Circuit Court of Appeals. Another case, Pariani et al. v. California et al.,[5] which is pending decision, is concerned with whether a state reservation of

mineral rights includes geothermal rights. Finally, a private reservation of mineral rights has been held to include geothermal energy (Geothermal Kinetics v. Union Oil et al.)[6] This case too is on appeal.

Two factors help mitigate the consequences of this ownership problem on the rate of geothermal development. First, the issue is already before the courts, and one can expect a resolution of the issue soon, at least for general federal and state reservations. Second, in several cases, the various alleged owners have allowed the developer to put rents and royalties into an escrow account until ownership can be determined. However, a clear legal definition is important for reasons other than ownership, including regulation and tax treatment.[7]

With respect to the problem of cost, the demand by landowners for a cash bonus at the time of the lease sale can put a severe strain on the financial resources of the smaller geothermal developers. In an area with very high potential such as The Geysers, cash bonuses to the federal government have been as high as $3,000 per acre.[8] In addition, both the state and federal governments will not lease land without first performing a careful environmental study of the impacts geothermal development might cause in that area. These studies have cost from a few hundred dollars to

$200,000.[9] When the state of California is the lessor, these costs are absorbed by the developer and, again, can put a strain on his financial resources.

These two problems contribute to the third difficulty, the amount of time required to fulfill the procedural requirements for obtaining a lease. Litigation of ownership questions can take a long time, as can collection of data for environmental impact reports. In addition, both the state and the federal governments have a backlog of lease requests, so that granting a lease on any individual parcel of land will require not only the time for processing that parcel but also the time for processing all the applications ahead of it.

The fourth problem is related to the conflicting objectives of those wanting to acquire leases and those who have them to sell. In California's recent past, three motives have predominated among those seeking to obtain leases of geothermal resources: (1) some entrepreneurs want to gain land for geothermal development; (2) some corporations or individuals want to obtain geothermal rights for investment purposes (that is, they want to hold the geothermal lease until it becomes very attractive to someone else and then sell their rights to that company--they have little or no intention of developing the leasehold themselves); and (3) some potential lessees apparently want to protect their

competitive position (that is, they have no immediate desire to develop the geothermal resources, but should the development of geothermal resources become more attractive, they want to have some resources they can develop).

Clearly, an increase in the relative attractiveness of geothermal resources would exert different effects on each of the three types of leaseholders. For those holding leases for development, an increase in attractiveness would produce little or no change, since they were already committed to development. For those interested in speculation, an increase in attractiveness would lead them to sell their geothermal rights. For those interested in protecting their competitive position, however, an increase in the attractiveness of geothermal power might lead them to start development more quickly than they would otherwise.

Evidence from leases signed by private, state, and federal landowners who have leased the geothermal rights to their land indicate varying combinations of three primary motives: (1) to gain immediate financial return, as shown by the use of cash bonuses; (2) to minimize environmental damage, as shown by the elaborate environmental reporting processes required by both the federal and state governments;[10] and (3) to have a guaranteed or steady flow of cash. Some lessors have shown very little evidence of a commitment to rapid development of the resource, since they set a low

level of rental charges and fail to include penalties for lack of development. This is a prudent policy for landowners who want a steady flow of cash over the life of the lease. A requirement for rapid development could terminate the rent if the lease proved to be of no further value to the developer.

The interest of some landowners in rapid development may be increasing, however. A few recent private leases have included time periods over which development must occur, and both the state and the federal government are discussing methods by which they can force development on their leased lands.

All three types of landowners--private, state, and federal--want to get the maximum value from the land they have to lease. But as noted, they have different incentives to set lease rentals and performance standards. They also have different incentives to wait for an increase in either the general value of geothermal lands or the specific value of their parcel of land. However, the federal government does face political pressure to lease land quickly. Since geothermal development at present has a long and uncertain path from the obtaining of the lease to the revenue-producing stage of geothermal electricity production, the landowner has strong incentive to focus on the cash bonus or

rental fee at the beginning of the lease, at the expense of considering royalties that might occur later. Lessees, on the other hand, are in a business that has relatively high risks. Consequently, they would prefer not to pay large amounts of money for leases that they may not be able to develop or sell for a long time.

3.4 Interactions with Governments

3.4.1 Federal

The federal government became involved in the process of leasing because of its position as the owner of land with geothermal resources. BLM issues both competitive and noncompetitive leases. Noncompetitive leases are issued for land not in a federal KGRA,[11] and for which no one else has applied within the same filing period. An Environmental Analysis Report (EAR) is required before BLM can issue the lease; in some cases an EIS might be required.[12] If the land is managed by an agency other than BLM, that agency must also give permission. A range of rents before production and a range of royalties after production begins are set by the Geothermal Steam Act of 1970.[13]

Leases for land within a federal KGRA are issued by competitive bid, using the cash bonus form of bidding. BLM has the legal authority to use other types of bidding, but probably will not use them because USGS and BLM perceive that bidding based on something other than a cash bonus will delay the return to the government and will involve too much administrative burden.

Before a piece of land is offered for competitive bid, the managing agency prepares an EAR with the help of the USGS. An EIS could be required in some cases. In addition, USGS performs a preliminary assessment of the potential of the land for the purpose of setting minimum bids. (Because the statute says, "The Secretary [of the Interior] shall lease such lands" rather than "The Secretary may," several participants have questioned BLM's power to set a minimum bid. One of these participants is Shell Oil, which is fighting the issue through the administrative appeal process.)[14]

Leases on lands controlled by federal agencies other than BLM have not been granted as rapidly as some in the industry might desire. At least part of the problem stems from the multiple, and potentially conflicting, mandates under which such agencies as the Forest Service must operate. In the case of reviewing applications for geothermal leases, the Forest Service must operate on the assumption that once a lease is granted, it will be developed to full capacity. Thus, before any lease is granted, the Forest Service, with

USGS assistance, must be certain that such development will involve minimal disruption of surface resources. A decision to grant a lease must thus be based on a detailed environmental analysis and a consideration of any special stipulations that may be required.

Forest Service personnel have noted that an environmental assessment is expensive and time-consuming and must be coordinated with the other Forest Service obligations. It has also been noted that the agency has a small staff qualified to evaluate bids that are made.[15]

It has been suggested that agencies such as the Forest Service worry that once they grant a lease, they will lose control of the development process. If they were given some assurance of continued control, permission might come much faster. Since the Forest Service controls roughly one-half of the land for which noncompetitive applications have been filed, working out an acceptable resolution of these concerns may accelerate this part of the federal leasing process.[16]

3.4.2 State Lands[17]

The state of California owns a substantial amount of land with good geothermal potential. Prospecting permits are issued on a first-come, first-served basis on lands that have not been classified by SLC as being within a state KGRA

(for state KGRA classification the area must contain at least one commercial geothermal well). This permit gives the developer the exclusive right to explore for geothermal resources for a period of three years, with the possibility of an extension for two years. No additional permits are required to conduct geophysical and geochemical surveys. A permit may be converted into a noncompetitive lease either upon discovery of a resource or earlier.

If the land under permit subsequently is classified as being in a KGRA, the developer is entitled to a noncompetitive lease. Any state land not under permit but classified as KGRA land must be leased by competitive public bid. Bidding is on the basis of a cash bonus, net profits, or other single biddable factor. SLC plans to hold the first such auction in 1976, with the bid factor being the percentage of net profits the leaseholder will pay to the state. In any case, the leaseholder will have to pay, in addition to the bid factor, rent of $1 per acre, a minimum royalty of $2 per acre after discovery of commercial steam, and a 10 percent royalty once production begins.

In contrast to the position of the federal lessors (BLM and USGS), SLC feels that it can handle the burden of administering a net profits bidding scheme. Since it must assemble

accounting data to compute royalties, the additional burden of computing net profits is not great enough to outweigh the advantages of this method of bidding. Among other advantages, SLC cites the fact that the small independent developer without substantial cash reserve for the large "up front" cash bonus would be encouraged to enter into the competition for leasing of state-owned lands.

Whether the state grants a prospecting permit, signs a lease, or holds competitive bidding, it must prepare an EIR. Preparing these reports has not cost a great deal of money ($8,000 has been the highest cost), but collecting the necessary data can take several months. Since there is usually a backlog of applications for prospecting permits, the time required for processing previous applications adds to the wait. In addition, the SLC staff has numerous functions to perform other than preparing environmental reports for prospective geothermal lessees.

Another factor slowing geothermal leasing on state lands is a pending proposal to allow SLC and the federal government to trade parcels of land to consolidate their holdings. SLC is not plunging vigorously ahead with geothermal leasing until it knows the outcome of these negotiations.

The state government provides an interesting contrast to the federal government in its treatment of leasing.

According to several lease applicants, when the federal government is the lessor, it conducts extensive discussions with the lessee before the lease is signed. These discussions are to resolve major questions about environmental impacts and their management before exploratory work begins on the leased land. The state government, on the other hand, conducts many of the negotiations after the lease is signed. Although the Division of Oil and Gas (DOG), plays a role at the state level comparable to that played at the federal level by USGS, SLC and DOG do not act as closely in concert as do BLM and USGS. The potential lessee can get his prospecting permit or even his lease and then begin negotiation as to how he will develop the land. SLC even has a separate procedure (discussed in Chapter 4 of this report) by which it gives permission for development activities once it has granted the lease or prospecting permit. Therefore, in comparing state and federal procedures, one must not be misled by the fact that the federal process seems to take so much longer. The federal government includes more steps in the process of signing a lease than does the state government. In certain cases, it may take as long or longer for the state to accomplish all that the federal government accomplishes in its leasing process.[18]

3.4.3 Local[19]

Local governments have not played much of a formal role in the leasing process although they may encourage or discourage

leasing activity by others. Local officials do play a formal role by commenting on environmental reports prepared for the leasing of state of federal land.

Conceivably, a county or a city could offer some of its own land for geothermal development. Lake County may have such land, and the holdings of the city of Los Angeles in Inyo and Mono counties may be even more significant. No local government, however, has yet offered land for lease. Furthermore, the amount of land involved is a very small part of the total and thus is unlikely to exert a major influence on the geothermal development process.

3.4.4 Private Leases

Geothermal leases can also be obtained from private organizations, groups, or individuals who own land with a resource potential. So far, private landowners have been a relatively neutral influence on the geothermal development process. They have been willing to lease their land for geothermal development but have not been insistent in pushing for rapid development of the leased land. Recently a few private landholders have included performance requirements in their lease agreements, but this has been the exception rather than the rule.[20] In general, private landholders have not put any pressure on lessees for rapid development.

3.5 Cooperative and Joint Development Ventures

If a developer does not obtain land directly from an owner, he may obtain land from another developer who already holds a geothermal lease. Geothermal developers who share leases in a given area have shown that they can cooperate at the stage of operating a geothermal field. The experience of Magma, Thermal, and Union Oil at The Geysers is the only fully commercial example of such cooperation, but this operation has run relatively smoothly. This evidence suggests that the lessees can work together to operate a geothermal field.[21]

At the leasing stage, cooperation between geothermal developers could take two forms: (1) small developers could lease and explore fields and then turn them over to large developers for the rest of the development process; and (2) small developers could undertake the exploratory work on fields where the large developers already hold leases. So far, however, neither possibility has been widely used, so that the feasibility of future cooperation at this stage is still uncertain.

Perhaps one of the main reasons for lack of interest in cooperative ventures is that the strongest incentives are still to go it alone. One possibility that has yet to occur, but may if the market in geothermal resources gets stronger, is that a small developer who proves up a field might sell

out to a large company that has the financial strength to hold the lease for years until the geothermal resource can be used for electric power production. Thus, the small company may have no incentive to undertake cooperative ventures since its best position might often be to sell out rather than hold the lease.

However, a more important negative feature of cooperative ventures is that the operators' fees are generally 6 to 10 percent of the total cash flow for the project. This feature provides a powerful incentive to be the operator in any joint venture. It is unlikely that any company, large or small, would enter into the secondary partner's role if it had other options.[22]

An additional problem has been that large companies with geothermal leases they are not developing have shown no great willingness to cooperate with small developers. In a few cases, a large lessee has allowed a small developer to begin exploration work on the lessee's land, but the arrangement has not been particularly favorable to the small developer. In one case, the large lessee allowed the small developer to proceed on one of the lessee's pieces of land but proceeded to lease all the land near the small developer's own lease in another state.[23]

An often-discussed partnership arrangement for a small geothermal company is a joint venture with a utility or private industrial corporation. Both publicly and

privately owned utilities, as well as corporations with a need for large amounts of electricity, have begun to lease land with the stated objective of generating power for their own use.[24] Such lessees tend to have a commitment and an ability to follow through the entire process of geothermal development that may be lacking in a geothermal developer who does not produce power, particularly one involved in other activities such as petroleum development. Among private utilities, SCE's Mono Power subsidiary and SDG&E's New Albion Resources Company are both leasing land and working with developers at the leasing stage. Among public utilities and industrial users, the city of Burbank, Dow Chemical, and AMAX have all formed partnerships with developers; these partnerships start working together at the leasing stage and continue to work together through several stages of development.[25]

3.6 Public Involvement

In general, local residents and other private citizens interested in controlling the process of geothermal development do not become involved at the leasing stage but rather in the environmental reviews and public hearings required for exploration and subsequent steps. The environmental reporting procedures built into both the federal and the

state leasing processes certainly provide opportunities for public involvement, but the public has not used them much in the past, primarily because the overwhelming bulk of the leases to date have been private ones, which offer neither the visibility nor the legal handles for intervention. In at least one case, where the potential lessee was the state, the public has intervened to stop the leasing.[26]

The lack of public involvement is apt to change, however. At least some of the intervenors have a commitment to land use planning that argues for intervention in the leasing stage. In addition, the California Department of Fish and Game has indicated that it will oppose geothermal development in one area, Pieta Creek near Clear Lake, as being incompatible with protection of fish and wildlife resources.[27] This agency, and perhaps others, may reach similar conclusions about other areas. Thus, although few oppose geothermal development <u>per se</u> (as they might oppose nuclear development), they do feel that protection of certain areas requires either prohibition of geothermal (and other) development or very stringent controls. Therefore, even though backlogs created by the newness of the leasing process are beginning to disappear, new delays may arise from active intervention and opposition by groups and individuals concerned with land use questions.[28]

3.7 Nonprocedural Problems

The lack of outside intervention in specific leasing decisions does not mean that the general geothermal leasing process has been free of controversy. The process has been subject to sharp attacks from different, often contradictory directions. On the one hand, the state and federal governments have felt a general pressure to increase the rate at which government land is leased for geothermal development. Some advocates see geothermal development as a relatively clean energy source that will contribute to both energy and environmental goals. On the other hand, some opponents are worried about the environmental implications of such energy development, the exploitation of public resources for private gain, and the monopolization of a new energy source by petroleum companies and a few large corporations.

The response to these pressures has produced a federal scheme that uses competitive leasing with cash bonuses to ensure that the public gets the return it deserves. The system also uses short-term leases and small acreage limitations to ensure that no organization or group of organizations monopolizes the resource.[29] The state scheme differs slightly in specific techniques but has responded to these pressures in similar ways.

Perhaps not too surprisingly, both the federal and the state schemes face proposals for major changes. Some of the

most commonly occurring complaints include:[30]

1. Public resources for public use--some people want a portion of the resources on public lands set aside for development by publicly owned utilities or public agencies. They find an analogy in the set-aside provisions governing the power from many large hydroelectric dams (e.g., Bonneville Power Administration).

2. An opening for the little guy--some people want a change in the lease and cash bonus system so that small developers can get involved. They stress either a bidding system that would allow delayed payment, such as royalty bidding or net profits bidding, or greater use of the noncompetitive method of leasing, perhaps even with a noncompetitive area set aside specifically for small developers.

3. Greater incentives for serious development--some people want the acreage limits raised and the lease terms lengthened so that large corporations can invest major amounts of resources in geothermal development. These people argue that no one will invest large sums of private money until

the developer he is backing has control of enough of the resource for long enough to make the investment relatively secure. Furthermore, many industry spokesmen point out that the major firms are the only ones with adequate financial resources to bear the risks of developing and utilizing geothermal resources.

Of course, attempts to make the geothermal leasing process serve these objectives will add to the time and money necessary to crank through the process.

3.8 Proposals Made by Various Participants in the Process

3.8.1 Federal Leasing Program

- Increase staff of USGS, BLM, and the Forest Service to process lease applications faster.
- Increase staff of USGS and BLM to enable them to hold competitive lease sales at a faster rate.
- Raise the acreage limit on lease holdings, perhaps to the level of oil and gas limits (240,000 acres).
- Remove the provision that allows renegotiation of lease terms every 10 years.

- Relax the criteria that determine which land is a KGRA and thus requires a competitive lease sale.
- Process overlapping lease applications by lottery, not by declaring the overlap a KGRA.
- Give the Forest Service some continuing control over geothermal operations on Forest Service land.
- Require BLM to accept the highest bid at a competitive lease sale.
- Remove the unilateral federal authority to close down operations on federal land.
- Create tax incentives and award discovery bonuses.

3.8.2 State

- Set a required timetable for development on state lands.
- Abolish escalating rents and royalties for delayed development.
- Require developers to make public any data on areas they decide not to develop.
- Create tax incentives and award discovery bonuses.

3.8.3 Private

- Obtain an authoritative court declaration to determine ownership of geothermal resources in lands subject to a minerals reservation (it may take a separate declaration for each type of minerals reservation).

- Consider the holding of a geothermal lease without geothermal development beyond an established period of time as prima facie evidence of an intent to monopolize under the antitrust statutes.

3.8.4 Other

- Require that some portion of public lands with geothermal resources (both federal and state) be set aside for public use, either by publicly owned utilities or by federal and state government agencies.

Chapter 3

FOOTNOTES

1. Letter from USGS.
2. Ibid.
3. Ibid.
4. Letter from SLC.
5. Discussions with the Attorney General's Office.
6. Ibid.
7. See Chapter 8 for a discussion of these points.
8. Christopher D. Stone, Geothermal Energy and the Law I: The Federal Lands Management Program, Draft Report University of Southern California Law Center. September 30, 1975.
9. Discussions with USGS and BLM.
10. CEQA, Public Resources Code 21000 et seq., NEPA 42 USC 4231 et seq.
11. See 43 CFR 3300 et seq. and 43 CFR 3200 et seq. for the regulations surrounding the federal leasing program.
12. Ibid. and discussions with BLM and USGS.
13. 84 Stat. 1566 et seq. See Sections 4.4.1 and 9.3 below.
14. Stone, op. cit. Discussions with BLM and USGS.
15. See footnote 14. Discussion with Forest Service.
16. Ibid.
17. Much of the material for this section came from a review of Public Resources Code Sections 3700 et seq., and 6902 et seq., Administrative Code Sections 2250 et seq., as well as discussions with, and letters from, SLC.
18. Discussion with BLM, USGS, SLC, DOG, and various developers.

19. Information for this section came from discussions with officials of the local governments mentioned and others.

20. Discussions with officials in Sonoma, Lake, and Imperial counties. Also reviewed were several studies from the University of California at Riverside (listed in the Bibliography).

21. Discussions with Union, Magma, Thermal, PG&E, and county officials in The Geysers area.

22. Discussion with the Geothermal Energy Institute.

23. Discussion with several smaller developers.

24. Discussions with, and letters from, SCE, SDG&E, Burbank, Republic Geothermal, Magma Energy, and Imperial Magma.

25. Ibid.

26. Discussion with Lake County officials.

27. Discussion with, and letter from, the Department of Fish and Game.

28. Discussion with Sierra Club Leaders.

29. See footnotes 8 and 11, above.

30. See footnotes 8 and 11, above. Also discussions with, and letters from, BLM, USGS, NCPA, and others.

CHAPTER 4

EXPLORATION

4.1 Overview

Exploration of leaseholds for geothermal resources involves conducting a series of geotechnical survey procedures, including the drilling of temperature test holes and ultimately the drilling of two or three full-size wells. Developers normally can perform survey work short of drilling without permits or related environmental reports. However, in order to drill a full-size well on nonfederal lands, California counties require that the developer obtain a conditional-use permit from the county.[1] For the sake of maintaining good relations with local governments, developers may find it necessary to obtain use permits for drilling on federal lands as well; this is especially important for those developers who are interested in nonfederal lands in the same jurisdiction. All use permits must be based upon adequate EIRs. The problems involved in obtaining these and other permits have been the target of a good deal of criticism and the source of a number of delays in the development process.

Many of the delays at the county level, both in environmental reporting and in the issuing of permits, could be

corrected through institutional learning on the part of the private developers and the public officials involved. These problems, therefore, will probably not require any major overhauls in the system Such learning has already occurred in the counties where geothermal development has proceeded on a large scale.[2]

It may be possible to accelerate this institutional learning process in counties where little geothermal development activity has taken place. The experiences of county officials in Lake, Sonoma, and Imperial counties could be particularly valuable for their counterparts in other areas of California that will have to face the same permitting and evaluation work in the coming years. Similarly, the environmental reports produced by consulting firms that have become adept at generating these documents should serve as models for consulting firms that may be producing such reports in other parts of the state.

The source of delay that will be more difficult to reduce is that caused by public hearings. Because the permits required for the exploration phase of development provide the first major chance for counties, their local residents, and private intervenors to exert influence over geothermal development, any strong local opposition to development that is going to appear will probably do so first at this stage.

The time involved in obtaining permits for drilling has varied tremendously across the state. The maximum time has been about two years in one case on private land in Lake County, while the minimum time has been eight weeks on land in Imperial County.[3] However, the permitting process is becoming routinized, and processing time currently can be as low as three months in some areas.[4]

4.2 Objectives

The objectives of the developers at this stage of the process are to minimize the time and money involved in demonstrating an exploitable resource on their leaseholds. Time is required for processing permits, gathering environmental data, preparing a site for drilling, actually drilling a hole, and letting the resultant wells flow. Cost factors include the expense of the environmental report, bonds and fees required for governmental permits, mitigation technologies that the governments impose as a condition for obtaining those permits, the amount of restoration developers must undertake, and the cost of the drilling and associated activity.

Although governmental regulators are generally not opposed to development, they have several objectives in regulating the process: (1) they want to protect the environment of their area; (2) they may want to utilize the permit-granting process for ends such as the collection of

baseline environmental data and the analysis of many options, including nongeothermal ones, that might be open to the area; (3) they may want to give local residents and others a chance to be heard in the permit-granting process; (4) they may want to control the pace of development in their jurisdiction; and (5) they want to achieve a politically acceptable resolution between pro- and antidevelopment forces.

Private intervenors in the process differ in their feelings toward geothermal development, but all seem to want its environmental impacts minimized. Some may oppose any development, including geothermal development, in a given area; for these, the permit-granting process often provides the first opportunity to voice that opposition.

4.3 Significant Problems

There are several problems that must be confronted by both the developer and the county officials in obtaining drilling permits. A general one is that the process usually begins before the developer or anyone else has a good idea of what will be found or where. Developers find that predicting the location of more than one or two exploratory wells is very difficult. As a result of this uncertainty, it is difficult to project the environmental impacts of development of the lease. Of course, an EIR can analyze the impacts of the first two wells and associated exploration activities, but intervenors and government officials involved

in the process often demand analysis of the total impact of field development (including the impacts of developing a production field). This demand for projections of the impact of a fully developed field is seen by the developer as an addition to his costs and risks, and one that is unjustified because of the uncertainty of the actual shape of the development at that time.

4.3.1 Environmental Effects

At The Geysers, the drilling of geothermal wells has encountered local opposition because of a number of environmental effects related to both technical and social problems. First, the Geysers area is in the Mayacamas Mountains, which are characterized by sharp ridges and steep valleys. Because these mountains are tectonically active, drilling is technically challenging. Drillers have encountered a number of erosion problems, and geological conditions have contributed to well blowouts. Second, because of the sharp ridges and steep valleys, parts of the area have considerable natural beauty and have attracted people seeking to use the region for recreation or to reside in several small communities nearby. Although the area is not densely populated, its combination of small recreation- and retirement-oriented communities and proximity to the San Francisco Bay area has led to a conflict between these different uses for the region. Given the more than 15-year history of active development at The Geysers and the existence of something on

the order of 150 producing wells, it is not surprising that geothermal development has acquired its set of critics.

Because the characteristics of both the terrain and the particular geothermal resource being developed affect the environmental impact of geothermal development, the situation at The Geysers cannot be casually extrapolated to other areas. Nevertheless, some generalizations do appear to be valid. The following discussion of specific environmental effects encountered at The Geysers suggests those impacts that might be experienced generally.[5]

Noise. While the drilling rig itself is a fairly noisy piece of equipment, the major concern is the noise of steam being ejected from the well after a producing zone has been penetrated. Formerly, the steam was freely vented through a "blooie line," bleeding steam off at the wellhead. Fifty feet away, the noise could reach 120 dB(A). Now cyclonic mufflers, which reduce the noise to 80-90 dB(A) at 50 feet, are used. Still, this level is sufficiently annoying to local residents so that county use permits commonly stipulate that wells be shut in as soon as possible after completion.

Odor. The steam at The Geysers averages about 200 ppm hydrogen sulfide.[6] The "rotten egg" smell of this gas can be detected by the human nose in exceptionally small concentrations, and the gas itself is toxic. During drilling, standby venting, and well clean-out, hydrogen sulfide is

unavoidably emitted. Approximately 20,000 pounds of hydrogen sulfide are vented to the atmosphere from the time the steam zone is penetrated until the well is connected to a power plant steam supply system. Although geothermal development has contributed to these emissions, there have always been natural hydrogen sulfide emissions in the area. In addition to the constant nuisance of the odor, the hydrogen sulfide oxidized in the atmosphere creates other problems, such as the presence of sulfate particulates in the air and sulfur dioxide damage to plants. Generally, the terrain creates turbulent air flows that encourage mixing of any hydrogen sulfide emissions with a large volume of air, an action that disperses the pollutant. Unfortunately, on calm days the sulfide tends to stay confined in ground-hugging air masses in the narrow valleys. If the circulation pattern is unfavorable, these air masses may concentrate in populated areas, giving rise to local complaints.

Erosion and landslides. Both roads and well pads must be graded in the steep terrain of The Geysers. Because of prior practices not requiring good compaction, adequate ditching for runoff, or careful placement, there have been instances of serious erosion and even landslides as a result of drilling-related activities. The finer material made its way into local water courses, potentially affecting spawning beds and creating siltation problems.

Such practices are no longer permitted. Engineering geologists are currently required to prepare detailed site plans to prevent such occurrences.

Sump failures. A sump is constructed adjacent to the rig itself to contain drilling mud and brines from the well. In the past, problems sometimes occurred with sumps built on steep hillsides; when these sumps failed, their contents poured into creeks and streams or percolated into groundwater. However, because of more stringent specifications in county use permits and permits from the Regional Water Quality Control Board (RWQCB), there has not been a sump failure for some time.

It should also be noted that the Geysers area is the site of a number of abandoned mercury mines. Sump failures or water contamination incidents from these operations have been erroneously attributed in the past to well operations at The Geysers.

Blowouts. On rare occasions, due to ground movement, surface instability, or a complex of factors, wells have blown out at The Geysers. In April 1975, Union's well GDC 65-28 near the Little Geysers was being vented and discharged a light blue-green serpentine material which killed vegetation in a 0.14 square kilometer area around the well.

Since there has been little experience with drilling activities in other geothermal resource areas, it is difficult to predict the sort of environmental problems that could constrain well operations. Just as there are some

impacts which are characteristic of The Geysers, other resource areas will likely have unique problems associated with drilling. These may become the focus of major debates before the agencies whose permission is needed to begin well drilling, as has happened at The Geysers. Some of the major impacts that could occur are summarized in the paragraphs below.

Brine disposal. In the more common, hot brine resource areas in California, a considerable volume of fluids may be produced during the testing and drilling of wells. Unless disposed of properly, these wastes could cause significant problems if they ended up in groundwater or surface streams, because some of the brines contain toxic materials (fluoride and arsenic). In the Imperial Valley, brines have been ejected to ponds, normally for temporary storage. Although the ponds must have impervious linings, this raises the question of groundwater contamination. More recently, fluids have been ejected to removable tanks and trucked to Class I or II disposal sites for permanent disposition. Transporting waste fluids out may involve considerable expense, thus increasing the incentive to reinject the waste.[7]

Air quality. Many geothermal resource areas are in regions of relatively pristine air. Any degradation of air quality may be resented by the public; furthermore, it may be prohibited by law. Pollutants could come from the

vehicles serving the drilling operation, the diesel engines on the rig, and the well itself. Even in hot water resources, some steam may escape during drilling; since hydrogen sulfide is a common constituent, it, along with other contaminants, could create problems.

Subsidence. There is speculation that, as geothermal fluids are withdrawn, the surface may settle. In most areas this phenomenon presents few problems. However, in the Imperial Valley there is an extensive gravity-fed irrigation and waste water collection system serving the large agricultural industry of the valley. This system could be disrupted by even minor changes in relative elevation.

Wildlife habitat destruction. Certain geothermal areas, especially in remote locations, are within or adjacent to important grazing, nesting, or migration areas for wildlife. The magnitude of disruptions at existing sites has been minor, but potential destruction of even a small fraction of these wildlife habitats may result in strenuous opposition.[8]

Noise. Even in a hot water resource, some noise from ejection of flashed steam will be created. In most cases few people will be disturbed.

Conflicts with other uses. Often geothermal resources are found in areas already committed to other uses. In some cases geothermal operations are compatible with the original uses; in other cases, they are not. Some concern has been

expressed over the loss of agricultural production and wildlife habitats due to the use of Imperial Valley land for wells and support facilities, but there appears to be no strong belief that geothermal development is completely incompatible with continued agriculture in the valley. In contrast, officials in Napa County are reluctant to approve any drilling for fear of an adverse impact of hydrogen sulfide emissions on vineyards. Also, the effects of geothermal development within national forests have been the subject of concern.

For most of the impacts mentioned, some sort of mitigation technique to eliminate the objections raised either exists now or could be developed. If significant resistance to drilling due to adverse environmental impact can be foreseen, the benefits of timely efforts to devise acceptable mitigation strategies are accordingly increased.

4.3.2 Data Collection and Analysis

Another problem of the permit-granting process is the time required for collecting and analyzing data about the factors discussed above. In some areas, previous applications for geothermal drilling permits were apparently the first activities to require formal environmental reporting under CEQA. These first reports necessarily required substantial data gathering. Similar situations could arise in cases where geothermal exploration is the first important development activity, creating a need for generation of new

environmental data. Consequently, the government granting the permit will often lack much of the required background data on environmental conditions, such as the quality and flow pattern of ambient air, the presence and quantity of vegetation and wildlife, and the basic geology of the area. Collecting these data takes a significant amount of time. Once they have been collected, however, both the environmental consultants and the permit-granting authority can use them for a variety of purposes.[9] The unfortunate problem for geothermal development has been that a few geothermal developers have had to pay the time and money costs of gathering background data that the county will then be able to use in analyzing all development, both geothermal and nongeothermal. In a sense, therefore, the costs of early geothermal EIRs have subsidized some subsequent EIRs or made them less costly.

The fact that geothermal wells were the first activities in the area to have to undergo the environmental reporting process has also meant that developers, regulators, and intervenors were all very new to the CEQA process. This is particularly true for specific environmental effects related to geothermal development. Therefore, each had to spend a significant amount of time learning what was required and how to respond to the requirements. Many developers prepared EIRs that regulatory actors later found unacceptable. When this occurred, a new, expanded EIR had to be

prepared. Although this trial-and-error process was time-consuming, it was the way in which environmental consultants, developers, and regulatory agencies learned what was acceptable.

4.4 Interactions with Governments

4.4.1 Federal

The federal government gets involved in the permit-granting process when the developer wishes to drill on federal land. USGS must approve the developer's general plan, and BLM and USGS must supervise the actual drilling and associated activities.

BLM has a dual role. As issuer of leases it is concerned with all federal land and rights subject to the Geothermal Act. As land manager it is concerned only with the so-called National Resource lands. The Forest Service has a parallel management role on the National Forest System lands, i.e., determining whether to lease and, if so, under what conditions. After leasing, the Forest Service continues its managerial responsibility in review and approval of operating plans in cooperation with USGS and acts as the primary observer to assure compliance with this agency. USGS has the ultimate authority for enforcement.

Once a lease is issued, and prior to the commencement of operations on the lease, a plan of operation must be submitted to USGS for approval. This plan is evaluated for environmental impact by means of an Environmental

Analysis (EA) prepared by USGS. It is site-specific and addresses in detail the proposed operations. The time involved in preparation of an EA is one to three months. From this analysis a decision is made as to whether or not the proposed operations would be a major action affecting the environment. If the decision is positive, an EIS must be prepared; if negative, the plan of operation is approved if the land management agency concurs.

Special lease stipulations can be added to leases prior to issuance as a result of an EAR, and special conditions governing operations can be added to the approval of a plan of operations as a result of an EA.[10]

In some states, USGS and BLM will approve such activities on the basis of a rather short, informal environmental report called an Environmental Assessment. In California, the state government has asked that the federal government use a full EIS and BLM has agreed. Although federal lessees have been advised that local conditional-use permits are not required for drilling on federal lands, most drillers also apply for and obtain local conditional-use permits. However, Burmah Oil in Lake County has refused to do so, and Magma Company in Imperial County has done so only under protest. USGS maintains that in general it applies the same standards as would the state DOG and the local government, but some of the local governments dispute this. These local governments argue that developers are required to undertake fewer mitigation and restoration activities when drilling on federal land.

4.4.2 State

The state gets involved in the permit-granting process in a number of ways. If the state owns the land on which exploration activities are to take place, SLC must give its permission for those activities to take place. The prospecting permit or lease both give permission for initial activity, but full-scale well drilling requires a separate approval on a well-by-well basis, as is the case with the federal government. Any driller on nonfederal land must get a permit for his drilling activities from DOG. Since the process of drilling and testing the wells involves discharges into the atmosphere and other discharges that may enter the water system, the developer must get permits both to construct and to operate from the local APCD and a discharge permit from RWQCB. The state is also involved in the environmental reporting process, because the environmental report prepared for any lead agency must be sent to the State Clearinghouse for circulation to all state agencies that may have an interest in that activity.

4.4.3 Local

The lead agency for the permit-granting process is usually the local planning commission. In some cases,

activities will go by appeal from the planning commission to the County board of supervisors. In Sonoma County, the planning commission had granted a blanket conditional-use permit to Union Oil, so the lead agency for Union Oil's permits became the local APCD.

The local planning commission gets involved because no area in California is currently zoned to allow geothermal drilling. Therefore such activity requires a variance in the form of a conditional-use permit. To drill anywhere in the state, the developer needs a permit that specifies the conditions he must meet in order to drill in a given zone. In contrast, petroleum drilling is often an allowable use in certain areas of the state; as an allowable use, it receives a categorical exemption from the environmental reporting requirements of CEQA. In areas where it is not an allowable use, petroleum drilling may still receive a negative declaration. That is, procedures for petroleum drilling are so well known and are felt to exert such minor impacts when operated properly that the lead agency is willing to declare that the environmental impacts are not significant enough to warrant a full-scale environmental impact study.[11] So far, only Lake County has been willing to make the same kind of declaration about geothermal drilling, and that only recently. Several other counties are considering such a process.

4.5 Interactions with Nongovernmental Participants

This chapter has already pointed out that the permit-granting process provides the first opportunity for local residents and other private intervenors to become involved in the geothermal development process. They are often outside the leasing process but are almost always able to participate in the procedures for granting use permits. These intervenors are divided into two groups: those who are against any geothermal development in a given area; and those who want mitigation of, or financial compensation for, the impacts of such development.

In responding to the pressures exerted by these groups, local regulators are often led to broad interpretation of the CEQA requirement for the use of mitigation measures. In fact, many local regulators feel that developers have a chance to reduce their political problems if they develop better procedures for mitigating noise, odor, and surface impacts. The same regulators often believe that developers do not share these interests. Accordingly, regulators look to the environmental documents, hearings, and their own investigations to learn about mitigation technologies. They then insist that the developers either adopt such technologies or justify not doing so.

Environmental consultants are another group involved at this stage. Since the geothermal development process has required environmental reports, several consulting firms

have specialized in the preparation of environmental reports for geothermal development. Originally, many of these firms were hired by developers to prepare the necessary reports. Because local regulators were dissatisfied with the results and are responsible for EIR certification under CEQA, they started choosing the consulting firms themselves, although the developers continued to pay the bills. Local regulators found the consultants they chose were much more satisfactory for their purposes. The group of consultants these local regulators use is small enough, and has been used often enough, so that they are beginning to develop a background of data and knowledge in this area. Thus, the time required to collect and analyze environmental data surrounding geothermal drilling activities should eventually decrease.

The whole permit-granting process has become embroiled in the general politics of the counties and the formal or informal agreements that local regulators must work out between prodevelopment and antidevelopment forces.[12]

4.6 Proposals Made by Various Participants in the Process*

4.6.1 New Procedures

- Reduce bonding requirements for wells.

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*See also other relevant proposals in the comparable sections of Chapters 9 and 10.

- Increase the state and local staff that supervise operations.

4.6.2 Responses to Existing Procedures

- Start application process earlier.
- Stockpile permits.
- Obtain one permit for several wells.

4.6.3 New Technologies

- Use slant drilling.
- Use new noise abatement devices.
- Use new exploration technologies.

4.6.4 Supplies

- Increase supply of drilling crews and drilling rigs.
- Increase supply of exploration experts.

Chapter 4

FOOTNOTES

1. A county could establish a zone where geothermal development might proceed without a separate permit, but no county has yet done so.

2. Several observers reject this optimistic view of the process; the report discusses the issue in more detail in Chapter 9.

3. Discussion with staff from several Lake County agencies.

4. Compiled for permit data from various counties. See the chart of permit times in Chapter 9.

5. All of the material for the following sections comes from environmental reports filed with Sonoma County.

6. Other pollutants beside hydrogen sulfide are present in the steam, including arsenic, lead, mercury, radon, and boron, but they do not present significant hazards at this time.

7. According to the Geothermal Energy Institute, Union, Phillips, and Chevron have demonstrated reinjection technology in the Imperial Valley.

8. Some people feel that geothermal development will have little effect on wildlife and may actually be beneficial.

9. Of course, much of this information may be too site-specific or cover the wrong parameters for some uses.

10. Letter from Area Geothermal Supervisor, USGS.

11. This situation may change in the future to one in which more formal environmental procedures are required.

12. For a discussion of how the political economies of the counties and the resulting political agreements affect the process of geothermal development, see Chapter 12.

CHAPTER 5

SELLING AND UTILIZING THE RESOURCE

5.1 Overview

Geothermal development can be divided into two phases: the first includes leasing, exploring, and proving up the existence of resources; the second involves developing the production field, the power plant, and the transmission lines. In part the reason for dividing development into these two phases is that the relative magnitude of the leasing and exploration work, involving capital outlays on the order of $1.5 million to $5.0 million for a successful field, is less costly than building a power plant, production wells, steam pipes and related facilities (on the order of $30 million), although the difference in cost is reduced when unsuccessful exploration is accounted for.[1] Another reason for the division is that normally a new party--the electricity producer--enters the process formally, once the resource is proven and is the one who will make much of the additional invesment. Finally, the major decisions about the use of a geothermal resource are made between these two phases. To date, these decisions have been largely encompassed in the sales contracts.

Generalization about sales agreements is necessarily difficult, since the only ones that have been negotiated at this point are those at The Geysers. In some cases, the

seller and buyer are different parties; in others, as noted in Chapter 2 a single organization (e.g., city of Burbank) may be the leaseholder, driller, developer, and power generator. However, even in the latter case a resource use decision must be made; such decisions closely parallel those involved in negotiating a sales contract.

In order to justify commitments to geothermal development and other resource commitments, two classes of conditions must be met.

First, a utility or other operator must justify commitments of resources to geothermal development in terms of the other available investment options. The very limited potential for expanding hydroelectric power, high price and questionable supply of oil and gas, safety concerns and potential price increases for nuclear plants, and similar problems with coal, tend, on balance, to favor geothermal development. This is so in part because of the relative costs of energy from various sources. Also, power suppliers are presently having great difficulty in predicting the costs of building future generating capacity, both the costs and availability of fuels and even electricity demand. In such circumstances, geothermal energy can be very attractive because the scale for efficient geothermal plants (100-200 MWe) allows much smaller and less expensive additions to capacity with somewhat more predictable operating costs.[2]

The other set of conditions deals with the characteristics of a particular geothermal resource. For example, production

fields will not be drilled unless the leaseholder is sure that he will be able to sell or use the geothermal product. Likewise, a utility company or other user will not invest in a power plant unless it is convinced that the plant technology is reliable, that it will provide electricity at reasonable costs, and that the reservoir is both sufficient and reliable. Although the technology for power production at the Geysers steam field has been generally accepted, technologies for power production from other geothermal resources have not been accepted by American producers.[3] Until such technologies have been demonstrated to the satisfaction of utilities and other users, it appears that, while leasing and exploration activities may proceed, utilization will continue to lag. With respect to such technologies, the government can influence the pace of development in several ways: (1) its agencies can buy geothermal resources; (2) it can support activities to demonstrate the viability of various generating technologies; and (3) it can help support privately sponsored demonstration projects.

5.2 Considerations in Developing Sales/Purchase Agreements

5.2.1 The Seller

By the time a geothermal field is sufficiently proven to allow sales negotiations to begin, the seller has invested, given present experience, a minimum of $1.5 million to $2 million.[4] Consequently, he would like to negotiate a sales agreement that would include an acceptable price and a

guarantee of minimum purchase. However, he faces several problems in trying to achieve this goal. The first is his need to start a stream of revenue as soon as possible. While the agreement that eventually emerges as to sales price can be expected to reflect the costs of the time between development investment and power plant operation, the seller will feel strong pressure to get things under way as soon as possible. This pressure is apt to be most intense for smaller sellers, since their costs of financing investments generally run higher and since they are less likely to be able to cope with delays.

A second problem facing the seller is the relative shortage of buyers, especially in comparison with those for other energy sources. The Geysers, with PG&E's monopsony powers under agreement with Union, Magma, and Thermal and ownership of the transmission lines out of the area is an extreme example; nonetheless, the limited number of users at a given site is apt to be a general condition.[5] Geothermal steam or hot water cannot be transported very far economically without major temperature drops. Thus, users are likely to be those who can site their end-use facilities (e.g., chemical companies) at the electricity generation site or those with established transmission lines between the generation site and their market area. In any event, there will be only a limited number of possible users for any given geothermal field.

Finally, the monopsonistic nature of the market implies a relatively weak bargaining position for the seller, both at

the time of the sale and over the life of the contract. The initial contract has to be on the order of 30 years, the normal life-span of a power plant, and offers little possibility for modification or replacement. The nature of the problem for the seller is not so much the specific issues that might arise over a long-term contract, but rather the difficulties inherent in negotiating such agreements when there are few routes for escape before the end of the agreement.

The present contracts at The Geysers involve several features which the sellers feel are unfavorable. The basic contract was negotiated at a time when the developer (Magma) was eager to obtain revenue from its investment and the buyer (PG&E) was skeptical of the feasibility of producing electricity from geothermal resources. The arrangements, which were optimal under those conditions, now are the cause of some dissatisfaction among steam suppliers. For example, the steam suppliers are paid solely on the amount of electricity generated, with no requirements for any minimum amount of production. The contract also gives PG&E first refusal rights to any steam produced on the contracting developer's lease within a designated area. However, as a result of operating experience, PG&E has felt safe in reducing the size of the contractually dedicated holdings in recent steam purchase contracts. Nonetheless, this set of arrangements may be discouraging other potential buyers from approaching

the steam developers. Currently, PG&E has been the only buyer at The Geysers, although NCPA has entered into a steam development and purchase agreement with RFL, as noted above, and several other organizations are now beginning to negotiate with steam developers for purchase arrangements.

5.2.2 The Buyer

The buyer faces a set of problems of his own in negotiating the purchase of geothermal energy. His basic interest lies in obtaining a reliable source of energy at a predictable price for at least the life span of his power plant (25 to 35 years). Thus, one set of problems concerns the various kinds of uncertainties associated with geothermal energy, such as the life of a geothermal field, the reliability of the technology needed to convert the energy into electricity, and the (increasingly remote) possibility that cheaper alternatives may become available.

A second set of problems arises over the viability of the power plant itself: geothermal generating plants appear to have neither alternative uses nor alternative sources of energy, whereas there is at least some ability to fire conventional thermal power plants with coal, fuel oil, or natural gas and to change the fuel source over the life of the plant.

The size and location of geothermal plants present some other problems, as well. Users, particularly very large ones, appear to be strongly interested in developing large facilities and may, therefore, find making geothermal

investment decisions relatively difficult. Remote locations raise the need for transmission facilities; these are relatively more expensive for small power sources than for large ones. The transmission issue has been raised as a problem at The Geysers for buyers other than PG&E, although PG&E has discussed wheeling with NCPA and is committed to consider wheeling arrangements on a case by case basis. It is apt to be an important issue in the Imperial Valley for plants designed to serve San Diego or Los Angeles. Such plants would, by and large, have to depend upon their output's being carried over existing transmission lines or over those planned for nongeothermal sources, since the geothermal output would not be likely to justify new transmission facilities in the near future. A major problem is likely to arise if the planned nuclear plant at Sundesert is not constructed and if its transmission lines are canceled.

Finally, the geothermal buyer suffers, at least to some extent, from a paucity of sellers. This problem, however, is not so severe as that faced by the seller, since the buyer has the option of making investments in nongeothermal plants.

5.3 Government Involvement

5.3.1 Federal

To date, the government's role at this stage is indirect. This is in contrast to its role in the drilling stage discussed

above or in the power plant construction stage considered below, where the federal government may take a very active role. There are no permits needed for the sale of geothermal resources, unless the buyer is purchasing power for resale or unless the buyer or seller happens to be a public agency bound to produce some form of environmental impact analysis in connection with its contract decision.[6]

The federal government's impact is essentially connected with research and development activities and with underwriting or reducing investment risks. For example, the government has provided demonstration grants and participated in joint ventures to demonstrate technologies for using low-temperature (150-300°F) or briny water; in addition, it has sponsored research projects for resource assessment, desalinization of water, and testing new generating technologies. Such programs will help reduce the risk for generating technologies to be used outside The Geysers. Federal research and development aimed at improving knowledge of geothermal fields can also help, by increasing the certainty of the extent and duration of the resource in a given field. The federal loan program can also play a facilitating role here by making it less risky to build power plants.

In addition to its indirect role in reducing the risk of geothermal development, the federal government--for instance, the Bureau of Reclamation--can play a more direct role as either a buyer or seller of geothermal energy.

5.3.2 State

California can play a role parallel to that of the federal government by participating in research and development activities both to improve knowledge of the extent of the resource and to demonstrate the feasibility of various generating technologies. The state's role arises from the powers of the CERCDC and from the CPUC's control over privately owned utilities.[7] CERCDC can participate in R&D projects, although because of limited resources not on the same scale as the federal government. It can also utilize its regulatory power to encourage (or retard) geothermal development. For instance, no power company in the state will invest in geothermal technology unless it is certain that the energy commission will agree that the intended generation capacity is needed and that there will be a favorable siting decision near the field involved. CPUC also affects geothermal development via its regulatory power: firms that are not utilities are unlikely to buy geothermal energy beyond their own immediate needs, because selling excess electricity may bring them under the control of CPUC.

Finally, like the federal government, state agencies may be either buyers or sellers. The most frequently mentioned possibility is that the DWR may use geothermal energy to generate electricity for its activities in pumping water from northern to southern California.

5.3.3 Local

Local roles are apt to increase as local, publicly owned utilities become buyers and, in some cases, developers of the resource. Burbank provides an excellent case in point.

A more important local role concerns taxation; thus far, there appears to have been relatively little increase in property taxes with geothermal development prior to negotiation of a sales contract. The negotiation and contract, however, allow a value to be put on the resource involved and therefore provide a defensible basis for revaluing the property involved.[8] This triggers major reassessments of the value of geothermal land and results in the frequently raised problem of the tax burdens rising before income, because of the delay between contract negotiation and the initiation of power plant operations.

5.4 Interactions with Nongovernmental Actors

The nongovernmental participants at this stage are almost exclusively those who are willing to consider producing electricity from a geothermal resource. Unless the participant considering power generation is a governmental agency of some sort, local residents and other private intervenors have little chance to involve themselves directly. They do have some opportunity to affect the way

CPUC controls regulated public utilities, but that power is one that involves very indirect action on this stage of the process.

Who is apt to generate power from a geothermal resource? One possibility, of course, would be the same developer-operator who discovered the commercially exploitable resource. These face three severe problems, however: (1) they usually lack the technical expertise necessary for supervising the construction and operation of a power plant that generates electricity; (2) they often lack the stable and large financial structure that would allow them to pay the costs of building the plant and acquiring the expertise; and (3) their involvement in electricity generation may make them a regulated public utility under California law and thus subject to the jurisdiction of CPUC[9] and perhaps of the Federal Power Commission (FPC). This third factor is one that discourages even those large geothermal developers, such as the oil companies, who have the expertise and resources necessary to construct and operate a power plant.

The second possible group of participants who might generate electricity from a geothermal resource are those corporations, such as Dow or AMAX, that need large amounts of electricity. Several of these corporations already generate much of their own electricity, so they have the requisite expertise in constructing and supervising electricity generation.

These corporations face two major difficulties. The first difficulty, as with the developer-operators alone, is the fear they have of governmental regulation and the very real possibility that producing electricity may subject them to CPUC or FPC jurisdiction. California law does allow producers that consume all of the electricity they generate to escape CPUC jurisdiction as long as no utility transmission lines are used. However, the most economic scale of geothermal plant development would imply surplus production for all but the largest users. While some companies may elect to build smaller plants, it is clear that reducing problems with selling surplus power might encourage more such development.

The second difficulty is that the power plant must be near the geothermal resources, and the corporations may have reasons for not wanting to locate their installation in that area. Consequently, what they really want to do is to produce electricity that can be traded to a utility for electricity delivered to their installation. The purpose of this elaborate arrangement would be to give the large corporation control over the cost and availability of the electricity it needs, but such an arrangement would be likely to bring it under the jurisdiction of CPUC or FPC, under current law.

A third possible group is regulated public utilities. In fact, the only geothermal electricity now being produced

comes from the power plants of such a utility, PG&E. The other two major utilities in California, SDG&E and SCE, have indicated serious interest in developing power from geothermal electricity. These utilities do not face many of the problems confronting other participants, but they do face all of the problems listed previously for other potential power generators. These include questions about the viability of the technology and the life of the resource.

5.5 Proposals Made by Various Participants in the Process

5.5.1 Helping the Seller

- Defer local property taxes until resource is sold or until revenue starts.
- Remove acres containing resources that the developer cannot sell from the amount of federal geothermal acreage he is allowed to lease.
- Insist on contracts that guarantee a minimum number of hours of plant operation.
- Sell resource by BTUs delivered.
- Sell steam or other resource at the wellhead.
- Involve the potential buyer in the early phases of development.
- Insist on inventories of spare parts for power plants and rapid repair schedules.

- Obtain loans for development from buyers.

5.5.2 Helping the Buyer

- Allow accelerated depreciation of geothermal plants for tax and rate base purposes.
- Regulate privately owned utilities to encourage investment in geothermal resources, by such methods as allowing higher rates of return for geothermal capital, listing the costs of risky technology as legitimate expenses, and so forth.
- Encourage buyers to participate in the federal loan guarantee program.
- Have ERDA actually make loans to buyers in some cases.
- Have state and federal governments build demonstration plants in areas with uncertain technologies.
- Have the buyer involved in the development process.
- Have the seller produce power himself.
- Change regulations on utilities so that developers and other potential plant operators, such as major users and government agencies, can produce electricity without becoming full-fledged public utilities.

- Have state and federal governments grant or loan money to utilities to help them build and operate demonstration plants.

- Have state and federal governments take the lead in publicizing the results of demonstration plants to potential plant builders and operators.

- Conduct antitrust activities against those who prevent potential buyers from obtaining geothermal resources.

Chapter 5

FOOTNOTES

1. Assumes roughly $500,000 per well, $2 million for steam pipes, and $20 million for a 110 MWe plant itself. These cost vary widely and are offered for illustration purposes only.

2. C. H. Bloomster, "Economic Analysis of Geothermal Energy Costs," Battelle Pacific Northwest Laboratories. Sale agreement between PG&E and Union Oil Company.

3. Obviously, such technology, particularly for using hot water, has been accepted outside the United States. It is being used just over the border in Cerro Prieto, Mexico, in New Zealand, and in various other places. The sticking point is that utilities in the United States remain unconvinced that the technologies will work well enough to serve their needs.

4. This estimate of $1.5 million to $2 million assumes roughly $500,000 per well for three wells, which appears consistent with past experience at The Geysers. Chevron is presently estimating such costs in The Geysers as closer to $5 million and apparently, McCullough spent over $1 million recently on a single well in Lake County. In contrast, however, drilling costs should be subsantially lower in the Imperial Valley. In any event, the point is that proving a resource requires a substantial investment; and, once the investment is made it provides a strong incentive to realize an early return.

5. PG&E notes that its agreement with Union, Magma, and Thermal by no means gives it control of all production at The Geysers; that it has held negotiations with NCPA about wheeling power; is, indeed, legally required to at least consider such an agreement; and that CPUC has specifically found that PG&E's contracts are not anti-competitive and do not preclude access to others. However, there has been some comment that steam suppliers have been reluctant to negotiate with other buyers, for fear of damaging their chances with PG&E. Moreover, control of the lines means that PG&E will undoubtedly (very properly) fulfill its own transmission needs before wheeling for others. At any rate, PG&E has, clearly, a very strong market position at The Geysers.

6. The Federal Power Commission regulates purchases for resale. For federal agencies, such analyses would be required by NEPA. The same general point about absence of permits applies for state and local agencies, as well. Here, any required permits would be subject to the environment reporting requirements of CEQA.

7. See Chapter 10 for a full discussion of CERCDC.

8. Interviews with Sonoma County Assessor's Office. Some commentators have raised the possibility of even earlier tax increases, but there is no firm evidence of this.

9. California Public Utilities Code 218. Assembly Bill 4009 would exempt sales of geothermal electricity to utilities or single customers from CPUC jurisdiction. PFC jurisdiction would apply to sale for resale.

CHAPTER 6

POWER PLANTS AND PRODUCTION FIELDS

6.1 Overview

Bringing power plants on line is the principal influence point for increasing the rate of geothermal development. There are two essentially separate situations--one at the Geysers area, and the other in the rest of California:

1. Accelerating the licensing process for power plants in the Geysers area. (This would increase the rate at which PG&E would bring planned plant capacity on line and the rate at which other producers would develop in the area.)

2. Demonstrating the technical and economic feasibility of using hot water and other geothermal resources with characteristics different from The Geysers steam to the satisfaction of potential buyers, such as SDG&E. This would increase willingness to invest in geothermal power plants in areas other than The Geysers.

6.1.1 Accelerating the Licensing Process

At The Geysers, existing technology for both drilling and electricity generation appears adequate to develop many more power plants than now exist.[1] Also, with minor deviations in development schedules, PG&E sources have indicated that

their company would bring 200 MWe on line each year if the relevant government agencies could process the applications that fast.[2] Present plans call for an average of slightly over 120 MWe to be brought on line each year through 1985, bringing the total at The Geysers to 1,900 MWe.[3]

Each 100 MWe requires roughly 15 production wells to supply the generators. Drillers presently holding leases in the area covered by a PG&E contract could easily provide the wells needed each year if the plant builders were able to shepherd the necessary power plant applications through the review procedures.

While debate exists over the total size of the geothermal reservoir at The Geysers, PG&E sources have indicated that they feel comfortable with a total development of 2,000 to 3,000 MWe with a 30-year generating life within the area covered by their existing contract. Exploration activities outside the productive portion of this area may substantially boost the total resource available at The Geysers area.[4]

The critical factor, then, is the utilities' ability to obtain permits. All the developers in the Geysers area have indicated that they could supply steam as fast as it could be sold.[5]

6.1.2 Demonstrating the Feasibility of Hot Water Technology

Little innovation is needed at the present time to extract the hydrothermal resources. Although well drilling

and the associated permitting problems may require substantial amounts of time and money, a very large number of production wells could be drilled on existing leases with present drilling technology. However, the drilling will not lead to the generation of electricity unless someone--most likely an electric utility or a private industrial user--is willing to use the steam or hot water.

The Imperial Valley is recognized as an area with one of the highest potentials in California for large-scale development of electric power production from high-temperature geothermal brines. But experience to date has defined significant technical barriers to its development. The high-salinity brines found in the Salton Sea and North Brawley KGRAs quickly corrode and deposit scale on well casings and surface equipment. New technology to control these problems is needed before large-scale development can proceed.

Power production in any new field will probably start with small plants (5-10 MWe) to test the technology and the reservoir. In the best of circumstances, approximately two to five years will be required for the utilities to satisfy themselves that the new field can justify a large-scale development program.[6] The government can help keep this testing period to a minimum by funding R&D, particularly in such areas as reservoir assessment and control of scale and corrosion, and by providing insurance against major loss from insufficient or unreliable reservoirs or technologies. Such government activities also help persuade utilities to test new fields and technologies.

6.1.3 Objectives at the Construction Stage

Some of the objectives of the power producers at this stage are fairly obvious: they want to build a power plant that will reliably generate electricity from a geothermal resource. Generally, they also want to build it as quickly and cheaply as possible. Of course, motives may not be as simple as they seem. In spite of existing geothermal activities by California's major utilities and vigorous opposing arguments by utility spokesmen and others, several observers have charged that utilities have an interest in moving slowly in adding geothermal capacity so that they do not handicap their arguments for adding nuclear capacity.[7] Others have argued that the present system of regulating utility rates creates financial incentives to prefer higher capital costs to lower ones for rate-making purposes and to prefer a combination of high capital costs and low operating costs to a more equal mixture between the two, even if the more equal mixture has a lower total bill.[8] Since the production of geothermal electricity involves relatively low-cost power plants compared to some other alternatives, several observers charge the utilities with moving slowly in building these plants.[9]

The regulators at this stage in the process have a variety of objectives, including many that are the same as those at other stages. CPUC must certify that any proposed plant will be safe, reliable, a financially

sound investment, and serve the public convenience and necessity.[10] CERCDC must certify that the plant is placed in an environmentally acceptable site and that the additional capacity it represents will not exceed CERCDC's forecast of future demand for electricity.[11] Others must review the proposed plant's emissions during both its construction and operation; its discharges, if any, into local water supplies; its need for appropriations from local water supplies; and its compatibility with area wildlife and existing patterns of land use.[12] At the same time, all of these regulators generally want political acceptance of the decisions they reach concerning a particular power plant application. They will, therefore, give varying weights to their estimates of political acceptability as well as to their specific mandates.

At this stage of development, the motives of local residents and other private intervenors are similar to those of such groups at the drilling stage. A few of these individuals and groups want geothermal development prohibited in given areas, many want it strictly controlled, and others want it accelerated. (As previously mentioned, almost no one is against geothermal development <u>per se</u>, as one might be against nuclear development.) For these concerns, the building stage provides a better forum than does the drilling stage. The process is more visible, it involves more levels of government, and the consequences of wrong decisions are more drastic. Although members of intervenor groups charge that favorable decisions at the drilling stage create almost

overwhelming pressures to go ahead at the building stage, the requirements for additional permits from different regulators also provide a forum for expressing concern about the effects of development and additional mechanisms for its control.[13]

6.2 Licensing and Procedural Problems

Once a developer has discovered a geothermal resource suitable for electricity generation and has made an arrangement for power production, the entity seeking to build a power plant must obtain at least one and perhaps two major permits. Almost all entities must obtain a certification that the site involved is acceptable and the plant's addition to capacity is consistent with CERCDC's forecast of energy needs.[14] If the entity is a privately owned utility, it must obtain a second major permit--a Certificate of Public Convenience and Necessity from CPUC.[15] In both cases, the agencies must hold hearings; these hearings afford many opportunities for those interested in controlling geothermal development or stopping a particular power plant to have their say.

In the Geysers area of California, obtaining appropriate permits to build power plants has been the bottleneck to producing geothermal electricity. At least two power plant projects in which the resource has been discovered and the production wells have been drilled waited years for governmental permission to begin building the generating

units. Although the permits for Geysers 12, 14, 15, and perhaps 13, will have been granted by the time this report is released, developers have waited for those permits for as long as three years, and may still wait for some of them. As a consequence of this delay, PG&E's construction schedule has slid several years into the future.[16]

6.2.1 Environmental Impact Controversies

The decision to allow power plant construction to go forward has consequences that are often the source of major public controversy. Power plant complexes (plants, wells, and steam lines) absorb a significant amount of land; they also exert strong influence on uses of the surrounding land, making it more attractive for some purposes, such as industrial development, and less attractive for others, such as residential or recreational development.[17]

Environmental impacts of power plants and their associated production wells have been the subject of major controversies, many of which are unresolved. The impacts vary enough from plant to plant to make any general resolutions extremely unlikely; the chances are much better for resolutions on a plant-by-plant or area-by-area basis. A number of the environmental objections raised have had the effect of slowing the pace of development. The concerns cluster primarily in the following areas: air pollutant emissions, water pollution, noise, visual impact, localized thermal effects, sump and brine discharges, and, for saline hot water systems, the availability of cooling water.[18]

The Geysers. As mentioned before, the only actual experience with electric power production from a geothermal resource in the United States has been in the dry steam fields at The Geysers. Because of a number of peculiarities of the technology used there, experience at The Geysers cannot be a universal indicator of problems that may be encountered elsewhere. The production fields at The Geysers produce dry steam at roughly 350°F.[19] An open-spray, direct-contact condenser system is used on present units, but this system is not planned for future units.[20] In this system, condensed steam is used as cooling water, so that fresh water from an outside source is not required. Because the condensed steam is a source of very high quality water and is low in dissolved solids, it is ideal for plant needs. The condensed steam is sprayed directly into the steam ejected from the turbine; the mixture is then further cooled in a mechanical draft wet tower. There is no attempt to separate spent steam from coolant. Because of the high quality of the condensate and its use as a coolant with reinjection of the surplus, there have been no brine disposal problems at The Geysers.

There are some problems with this system, however. First, since the water in the wet tower is evaporated to provide the necessary cooling, there is a net loss of fluid to the Geysers reservoir; in fact, only approximately 25 percent of the steam entering the turbine is reinjected

to the producing zone as water. There has been some concern over this operation, but so far only slight decreases in the output from existing wells have been noticed.[21]

Second, any noncondensable gases entrained in the steam ultimately are vented to the atmosphere. The most troublesome of these gases is hydrogen sulfide. Uncontrolled, a 55 MWe plant ejects about 900 tons of the malodorous gas into the air each year. Because of the poor mixing in the narrow valleys of The Geysers, the gas is not well diluted and remains a localized problem. Even though there is a fairly high ridge (3,200 feet) between Sonoma and Lake counties (all power plants so far are in Sonoma County), the air mass near the plants seems to drift over the ridge and flow down the canyon into the populated areas. For three out of 30 days tested by PG&E, ambient air quality around The Geysers plants exceeded the 30 ppb standard set by ARB. PG&E has now begun to retrofit its old plants with a catalytic iron scrubbing system and others, and plans to build its new plants with an indirect-contact, shell-and-tube condenser; this device will isolate the noncondensable gases in order to reduce the amount of sulfide emitted to the atmosphere.[22]

Hot water system.[23] Hot water systems must provide proper disposal of the brines. In the Cerro Prieto field in Mexico and the Wairakei fields in New Zealand, the brine condensate is simply dumped. Most power plant systems being researched in the United States envision brine reinjection.

Assuming that the expense of reinjection is reasonable and will be borne by the plant owner, brine disposal should be manageable in most situations.[24]

In most proposed designs--multiple stage flash, total flow, binary fluid--the geothermal resource never contacts the atmosphere, largely as a consequence of attempts to hold down scaling and corrosion in high-salinity areas. Nonetheless, at least some noncondensable gases will probably be vented, perhaps to reduce the volume of material that must be reinjected. However, the amount vented will undoubtedly be less than in a steam field, so attaching scrubbing devices to each vent should be easier.

Cooling water, however, may present some challenges. The basic conflict, especially in the Imperial Valley, is between (1) flashing some of the brines to produce a high-quality cooling water for consumptive use in wet towers, and (2) reinjecting the equivalent volume of fluids which are produced to prevent subsidence. If subsidence or reservoir depletion is not a concern, obtaining a portion of the cooling water from flashing of the brine is reasonable. However, geothermal resources are often found in remote, arid areas, such as the Imperial Valley, where the brines themselves are often the only water source available. If subsidence becomes a problem and other sources of process water are unavailable, development could be slowed or stopped.

At present there is fresh water available for irrigation in the Imperial Valley. However, the supply of fresh water is currently at a premium, and its availability and the competing demands of alternative uses pose serious problems requiring careful attention. If geothermal development occurs on a significant scale, tens of thousands of acre-feet of water will have to be evaporated to provide power plant cooling. Since this problem is widely recognized among the developers, it is receiving a great deal of attention.

Two solutions currently under investigation are (1) the use of saline water from the Salton Sea in specially designed cooling towers, and (2) reinjection of Salton Sea water (some of which must be disposed of in any case in order to prevent its escaping and damaging agricultural land) and flashing of the geothermal brines to produce cooling water. According to the developers, dry cooling towers, which consume almost no water, are not viable in this application because they would reduce the already slim temperature difference on which the plants operate.[25] The loss in efficiency and increase in cost resulting from a further reduction of temperature difference would be enough to eliminate any economic advantage of geothermal, as opposed to more conventional, power production. However, a recent study shows that a hybrid wet-dry tower would be viable.[26] Development of alternate cooling systems would be appropriate for further government-sponsored R&D work.

6.2.2 Other Controversies

Land use considerations and regionwide development issues invariably become involved in power plant siting hearings. Clearly, construction of the power plant is important to more than the local area: the placement of a geothermal power plant can affect the later siting of coal or nuclear power plants; the placement of transmission lines; and the location of industrial, residential, agricultural, and recreational activities. Thus, debates emerge over the secondary and tertiary impacts that may be associated with a given geothermal generating plant. Most of these broad issues of regional development remain unresolved.

The construction of a power plant is also the stage at which concerns about conservation of existing energy supply versus expansion of that supply come to a head. Indeed, California law[27] now requires CERCDC's energy demand forecast to include explicit consideration of energy conservation as an alterrative to building new generating plants. This forecast then plays a major role in deciding when and where to site new power plants.

At this stage of the geothermal development process, the participants involved are required to spend time, money, and effort wrestling with the major issues surrounding all forms of energy development. Moreover, the issues that must be examined in CPUC and CERCDC hearings and in other forums have been changing rapidly and will probably continue to do so.[28]

6.3 Interactions with Government

6.3.1 Federal

The federal government may get involved at this stage of geothermal development in one of two ways: (1) if it owns the land on which the power plant is to be built, and (2) if a federal agency wants to build a power plant. The federal government can also get involved indirectly by giving a grant or loan to an entity that wants to construct and operate a power plant.

Few rules exist concerning the federal government's involvement. If a federal agency wants to construct and operate a power plant, it will probably abide by the same rules and procedures as would a state agency or a privately owned utility. Although some possibility does exist that the procedures might be different in some way, it is not at all clear what the differences would be. The same is true for power plants to be built on federal land: no one knows exactly what will happen. The land-managing agency will be involved, and possibly the USGS; but participation by other federal agencies is very uncertain, as is the relationship of such participants to state, local, and private parties.

One problem has already arisen. A power plant operator will almost certainly be subject to the conditions imposed on the geothermal resource lessee. In addition, the producer will probably have to apply to BLM for a Special Land Use Permit.

Neither requirement is currently acceptable to most producers. Both geothermal leases and Special Land Use Permits have terms of 10 years with uncertain renewal; economic factors generally require that a plant operate for roughly 30 years. This problem is only one of the many that need some resolution before power production is likely to take place on federal lands.[29]

The time required for federal and other participants to work out their roles in this development stage may be another source of delay in the process. The effort to clarify some of the issues through regulations under the Geothermal Steam Act of 1970 was just beginning in July of 1976. BLM and USGS are aware of the problems and have begun meeting with each other to work out solutions, but they have yet to conduct more than informal discussions with many of the other parties that will be involved.[30]

6.3.2 State Government Influences

At the state level, the major agency has been CPUC. That agency has had the responsibility for certifying the economic advisability, the technical feasibility, and the environmental amenability of any power plants that privately owned utilities want to construct and operate.[31] After political negotiations, the county planning commission, which must grant a conditional use permit, functions as a colead agency with CPUC, and pays primary attention to the production

wells and piping associated with the power plant. These two agencies share the lead in having EIRs prepared and in conducting the hearings. These reports are then circulated to various state agencies through the State Clearinghouse.[32]

A number of other state agencies are also involved at this stage but play smaller parts. Power plants need to obtain permits from the RWQCB if water discharges are involved; from the Department of Fish and Game if stream bed alterations are involved; from the State Water Resources Control Board Division of Water Rights if allocations of surface water are involved; and from the local APCD for emissions involved in construction and operation. DOG has to grant a permit for all the drilling activities involved. If a power plant is to be constructed on state-owned land, SLC will also be involved. In the future CERCDC will play a very major role, as Chapter 10 discusses in detail.[33]

6.3.3 Local Government Influences

At the local level, the planning commission must approve a use permit for wells and piping. The County Board of Supervisors might be involved as the appeals board from the planning commission's decision. Publicly owned utilities may become involved as potential constructors and operators of power plants.

As previously mentioned, it is difficult to discuss specific problems occurring in this stage of development

because the procedures have been changing so rapidly. In addition, only one area of the state--Sonoma and Lake counties in the Geysers field--has reached this stage of geothermal development. Therefore, producing either a definitive statement of the problems or a list of effective proposals for change is very difficult.[34]

6.4 Interactions with Nongovernmental Participants

Many of the relationships with nongovernmental participants at this stage of development are continuations of the interactions that took place in the previous stage of development--the sale of the resource. For instance, the developer who leased the land and discovered the exploitable field remains a significant participant in the process of obtaining a permit to construct and build a power plant. As the one who will drill the production wells and construct the pipelines to take the geothermal resource from the wells to the power plant, he is also the one who must obtain the permits for these wells and piping.

Another set of nongovernmental participants are privately and publicly owned utilities other than the one applying for the permit. Publicly owned utilities have intervened in the past to argue that CPUC should deny the privately owned utilities the permits to construct particular power plants. The only interventions so far have been by

NCPA in Geyser proceedings because it believed the steam supply contracts were anticompetitive. In every case to date the CPUC ruled against NCPA's contentions.[35] One can, however, imagine that privately owned utilities or heavy users of electricity may intervene in the new procedures involving CERCDC for much the same reasons.

This stage also provokes activity by a whole range of suppliers. The availability, cost, and operational experience of various plant components become an issue. These plant components include both those designed for power production, such as turbines, and those designed for environmental mitigation, such as various types of treatment machinery for air emissions. Since many turbines for electric generators are custom-made, the backlog of turbine orders at turbine construction firms could markedly affect the time needed for construction and thus also the economic and environmental impacts of the power plant.[36]

In addition, many of those involved at the construction hearings have argued that a power plant that is taken off line for a few days may exert more serious environmental impacts than one that is operating. When plants shut down, it is often necessary to vent the steam from the production wells directly to the atmosphere to prevent the wells from becoming clogged. If the plant will be off line for no more than three days, the steam suppliers would prefer to vent the wells rather than cap them because of the clogging

potential. This vented steam is, of course, not run through the plant's pollution control devices. Thus, the ability of suppliers and the power plant operator to keep the plant running becomes an issue in whether or not the power plant should be constructed.[37]

Section 6.2 has already mentioned the intervention of local residents and others concerned about a wide range of potential impacts of power plant construction and operation at a particular site. The visibility and immediacy of impacts stemming from construction and operation make this stage of the process the one most often chosen to force the resolution of many of the serious issues confronting all forms of decisions about energy production. In general, the intervenors at this stage are the same as those found at the drilling stage. The difference in their intervention at this stage is that the debate is more focused and the impacts are presumably more predictable. Therefore, the fight may involve more people and be far more bitter.

The potential for the involvement of large numbers of people in bitter debate highlights the importance of decisions about who can become involved in this process and in what form--in particular, who can testify at the certification hearings and what forms their testimony may take. If many participants can appear as parties to the hearings, give their own oral testimony, and cross-examine other parties to the proceedings, one can expect the cost and

delay of the proceedings to increase. However, if potential participants have to give their testimony in written form and are not allowed to cross-examine the testimony of others, the cost and delay of the proceedings may decrease. Of course, shortening the proceedings in this manner may raise further questions relating in general to hearing procedures and to the ability of the hearing process to resolve the political disputes involved in the location of power plants.

Of course, the explicit function of the hearing process is to generate additional information and analysis that might help the public agency conducting the hearing reach a better decision. Nevertheless, the hearing process does more. When it allows many groups and individuals to "say their piece," it helps create acceptability for the decision the public agency reaches. For example, if a shortened hearing brings on a viable court suit, the hearing process will not have performed this less explicit function--the total procedure will be lengthened instead of shortened. The impending entrance of CERCDC into this stage of geothermal development affects this issue as well as many others.[38]

6.5 Proposals Made by Various Participants in the Process[39]

6.5.1 State versus Local Control

- Set time limits for local decision making.

6.5.2 Organizational Learning

- Encourage information flow from one county to another, from experienced counties to state agencies, from one state agency to another, and so forth.
- Encourage information flow from one utility to another; in particular, from PG&E to anyone else interested in building a geothermal power plant.
- Use experienced consultants to prepare EIRs that will anticipate questions the public will ask.
- Keep all parties abreast of the costs and benefits of new mitigation technologies.
- Keep all parties abreast of new power generation technologies.

6.5.3 New Procedures

- Set a higher priority among potential builders for building geothermal power plants than for building other types of power plants.
- Set a higher priority for approving geothermal power plants among those who must approve them.
- Control who testifies at geothermal power plant hearings.

- Anticipate the issues that will arrive at those hearings and prepare responses for them.
- Use federal and state funds to encourage the experimental use of mitigation technologies in power plants.
- Have governmental agencies build power plants as part of demonstration efforts.
- Have regulators insist on adequate parts inventories and repair schedules.
- Match the federal programs for studying hard-to-exploit resources (geopressured zones, hot dry rock) with state and federal programs to test technologies associated with easier-to-exploit resources.

Chapter 6

FOOTNOTES

1. The actual limits to the power capacity of The Geysers are very uncertain. The temperature and pressure at existing wells has been decreasing, but new methods of reinjection may markedly delay any major depletion of the resource. In addition, a geothermal resource may exist below the present one and thus represent additional capacity, even though it would require new drilling and production technologies to exploit. Reich v. Commissioner, 52 TC 700 (1969) and letter from Republic Geothermal.

2. Discussion with PG&E.

3. The plan submitted to CERCDC by PG&E gave the following schedule for additions to geothermal capacity:

Year	1978	1979	1980	1981	1982	1983	1984	1985
Capacity (in MWe) to be added	106	300	220	110	220	110	110	220

4. Letter from PG&E.

5. Discussions with Union, Natomas, Magma, Pacific Energy, and others.

6. Discussions with SDG&E, SCE, Chevron, Union, Imperial Magma, and others.

7. This point has been made several times in hearings and other communications to the California Assembly, according to staff of the Committee on Land Use, Resources, and Energy.

8. For a recent example of the academic literature making these points, see Robert A. Meyer, "Capital Structure and the Behavior of the Regulated Firm Under Uncertainty," Southern Economic Journal 42 (April 1976), pp. 600-609.

9. See Chapter 5 for further discussion of the motives of potential power plant builders.

10. Public Utilities Code, Sections 1001 et seq.

11. Public Resources Code, Sections 25000 et seq.

12. Discussion with the relevant state and local agencies. The JPL report also contains a description of the agencies involved in geothermal development and the responsibilities of each.

13. Discussions with Sierra Club leaders and various county officials.

14. See footnote 11. One exception concerns plants of less than 50 MWe. Other possible exceptions include plants to be built on federal land or by federal actors. See Section 6.3.1 for more discussion of the federal government's role in this stage of development.

15. Public Utilities Code, Sections 1001 et seq.

16. Discussion with PG&E.

17. Agriculture and geothermal development may be quite compatible. In Th Geysers, cattle graze in areas around plants and steam lines; in the Imperial Valley, wellheads and SDG&E's thermal test loop are in, or immediately adjacent to, croplands.

18. Discussions with Sierra Club leaders.

19. The data for the discussion in this paragraph and ones immediately following were compiled from various EIRs filed with Sonoma and Lake counties and CPUC.

20. Letter from PG&E.

21. The amounts were small in numbers, but high enough to convince the federal courts that a depletion allowance was justified. Reich v. Commissioner 52 TC 700 (1969).

22. Discussion with PG&E.

23. Much of the information for this discussion comes from discussions with the developers, utilities, and regulators active in the Imperial Valley as well as from reports prepared at the University of California at Riverside and elsewhere.

24. As previously mentioned, The Geothermal Energy Institute reports that reinjection has been demonstrated in the Imperial Valley.

25. Discussion with SDG&E and Imperial Magma.

26. Letter from Chevron.

27. Public Resources Code, Sections 25000 et seq.

28. See Chapters 9 and 10 for more discussion of these issues.

29. Letter from USGS.

30. Ibid. and letter from BLM.

31. Public Utilities Code, Sections 1001 et seq.

32. Discussions with Lake and Sonorma County officials, PG&E and CPUC.

33. The relevant statutory provisions are scattered throughout the California codes dealing with the agencies involved. Reviewing the legal record of a power plant application (on file at CPUC) or talking to a power plant applicant are the fastest ways to uncover this information. The study team used all three. The JPL report also has a comparable discussion.

34. Further discussions of this point appear in Chapters 9 and 10.

35. See, for instance, CPUC's Decision #85276 in Application #53465. For an argument that CPUC was wrong, see Stanford Environmental Law Society, Geothermal Energy: Legal Problems of Resource Development. May 1975.

36. Further discussion of this point appears in Chapter 5.

37. Discussions with Sonoma and Lake county officials and various steam suppliers.

38. A more complete discussion of the influence of CERCDC appears in Chapter 10.

39. See also other relevant recommendations in the proposals sections of Chapters 5, 9, and 10.

CHAPTER 7

TRANSMISSION ISSUES

7.1 Overview

For large, central-station, electricity-generating units, the transmission of power to customers does not constitute a major factor in the total costs of such a project. However, for geothermal plants, transmission of the power may involve some special problems because geothermal energy is a site-specific resource generally located far from load centers and is used in small generating plants (10-100 MWe). Transmission of power over large distances is not much of a hurdle for large power plants in remote locations: because of advantages derived from economies of scale, transmission costs are a small fraction of the total costs. However, for the small plants that, typically, are built to utilize geothermal resources, transmission costs may represent a substantial fraction of the total cost of producing and delivering power.[1]

Whether these costs are prohibitive depends on a number of other physical and economic factors; high transmission costs alone may not rule out a geothermal project. However, high transmission costs may make a geothermal venture come under closer scrutiny, especially if there is a chance that the plant may not work out technically or that the reservoir

may be rapidly depleted and the transmission line become superfluous. Pilot plants in remote, new geothermal fields may therefore be unattractive to utilities and represent a significant obstacle to expanding development, unless the utilities are confident that several hundred megawatts of capacity could be produced at the site. At this level, transmission costs would be much less of a factor. If a plant is not the first in a particular field, but is the first of a new developer (i.e., a utility or other energy producer) in the area, new lines for the new participant may be necessary. Again, the total cost of the project--compared to the alternatives available to the participant--must be carefully examined before concluding that the transmission costs are prohibitive. In general, building several transmission systems in the same area is economically impractical.

7.2 Principal Problems

If new transmission lines from geothermal plants to points of interconnection with another power system must be built, the principal difficulties will be assembling the necessary right-of-way and obtaining government approvals. These problems are not unique to geothermal resource utilization. However, in the developer's efforts to avoid building long new lines, several strategies may be employed which involve other more important difficulties. These strategies include:

1. Building plants only in those geothermal resource areas that are close to existing transmission lines or local load centers.

2. Selling power into another system that is closer than the developer's own.

3. Using a preexisting transmission system, having it "wheel" the power.

These strategies have varying significance depending on the particular geothermal field and the particular power producer.

7.2.1 Geothermal Areas Close to Existing Lines and Loads

In California, several of the federal KGRAs are, fortunately, near existing high-voltage transmission networks or near service areas which can absorb the power. These KGRAs include The Geysers-Calistoga (and the nearby peripheral KGRAs), Lassen, Mono Lake-Long Valley, Randsburg, and the Imperial Valley region.

The Geysers-Calistoga. Even in 1960, when construction on plants was first underway at The Geysers, the PG&E had high-voltage lines nearby to tap into for transmitting power out of rural northern Sonoma County. As development has proceeded, PG&E has added new lines to increase the transmission capacity and is now planning to build a major new line from The Geysers to the Lakeville substation. If PG&E's plans for additional geothermal capacity in the area

proceed on schedule, substantial new capacity will have to be added again by 1985.[2] However, if energy producers other than PG&E wish to ship power out of the Geysers area, alternative, publicly owned transmission systems are quite some distance away and would require more than 100 miles of new circuits to reach an existing substation for interconnection. The significance of this situation is discussed below. For PG&E, future development at The Geysers poses no major transmission problems; but it does pose such problems for other potential producers, unless PG&E is willing to lease its facilities.

Lassen. The Lassen KGRA is very near to the high-capacity 500 kv AC transmission lines of the Pacific Northwest-Southwest Intertie. However, interconnection with the intertie is impractical for amounts of power less than 100-200 MWe because of the high cost of adding a new substation.[3] Therefore, it probably would be necessary to construct new lines to tie any power from geothermal plants in the Lassen area into lower-voltage systems (for which the costs of interconnection are not so high). Since the Lassen KGRA is within the PG&E service area and is near several hydroelectric dams owned by PG&E, several opportunities for convenient interconnection with 69 kv and 115 kv lines exist. However, these lines could provide capacity for no more than 50 MWe of additional power. Further expansion of capacity from geothermal plants in the Lassen area would require construction of extensive new transmission facilities.

Publicly owned transmission lines are also relatively nearby at Shasta Dam, but these too would probably be limited to 50 MWe of additional capacity. Gaining access to these lines would also involve negotiations with PG&E because of prior arrangements made between PG&E and the U.S. Bureau of Reclamation (USBR).

Mono Lake-Long Valley. SCE and LADWP both have major transmission lines in the Owens Valley area of California to bring electricity from hydroelectric dams. These lines terminate just southeast of Lake Crowley, putting most of the geothermal areas within 50 miles of 155 kv and 230 kv lines. The 750 kv DC circuit of the Pacific Intertie is also located near this region. However, it would not be available for interconnection, at least in the early stages of development, because of the high cost of the substation that would be required. To serve communities in the Owens Valley area, the lower-voltage lines, at least for SCE, not only carry power out of the region during the high water flow in the spring but also carry power in during low water flow. Arranging system conditions to handle a continuous base load flow of power from the Mono Lake-Long Valley region may be difficult, but it would not be impossible. The maximum amount of additional capacity that could be handled on these lines is 50 MWe for the SCE lines and 50 MWe for the publicly owned lines of LADWP.[4]

Randsburg. Little activity has occurred at the Randsburg KGRA, but if it does occur, lines of both public and

privately owned utilities are nearby. LADWP transmission lines bringing power from dams on the Colorado River pass close to the area. When the fossil-fuel-burning SCE plant near Coolwater, California, is completed, 220 kv transmission lines will be very near.[5] The exact amount of additional capacity each line could accommodate is uncertain, but the amount is unlikely to be more than 50 MWe in either case.

Imperial Valley. Each of the six KGRAs in the Imperial Valley (Salton Sea, Brawley, Glamis, Dunes, East Mesa, and Heber) are in the service territory of the Imperial Irrigation District (IID). IID has listed its intention to build 200 MWe of geothermal power plants in the area, but it is likely that other utilities will also wish to develop fields in the region. No high-capacity, high-voltage transmission lines are at present conveniently located to bring power from the Imperial Valley to load centers in the urban areas of southern California. However, SCE and SDG&E have physical interconnections with IID and hope to enter into some sort of cooperative arrangement with IID in order to avoid building their own new lines into the area, at least for the initial plants.

Other KGRAs. Other KGRAs in California are not so conveniently located in relation to existing transmission lines. Several are in areas served only by small utilities that do not have the transmission network, the loads, or the financial resources to risk supporting a geothermal venture.

The Wendell-Amadee and Honey Lake KGRAs are in areas near the service territory of the California-Pacific Utilities Company and the Sierra Pacific Power Company. The Lake City-Surprise Valley KGRA is in the service territory of a small electric cooperative, but it is also near lines of the Pacific Power and Light Company (PP&L), a larger privately owned electric utility headquartered in Portland, Oregon. Other KGRAs are in fringe areas of large utilities where high-voltage lines are rare. This situation seems to hold for Glass Mountain (PP&L), Beckwourth Peak (PG&E), Coso Hot Springs (PG&E, SCE), Ford Dry Lake (SCE), and Sespe Hot Springs (PG&E, SCE). In either case, costly new transmission lines to connect to larger systems may be required even for the initial plants in these unexploited fields.

New transmission lines for other plants. Utilities in California are planning to add large new nuclear and fossil-fuel burning power plants in remote locations both inside the state and in other parts of the western United States. In some situations, it appears that the transmission lines for these facilities will pass near KGRAs that otherwise might have a transmission problem. SDG&E is planning to build its large Sundesert Nuclear Plant near the Colorado River just outside Imperial County. The transmission lines from the plant will head almost due west to San Diego and run near several KGRAs in the Imperial Valley region. The proposed nuclear plant at Vidal could also result in SCE transmission lines passing near the Imperial Valley and the

Ford Dry Lake area. Coal-fired power plants built in the southwestern states by California utilities could also result in new high-capacity lines passing near the Imperial Valley (SCE, LADWP) or Honey Lake, Wendell-Amedee, Lake City-Surprise Valley, and Lassen (PG&E). PP&L is also planning a transmission line from the coal-fired Jim Bridger power plant in Idaho that might provide convenient interconnection for geothermal power plants in the Surprise Valley or near Glass Mountain. However, the utilities are facing strong pressures to delay or terminate their plans for these large plants. In particular, three bills signed into law in California in June 1976 put conditions on the approval of future nuclear power plants in the state; these conditions may result in substantial delays.[6]

7.2.2 Selling or Trading Power into Another System

If a utility builds a geothermal plant on the fringes of, or outside, its own service area and far from its own high-voltage network, the utility may want to sell or trade the power to another utility. Several opportunities for this type of arrangement exist in the Imperial Valley. SCE, LADWP, or SDG&E may try to sell the power from their initial pilot plants to IID. This arrangement is limited, however, by the fact that IID plans to add only 220 MWe of capacity in the next 20 years. LADWP also has the option of trading power with IID, since both IID and LADWP receive power from USBR dams on the Colorado River. LADWP could put 30 MWe of

power into the IID system and in return divert the 30 MWe of power IID would normally receive from the Bureau of Reclamation.[7] LADWP could also use the USBR lines that run between the Colorado River and the IID to transmit an additional 30 MWe from the IID area back to the LADWP lines at the Colorado River, thus reversing the normal flow of power on those lines. Using the diversion plus the reversal would create a total capacity of 60 MWe from Imperial Valley for LADWP (or Glendale, Burbank, or Pasadena) on existing transmission lines.

Under similar arrangements, PG&E could sell power to PP&L or the Surprise Valley Rural Electric Cooperative from pilot plants PG&E might build in the geothermal areas in northernmost California. SCE or LADWP could sell power to one of several Nevada power companies from small plants in the Mono Lake-Long Valley area.

While these examples are intended to represent the major transactions that are possible, arrangements involving other combinations of power producers and users could evolve. These other combinations, however, require not only the construction of transmission lines to tap into some power system, but also agreement among all the parties involved. For reasons discussed in the following sections, such agreement is often difficult to obtain.

7.2.3 Using Another Party's Transmission Facilities--"Wheeling"

While transmission lines of adequate capacity may exist near the site of a geothermal power plant, the lines may be

owned by another party. Situations similar to this have arisen before, in which the party operating a plant would like to avoid the expense of a duplicate transmission system by feeding his power into some other party's transmission network and receiving the comparable amount of power at another point on that system. The power is not necessarily physically transmitted from the point of production to the point of use, but an exchange of power is worked out for an agreed-upon fee--a service known as the "wheeling" of power. Wheeling arrangements are not uncommon in the United States, but there are certain long-standing tensions between some parties which make the cooperation necessary for wheeling difficult to achieve. The best-known instance is the tension that exists between the privately owned and the publicly owned electric utilities. Commonly, publicly owned utility systems do not have extensive transmission networks (TVA is one exception), and therefore have a reduced flexibility in siting power plants. Some observers suggest that the economic control of transmission lines by privately owned utilities acts as a compensation to those utilities to offset the tax-free status of the publicly owned utilities.[8] These observers predict that privately owned utilities will fight very hard to retrain this control in order to keep what they view as their competitive edge over publicly owned systems.

Another similar set of tensions exists between utilities and former big customers who are looking for an independent source of power, usually for industrial plants. A

utility cannot be expected to welcome the prospect of the loss of revenue from a big customer and to willingly co-operate in wheeling power from a remote plant. One would expect, instead, that the utility would deny the customer access to the utility line in order to make the option of an independent power source as economically unattractive as possible.

Wheeling arrangements between two privately owned utilities seem, in general, to be the easiest to achieve. However, if electricity from geothermal resources will be as relatively cheap as predicted, trading relatively low-cost geothermal power for relatively high-cost fossil-fuel power may run into difficulties because the trade can affect competition between neighboring private utilities.

Wheeling arrangements of all the types mentioned above have been suggested as possible approaches to solving transmission problems. The more important of the suggested arrangements are:

1. NCPA-PG&E. NCPA, a joint exercise-of-powers agency composed of 11 cities and one rural electric cooperative, wishes to build at least 220 MWe of capacity at The Geysers and to have the power distributed by PG&E to its member systems, which are spread throughout northern California. NCPA has been negotiating with PG&E for many years over wheeling arrangements. It has intervened in CPUC

proceedings concerning PG&E's application for permission to construct plants in The Geysers; it asked CPUC to take antitrust action against PG&E.[9] It also has sued PG&E in federal court in an attempt to gain access to PG&E's transmission lines.[10] At present, NCPA and PG&E have reached an "agreement in principle" concerning wheeling out of The Geysers but are still negotiating over price.

2. DWR. The California Department of Water Resources, in trying to obtain power to meet the requirements of pumping plants in the State Water Project, has been talking to PG&E and SCE about wheeling arrangements for power produced by plants DWR might build at The Geysers. At present, PG&E, SCE, SDG&E, and LADWP provide power to the pumping plants through a sales contract that is due for renegotiation in 1978. DWR, instead of continuing to purchase power, believes it could obtain power more cheaply if it owned its own plants. The utilities are naturally reluctant to agree to a wheeling arrangement, thereby losing a big customer. DWR reports that the negotiations have not been satisfactory from its perspective.[11]

3. Dow Chemical Company-PG&E. Dow Chemical is investigating the potential of building geothermal

plants either in the Geysers area or in the Surprise Valley. In either case it would need the PG&E system to deliver the power to Dow's plants in the Bay area town of Pittsburg. Again, PG&E would naturally be reluctant to make any arrangement that would result in the loss of so big a customer.

4. IID. SCE, SDG&E, or LADWP could enter into arrangements with IID to wheel power to a point of interconnection, as an alternative to selling or trading power to IID. Apparently no specific discussions of this possibility have been entered into with IID.

5. LADWP. The Los Angeles Department of Water and Power is looking as far north as The Geysers for potential sites for geothermal power plants[12] and would require the use of the PG&E transmission system as well as that of SCE. At this point, LADWP is investigating a broad range of options and is not committed to any one course of action.

6. SMUD-PG&E. The Sacramento Municipal Utility District is currently planning to add 300 MWe of geothermal capacity starting in the mid-1980s, probably at The Geysers. It probably would depend on PG&E to deliver the power. SMUD and

PG&E have entered mutually beneficial cooperative arrangements in sharing the output of a large nuclear plant owned by SMUD and in trading power between summer and winter peaks. These arrangements tend to indicate that SMUD may have an easier time reaching wheeling agreements with PG&E than others may have.

Other combinations are, of course, possible. Some parties, however, said they preferred to avoid wheeling arrangements entirely. The city of Burbank has said that it is only interested in developing geothermal power in areas near publicly owned transmission lines in order to avoid wheeling disputes. LADWP has also indicated that it did not consider fruitful a discussion of wheeling arrangements with SCE to bring power out of the Imperial Valley, especially since LADWP's existing system would be close enough to make new lines less of a major cost for geothermal development. DWR has indicated that, while it may be more expensive, new DWR-owned lines could be built out of The Geysers to connect with USBR's transmission system, which now ships power produced in the dams of the Central Valley Project. There is some chance SMUD would join in building such a line, but the chance is slim.

For some of the KGRAs with the highest potential for development at this time, there either appears to be sufficient slack capacity in nearby lines, or sufficiently good

prospects to sell or trade power, that demonstration or pilot plants in the new fields can probably be built up to a 30 MWe size with few transmission system difficulties. Additions beyond this level will probably require extensive new transmission lines. In order to justify the expense of new lines, utilities need confidence that the sufficiency and reliability of both the resource and the technology justify installing enough plant capacity to produce several hundred megawatts of electricity. Such confidence usually comes from the operation of the first few plants in a given area. There may be a considerable lag between the completion of the first plants and commitments to construct additional units, since the utilities need time to gain operating experience and to determine whether they can risk additional capital.[13] However, the transmission system is not equally accessible to all potential parties interested in producing electric power from geothermal resources. Those with transmission systems available may not be the parties most interested in development of a particular area of geothermal activity. To that extent, the institutional nature of the transmission system in California may result in delays in the most optimistic schedule of geothermal development. On the other hand, there is no guarantee that the parties with the most interest in geothermal development will, in fact, have the financial resources and the skill to implement their development plans successfully. In any

case, due to the site-specific nature of the geothermal resource, finding the means to transmit the power to load centers may be a significant friction point in the development process.

7.3 Interactions with Government

7.3.1 Federal

The federal government could be involved in this stage of the geothermal process for several reasons: (1) the power plant and/or the transmission facilities could be on federal land; (2) the power plant and/or the transmission facilities themselves could be owned by the federal government (USBR now owns some major transmission lines in California); and (3) the federal government supervises the public utilities' sales of electric power to other than final consumers and expansion of transmission lines.

At this point, the federal government's involvement as a landowner is not clear because it is not yet an issue. For example, transmission lines from coal-fired power plants crossing federal lands have been dealt with several times before so that the procedures have been worked out. However, the specific problems of transmission lines from geothermal areas have not been encountered. Transmission lines in wilderness areas would probably be controversial and federal landowning agencies would be involved in the dispute. For example, PG&E spokesmen believe it unlikely that they would be allowed to construct a transmission line over

certain portions of the Sierra Nevada Mountains to the Mono Lake-Long Valley region. The transmission lines would cross national forests and the approval of the Forest Service would be required. PG&E believes there are some acceptable routes for transmission lines into the region but all would involve some degree of controversy. Because other KGRAs are situated near wilderness, wildlife, or scenic areas as well as near national forests, disputes before BLM, the Forest Service, and other federal agencies may continually arise concerning approval of proposed transmission facilities.

The federal government as an owner of transmission facilities (through USBR) would be involved in negotiations over wheeling and access to these public lines. The federal transmission system in California is not extensive; some have suggested that the United States build more transmission lines to make geothermal plants (and other new power sources) more accessible to publicly owned utilities. Embarking on a major program to construct transmission lines would itself be a controversial undertaking and probably would involve interactions with many other governmental agencies and parties.

The involvement of the federal government as a supervisor of the wholesale transactions of utilities occurs through FPC. The commission must approve the interconnection of utilities and the rates charged in sales of electricity that will be resold.[14] Both wheeling and sales

from one utility to another would be subject to FPC jurisdiction. This situation need not create any particular problems, but it may make a development schedule that includes resale take longer than one in which the utility sells all the power produced to final users. If FPC chooses to apply its standard schedule of tariffs for sales between utilities, the utility wishing to sell power from a demonstration plant might not recover its higher-than-normal costs. FPC may be willing to add a special class to its tariff schedule to cover such situations, but considerable time and effort may be required to work out such arrangements.

7.3.2 State

The state government could be involved in the geothermal process for the same three reasons as the federal government: (1) the power plant and/or the transmission facilities could be located on state land; (2) a state agency could own the power plant or the transmission facilities (DWR owns both power plants and transmission lines now); and (3) the transmission line could be subject to CERCDC or CPUC jurisdiction.

State government involvement as a landowner would occur primarily through SLC. Although the specific case of a transmission line from a geothermal power plant across state lands has not yet been encountered, the placement of other transmission lines on state lands has been handled a few times before. No particular problems with transmission

lines from geothermal areas are expected; but again, if the lines must cross wilderness, wildlife, or scenic areas, controversy can be expected to focus on state agencies that must grant the right to build the line across state lands. There may be some delay if the agency is inexperienced in dealing with such controversies.

State government involvement as the owner of transmission lines is limited by the fact that, thus far, only one agency (DWR) owns any transmission line--and it owns a total of only 13 miles. However, DWR is interested in building its own lines out of the Geysers area to the Tesla substation on the USBR system as an alternative to wheeling arrangements with PG&E. Such a line would benefit other publicly owned utilities and large companies such as Dow Chemical that may need transmission facilities out of the same area. These other potential producers have discussed the idea of joint participation in the construction of a state-owned line in order to get what they consider to be easier and more favorable access to transmission facilities. Such a project would be a major undertaking for DWR and would be expected to encounter strong opposition from PG&E.[15]

CPUC and CERCDC share regulatory jurisdiction over transmission lines. The energy commission's jurisdiction is limited to lines that run from a power plant to a point of interconnection with a high-voltage transmission network.[16] If the power plant is less than 50 MWe in size, the energy

commission has no jurisdiction (unless the plant owner wishes to waive his exemption in order to take advantage of the procedures under the commission[17]), so any associated transmission line would also be exempt. CPUC jurisdiction is limited to privately owned utilities, but covers all high-voltage transmission line construction, not just construction directly related to new power plants. CPUC has been handling transmission line applications for many years and is not expected to encounter any new difficulties. CERCDC, however, is a new agency[18] and has not yet approved any transmission lines or power plants, so it may encounter ordinary start-up problems in the approval of transmission lines from geothermal areas until it acquires experience as a regulatory body.

7.3.3 Local

Local government can be involved in the process both as a regulator and as an entrepreneur. Whether local planning commissions and county boards of supervisors will be involved directly depends on exactly where the transmission facilities would be placed and whether CERCDC has jurisdiction over the transmission line. If CERCDC has jurisdiction, it will issue the sole state permit for the line.[19] However, local government is indirectly involved in the decision making by the commission because CERCDC must enforce local rules, regulations, and ordinances.[20]

Local government can participate as an entrepreneur by building power plants and/or transmission lines. The city of Burbank is actively engaged in planning for several geothermal units and associated transmission lines, and LADWP is also keeping the matter under investigation. If the plans of these agencies are controversial, the entire project is likely to be affected since it is improbable that a transmission line would be considered separately.

7.4 Interactions with Nongovernmental Participants

Nongovernmental participants interact at the transmission stage because of concerns over power line location and because of the special arrangements that may be necessary to deliver power from geothermal areas to customers long distances away.

The siting of transmission lines in California has been controversial in the past when the lines have passed near populated areas or regions of great natural beauty. Because geothermal resource areas are located in sparsely populated areas with some recreational and scenic value, the criticisms raised about transmission lines for geothermal power plants will no doubt mirror the concerns that have been raised before. The intervenors will probably be a mixture of local residents, and recreational and environmental interests. If government and corporate participants manage environmental impacts well and insure minimal disruption, complaints and

intervention will be considerably reduced. One major strategy for diminishing the objections to a particular power line has been rerouting it. For most transmission lines, route changes add little to the total cost, especially if it is a long line. In the geothermal case, where the attempt is to keep lines, initially, as short as possible, rerouting may add significantly to the overall cost. Therefore, there may be considerable friction in certain instances that might discourage a potential producer from proceeding with a geothermal development. Because the controversies will be very site-specific, little more can be said without discussing a particular place.[21]

The arrangements that must be made between nongovernmental participants to sell, trade, or wheel power add a new layer of complexity in comparison to what is necessary if a more conventional generating facility is built. With a conventional unit, the operator generally has to obtain only governmental approvals before he can produce power for his own needs, and he does not have to make arrangements with any other party. For many potential participants in geothermal development, this is still the case. PG&E needs agreement from no other nongovernmental party to transmit power from The Geysers into its system; SCE needs no one else to bring power from any plants it may build in Long Valley. In order to avoid making arrangements with others, a producer needs its own transmission line to an area. As

has been discussed, this situation limits the number of KGRAs and participants that could develop geothermal resources.

Making arrangements to sell, trade, or wheel power also involves standard contract negotiation. An added complication is that one or more parties may be reluctant to enter into such agreements. As already mentioned, privately owned utilities consider their economic and physical control of electric power transmission a valuable factor in their competition with publicly owned utilities, so they are not apt to grant publicly owned utilities easy access to transmission facilities. Some large corporations are seeking to control their own sources of electricity so they will not be subject to the rate increases imposed by privately owned utilities. The problem is particularly acute because CPUC has tended to raise the rates charged to large corporations much more than those charged to residential customers.[22] Consequently, the privately owned utilities are, understandably, reluctant to make this move by former large customers easier. A 1973 Supreme Court decision[23] somewhat strengthened the hand of publicly owned utilities trying to gain access to privately owned lines by requiring privately owned utilities at least to bargain in good faith over wheeling.[24] A bill now before the California Legislature (AB 4069) would interpose CPUC as an arbiter of wheeling negotiations, and would give it the authority to order interconnection and wheeling if an application for such an order is brought before it. The bill would limit this

authority of CPUC to electricity that is produced by unconventional energy resources (i.e., resources other than nuclear energy and fossil fuels). If enacted, this bill would further strengthen the hand of those in search of wheeling, including nonutilities such as Dow Chemical, but would not settle disputes with the privately owned utilities and could not guarantee full cooperation. Because wheeling is crucial to the plans of several potential participants, one can also expect that these participants would intervene in proceedings before federal and state agencies to request that any leases of state or federal lands for well-drilling or power plant construction require the lessee to make his transmission lines accessible for wheeling to others for a negotiated fee. The nature of this conflict probably guarantees that it will go on for some time.

Another source of the parties' reluctance to enter into sale, trade, or wheeling arrangements might be the desire of one of the parties to maintain control of a geothermal resource for its exclusive use. This situation would be especially true if it were clear that the resource would produce very cheap electricity. Because there is only one producing field in the state, cases of such reluctance to negotiate arrangements are probably rare at present, but as more areas are opened up, the problem could become more acute.

Transmission is a vital link in the development of geothermal resources for electricity production. The

existing network also forms the basis for potentially very powerful control over that development. Those that have the control now, naturally, do not wish to see their position weakened. Those now disadvantaged wish to see some sort of government intervention to improve their position. Until some mechanism is established to resolve this conflict, the institutional nature of the transmission system in the state may be very influential on the pace and pattern of geothermal development in California.

7.5 Proposals Made by Various Participants in the Process

7.5.1 Existing Lines

- Require privately owned utilities to deal with others who want to transmit power over the privately owned utilities' lines.
- Require privately owned utilities to carry others' power over the privately owned utilities' lines.
- Conduct antitrust actions against privately owned utilities that refuse to wheel others' power.
- Place all electric transmission lines in "common carrier" status.
- Have the state or federal power producers guarantee the power of the others who want to transmit power over privately owned lines.

7.5.2 New Lines

- Build new publicly owned lines to connect geothermal areas to load centers.
- Require that lines built to nuclear plants carry geothermal power as well.
- Have the state designate transmission corridors and assemble the "rights of way" across them.
- Allow accelerated depreciation for the cost of building transmission lines from geothermal areas.

Chapter 7

FOOTNOTES

1. New high voltage transmission lines operating at 69 kv cost on the order of $35,000-$50,000 per MWe mile according to discussions with various utilities. If a new 25 MWe geothermal plant, the first for a new hydrothermal field, cost $12.5 million and requires 100 miles of new lines, the lines would represent 28-40 percent of the total capital cost of the project. By comparison, the cost of transmission lines is typically 10 percent or less for a remotely sited fossil-fuel-fired power plant of about 750 MWe capacity.

2. Interview with John Dutcher of CPUC and also confirmed by Ed Terhaar of DWR.

3. Seven million to eight million dollars--telephone interview with Mr. H. R. Perry, Chief Planning Engineer, PG&E, July 23, 1976.

4. Telephone interview with M. D. Whyte, Manager, Electric System Planning, SCE, June 16, 1976. Interview with Peter G. Lowery, Power System Development Division, LADWP, July 6, 1976.

5. Information from same interviews listed in n. 4.

6. Chapters 194, 195, 196. California Statutes of 1976.

7. Lowery interview, see n. 4.

8. Discussion with former utility executive.

9. CPUC application #51892.

10. Discussion with NCPA.

11. Discussion with DWR.

12. Interview with Lowery, see n. 4.

13. Transmission is, of course, only a part of the reason the utilities will wait for experience to be accumulated before making investment plans.

14. Discussion with NCPA, referring to FPC regulations.

15. PG&E has opposed such a 13-mile line before. Discussion with DWR.

16. Public Resources Code Section 25107.

17. Public Resources Code Section 25120.

18. See Chapter 10.

19. With certain exceptions; see Chapter 10.

20. See Chapter 10.

21. For descriptions and issues likely to arise in each KGRA, see the JPL report.

22. Discussion with CPUC.

23. Otter Tail Power Company v. United States, 410 U.S. 366 (1973).

24. The NRC must now look at the antitrust aspects of a nuclear plant application, including the transmission network, before it can grant a construction permit.

CHAPTER 8

FINANCIAL ASPECTS OF GEOTHERMAL DEVELOPMENT

8.1 Overview

8.1.1 No Absolute Problem

Geothermal development faces no absolute financial problems. Obviously, geothermal projects must compete with other investments for capital resources, but there is no barrier apart from this competitive one.[1]

One reason for the absence of major problems is that geothermal power is a small part of the energy industry and is likely to remain so. For the foreseeable future, geothermal entrepreneurs are apt to seek a small share of energy capital. Moreover, geothermal projects are themselves small relative to other energy projects: development of a power plant and production field at The Geysers is much less expensive than building a nuclear plant. The point is not that small investments are generally easier to make than large ones; indeed, capital markets often prefer large ones. However, very large projects or attempts at major and rapid reallocations of capital within an industry are apt to run afoul of investor preferences for risk spreading, even though the large projects or reallocations may promise superior returns.

A second reason for the absence of major financial barriers is the strength of the principal geothermal

entrepreneurs. Within rather broad limits, large and sound companies like Chevron and PG&E can raise money for virtually any investment they care to undertake, so long as they are willing to pay the interest costs and provide collateral. Such entrepreneurs can also use their very substantial internal resources to finance geothermal investments.

Whether large or small, private or public, entrepreneurs evaluate geothermal investments on the basis of their likely returns. Projects will be undertaken to the extent that they offer better returns than alternative investments. Development at The Geysers shows very clearly that some geothermal projects are competitive and Chevron, at least, views geothermal development as roughly equal to present oil and gas development.[2] There are, however, problems that affect geothermal projects' attractiveness to investors. These problems and financial considerations related to them are the subject of this chapter.

8.1.2 Resource Needs for a Geothermal Field and Power Plant

In the earliest stage of geothermal development, that of obtaining leases, there may be substantial costs, but there are no prohibitive financial barriers to even small entrepreneurs. Leases at The Geysers have averaged $836 an acre, with much higher prices in some cases, but The Geysers is a proven and producing field.[3] Outside The Geysers,

leases have averaged $36 an acre. Apart from the first costs in obtaining leases, there are annual rents and occasionally small tax burdens. By and large, the costs of controlling geothermal land do not rise until a resource has been proven. While these costs may be relatively small, they are not trivial, and may amount to 10 to 20 percent of a firm's exploration budget.[4]

The initial investment is increased during the exploration stage roughly by the cost of drilling three wells. At The Geysers, the drilling of three wells presently costs about $1.5 million but is increasing each year; in the Imperial Valley, where drilling is easier, the cost per well will be somewhat less. Although variations in drilling conditions and in the number of test wells required may result in substantially higher costs, and allowance for unsuccessful exploration raises the ante still higher, it does not take a firm with enormous resources to raise the amounts of money necessary to lease and prove up a geothermal field. Diablo Exploration Company, a comparatively small operator, estimates that it has the wherewithal to lease and explore a minimum of three fields, and large companies of course can do more.

Finally, the developer needs to drill additional wells, generally 12, to reach the total needed for a power plant. To date, this has occurred <u>after</u> a sales contract has been negotiated; by this time, the original developer may have

sold his interest and left both production drilling and operations to another entrepreneur. In general, the developer will pay for the production wells and for the piping to carry the steam or hot water from them to the power plant, a total investment on the order of $8 million. However, the sales agreement, with whatever accompanying guarantees are given regarding the buyer's intention to construct and operate the power plant, provides an asset that can be used for raising the additional capital. Coal mines, for instance, are sometimes financed on the basis of long-term sales contracts. It seems extremely unlikely that a geothermal developer, large or small, would find it difficult to raise investment money for the purposes of field development once he has proved the existence of a resource and negotiated a sales contract.[5]

The geothermal energy user must, of course, raise money to build a power plant and whatever transmission facilities are needed. Once again, there is likely to be no major financial problem, since geothermal power plants are relatively small, costing on the order of $16 million to $20 million for a 110 MWe steam plant and perhaps $25 million or $30 million for a 55 MWe hot water plant.[6]

8.2 Principal Competitive Problems

The financial problems that concern geothermal entrepreneurs are those inherent in any major investment: the

relationships between costs and benefits, both within particular projects and between those projects and other potential investments. Some of the costs are obvious--for example, those costs involved in obtaining leases, exploring for resources, constructing and operating power plants, and transmitting power to final users. In addition, there are incidental costs such as environmental reports, appearances at governmental hearings, contract negotiations, and possible lawsuits. Such costs can reach a significant level by the time electricity reaches final users.

In assessing the costs and benefits, a number of uncertainties must be taken into account. First, major technical risks are involved. Since exploration techniques are not infallible, the risk of finding no resource always exists. In addition, the technology for power production from geothermal steam has had more use than that for other geothermal resources. Consequently, the developer faces the risk that, even if he finds a resource, it may be one for which the technology is uncertain.

Augmenting these two technical bases of uncertainty are those which stem from legal, institutional, and political problems. One, the lack of vertical integration in geothermal development, means that any one entrepreneur will have to negotiate with a variety of others before electricity reaches final users. Of course, the first set of participants might get money from the next set before electricity is

sold, but all returns stem ultimately from the production of electricity. If the production of electricity is uncertain, all participants may have to wait for production before any of them obtains a return. Thus any one entrepreneur is subject to the risks inherent in dealing with others. However, the number of participants, particularly at the stages of power production and transmission, are so few that the uncertainty to be faced is not the relatively well understood uncertainty of the marketplace. Instead, it is the relatively poorly understood uncertainty of activities by a very few organizations, some of whom hold significant monopoly or monopsony power.

A second basis of uncertainty arises because the federal, state, and local governments have not settled into standard treatments of the geothermal development process. Tax questions at the federal and state levels remain unresolved, as does the willingness of federal, state, and local governments to allow or encourage geothermal development. Not only will incidental costs mount, but potential returns will fade into the future as various government agencies try to resolve how they will treat particular issues.

Entrepreneurs face a third source of uncertainty because they have trouble predicting many of the incidental costs. Costs of environmental reports, appearances at governmental hearings, contract negotiations, and possible lawsuits are set by the joint activities of many participants and may vary widely among technically similar projects.

Even without delays from the uncertainties described above, exploration activities, field development, and power plant construction all take time. Expenses are high enough to exert significant borrowing or opportunity costs, so that a very high rate of return is necessary to compensate for the expenses and delay. What little evidence we have--the development of electricity from geothermal steam at The Geysers--suggests that the eventual geothermal returns can justify some investments. Nevertheless, the expenses, the delay, and the risks are significant and do lead some entrepreneurs to avoid or leave geothermal activities.[7]

The picture is not completely bleak, however. The process of geothermal exploration and development has enough technical similarity to the process of petroleum exploration and development that many entrepreneurs can develop fairly firm estimates of the major obvious costs involved and some idea of the incidental costs. Therefore, the costs of geothermal development are more predictable than the costs of developing energy sources that require less familiar technology (e.g., coal gasification).

8.3 The Role of Governments

8.3.1 Federal

The federal government is inevitably involved in shaping the geothermal financial picture. Its treatment of

costs and returns for income tax purposes can exert a marked effect on the financial attractiveness of geothermal development. In petroleum development, the federal government has allowed developers to deduct the intangible costs of exploration and drilling (e.g., labor costs) as a current expense rather than having to add them to the capital value of the well and deduct them as depreciation expenses over time. A court case has applied this practice to geothermal steam drilling that occurs in areas under the jurisdiction of the Ninth Circuit Court of Appeals (California, Oregon, Nevada, Montana, Washington, Idaho, Arizona, Alaska, Hawaii, and Guam) on the grounds that geothermal steam is a mineral resource rather than water.[8] The Internal Revenue Service has warned that it will attack this interpretation in other circuits, and its application to geothermal hot water wells is very much in doubt.

The federal government also may allow a taxpayer to deduct a percentage of his return from his taxable income as an allowance for depletion of the resource. Such a depletion allowance was permitted, although it has recently been restricted, for petroleum and minerals, but not for water wells. The court case mentioned above allowed a depletion allowance for geothermal steam wells in the Ninth Circuit, but left the same doubts as to its applicability both outside the Ninth Circuit and to geothermal hot water wells.

The federal government can obviously affect the financial picture of geothermal development in other ways. Most directly, it can provide money for geothermal development. It currently plans to do so in two ways: through loan guarantees and through demonstration grants.

Under the geothermal loan guarantee program, the federal government guarantees to the lender 75 percent of the amount of loans for geothermal development. This guarantee will presumably make banks and others more willing to lend for the purposes of geothermal development. Apparently, only the Wells Fargo Bank is involved in financing geothermal activity, but ERDA's loan guarantee program staff indicates that there is substantial interest in the program by potential lenders in California and elsewhere.[9] Some industry people, however, feel that the loan guarantees will not work very well. Many developers have a general preference for equity versus debt financing in risky ventures, and the loan guarantee program does little to change that preference. Also, the loan guarantee program will not make as much money available for geothermal development as the program sponsors might have thought, because the banks and other lenders are usually more interested in developing relationships that have long-term returns than in avoiding failure. Consequently, they are more interested in doing business with large, stable participants that have a long-term commitment to geothermal development than with newly formed organizations

just trying to break into the area. Unfortunately, the provisions of the geothermal development program make these newly formed participants more interested in obtaining loans than the larger, more stable participants, which have no trouble obtaining loans.

The federal government's second method of providing money for geothermal development--its demonstration grant program--pays a portion of the costs of some power generation facilities in order to demonstrate the attractiveness of geothermal development. Such grants might be a particularly appropriate way to absorb the risks of developing technologies for hot water resources.

The federal government also affects the financial picture of geothermal development in indirect ways. For example, the restrictions that the Securities and Exchange Commission (SEC) places on firms seeking public investment (the method of financing preferred by many developers) affect how easily firms can raise money from the public for geothermal investment and how easily one geothermal development firm can merge with another.

Another way in which the federal government affects geothermal finances indirectly is through its actions as a participant in the geothermal development process. As a lessor, it imposes costs for bonuses, rents, and royalties. As a regulator, it requires that developers take actions that cost money. As a research-supporting agency, it

supports studies that may reduce costs or risks of activities in the development process. Of course, the federal government may also take actions in other spheres, such as those of nuclear energy and petroleum energy, which affect the relative attractiveness of geothermal investment.

8.3.2 State

The state influences geothermal finances in many of the same ways as does the federal government. California can affect finances directly through tax provisions, securities regulation, and demonstration grants. For example, regulations preventing the public sale of high risk securities have hampered attempts to raise funds for geothermal activities. It can also sponsor research that might reduce the costs of geothermal activities: for example, CERCDC is sponsoring a baseline study of environmental conditions at The Geysers. Finally, the state's participation in geothermal development as a lessor and regulator can affect finances. For instance, its willingness to use a net-profits basis for competitive lease bidding reduces the immediate cash demand of geothermal development at the expense of the long-term return.

Note that both the federal and state governments, through their regulation of utilities and agencies, have another way to affect geothermal fi es: they have the power to make utilities and agenc ore or less risk-averse, and to directly encourage or discourage investment in geothermal development. How the federal and state

governments regulate utilities may thus have a relatively significant effect on the financial picture of geothermal development.

8.3.3 Local

Local governments have a slightly different set of influences on geothermal finances. Most explicit is the local property tax. In California, local governments are required to charge the "full market value" of property for tax purposes. When a developer has proven the existence of a resource to the satisfaction of a power producer, he has also proven it to the satisfaction of the County Assessor, even though the power plant may not be built nor revenue generated for several years thereafter. At least two developers in Sonoma and Lake counties are now facing severe tax bills even though they have no revenue from the resource they possess.

Perhaps the major financial influence of local governments, however, is their ability to affect the incidental costs of geothermal development. Local governments charge fees for producing EIRs; they have the power to require mitigation measures that increase the costs of various geothermal activities; and they choose how to conduct the hearings (and sometimes lawsuits) that accompany procedural matters. Since environmental reports, for example, can cost over $100,000, this power to affect incidental costs is significant.

8.4 Sources of Capital

8.4.1 Internal Sources

Governmental agencies are not the only participants that can affect the financial aspects of geothermal development. One source of money is the geothermal developer himself. He presumably starts with an initial amount of money that he wants to invest in geothermal development. His existing geothermal projects can thus play a crucial role in his decisions about any future project--either by absorbing his funds or providing new ones. For instance, if all of his projects are in the exploration stage, he may run out of money before he has done all the exploration and development work he wants to do. On the other hand, if at least one of the projects produces revenue, either from sale of the field or production of electricity, he will have funds for exploration and development elsewhere. Magma Power is apparently in this position. Revenue from the projects at The Geysers provides money to pay for exploration and development activities in the Imperial Valley and elsewhere. Consequently, an improvement in the return to geothermal developers will, under Magma's present plans, go directly into more geothermal exploration and development within the company.

Nongeothermal projects of a developer also play the same dual role: they can either take away money that the

developer would use for geothermal exploration and development, or they can provide revenue that he can apply to such activities. For various oil companies, petroleum projects have apparently worked both ways. Some have used revenue from such projects to invest in geothermal exploration and development; others have found that the opportunity to invest in petroleum development discouraged the use of these funds for geothermal development. Therefore, the internal funds available to a developer depend on the role of other projects immediately available to him.

8.4.2 External Sources

Other developers. Geothermal developers will sometimes get money, as well as other resources, from other developers. Occasionally, a small developer has obtained access to a leased geothermal area and some development capital by going into partnership with a large company that held geothermal leases. On other occasions, especially in The Geysers, two or three developers have merged their operations so that they can help each other pay the costs of operating the field and attending various governmental hearings and contract negotiations. Cooperative ventures are unlikely to be widely entered into because of the value of the fee for operating the field. However, there are theoretical advantages in small developers' working with large ones, such as a large firms' being better equipped to represent the joint venture in contract negotiations and governmental hearings.

Geothermal users. Another source of funds for geothermal development comes from power producers. Privately owned utilities have shown a willingness to invest in geothermal development. Some of this development has even occurred in stages of the process prior to construction and operation of a power plant. SCE and SDG&E have both formed subsidiaries: in some cases, to obtain leases; in others, to help developers test resources or technologies.

Publicly owned utilities are another source of resources for geothermal development. The city of Burbank went into partnership with Republic Geothermal at the beginning of the process, helping to obtain leases for geothermal development. NCPA, as noted above, has entered a development and purchase agreement with RFL, for which it paid $930,000. A few state and federal agencies, notably DWR in California, have expressed interest in geothermal development. This interest may include activities at all stages of the process, from obtaining leases to constructing transmission lines.

Private and public utilities obtain their financing from retained earnings, sales of bonds and issuance of both preferred and common stock, all of which are regulated by government. The general process has been analyzed extensively and is outside the scope of this report, except for the particular actions the state might take to encourage geothermal investment versus other investment.

Large corporations that use substantial amounts of electricity have also expressed serious interest in geothermal development and on occasion have contributed resources. Dow Chemical has invested money for geothermal development in one of the Magma companies in return for a good negotiating position when it tries to obtain resources for its own geothermal electric plant. AMAX has also expressed interest in arrangements like this one.

Outside investors. Of course, a wide range of investors outside the geothermal development process might also contribute resources. Most prominent among them are high-income individuals and groups seeking tax shelters. These taxpayers are going to be very sensitive to the treatment of geothermal costs for tax purposes. An increase in the certainty of their ability to deduct intangible expenses as a current expense or to use the depletion allowance would, according to most predictions, vastly increase the amount of money available from such sources.

A second source of outside investment might be middle-class investors. According to one analyst, these investors are not so much interested in steady returns as in a significant chance at a very big one. Therefore, they are not going to be so sensitive to the treatment of costs for tax

purposes, but they might be very sensitive to the treatment of returns--for example, changes in the depletion allowance. Another problem they face is the difficulty of obtaining enough information about developers to feel knowledgeable in picking one project for their long-shot investment. The developers also face a significant question: they must decide whether these middle-class investors represent enough money to justify the time and effort involved in contacting them and convincing them that a particular developer is a good place to invest money.

A third set of outside investors who might contribute substantial resources to geothermal development is institutional investors, such as trust funds, insurance companies, and educational institutions. These investors generally have enough financial stability to be able to stand the expense and delay of geothermal investment, if they can buy into the investment in small quantities. The federal and state governments could do a great deal to get them involved. A first step would be to write and interpret the trust laws so that the goals of investing in geothermal development would outweigh its technical and nontechnical risks; that is, so that the investment would be considered "prudent" by those who apply the laws requiring that trustees make only "prudent" investments. Other steps might include some form of tax break for investing in geothermal development--perhaps lighter taxation for returns from geothermal

investment. Models for such actions can be found in the Keogh plans for individual investors and in the treatment of insurance expenses in some foreign countries. In these cases, taxation on income that is invested (in this case, in geothermal development) may be deferred until a return from the investment is realized; then, when taxes are paid, the interest costs of waiting for the return may be deducted.

Lenders. Funds for geothermal development are also available in the form of loans from more traditional lenders, such as banks. Indeed, the federal loan guarantee program discussed above is designed to increase the availability of funds from such sources. A developer seeking a loan will probably have to provide about 25 percent of the total cost from other sources and provide assets as collateral.

8.5 Political Considerations

Many of the steps that the federal and state governments could take to improve geothermal finances will face serious political opposition. At present, the major actors in geothermal development are oil companies and utilities. The major investors are oil companies, utilities, large corporations that use significant amounts of electricity, and high-income individuals. None of these groups is politically popular at present. Consequently, measures that help these groups, even if they also help geothermal development,

may not be received with great acclaim in Congress. In fact, some of the people involved in geothermal development feel that the power to deduct intangible expenses as a current expense and the power to deduct a percentage of revenue as depletion allowance in geothermal development have both been held up only because Congress is afraid the public will perceive them as measures to help the oil companies rather than as measures to help geothermal development. Similarly, regulatory agencies sensitive to public outcry over electricity rate increases are going to be worried about measures that would allow the costs of geothermal development to be absorbed in electric utility rate bases. Measures to increase investment by rich individuals and large corporations face more of the same antipathy.

The provisions concerning institutional investors, which are not objects of the same antipathy at present, may be one way around this dilemma. Another way may be increased governmental activities, such as demonstration grants. Of course, demonstration grants often go to the same people (or public-private partnership arrangements) who would receive the benefits of the tax breaks described above, so these grants may or may not be perceived as less nefarious than the tax breaks.

8.6 Proposals Made by Various Participants in the Process

8.6.1 Tax

- Allow intangible costs of drilling geothermal wells to be deducted as a current expense for tax purposes rather than capitalized in the value of the well (i.e., treat geothermal wells like oil and gas wells).

- Allow the "expensing of intangibles" as above, but only to the extent that the tax benefit covers geothermal revenue or the tax savings go directly to geothermal expenditure.

- Allow revenue from geothermal wells to be subject to a 22 percent depletion allowance instead of cost depletion (i.e., treat it similarly to the way revenue from oil and gas wells is treated).

- Allow percentage depletion only to the extent of further investment in geothermal development.

- Allow geothermal developers to write off (deduct as current expense for tax purposes) 300 percent of the costs associated with dry holes.

- Use a biddable factor other than a cash bonus (such as a percentage of net profits or the level of royalties) in competitive lease sales.

- Allow rapid depreciation of capital expenditures for geothermal development.
- Defer the imposition of local property taxes until the wells start producing revenue.
- Replace the local property tax with a severance tax in the case of geothermal holdings.
- Eliminate the capital gains tax on sales of geothermal assets.

8.6.2 Loans

- Vigorously implement the federal loan guarantee program.
- Have ERDA make loans as well as guarantee them.
- Obtain loans from utilities and heavy users of electricity (with any necessary changes in utility regulations to allow these loans).

8.6.3 Other

- Relax California restrictions on selling risky securities.
- Promote more limited partnership agreements.
- Grant a higher rate of return for capital used in geothermal electricity than in other forms.

- Conduct state or federal government demonstration projects.
- Form more partnerships between utilities and developers.
- Lower bonding requirements for geothermal wells.
- Encourage utilities to do the development drilling of known fields themselves.
- Have California change its tax laws as a model for the suggested IRS changes.
- Have the federal government take a stronger position than the Tax Reduction Act of 1975 so investors would be more certain of the tax aspects of their investments.
- Enact provisions somewhat like those surrounding Keogh plans to encourage institutional investment in geothermal development.
- Legislatively set a time period for cost depletion purposes.

Chapter 8

FOOTNOTES

1. General comments on the analyses in this chapter range from a major utility's view that ". . . the statement of the problem and proposals represent a rather naive approach to the issues of financial risk . . ." to a major developer's view that "Chapter 8 on financing was well done and showed some keen insight into the workings of a free enterprise system of risk exploration." The reader is invited to make his own judgment. The authors hope that, in any event, the chapter is useful.

2. Interview with Dave Butler, of Chevron, January 13, 1976.

3. Christopher D. Stone, Geothermal Energy and the Law I: The Federal Lands Management Program, Draft Report, University of Southern California Law Center, September 30, 1975.

4. Chevron notes that these costs over a 10-year lease period for a full allotment of 20,480 acres of federal land can amount to nearly $1,000,000.

5. Indeed the NCPA-RFL contract's provision for payment of $930,000 to RFL in return for exclusive rights to the steam appears to be an example of the user's supplying capital at the exploration stage. There has been comment that PG&E paid $5,000,000 at the signing of its purchase agreement at The Geysers, although PG&E states that it has never advanced money for geothermal development.

6. Estimates of PG&E's Geysers Unit 14 and Chevron's predictions of hot water plant costs. Although there is considerable variation in the cost estimates for future plants, the important point is that individual geothermal plants are not apt to require large investments relative to other activities by major utilities.

7. There are reports that Shell may end its development activities.

8. Reich v. Commissioner, 52 Tax Court 700 (1969).

9. Telephone interview with Mark Silverman, ERDA, June 29, 1976.

CHAPTER 9

ENVIRONMENTAL IMPACT REPORTING

9.1 Introduction

The requirement for formal consideration of environmental impacts in governmental decisions has been the center of much attention in discussions of nontechnical barriers to geothermal development. From the developers' point of view, it is regularly singled out as the cause of significant delays. Consequently, a long list of proposals has been made to reduce these delays, up to and including exempting geothermal development from environmental reporting requirements. Government agencies, on the other hand, allege that much of the delay is brought on by the developers' negative attitude toward reporting requirements in the first place.

Environmental reports are required for both federal and state actions for geothermal development.[1] Consequently, there are hardly any discretionary permits that can be obtained without preparation of a detailed EIS (under NEPA) or EIR (under CEQA). Because of the sequential nature of geothermal development, at least two and perhaps as many as four separate impact reports are required: (1) for leasing federal or state lands; (2) for obtaining permission to drill; (3) for obtaining permission to build a power plant; and (4) for obtaining permission to build a transmission line, if the line is considered separately from any particular

power plant. Leasing private lands and consolidating any transmission facilities with the power plant decision can reduce the total reports to two. In theory, one comprehensive statement could be prepared that would be acceptable to all the agencies involved.

There is no question that the environmental impact reporting requirements have resulted in more lengthy approval processes and significant costs to the developers. At The Geysers, well-drilling EIRs can cost $10,000-$30,000, while power plant reports can cost on the order of $250,000.[2] In areas where the geothermal resource is confirmed, simply writing the EIR can add months to the permit approval time. On the other hand, there are legitimate environmental problems that were largely unaddressed until CEQA and NEPA forced agencies and developers to confront them, at least to the point of acknowledging their existence. These problems have involved soil erosion and disruption of the land during the preparation of well pads and during drilling; noise and odor associated with well and power plant operations; and the longer-term consequences of subsidence, air pollutant emissions, and the potential for discharges to lakes and streams.[3] Measures to mitigate these problems are now commonly included as conditions for obtaining required permits.

9.2 Problems in Applying NEPA and CEQA

To some extent the problems that have been encountered in applying NEPA and CEQA are the result of the newness of

the concept, the procedures, the issues, and some of the individuals and organizations involved. As experience has been accumulated, processes have begun to operate more smoothly.

However, because of the open-ended nature of some provisions in both NEPA and CEQA, the documents' required content is constantly changing. The evolution has generally been toward requiring more and more material and more detailed analysis. People in the industry often complain about these frequent changes in the "rules of the game."

9.3 New Procedures Under NEPA

The requirements of NEPA became effective in January, 1970, and BLM's geothermal steam leasing program was one of the first major federal actions to which they applied. As the EIS was being prepared on this program, a number of court cases set new standards on the content of such reports. Partially as a result of the rules set down by the courts and partially because of varying policies within BLM on the scope and content of the EIS, the statement itself was redrafted a number of times. Finally, after two and one-half years of gestation, the BLM geothermal leasing program EIS was issued. It appears that subsequent environmental documents on less extensive lease sale areas will be prepared more quickly. Nevertheless, the difficulties in producing an adequate EIS or related document have not all disappeared.

The environmental assessment process for federal lands begins with a prelease assessment performed by the land management agency, most likely BLM or the Forest Service. This assessment is accomplished by the preparation of an Environmental Analysis Report (or Record, if prepared by the USFS). This report usually encompasses an entire KGRA or even larger area and is general rather than site-specific in approach. Preparation time averages three to six months. From this report, a determination is made as to whether or not geothermal development would constitute a major federal action affecting the human environment of the area. If so, an EIS is recommended and a Department Task Force is formed to prepare it. An EIS is completed in one to two years. If the EAR shows that development will not affect the environment significantly, a negative declaration is made, and leasing can begin by the competitive or noncompetitive processes.[4]

Once a lease is issued, and prior to the commencement of operations on the lease, a plan of operation must be submitted to USGS for approval. This plan is evaluated for environmental impact by means of an Environmental Analysis (EA) prepared by USGS. It is site-specific and addresses in detail the proposed operations. The time involved in preparation of an EA is one to three months. From this analysis a decision is made as to whether or not the proposed operations would be a major action affecting the environment. If the decision is positive, an EIS must

be prepared. If the decision is negative, approval of the plan of operation is given with the concurrence of the land management agency.

Special lease stipulations can be added to leases prior to issuance as a result of an EAR, and special conditions governing operations can be added to the approval of a plan of operations as a result of an EA.[5]

No stages subsequent to exploratory drilling have been conducted on federal lands. It can be expected, then, that the initial decisions for each of these later stages will involve similar delays as the organization learns to cope with the new situation.

9.4 New Procedures Under the California Environmental Quality Act

Experience with CEQA has accumulated over a somewhat shorter time frame, but more decisions on various elements of geothermal development have been made in this period; consequently, the procedures of state, local, and regional agencies in geothermal development appear to be more mature than those of their federal counterparts. Although CEQA itself became effective in 1971, its application to geothermal development did not occur until 1973, after a California Supreme Court decision and an amendment to the original act itself extended the EIR requirement to apply to all discretionary decisions of government agencies rather than simply to projects carried out by them.[6] Complaints voiced by developers

about the delays caused by CEQA have focused almost exclusively on a few extreme cases, essentially the first ones to require EIRs after the 1973 revisions.

In Sonoma and Lake counties, the granting of use permits for the drilling of exploratory wells required one to two months prior to 1973 (see Figure 3). Between late 1973 and 1974, they required nine to 12 months. For one Lake County well, nearly 30 months was required before drilling was allowed to proceed. Planning Commission hearings alone were conducted over a period of nine months. When the use permit was finally granted, a lawsuit alleging EIR inadequacy was filed and resulted in an additional 11-month delay. But once citizens are given a chance to air their views; once guide-lines, both formal and informal, are established for the expected content of EIRs; and once the governmental agency acquires some understanding of the problems and issues raised by geothermal development, the permit approval process accelerates. For Lake and Sonoma counties, at least, the shock wave sent through the system by CEQA seems to have passed: recent approvals have been handled in three to five months.

For other agencies, particularly SLC, the process has had a similar evolution. Prior to passage of CEQA, SLC staff approval was required for wells drilled on state leases.[7] Now that CEQA is in effect, well approval requires some type of environmental review, usually an EIR. As an added

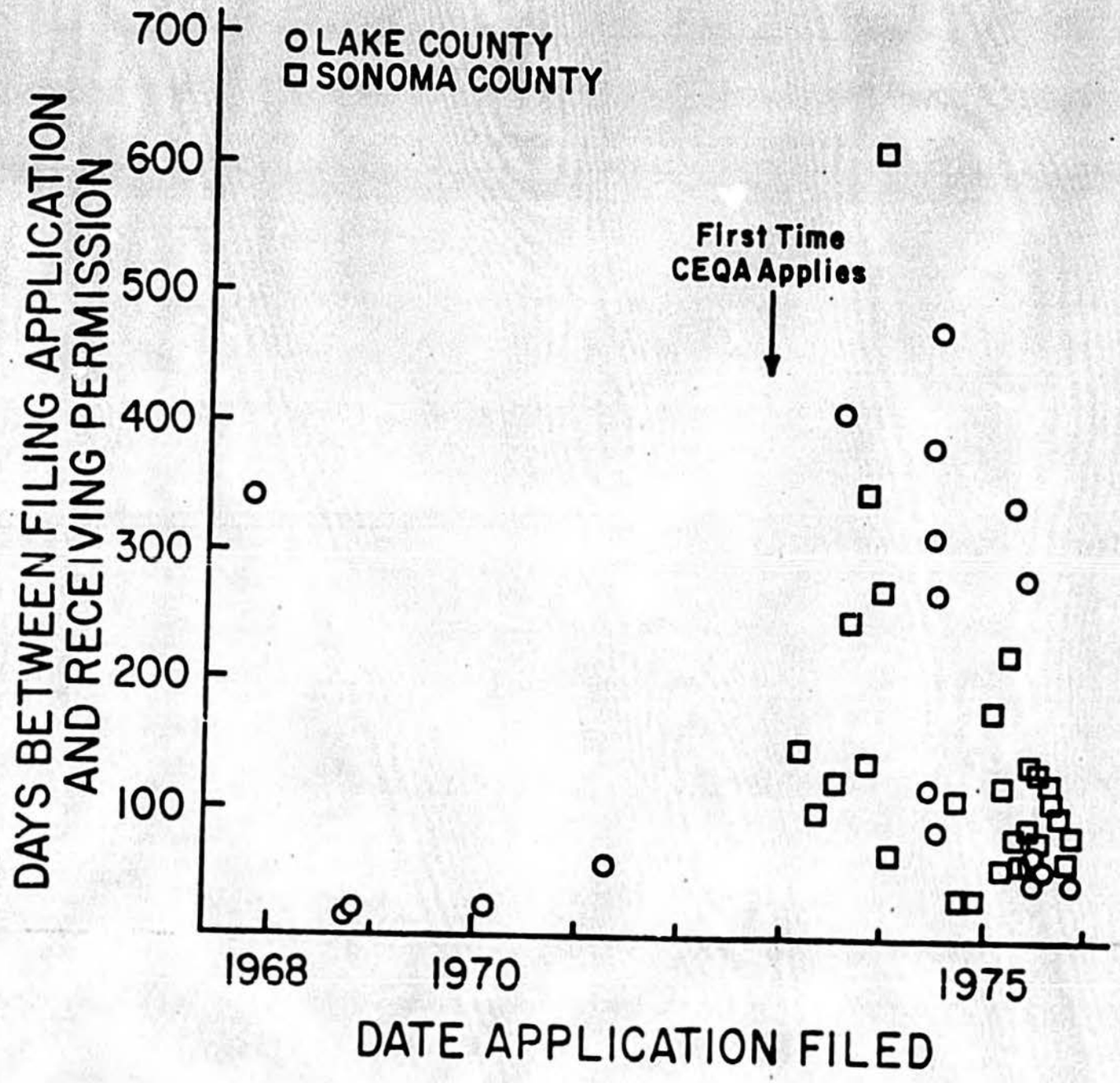

Fig. 3. Time required to obtain permission from counties to drill wells in The Geysers.

complication, the developer must comply with all county requirements, which usually means that he must obtain a county use permit. In most cases SLC has been able to adopt the environmental documents prepared by the county. Because the commission meets only once each month, 30 to 45 days are required for well approval in addition to the time required for county approval. The counties and SLC work closely together and have been able, in most cases, to process environmental documents concurrently. In addition, SLC must prepare or adopt an existing environmental document before a leasing decision can be made. SLC estimates that the preparation and certification of EIRs take from four to six months.

Experience with geothermal power plants in the environmental impact reporting process is even more limited than for other stages. Only three plants (PG&E Geysers Units 12, 14, and 15) have completed the review process and Unit 13 is approaching final approval (see Figure 4). Although the total approval process for Unit 12 took three and one-half years, the delay was partly due to a dispute between CPUC and the county over which agency was lead agency for the project. Once this dispute was settled, CPUC hearings were further delayed until the county had prepared a draft EIR on the entire Geysers leasehold of Union Oil. Other Geysers units required slightly less time: Units 14 and 15 took approximately two and one-half years, and Unit 13 is expected

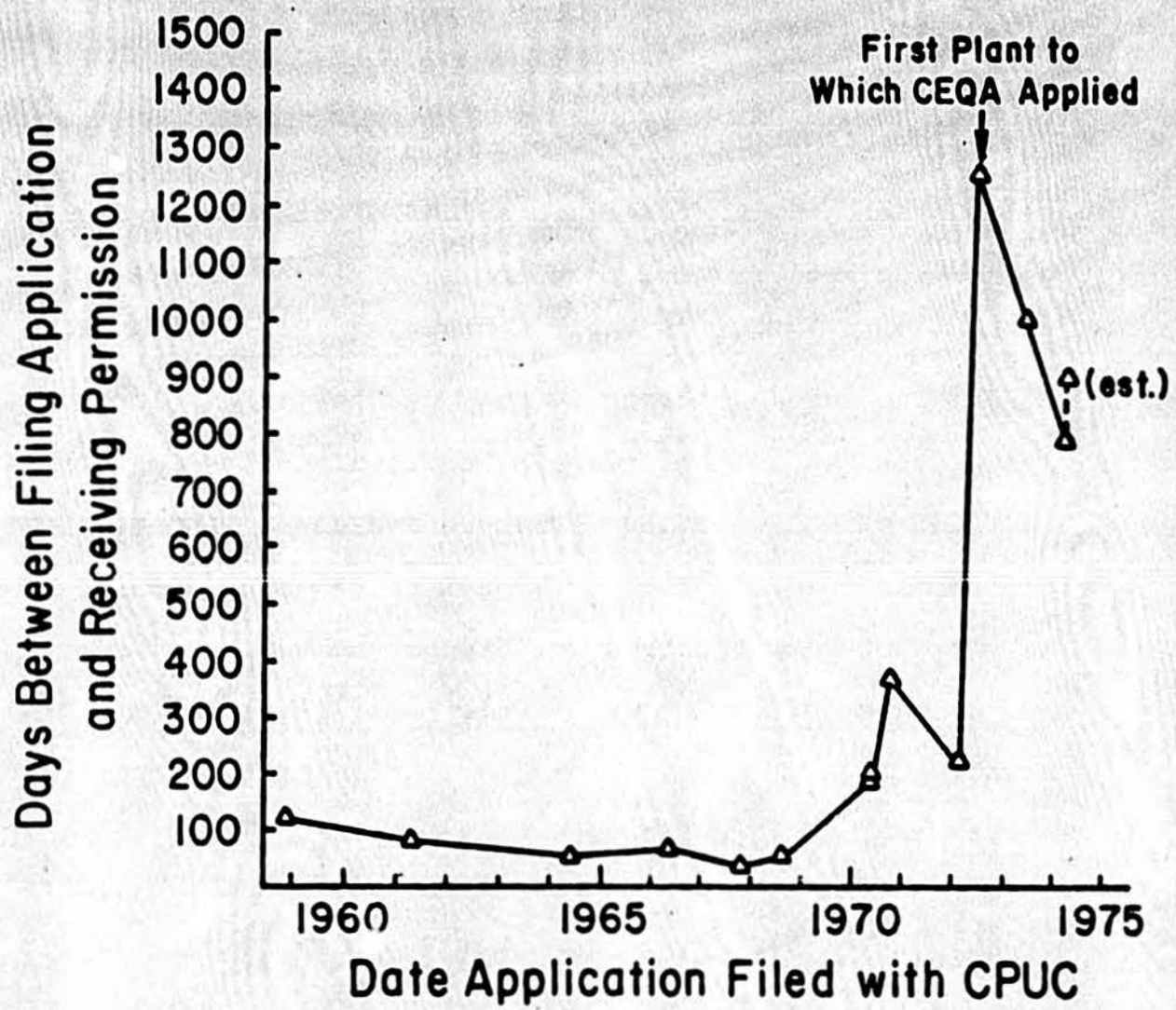

Fig. 4. Time required to obtain permission from CPUC to build a geothermal power plant.

to take a similar amount of time. Not all of the delay, however, is attributable to EIR processing. For Unit 12, only 12 months were spent on processing the EIR; the other 30 months were taken up with preparing for and holding hearings on the EIR. Of the expected two-and-one-half-year processing time for Unit 13, only 11 months were spent on meeting EIR requirements, and much of this time was spent investigating possible harm the plant might do to a Peregrine falcon habitat. Therefore, pre-CEQA plants at The Geysers gained approval in as little as three months; the EIR process is only one element in delays experienced since 1973. Increased controversy over geothermal development at The Geysers is another element, as is diversion of both CPUC and PG&E attention to rate changes and other matters.

While the EIR procedures have begun to be ironed out within CPUC, jurisdiction for Geysers Units 18 and beyond, and perhaps for 16 and 17 as well, will involve a new state agency, CERCDC.[8] Because of its broad mandate concerning environmental protection and conservation, CERCDC is faced with the task of working out a new set of accommodations with interested parties, as well as routinized procedures for handling geothermal power plant EIRs.

9.5 New Issues, New Faces

As has been implied, the first time an environmental report is required for a particular decision, delay is

inevitable. Over time, the handling of these reports becomes more efficient. This initial sluggishness is often the result of inexperience--the inexperience of the agency issuing the permit; of the developers, who are anxious to proceed; and even of the consultants or staff engaged to prepare the environmental report.

For all these participants, a certain amount of learning is required. The agency must learn about the controversial impacts of a proposed project and possible techniques for mitigating adverse impacts in order to make reasonable decisions in light of both opponent and proponent arguments. It must also determine the threshold between adequate and inadequate environmental documents so that they will withstand judicial scrutiny and perhaps even preclude serious challenge. The developer must learn what information the agency wants and which actions the agency will feel are unacceptable. He must learn to anticipate the response of the agency and to alter his plans accordingly. He must also learn tactics (such as applying for a number of permits at a time) that will offset the time required to issue permits. These who actually prepare environmental reports, whether agency staff or private consultants, must learn the overall environmental setting of a proposed project and the issues that will be of most concern, both to the agency reviewing the project and to the public. They must also be able to assemble people experienced in either the

geographic area or the type of project involved, in order to bring together sufficient and accurate information quickly.

As new areas are opened to geothermal development, it can be expected that a pattern of learning will emerge and will be replicated in each agency faced with its first geothermal-related decision. Accordingly, if means could be found to expedite this learning process or to provide an incentive for agencies to share information and experiences, some of the initial delays could be overcome. The learning described above will eliminate neither opposition nor controversy about geothermal projects. It will, however, enhance agency decision making and perhaps hasten the resolution of related conflicts.

9.6 Irreducible Minimum Requirements

Hastening the learning process is no panacea. The environmental impact reporting process, even when functioning smoothly, still requires a certain amount of time for data collection, report circulation, and public hearings. In addition, controversial projects are apt to require more time for preparation of environmental documents than others. The same maxim will also apply to other aspects of public agency decision making. Agencies that must solicit public input or incorporate explicit consideration of environmental values into their decisions face a process that is necessarily more complex and protracted.

9.6.1 Baseline Data

The environmental statutes and their guidelines for report preparation require certain fundamental information--on geology, soils, watercourses, flora, and fauna. If this information has not been previously collected over a wide area, bringing in qualified experts to provide the necessary data can be very time-consuming. Frequently, identical information is collected on two adjacent parcels of land for which applications for some type of permit were filed at disparate times. Had it been known that the data were needed for both parcels, they could have been collected simultaneously at a significant savings. Coordinated and broad-scale collections of baseline information, then, can be of great help in speeding up the reporting process, but only if the following two conditions are met:

1. The information collected will be sufficiently detailed for the needs of individual environmental reports. (Often baseline data are collected at too coarse a level to be useful; efforts spent in this type of endeavor would be wasted.)

2. Several individual environmencal reports, encompassing a large contiguous area, are expected in the near future. (If it appears that reports will be required on a patchy basis, it makes no sense to gather finely detailed data on a huge area. It is more economical to collect the data only as

needed; otherwise, projects could be delayed pending completion of a needless survey.)

9.6.2 Circulation of Draft Environmental Reports

Definite minimum times are set for the review of a draft environmental report.[9] The time required beyond the minimum is largely controlled by conflicting time commitments and interest in the subject, especially in public agencies. In the state, an EIR Clearinghouse was created to ensure adequate and rapid circulation of draft reports to relevant agencies. However, for portions of geothermal development in which the lead agency processing times are short (mostly exploratory well drilling), some have complained that the clearinghouse procedures result in delay rather than acceleration. The reason for this complaint appears to be that the clearinghouse function is adapted to handling large projects and is inappropriate for small projects. It has been suggested that in these cases, agencies should be allowed the option of doing their own circulating. But even with the fastest methods of circulation, a minimum of 30-60 days must be allowed for review. It is, of course, possible to establish maximum circulation periods as well; indeed this approach governs CERCDC's review of all power plant siting decisions.

9.6.3 Public Hearings

While not specifically required by NEPA or CEQA themselves, public hearings are required to be held for nearly all

geothermal decisions for which EIRs and EISs are prepared. In some cases these hearings have dragged on for months; for example, hearings for one well application in Lake County lasted nine months. Developers become impatient with such incidents and plead for the establishment of arbitrary limits on the hearing process. However, for many agencies, extended hearings are the price to be paid for obtaining information, keeping the political peace, and to some extent resolving conflicts over controversial projects. In any case, extended public hearings on geothermal projects are unlikely to become a routine occurrence. More commonly, after an initial venting of feeling by the public, fewer and fewer persons show up at hearings as particular types of projects are repeated--unless there has been an event on an existing project which has upset the public, or a particular proposal is especially controversial. Arbitrary limits in these cases would probably be counterproductive.

9.6.4 Agency Schedules

One fact often overlooked in discussions of delays before government agencies is that these agencies have crowded agendas. In some cases, the time lag between application for a permit and the holding of the first public hearing on an environmental report is not so much a function of the time required to prepare the report as of the lack of

open slots on the agency agenda. In recognition of these constraints, agencies themselves have often set up mechanisms to improve the decision-making flow:

1. Special purpose environmental councils have been set up to evaluate the need for environmental reports, screen them, and/or receive public comments (e.g., the Environmental Protection Council in Sonoma County, and the Conservation and Environmental Quality Committee in Napa County). These councils attempt to serve as a focus for controversy so that reviews of the report by other agencies can be handled quickly.

2. When several agencies are involved in issuing permits on a proposed project, one becomes lead agency; that is, one shoulders the burden of receiving public comments and shepherding the environmental report along, thereby lessening the pressure on other agencies. This lead agency concept was specifically established by CEQA.[10]

3. Subsequent development is handled as an addendum to an initial broad environmental report. Anticipating that a developer asking for permission to drill a few exploratory wells may be back to get permission to drill a dozen or so developmental wells, Sonoma County asks that the first EIR on a leasehold be quite comprehensive. Additional

drilling is then handled in a brief addendum to the full EIR. This process results in a substantial decrease in total processing time. However, if the geothermal resources do not turn out to be commercially valuable in the near future, the time spent in preparing an EIR in a manner that assumes ultimate commercial production will have been wasted. Therefore, this approach would probably not be workable in areas with a low chance of success in finding a geothermal resource that is immediately commercially valuable. This would be the case almost anywhere outside The Geysers at present.

Not all agencies have managed to pare their processing times down to the minimum; such agencies could profit from adopting some of the schemes that have worked elsewhere. Again, the sharing of information seems to be crucial.

9.7 Summary

Overall, the environmental impact reporting process has been subjected to considerable criticism--some deserved, some not. The comparison is commonly made between the time required to obtain drilling permits at The Geysers (up to 30 months) and in Imperial County (two to three months). This comparison appears to be invalid. There is no power production from geothermal resources in the Imperial Valley. Consequently, the problems that may be encountered--noise,

subsidence, odor, consumption of scarce fresh water for cooling--have not yet been the subject of much public concern. Once power production begins in the Imperial Valley, opposition will probably begin to materialize, and the permit-granting time will increase accordingly. In contrast, the problems at The Geysers are publicly recognized, procedures are becoming smoother, and mitigation measures are being applied. Therefore, the average approval time at The Geysers should decrease. This is not to suggest that there will be no problems at The Geysers, but merely that conditions at The Geysers are relatively mature and settled, whereas other areas have yet to enter their unsettled period with regard to geothermal development.

9.8 Proposals Made by Various Participants in the Process

9.8.1 Eliminating Some Reports

- Allow initial EIRs to be amended for subsequent wells on the same leasehold.
- Allow geothermal wells to receive a negative declaration.
- Grant geothermal wells a categorical exemption.
- Make drilling geothermal wells an allowable use under local zoning ordinances in KGRAs and other potential areas.

- Prepare an EIR for the entire potential area in the county and let all wells be permitted on the basis of that "generic" EIR.

- Allow EIRs for wells to omit consideration of power plant impacts if the leasehold has no pre-existing producing wells.

9.8.2 Changing Procedures

- Insist on a broad scope in the first EIR on a leasehold and allow subsequent permits to be granted by amendments to the first EIR.

- Set time limits for the preparation and consideration of an EIR.

- Eliminate the role of the State Clearinghouse.

- Speed up the State Clearinghouse.

- Allow EIRs to be sent directly to the local offices of state agencies.

- Require each lead agency to draw up a set of uniform requirements for geothermal EIRs.

- Have applicants apply for permits well ahead of the time they will need them.

- Have the lead agency, instead of the applicant, hire the consultant who will prepare the EIR.
- Hire consultants with experience in the area and sensitivity to the issues likely to be raised by the public.
- Include more than one well in each permit.
- Require uniform, reasonable steps for complying with laws such as the Antiquities Act and the Endangered Species Act.
- Set boundaries on the scope of each EIR.
- Require those who appeal decisions on the grounds of EIR inadequacy to post bonds.
- Establish an administrative board to hear appeals based on the alleged inadequacy of EIRs.
- Have the federal and state governments help collect baseline data in areas most likely to be sites of geothermal development.
- Have potential applicants help collect baseline data on areas likely to be sites of geothermal development.
- Increase staff of lead agencies to give them more time to review EIRs before public hearings.

- Have the staff in lead agencies attempt to predict the conflicts that will be of concern to the public and propose solutions where possible.
- Require EIRs for any disturbance of vegetation.
- Write county land use plans that set aside zones in which geothermal development will be excluded.

Chapter 9

FOOTNOTES

1. For federal actions, these are required by NEPA, 42 USC 4321 et. seq. For state and local ones, by CEQA, California Public Resources Code, Section 21000 et. seq.

2. Discussions with planning officials in Lake and Sonoma counties, geothermal developers, and PG&E.

3. Some have commented that no such discharges have thus far occurred.

4. As noted in Chapter 3, BLM policy about using EARs instead of EISs for leases in areas covered by the EIS for the geothermal leasing program is at present the subject of litigation.

5. The procedures are described in a letter from USGS, June 8, 1976.

6. Friends of Mammoth v. Board of Supervisors of Mono County, 8 CAL 3d 247 (1972).

7. Description of SLC procedures is from an SLC comment in a letter of June 3, 1976.

8. See Chapter 10 for a discussion of the CERCDC.

9. An example of intense developer concern with the environmental reporting process is the following comment on minimum review periods: "This is dumb and a typical example of the problem that exists. It says no matter how short a time it could be done in, by golly you are going to have to cool your heels for this long a period."

10. California Public Resources Code, Section 21067.

CHAPTER 10

THE CALIFORNIA ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION

10.1 Introduction

The entrance of California's newly created CERCDC into the process of geothermal development significantly affects both the drilling and the power plant construction stages of the process and may well have ripple effects in all stages.[1]

CERCDC creates effects in two major dimensions--as a new participant and as a state participant. As a new participant, CERCDC poses the questions of how well and how fast it will learn to fulfill its mandate. CERCDC's task is somewhat simplified, since it is responsible for handling old concerns. In part, its success will depend on how much it learns from the experiences of other agencies and how much it disturbs the accommodations that have developed among existing parties. As a state participant, CERCDC poses questions of the state's relationship to local governments and to others that might be involved in regulating geothermal development.

It appeared as this report was written that both the commissioners and their staff understood the problems facing them and were taking steps to fashion solutions. How effective they will be cannot be determined. Hence the discussion

below is primarily intended to underscore the actual and potential issues facing the commission in geothermal development.

10.2 The Authority of CERCDC

CERCDC is granted authority over possibly the most important stage in the process--building power plants.[2] Its authority to approve power plants and sites supersedes all other permits required by state, regional, or local agencies, with three exceptions. For one, the Certificate of Public Convenience and Necessity is to be obtained from CPUC, a step that will involve a review of the economic, reliability, safety, and rate base implications of the proposed plant. Second, for any plant proposed to be located in the 1,000-yard coastal permit zone, a construction permit is required from the California Coastal Zone Conservation Commission (CZCC) or a regional commission (provided such a commission is still in existence). Finally, permits required by state, regional, or local agencies administering federal statutes are still required.

Certification of sites and plants will occur in two stages: the Notice of Intent (NOI) and the Application for Certification (AFC) processes. A party wishing to build a power plant must first submit a Notice of Intent to file an

application. The commission's deliberations on the NOI are for the purpose of preliminary screening of proposals.

Approval of an NOI allows a party to file an AFC, a detailed application for specific location and plant design. For geothermal plants, the combined NOI-AFC review process is required to be limited to 18 months, clearly a more rapid process than the previous one. However, with the inexperience of the commission and its staff and the shakedown problems that inevitably occur in a new agency, the 18-month deadline may be difficult to meet.

In addition to its regulatory responsibilities, CERCDC is also able to parcel out R&D funds to geothermal development and a broad range of other technical energy questions. CERCDC can thus play a role in stimulating geothermal development by reducing risk in advanced technological ventures.

10.3 CERCDC as a Conflict Focal Point

CERCDC was created to resolve serious disputes that the legislature felt were not being adequately addressed in the existing process.[3] These disputes were focused in the areas of:

1. The rationality of a continually rapidly growing need for energy.

2. The role of conservation as an alternative to building power plants.

3. The protection of the environment.

4. The adequacy of existing decision-making processes and attitudes toward utilities vis-à-vis the general public.

All of these concerns are now thrust upon a single agency. Additionally, new decision criteria are brought into the plant approval process. First, CERCDC is to make an independent forecast of the 10-year and 20-year demand for electricity. No plant that would provide power in excess of that forecast may be approved. The forecast thus will become the focus of extended debate, especially since there is no precedent for this type of activity. In particular, conservation is to be considered an alternative to increased generating capacity in producing the demand forecast.[4]

One should expect, therefore, that a good deal of time will be required to find solutions that are acceptable to all parties in the controversy. This may mean that the decisions made by CERCDC on its first power plant applications will require considerable time, perhaps even in excess of statutory deadlines.

10.4 CERCDC Inexperience

A likely source of difficulty in the processing of the first few NOIs and AFCs is the newness of the agency itself. This newness is reflected in the inexperience of the staff

in carrying out the mandates of a new law and that of the commission itself in dealing with the actors and issues which come before it. In the process of organizational learning, formal and informal mechanisms for dealing with disputes and problems will evolve, along with a set of workable rules and regulations and a staff knowledgeable of the context in which the commission operates. But such evolution inevitably requires time and, generally, some mistakes along the way.

Currently, the planning commissions of Sonoma, Lake, and Imperial counties, CPUC, DOG, SLC, BLM, and USGS appear to have had the most regulatory experience with geothermal development. Many participants in the process were worried about how much CERCDC could learn from their experiences and how much they actually would.[5] CERCDC has initiated formal and informal contacts with various agencies for that purpose. To date, the emphasis has been on laying the groundwork for agreements with the relevant federal agencies and with state and local agencies that administer federal laws.[6]

Some means to transfer the experience of existing agencies to CERCDC would probably reduce the total learning time for the commission.

10.5 CERCDC and the Existing Regulatory Process

For a number of reasons, the relationship of the commission to existing regulatory processes is also a sensitive

point. Most important is the nature of the preemptive authority of CERCDC. While the law grants the commission nearly exclusive authority, it also mandates the commission to apply and enforce the relevant rules, regulations, ordinances, and standards adopted by other state, regional, and local agencies.[7] While the commission may adopt more stringent standards than those applied by other agencies, it does not have a free hand to violate such standards, except in unusual circumstances. Moreover, CERCDC has no authority to change standards set by federal law, even though they may be applied by state agencies. Thus, while the commission is granted the ultimate decision-making authority in approving a site and power plant, substantial discretion in standard-setting remains with other agencies of government.

Shared responsibility for standard-setting and the independent permitting powers retained by CPUC, CZCC, and others are constraints on CERCDC's freedom of action. How the commission will deal with them is a significant issue. Avoidance of conflict both with the other agencies and with intervenors over the exercise of shared powers can greatly enhance geothermal development, particularly in the short run. CERCDC's options for accommodating the other agencies range from minimal compliance with the procedural requirements for notification and solicitation of comments, combined with its own interpretations of their standards, to very extensive consultation limited only by the requirement that

the commission itself rule on NOIs and AFCs.[8] Presumably the probability of conflict falls as consultation increases, although the same increases may of themselves consume significant time and energy. The tradeoffs between conflict and consultation costs represent important decisions for CERCDC.

One possible solution may be to supplement the requirements for notification and consideration of comments by conducting joint hearings at both the NOI and AFC stages. Through this approach, the commission could allow other agencies a direct role in eliciting information from those testifying as well as asking each agency directly for its findings as to whether proposed plants and sites conformed with its requirements. The other agencies would then be involved essentially as partners in the decision-making process.

The minimal approach seems to remove many participants from the approval process, while the second, very expansive method appears merely to add one new "umbrella" participant to the scene. However, the political costs of attempting to exclude an actor whose expertise in the matter is legitimized by the required acceptance of his standards and criteria must be considered. Approval of NOIs and AFCs is likely to be more expeditious to the degree that CERCDC can obtain agreement beforehand among all the interested parties as to how the preemption will work. Allowing agencies the most

direct possible role may be necessary to facilitate such agreements.

The question of the relationship of CERCDC to existing processes comes up again in considering the potential jurisdiction of CERCDC over the drilling of geothermal wells. Under the existing system, the agencies involved in regulating geothermal development have reached a series of agreements on the limits of their regulatory jurisdiction. In general, the counties have jurisdiction over all surface impacts (with the exception of any permits required from a regional water quality control board), and DOG regulates everything below ground, although it also controls the surface effects that directly result from drilling (e.g., the installation of mufflers). The county, furthermore, in approving power plants, evaluates the environmental impact of the associated wells and piping, and CPUC evaluates the construction and operation of the power plant. This particular arrangement was the product of a lengthy dispute between the counties and CPUC, a dispute that could be headed for a reprise. The potential controversy centers both on whether CERCDC has preemptive authority over well drilling and on the extent of its exercise.

The Warren-Alquist Act, which created CERCDC, grants the commission jurisdiction over thermal power plants "and any facilities appurtenant thereto."[9] Since (1) geothermal wells are drilled in areas that as yet have no power plants

installed nor seriously planned, and (2) three or more exploratory wells are drilled in a field, even at The Geysers, before a utility will agree to purchase the steam and build a plant, there is a question whether the wells are in fact "appurtenant facilities."

Moreover, an exercise of jurisdiction by CERCDC over exploratory wells might substantially delay development. The NOI filed with the commission must include preliminary power plant specifications and site description, even though the utility may not know if the resource will be found in that field. The more formal AFC must contain detailed plant and site specifications, again without being sure of the existence or characteristics of the geothermal resource. Were the law strictly interpreted, no wells could be drilled until, first, CERCDC had reviewed and given preliminary approval for an entire power plant, as outlined in an NOI; second, an AFC had been reviewed; and third, the plant had received commission certification for construction. This process may require less than the statutory 18 months, but it is likely to take more than the 90 days in which counties can often issue conditional permits.

There are two other possible solutions to the question of the extent of CERCDC jurisdiction. First, the commission could take jurisdiction over only the dozen or so developmental wells normally drilled after the resource has been confirmed by exploratory drilling and after the utility has

obtained all the necessary permission to construct a power plant. Jurisdiction over exploratory wells could remain with the counties (as lead agency), DOG, and others. Second, CERCDC could take jurisdiction over only the actual power plant, and leave jurisdiction over all wells to the agencies that have regulated them thus far. This arrangement would, in effect, continue the one worked out previously between CPUC, the county, and other agencies.

Consideration of the interface between CERCDC and other regulatory agencies also poses a sharp question about which level of government will regulate environmental concerns. At present, the environmental effects of geothermal development differ greatly by type of resource and location. Support or opposition to geothermal development differs according to the political economy of the region. The technical and political measures that serve to mitigate local concern also differ from place to place.

Thus, the question CERCDC poses is whether the state's concerns will change the agreements that local concerns produce and, if so, how much. CERCDC will have to know not only the way in which proposed development would fit into the general environmental protection and energy resource conservation concerns, but also the specific measures that help to produce agreement in that area. Since local measures differ so much, operating from a statewide base will be very difficult. If CERCDC misperceives the importance of prior

arrangements between the developers and the regulators and tries to override those arrangements, it may encounter substantial resistance that will result in delays.

It should be noted that CERCDC has not as yet defined the extent to which it will exercise control over geothermal exploration or production wells. It is clear that CERCDC will control the siting of power plants, it appears likely that it will exert some control over production fields, and it seems unlikely that it will regulate exploration.

10.6 CERCDC in Flux

The problems noted above are a function of the fact that CERCDC is still largely untested 20 months after its creation. There has been the personnel uncertainty usual in any new agency; some regulations have been amended a number of times, and others--for instance, AFC procedures--have yet to be defined. Such uncertainties have necessarily been confusing to the utilities and to other groups that intend to build geothermal power plants. Until this activity settles down, little can be said about the effect of the commission as a regulator, particularly for situations where CERCDC jurisdiction is ambiguous.

10.7 CERCDC and Special Situations

Several special situations in geothermal development may confront CERCDC with problems that are exceptionally

challenging because they are not dealt with explicitly in its enabling act. The question of jurisdiction over geothermal well drilling itself, discussed above, falls into this category.

10.7.1 Grandfather Clause Exemptions

An equally knotty problem is the extent of CERCDC jurisdiction over geothermal plants that are exempted by law from CERCDC authority because they were planned for construction before CERCDC was in operation and could reasonably have been expected to process the application for their construction. The exemption meant that approvals could be obtained through the previous process, which involved CPUC, the counties, and other state agencies. Many of these plans have since changed, and the jurisdiction over the plants is clouded. Units 16 and 17 at The Geysers, proposed by PG&E, are likely to be the plants most directly affected by this situation, but an additional 220 MWe of capacity originally planned by Burbank is also involved, as are NCPA plans.[10] The commission, by regulation, has chosen to consider exemptions on a case-by-case basis.[11] Its proposed procedures establish a maximum of nine months for deliberating on each claim of exemption. There are objections to these procedures on the basis that they eliminate the statutory right of the utilities to exemptions and impose additional delays. In all likelihood, these procedures have been designed around exemption disparities on very large thermal

power plants, and the commission may have less trouble expeditiously deciding a claim on a geothermal power plant.

10.7.2 Exemptions Due to Size

In addition to the question of those plants exempted from commission jurisdiction by "grandfathering," geothermal plants can also escape commission jurisdiction because of size. The law exempts from CERCDC review thermal power plants of less than 50 MWe size.[12] The commission itself may also choose to exempt geothermal power plants of 100 MWe or less if it determines that plants of this size pose no significant adverse environmental impact.[13] Again, exemption in either case means that separate permits must be obtained from the set of state, regional, and local agencies with previous responsibility for such approvals. An applicant has the choice of waiving the exemption and choosing CERCDC jurisdiction if he believes it in his best interest to do so.

While most recent power plants have been in the size range of 55 to 135 MWe, it is conceivable that initial units in hot water fields would be less than 50 MWe capacity. For potential plant owners, the threshold in CERCDC jurisdiction may cause confusion, but it also provides them with the opportunity to choose their own regulatory path, avoiding either CERCDC (by building a plant less than 50 MWe in size) or other state, regional, and local agencies (by

waiving exemption or building a plant greater than 100 MWe). For CERCDC, this may create problems in keeping track of power plant construction plans. Eventually, CERCDC may find it necessary to revise its regulations in order to avoid the construction of a large number of 49 MWe plants that are outside its jurisdiction. But the greatest difficulty may be for state, regional, and local agencies to preserve, and in some cases create, the rules and procedures to handle the occasional non-CERCDC plant approval in an expeditious manner.

10.7.3 Plants Built by Nonutilities

Heavy users of electricity, such as Dow Chemical Company and AMAX, are now considering the construction of their own power plants to stabilize energy costs, which have been rising rapidly and are likely to continue to do so. There are two reasons for this cost increase: (1) utilities have been forced by rising oil prices and capital costs to increase the cost of delivered power, and (2) there has been a growing feeling that rate structures should be revised so that heavy users bear a large proportion of the increased burden in order to correct for perceived inequality in the past. For such users, geothermal energy promises a long-term source of supply at a low and stable cost. Since they are not traditional utilities, however, obtaining permission from CERCDC to construct plants may be difficult. As noted

above, the commission's approval must involve a finding that the proposed plant is scheduled in a manner consistent with the service area forecast of demand adopted by the commission. A heavy user has no "service area" in the traditional sense but is a part of the area served by another electric utility. The heavy user and the utility may then become explicit competitors before the commission. Any capacity built by the heavy user would subtract from that which the utility could build, and vice versa. While this is not an insoluble problem, there will probably be very few applications from heavy users and, thus, little or no opportunity for a workable procedure to evolve over time. Instead, each application by a heavy user to build a geothermal plant may involve a great deal of conflict and delay, sufficient perhaps to discourage the heavy user from proceeding. This situation may provide one of the most compelling reasons for building plants with a capacity of less than 50 MWe, thereby avoiding CERCDC jurisdiction.

10.7.4 Geothermal Plants on Federal Land

Because much of the highest-potential geothermal land is owned by the federal government, it is likely that someone will eventually propose to construct a power plant on federally owned land. A question can be raised whether the CERCDC has any jurisdiction in this situation and from which federal agencies approval would be required. Potentially, plants could be built on federal land with a minimum of

administrative processing time if few federal, and no state or county, approvals were required. For a utility that must deal with CERCDC regularly for a series of plant approvals, it may be good politics to ask CERCDC for its approval of a plant on federal land, despite the fact that this action may not be required by law. But circumstances may arise (e.g., if a heavy user wishes to build a power plant) in which the question of CERCDC jurisdiction over plants on federal land could be a central dispute and cause significant delays. There is also a question as to whether federal agencies have considered how to handle a proposal to build a plant on federal land. Advance planning, both by CERCDC and by federal agencies, could be useful in reducing delays in the first such proposed plants.

10.7.5 Role of CPUC with Regard to CERCDC

In addition to obtaining a certificate from CERCDC, privately owned electric utilities (but not publicly owned utilities or heavy users) must secure a Certificate of Public Convenience and Necessity from CPUC. By law, this commission is to consider the "economic, financial, rate, system reliability, and service implications" of proposed power plants.[14] To a large extent, however, both agencies will need the same information to make their decisions. The law allows an applicant to file simultaneously with CPUC and CERCDC but requires the CERCDC permit to precede that of CPUC.[15] It is conceivable that the CPUC process could

follow CERCDC's instead of running simultaneously. This would be especially true if CPUC felt that significant changes in plant design and equipment might be required by CERCDC. In this case, the plant approval process could become very lengthy. It could be smoothed out, however, by efforts of CPUC and CERCDC to reach accommodations on sharing information and establishing sufficient interaction to ensure that the actions of one commission do not come as a surprise to the other.

10.7.6 Role of CERCDC with Respect to CZCC

No permit may be obtained from CERCDC for building a power plant in the 1,000-yard coastal "permit" zone unless a permit has first been obtained from the CZCC or a regional counterpart.[16] This situation is analogous to the one between CPUC and CERCDC. A major difference is the uncertain future of the CZCC. According to the initiative which created it in 1972, CZCC is to go out of existence in January 1977. The role of CZCC was to develop a coastal plan and recommend to the legislature a scheme to implement it. Because of the complexity of the issue, the legislature may not be able to enact the proposed legislation before the agency expires. While there is a growing sentiment for extending the life of the CZCC 18 months while legislative deliberations continue, the future regulatory status of California's coastline is still highly uncertain.

10.7.7 CERCDC as a Promoter of Geothermal Development

CERCDC may, in the exercise of its powers over the siting of power plants, exert considerable influence to promote geothermal development. In some sense such influence is mandated by the commission's statute. For instance, geothermal NOIs do not need to list three sites, as others do.[17] More importantly, the periods for consideration of geothermal NOIs and AFCs total 18 months, half the time allowed for other power plants.[18] While the commission probably cannot legally adopt explicit policies giving further preference to geothermal plants, it can exert pressure in that direction by various means. One might be to require the consideration of geothermal energy as an alternative project in the EIR required before certification decisions can be made. Similarly, CERCDC concern with environmental impacts and its choice of mitigation measures to reduce them could favor the geothermal alternative. Finally, there is obviously considerable leeway in such procedural matters as scheduling of hearings and assignments of staff to review document submissions.

In addition to the power plant regulatory duties assigned to CERCDC, the commission is mandated to conduct an R&D program that, among other things, is to accelerate the development of geothermal energy. The commission has several million dollars to devote to this program, but it cannot match the commitment made by ERDA. In fiscal year 1976-77, CERCDC proposes to spend $655,000 in state funds

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

effectiveness as +1 and we think its effects will be evident in the short term.

Proposal 14.5.8: Use Federal and State Funds to Encourage Experimental Use of New Mitigation Technologies

The issue of how to mitigate undesired environmental impacts is often a major bone of contention in geothermal hearings. Occasionally, new or still experimental techniques are available to reduce certain impacts, but power plant or steam field operators are justifiably reluctant to bear the full risk of using new technologies.

This proposal argues that the willingness of power plant builders or field operators to use unproven mitigation technologies could be substantially increased if the federal and state governments would provide funds for such applications. The proposal also argues that the development of improved mitigation technologies will go a long way toward decreasing state and local agency resistance to geothermal development.

We think the cost of implementing this proposal would be low in time and money and medium in trouble. The primary cause of the trouble would be the reallocation of funds from plants and basic research to this specific applied purpose. We think the benefits of this proposal would be a low reduction of the time, money, and trouble involved in the geothermal development process. We rate the proposal's effectiveness as +1 and think its cumulative effects will

occur in the long term, although the effects of any successful mitigation technologies are apt to be short term.

14.6 Transmission Issues

An installation needs to have a minimum generating capacity of roughly 200 MWe before the construction of new transmission lines can be justified. However, most of the presently envisioned generating units will have capacities of 50 to 100 MWe, and will therefore be too small to justify construction of their own transmission lines. Although some geothermal fields are near existing lines that have the needed capacity availab e, others are not. Consequently, many questions have arisen concerning access to transmission facilities.

The major controversies center on the rights of smaller companies to access to existing lines and the role of the government in insuring that reasonable access opportunities exist. Proposals offered range from policies that would force transmission line owners to wheel power for any producer, to those that would require government ownership and operation of transmission facilities.

Proposal 14.6.1: Supervise Transmission Negotiations between Privately Owned Utilities and Others Who Want to Transmit Electricity

This proposal argues that even though the Otter Tail case requires privately owned utilities to negotiate in good

faith with others who want to use their power lines, such negotiations still need supervision. There are two reasons for this situation: (1) the vastly unequal bargaining power of the parties, and (2) the fact that the public interest would be served best by a swift conclusion of negotiations.

Before beginning to assess this proposal (or any of the others that deal with transmission problems), we should note that the whole relationship between electricity transmission and newer and more dispersed power sources needs a great deal of study. The issues raised are not likely to be resolved quickly, but until some resolution occurs, these questions are likely to cause problems for both industry and the public.

We think the costs of adopting this particular proposal would be medium in time, low in money, and high in trouble. We suspect that the utilities would put up strong resistance to such supervision on the grounds that it would favor those that want to transmit power over those that have built and operated the transmission facilities. With respect to changes that the proposal would bring about in the geothermal development process, we think that it could produce a low reduction in the time involved, a low to medium reduction in money, and a medium reduction in trouble, since geothermal development in outlying areas would depend on the ability of power producers to transmit that power back to load centers. We rate the overall effectiveness of this

proposal as +1 to +2 and think its effects will occur in the long term.

Proposal 14.6.2: Have Privately Owned Utilities Transmit Power for Other Entities

This proposal goes beyond Proposal 14.6.1: instead of merely calling for supervision of negotiations, it would have the government require that negotiations reach a favorable outcome. Therefore, we expect the adoption costs for this proposal to be higher than those for the previous one. We estimate these costs as being high in time, low in money, and high in trouble. We think the changes that the proposal would bring about in the development process would be a low reduction in the time involved, a low to medium reduction in money, and a low reduction in trouble. We estimate trouble reduction as less in this case than in the case of the previous proposal because this proposal could be expected to cause greater utility resistance. We estimate the overall effectiveness of this proposal as +1 and think its effects would occur in the long term.

Proposal 14.6.3: Conduct Antitrust Actions Against Privately Owned Utilities That Refuse to Wheel Others' Power

This proposal is one of the methods for enforcing the two previous proposals; however, it involves antitrust litigation. Such litigation, as we have noted before, is costly in time and effort and is not a particularly effective policy instrument. We estimate the adoption costs of

this proposal to be high in time, money, and trouble. We think any changes it would bring about in the geothermal development process are apt to be low. Consequently, its overall effectiveness is rated as near 0, and its effects, if any, are seen as occurring in the long term.

Proposal 14.6.4: Place Existing Electric Transmission Lines in "Common Carrier" Status

This proposal represents another way to have transmission line owners wheel small producers' power output. We think the costs of adopting this proposal, like those of using antitrust actions, would be high in time, money, and trouble. It appears that the overall effectiveness of this proposal would be -1, since it is likely to cause more problems than it would solve. Its effects would occur in the long term.

Proposal 14.6.5: Have the State and Federal Power Producers Guarantee the Power of Others Who Want to Transmit over Privately Owned Lines

One of the objections that transmission line owners have to transmitting the power of others is that such power is unreliable, and that they, as the owners, are the ones held responsible for the reliability of the system. One way of dealing with this problem might be for governmental power producers to act as power insurers for the other power sources.

Although this proposal shows a fairly good understanding of some of the reasons for the utilities' reluctance to

transmit power from other sources, it probably is not the best form for dealing with those problems.

We estimate the costs of adopting such a proposal to be high in time, medium in money, and high in trouble, since the arrangement would be very difficult to work out, both technically and administratively. We estimate the changes that it would bring about in the geothermal development process to be a low reduction in time, a low reduction in money, and perhaps a low increase in the amount of trouble involved. Consequently, we rate its overall effectiveness near 0. We think that its effects, if any, would occur in the long term.

Proposal 14.6.6: Build New Publicly Owned Lines to Connect Geothermal Areas to Load Centers

Since a geothermal power plant can be fairly small and still be economically efficient, many small public utilities are very interested in geothermal development. However, such publicly owned utilities tend to be located at some distance from geothermal resource fields, and consequently would need transmission lines. Some (but certainly not all) of these utilities are quite leery of having to use privately owned transmission lines and would prefer to wheel their power over publicly owned lines. This proposal argues that the way to connect such publicly owned utilities to geothermal fields is for the state or federal government to build more transmission lines into those fields so that

the public utilities could use publicly owned lines to get power from the geothermal fields to their service areas.

We estimate that the cost of adopting this proposal would be medium in time, medium in money, and high in trouble. Quite often the public line would simply duplicate a privately owned line; furthermore, it would have all the right-of-way problems that the private line had already gone through. We think that the changes that could occur in the development process would be medium reductions in time, money, and trouble. Nevertheless, we give this proposal a favorable rating because at present several public utilities are willing to look only at geothermal fields that are near publicly owned transmission lines. We rate the proposal's overall effectiveness at +1 and we think that its effects will occur in the long term.

Proposal 14.6.7: Require that Lines Built to New Nongeothermal Plants Make Provisions to Carry Geothermal Power Where Appropriate

This proposal is addressed to the complaint of many utilities that existing lines sometimes lack the capacity to carry geothermal plant output. The proposal argues that all transmission line extensions should plan for future geothermal development when they are to be routed near geothermal fields. The primary virtue of this proposal is that geothermal development would not have to pay an independent price for the time, money, and trouble of assembling a right-of-way and building a transmission line.

We estimate that the cost of adopting this proposal would be medium in time, low in money, and medium in trouble. We think the changes it could bring about in geothermal development processes are a medium reduction in time, money, and trouble. We rate its overall effectiveness as +1 and think that its effects will occur in the long term. Of course, many participants in the geothermal system plan to transmit goethermal power over transmission lines that will also carry power from planned nuclear plants in nearby (also remote) sites. The opposition to nuclear plants in California, even with the failure of Proposition 15, may well succeed in delaying or preventing the construction of both the plants and their associated transmission lines. Without the economies of scale available through "piggybacking" transmission from geothermal plants onto lines designed to handle much larger loads, bringing power from remote geothermal resource locations may pose economic problems. Therefore, if such lines are not going to be built, the geothermal participants will have to make other plans.

Proposal 14.6.8: Have the State Designate Transmission Corridors and Assemble the "Rights-of-Way" Across Them

This proposal would require that the state government, rather than the utilities that are going to transmit the power, bear the time, money, and trouble costs of choosing the transmission corridors and assembling the rights-of-way.

We estimate that the cost of adopting this proposal would be high in time, money, and trouble. Part of the problem is that the transmission corridor selected by the state government may be in the wrong place and may be assembled at the wrong time to be of optimum use to the entities that want to transmit power to that corridor. Nevertheless, if the state government does assemble such corridors and the attendant rights-of-way, we think the proposal would produce a medium reduction in the time, money, and trouble involved in geothermal development. We therefore rate the proposal as +1 and think that its effects would occur in the long term.

14.7 Taxation and Finance Issues

As in any industry, taxation issues in geothermal development can serve as either powerful inducements or deterrents to expansion. Several tax-related issues have been mentioned under other headings. In this section, we address the major tax change proposals that have been put forth in the past few years.

Proposal 14.7.1: Allow Intangible Costs of Drilling Geothermal Wells to be Deducted as a Current Expense for Tax Purposes

Normally, the Internal Revenue Code requires that taxpayers include all expenses associated with the obtaining of capital goods in the "basis" of the capital and then allows them to deduct a portion of the basis from their current

income over the life of the capital goods. In the case of oil or gas wells, however, a special provision allows the taxpayer to deduct all the wells' intangible expenses (such as those for the labor of exploring the area and drilling the hole) from current income immediately. This provision makes investment in oil and gas drilling an attractive prospect for companies and individuals seeking deductions to "shelter" income from other sources, and it frees income from one set of wells for use in drilling the next set. Court cases in California have applied this provision to geothermal steam wells, but its application to geothermal hot water wells remains in doubt. This proposal calls for application of the provision to all geothermal wells.

We estimate that the cost of adopting this proposal would be medium in time, medium in money, and medium in trouble. It does require congressional legislation, and it does favor resource extraction industries; however, because the legislation has already come close to passage in Congress and the bill is currently in the legislative process, its adoption costs are less than they might otherwise be.

In terms of the changes that the proposal could bring about in the geothermal development process, we estimate that it could produce a low reduction in the time and money involved, and a medium to high reduction in trouble. Its main advantage is that it would make outside money for geothermal investment less costly and easier to raise, since high-income individuals would be attracted to the shelter

aspects of geothermal investment despite its inherent risks. We rate its overall effectiveness as +1 to +2 and think that its effects would occur in the short term.

Proposal 14.7.2: Allow the Deduction of Intangible Expenses as Current Expenses, but Only if the Tax Savings Go Directly into Geothermal Expenditures

This proposal imposes the limits on the deduction of intangible expenses as a current expense in order to make the procedure more palatable to Congress and the public. However, we think that the restriction on the use of the tax savings would hamper their ability to attract outside investment. Consequently, we think the proposal would be slightly harder to implement than Proposal 14.7.1 and would have slightly less positive impact (0 to +1) on geothermal development.

Proposal 14.7.3: Allow Revenue from Geothermal Wells to be Subject to a 22 Percent Depletion Allowance Instead of Cost Depletion

Normally, taxpayers are allowed to take cost depletion allowances, in which they may deduct no more than a fixed portion of the original cost of each resource over the predicted life of the resource. In the case of minerals, however, a taxpayer may deduct a certain percentage of the income from the mineral as long as he has income from it, regardless of the original cost of the mineral source. This proposal calls for the application of this depletion allowance to all geothermal resources. Once again, a court case

in California has applied the provision to geothermal steam, but not to geothermal hot water.

The primary virtue of this proposal would be to free the internal funds of geothermal development companies for further investment in geothermal development. The assessment of the proposal in terms of adoption costs--medium in all three categories--is very similar to that of Proposal 14.7.1, since this provision is part of the same bill as the provision involved in Proposal 14.7.1.

With respect to the changes it would produce in the geothermal development process, we think it would bring about a low reduction in the time involved, a medium reduction in money, and a medium reduction in trouble. We rate its overall effectiveness as +1 to +2 and think that its positive effects would be seen over the long term.

Proposal 14.7.4: Allow Percentage Depletion Only to the Extent that Tax Savings are Invested in Geothermal Development

This proposal suggests a restriction on the use of tax savings from an income depletion allowance to lower the adoption costs of such an allowance. We estimate these costs as low to medium in all three categories. The restriction on the tax savings would not detract markedly from their attractiveness; therefore, the proposal would make more money available for geothermal development. Its effect on the development process will be a low reduction in the time involved, a medium reduction in money, and a medium

reduction in trouble. We rate its overall effectiveness as +1 to +2, and think that its effects will be long term.

Proposal 14.7.5: Allow Geothermal Developers to Deduct as Current Expenses 300 Percent of the Costs Associated with Dry Holes

This proposal, like others above, is designed to increase the attractiveness of geothermal investment for those in high tax brackets. The premise is that if one in three geothermal wells is successful, writing off 300 percent of the costs associated with dry holes would make geothermal investment almost a no-lose proposition.

We estimate that the adoption costs of this proposal would be high in time, money, and trouble. It is extremely favorable to individuals in high tax brackets, and is favorable in a form that neither Congress nor the public seems in any mood to support; therefore, it is apt to face very stiff resistance. We estimate that it could produce a medium reduction in the time, money, and trouble involved in geothermal development because it would vastly increase the number of both people and dollars going into geothermal development. However, counties and state agencies would still want to proceed fairly cautiously with permit-granting and other procedures. We rate the effectiveness of the proposal as +1, but think that its most notable effects would occur in the short term.

Proposal 14.7.6: Use a Biddable Factor Other than a Cash Bonus in Competitive Lease Sales

At present, the federal government grants leases in KGRAs to the potential lessee willing to pay the highest bonus (cash value per acre) for the lease. The California SLC is currently trying a lease bidding procedure in which the potential lessees offer to set aside a percentage of net profits for the state. This proposal argues that the bonus bidding procedure rewards those with immediate cash, thus favoring the bigger resource companies. The net profits bidding procedure, however, has some difficulties. First, it involves substantial administrative expenses to check the accounting by which the leaseholder determines net profits. Second, it poses a problem for public agencies, which have difficulty defining "net profits." Therefore, this proposal calls for BLM and SLC to experiment with royalty bidding as a compromise. This method of bidding would also allow money that would have gone into bonuses to be used for exploratory and development drilling instead.

We estimate that the costs of adopting this proposal would be low in time and money but medium in trouble, since it would face resistance from those who feel the federal and state governments should get as much as they can for leases immediately. We estimate the effects it could exert on the geothermal development process as a medium reduction in the time involved, a low reduction in money (the lessee would pay with later dollars rather than earlier ones), and a

low increase in the trouble involved (instead of a simple, one-time cash bonus, the developer now has to worry about calculating either increased royalties or net profits in the future). We rate the overall effectiveness of this proposal as +1, and think that its effects will occur in the long term.

Proposal 14.7.7: Replace the Local Property Tax with a Severance Tax

This proposal would do away with the property tax on geothermal resources and would tax only the value of resources removed from the ground.

Because it would require a legislative and perhaps even a state constitutional change, its adoption costs are high in time, money, and trouble. Resistance can be expected from two sources: from developers, who would fear greater tax increases (it is easier to change the severance tax than the property tax); and from the counties, which would oppose erosion of their property tax base, elimination of their control in taxing what they view as a local resource, and the loss of revenue to compensate for the risks associated with power plants.

We estimate the changes that this proposal would produce in geothermal development as virtually zero reduction in the time involved, a low reduction in money (presumably, the severance tax would not start until the developers started delivering the geothermal resource), and a low

increase in trouble (it is apt to increase the counties' resistance to geothermal development for the same reasons that made it hard to adopt). We rate the effectiveness of this proposal as -1 to 0 and think that its effects, if any, would occur in the short term.

Proposal 14.7.8: Eliminate the Capital Gains Tax on Sales of Geothermal Assets

This proposal is another unusual tax break to encourage geothermal development. It argues that increasing the ease with which lands containing geothermal resources could be transferred from one owner to another would lead to their ownership by those most eager to develop them. Since this proposal requires a legislative change that is both favorable to a resource extraction industry and unusual, we feel that adoption costs will be high in time, money, and trouble. (For some reason, propositions that favor resource extraction industries in unusual ways appear to fare even worse than those that favor them in normal ways.) We estimate that the changes this proposal would produce in the geothermal development process would be a zero reduction in the time involved, a low reduction in money, and perhaps a low reduction in trouble. We rate its effectiveness as near 0 and think that its effects, if any, would occur in the long term.

Proposal 14.7.9: Relax California Restrictions on Selling Risky Securities

The argument for this proposal is that geothermal investments are so risky that they cannot be offered through the normal security sales process. We estimate that this proposal would have adoption costs high in time (if the securities restrictions were to be relaxed, a new set of securities restrictions would have to be developed); low in money; and high in trouble (such a move would be very controversial and would be hard to justify for geothermal development alone--as opposed to other risky developments). We estimate the changes this proposal could produce in the geothermal development process would be low reductions in time, money, and trouble. We rate its overall effectiveness as -1, because the side effects on securities markets, together with the political pressure exerted by annoyed investors who lost money as a result, would more than cancel out any gain in ease of marketing geothermal securities. We estimate that the effects, if any, would occur in the long term.

Proposal 14.7.10: Promote More Limited Partnership Agreements

The limited partnership agreement provides a device for raising money from those outside the geothermal field without incurring many of the restrictions involved in selling securities. Some companies have already begun using this technique to raise money for geothermal development. We

estimate that its adoption costs will be low in time, low in money, but high in trouble (geothermal development is a very risky investment with an uncertain tax status, so that attracting more money is going to continue to be difficult no matter what mechanisms are used).

With respect to changes in the geothermal development process, we estimate that the proposal could produce low reductions in the time and money involved and a medium reduction in trouble, since limited partnership agreements place the developer under fewer obligations than do loans. We rate the overall effectiveness of the proposal as 0 to +1. We think that its effects, if any, would occur in the long term.

Proposal 14.7.11: Have California Change Its Tax Laws as a Model for the Suggested I.R.S. Changes

This proposal would allow both the deduction of intangible expenses as a current expense and income depletion to be incorporated into the California income tax law as a model for the way the federal statute might read. We estimate the adoption costs of this proposal to be roughly medium in time, money, and trouble (not much money is at stake, but the proposal does require a legislative change). We think that the proposal's effect on the development process would be a low reduction in time, money, and trouble. The action itself cannot be expected to have much of an effect, since the California income tax rate is fairly low.

Furthermore, at the present time this arrangement is not apt to serve as a model for the I.R.S.: first, because the I.R.S. has already announced a position against such legislation; and second, because similar models of such legislation have already been introduced in Congress. Therefore we rate the proposal's overall effectiveness as 0 to -1. We think that its effects, if any, would occur in the long term.

Proposal 14.7.12: Enact Provisions Similar to Those Surrounding KEOGH Plants to Encourage Institutional Investment in Geothermal Development

In geothermal development, there appears to be a long time between the initial investment and the return. Consequently, the investment is not attractive for those seeking more than a tax shelter. Some middle-class investors who are willing to take large risks and wait many years for the chance of a return that would vault them into another income class may find geothermal investment attractive, but they do not represent enough money to sustain a high rate of investment in geothermal development. Therefore, this proposal calls for tax and trust provisions that would attract the large investors who can and will wait for a long time: institutions such as universities and pension funds. These provisions could include deferment of taxation on income invested in geothermal development; changes in the trust laws allowing geothermal resources to qualify as "prudent investments" (on the grounds that these investments

serve a particularly valuable public purpose); and lower rates of taxation on geothermal income that returns to the investing institutions.

Because many of these provisions are statutory changes, the adoption costs are going to be medium to high in time, money, and trouble. The proposal also faces the danger that if these provisions were enacted for geothermal development the government might be besieged with requests that other investments receive similar dispensation. The proposal would then become a general tax preference package and would face increasing political resistance.

Even if such provisions were enacted, however, we doubt that that much money would be forthcoming. We therefore think that the proposal would exert low effects on the time, money, and trouble involved in geothermal development. In addition, the proposal could have many unfavorable side effects, such as the pressures it creates to give special treatment to other investments. Consequently, we rate its effectiveness as 0. We think that its effects, if any, would occur in the long term.

Proposal 14.7.13: Establish a Time Period for Cost Depletion Purposes

This proposal, like Proposal 14.7.8, represents a change in the tax treatment of geothermal resources in order to make it easier to transfer them from one owner to another. If the I.R.S. would set a definite time period for cost depletion of the geothermal resource, negotiations between

buyers and sellers of land with geothermal potential would be much easier.

We think that this proposal could probably be accomplished by regulation, which would make its adoption costs low in time and money, and medium in trouble (the trouble arising over arguments as to the exact time period to be allowed for cost depletion). We think the effects of the proposal on the process would be a zero reduction in the time involved, a zero reduction in money, and a low reduction in trouble (it would be slightly easier to transfer land with geothermal potential). We rate its overall effectiveness as between 0 and +1. We think that its effects would occur in the long term, since the process of transferring land from one owner to another is apt to take a long time.

14.8 Environmental Reporting

Environmental reporting is one area that has been the source of numerous and continuing complaints. This is also an area where institutional learning and administrative changes can produce some desired improvements in a relatively short time.

Proposal 14.8.1: Do a Leasehold EIR and Then Require No More than Addenda for Subsequent Wells on that Leasehold

This proposal addresses the issue of how much data and analysis--as well as how large a geographic area--should be

included in the initial EIR. It argues that the total permitting process would be faster if the applicant and the county followed the procedures now usually used in Sonoma County, where the first application includes a relatively large land area, and subsequent applications are merely added to that first EIR.

We estimate the adoption cost of this proposal to be low in time, low in money, and medium in trouble. The trouble is likely to arise from resistance by the developers, who appear to take the position that EIRs on the first wells in an area should be quite small. Since the discovery of a dry hole will mean that the developer will pull out entirely, developers argue that a more extensive EIR should wait until the area gives evidence of having a fairly high geothermal potential.

The effects of this proposal on the geothermal process will depend on whether early exploratory wells do discover geothermal resources. If one of the first exploratory wells were to discover a geothermal resource, then the effects on the process would be a low reduction in the time, money, and trouble involved. If none of the initial wells were to find a geothermal resource, then the effect of the proposal would be to create a low increase in time, money, and trouble. Perhaps a useful modification to the proposal would be to apply it only in areas with very high geothermal potential.

We rate the overall effectiveness of the proposal as 0 to +1 in high potential areas and -1 to 0 in low potential areas. In any case, we think its effects will show up in the short term.

Proposal 14.8.2: Allow Geothermal Activities to Receive a Negative Declaration

At least theoretically, counties do have the power now to declare that the drilling of geothermal wells exerts little significant impact on the environment. Indeed, one argument for this proposal is that exploratory drilling itself provides data essential to an adequate EIR. Such a "negative declaration" would mean that less extensive documentation would be required for permit granting. Therefore, we estimate the adoption costs of this proposal to be low in time, low in money, and medium in trouble. The trouble is likely to arise because of the controversial nature of giving a negative declaration for what is still a fairly new kind of activity. A compromise that might lessen the controversy would be to prepare EIRs to cover only the disturbance of vegetation.

We estimate that the effects of this proposal on the geothermal process would be a low reduction in the time, money, and trouble involved. If a county's negative declaration decision would be upheld by the courts, the proposal would exert a positive effect on the system. However, such an effect would be small at best, because the time, money, and trouble involved in a negative declaration process are only somewhat less than those required by a full EIR process.

Therefore, we rate the proposal's overall effectiveness as 0 to +1. We think that its effects would occur in the short term.

Proposal 14.8.3: Grant the Drilling of Geothermal Wells a Categorical Exemption from Some of the Environmental Procedures

This proposal, like the previous one, would also reduce the reporting requirement surrounding the permitting of geothermal wells. However, it would go even further than the previous proposal, arguing that if the drilling of geothermal wells follows certain specified procedures, the activity should exert no environmental impacts that need analysis in an environmental impact report. Many petroleum wells receive such a categorical exemption now and thus escape the requirements of the environmental reporting process. However, there is some discussion to the effect that petroleum wells may be losing their categorical exemption in the future. Therefore, we estimate the adoption costs of this proposal as low in time, low in money, but high in trouble: even though the counties have the power to implement the proposal, any attempt to let geothermal wells escape the environmental reporting process is apt to be very controversial, and may be prevented by litigation.

Our basic reservation about the proposal is that the reduction in the time, money, and trouble involved in the environmental reporting process will be somewhat cancelled

out by the increased trouble in dealing with the resistance that is likely to arise. We estimate that the effects of this proposal would be to bring about a low reduction of the time, money, and trouble involved in geothermal development; that its overall effectiveness will rate somewhere between 0 and +1; and that its effects will occur in the short term.

Proposal 14.8.4: Make the Drilling of Geothermal Wells an Allowable Land Use in KGRAs and Other Areas of High Geothermal Potential

This proposal argues that decisions about where geothermal development should and should not occur need to be set forth in a comprehensive planning decision. Proponents of this proposal expect that it would produce one of two results: (1) a county might balance zones of exclusion with zones of inclusion, so that development could proceed faster in included zones; and (2) even if zones of inclusion are not specified, the protection of the most sensitive zones from geothermal development would reduce the opposition to such development in the county as a whole.

We think that the counties have the power to institute this proposal now. If they were to do so, drilling geothermal wells would not require a separate conditional-use permit, but could simply proceed under rules previously set up to govern drilling in each area. However, the counties are very much against any process that would eliminate their well-by-well control of geothermal development. Therefore, we estimate that the adoption costs would be low in time, low in money, but very high in trouble.

Because the preparation or amendment of county land-use plans always takes a great deal of time and effort, we estimate the changes that this proposal would bring about in the geothermal development process as a low reduction in time involved, a zero reduction in money, and a medium reduction in trouble. This reduction in trouble, however, will occur only if those opposed to geothermal development are satisfied that it is excluded from the right areas. Otherwise, a county land-use plan is apt to make the situation worse, because it may exclude areas of high potential while granting permission for geothermal development to proceed in areas of very low potential.

In some counties and in some political situations, this tactic may be very effective in reducing opposition to geothermal development. In other counties, it may be ineffective for that purpose and may, in addition, severely harm geothermal prospects. Consequently, we rate the overall effectiveness of this proposal as -1 to +1. In any case, we think its effects will occur in the long term.

Proposal 14.8.5: Prepare a "Generic" EIR for the Entire Potential Area in the County and Allow All Wells to be Permitted on that Basis Alone

This proposal suggests the preparation of a "generic" EIR that would be county-wide, or perhaps even KGRA-wide. Such an EIR would undoubtedly cost more in time, money, and trouble to produce and would have less detail than EIRs done on a well-by-well basis; nevertheless, the total amount of

time, money, and trouble involved might be less than that required by a whole series of individual EIRs.

We estimate that the adoption costs of this proposal would be high in time, medium in money, and high in trouble, since counties appear to welcome such generic EIRs as a supplement to the individual EIRs but not as a substitute. In addition, such a wide-scale report would undoubtedly be expensive and take a great deal of time. We estimate that the effects of the proposal on the geothermal development process would be a medium reduction to a medium increase in the time involved (whether one large EIR would take less time than many small EIR's is somewhat uncertain), a low reduction in money, and a low increase in trouble, since it is likely to engender the sort of legal challenge that is presently directed against BLM's reliance on its programmatic EIS for leasing.

We rate the overall effectiveness of the proposal as 0 to -1. One of the reasons for this low assessment is that is would interfere with the smooth flow of development proceedings. Geothermal developers would have to wait for the completion of the area-wide EIR (which is apt to take a long time because of its breadth) before they could carry out tests in that area.

Also, an area-wide EIR is most effective in cases where impacts and outcomes are fairly certain. With geothermal development, however, impacts and outcomes are relatively uncertain. In such a case, it is very helpful to be able to

use information from the first well to evaluate the second well, and so forth. This proposal would deprive the counties and others of the valuable information provided by an incremental approach. Therefore, although an area-wide EIR might well be a good supplement to individual EIRs, it is not a good substitute.

Proposal 14.8.6: Allow EIRs for Wells to Exclude Power Plant Impacts if Leasehold Has No Preexisting Producing Wells

This proposal addresses a conflict between developers on the one hand and counties and state agencies on the other. Before allowing an exploratory well in a given area, counties and state agencies want to know what would be the impact of full-scale development in that area. The developers argue that unless the test wells reveal the existence of a geothermal resource, the area will experience no impacts at all. Therefore, this proposal suggests that at least the initial wells should be drilled on the basis of well impacts only and a more comprehensive analysis of impacts should be undertaken only when a resource is discovered.

The counterargument to this proposal is that once a resource is discovered, the political pressure to develop that resource is almost irresistible. Therefore, people who are very concerned about the spread of geothermal development feel that possible impacts need to be analyzed before the resource is discovered.

We estimate that the adoption costs of this proposal would be low in time, low in money, but high in trouble. Although the counties have the power to accept such EIRs now, they are apt to meet very stiff resistance from the public and from some state agencies if they attempt to do so.

We estimate that the proposal's effects on the process would be to produce low reductions in time, money, and trouble. We estimate its overall effectiveness as between 0 and +1, and think its effects, if any, would occur in the short term.

Proposal 14.8.7: Speed up the State Clearinghouse

This proposal addresses the problem of delays in getting environmental reports to the appropriate state agencies and in receiving comments from those agencies. Many people have not been satisfied with the speed with which the State Clearinghouse has been performing this function. Normally, adoption costs for this type of proposal would be high, because it is likely to involve legislative action. However, a bill addressing this subject (Assembly Bill 2649) has already been introduced into the legislative process. Although the bill is not yet in final form, modifying an existing bill is almost always easier than introducing a new one. Therefore, we estimate the adoption costs as low in time, money, and trouble.

Here again, this proposal would reduce system delays by a small amount. Therefore, we estimate that its effect on the geothermal development process would be to produce a low reduction in the time involved and near zero reductions money and trouble. We rate its overall effectiveness as between 0 and +1, and think its effects would occur in the short term.

Proposal 14.8.8: Allow EIRs to be Sent Directly from Counties to the Local Office of the Appropriate State Agencies

Currently, counties must send draft EIRs through the State Clearinghouse before they can go to local offices of state agencies. Some counties feel that the previous procedure, which allowed them to deal with the local agencies themselves, gave them more information relative to the local conditions and gave it to them faster.

We estimate the adoption costs of this proposal to be low in time, low in money, and medium in trouble, since state agencies would probably resist such a move on the grounds that it would interfere with policy coordination between the state and local levels. We estimate the benefits to geothermal development as a low reduction in the time involved and near zero reductions in money and trouble: although the counties would get some immediate local feedback, they would still have to wait for feedback from the state level. The counties might also have to deal with the differences between the state and local offices' view of the

problems involved. We rate the effectiveness of this proposal as between 0 and +1, and think its effects would occur in the short term.

Proposal 14.8.9: Require Each Lead Agency to Draw up a Set of Uniform Requirements for Geothermal EIRs

This proposal addresses the complaint that those who must prepare EIRs have no explicit guidelines on either scope or content required for geothermal activities. Furthermore, the lack of explicit criteria has meant that requirements for EIRs have tended to shift over time. Thus, participants complain they are always trying to hit a "shifting target." This proposal calls for promulgation of explicit criteria to remedy these difficulties.

We think the adoption costs of this proposal would be medium in time, money, and trouble, since setting down such uniform requirements is hard to do. Such criteria have been produced for large portions of the EIS for nuclear plants and geothermal plant and field impacts are extremely simple by comparison. Nevertheless, because uncertainty exists as to some of the effects of geothermal development in individual areas, standard criteria are apt to miss some issues that are important in particular areas, while requiring analysis of other issues that are not always applicable.

We estimate the changes that this proposal would bring about in the process would be a low reduction in the time involved, a low reduction in money, and a medium reduction

in trouble. We rate the proposal's overall effectiveness as 0 to +1 and think its major effects would show up in the short term.

Proposal 14.8.10: Have the Lead Agency, Instead of the Applicant, Hire the Consultant Who Will Prepare the EIR

This proposal argues that the practice of having the lead agency hire the consultant--a practice that already exists in some counties--should be extended to all agencies. The rationale is that in the absence of explicit criteria for the content of EIRs and in light of the unique local problems that are often encountered, the lead agency would be better able to recommend a consultant who is familiar with the particular issues that need to be addressed in a given locale.

We estimate the adoption costs of this proposal to be low in time, money, and trouble. We think its benefits to geothermal development would be a low reduction in time, probably a zero reduction in money, and a low reduction in trouble. We rate its overall effectiveness as 0 to +1 and think its effects would occur in the short term. However, to be most effective, this action should be linked with Proposal 14.8.9 (requiring lead agencies to draw up a uniform set of requirements).

Proposal 14.8.11: Require Uniform, Reasonable Steps for Complying with Laws such as the Antiquities Act and the Endangered Species Act

Several participants have argued that the search for, and protection of, endangered species and/or antiquities

appears to have no inherent limit according to current statutes and regulations. Therefore, this proposal calls for regulations that will set limits on the effort (in terms of time, money, and trouble) that participants must exert to search for or protect antiquities and endangered species.

We estimate the adoption costs on this proposal to be medium in time, low in money, and medium in trouble. The time and trouble would go into determining which steps are reasonable for the protection of antiquities and endangered species.

Because the open-ended nature of the requirements under these acts currently appears to be slowing development in several areas, setting limits on the amount of effort required should enable development in those areas to go ahead. Consequently, we estimate the proposal's benefits to geothermal development as a low to medium reduction in the time involved, a low reduction in money, and a low to medium reduction in trouble. We rate the proposal's overall effectiveness as between 0 and +1, and think its effects would occur in the short term.

Proposal 14.8.12: Require Those Who Appeal Decisions on the Grounds of EIR Inadequacy to Post Bonds

This proposal argues that those who challenge the adequacy of an environmental impact report should post bonds to pay the costs of demonstrating the adequacy should the claims of inadequacy be declared invalid. This proposal is very controversial, since it opens the door for allowing

applicants to get away with shoddy EIRs. It is very doubtful that any measure of this sort would be politically acceptable. Consequently, we estimate the adoption costs of this proposal to be high in time, low in money, and high in trouble. We estimate the changes that the proposal would bring about in the geothermal development process to be a low to medium reduction in the time involved, a medium to low reduction in money, and a low to medium reduction in trouble.

Presumably, the posting of bonds would prevent people from appealing on the grounds of EIR inadequacy when they really had some other grounds for appeal in mind. However, if the full burden of contesting an EIR's adequacy were placed on individual citizens, then legitimate challenges would be prevented along with fallacious ones. The potential for deterioration in both the quality of EIRs and the political acceptability of the process probably outweighs any advantages that the proposal might have in eliminating frivolous appeals. Therefore, we rate the overall effectiveness of the proposal as -1. We think that the effects would occur in the short term.

Proposal 14.8.13: Establish an Administrative Board to Hear Appeals Based on the Alleged Inadequacy of EIRs

Many people feel that taking EIRs to court is very costly and requires environmental expertise that the courts do not have. This proposal argues that an administrative board established for the purpose of hearing such appeals

would have the necessary expertise and would also be able to deal with such issues more promptly.

We estimate the adoption costs of this proposal to be high in time, low in money, and high in trouble, since the establishment of a board would require legislative change and a budget allocation. The proposal is also apt to be fairly controversial. We estimate the changes it would produce in the geothermal development process to be a low increase in the time, money, and trouble involved. Our reason for giving such a negative assessment is that we think the existence of the board would encourage people to make more EIR appeals. In addition, those making appeals would probably not be satisfied with an unfavorable decision by the administrative board and would take the case to court anyway. Of course, the intensive review of the EIRs could produce better EIRs; on the other hand, it could simply produce bigger ones. At any rate, the net effect would probably be to add much more time to the EIR review process; therefore, we rate the overall effectiveness of this proposal as -1 and think its effects would occur in the short term.

Proposal 14.8.14: Have the Federal and State Government Help Collect Baseline Data in Areas Most Likely to be Sites of Geothermal Development

This proposal argues that much of the baseline information necessary for individual EIRs does not now exist and that the state and federal governments should help gather

those data. Once gathered, the data could then be incorporated into individual EIRs as needed. Some activity of this nature is already in process: the CERCDC study of The Geysers is a good example.

We estimate the adoption costs of this proposal to be medium in time, money, and trouble, since collecting such data would be both time-consuming and expensive, and would involve the reallocation of budgets within agencies. However, the availability of the necessary baseline data could significantly reduce the time, money, and trouble involved in producing individual EIRs. It would also shift the burden of payment of the data collection costs: instead of the applicants paying the costs on a site-by-site basis, the federal or state government would pay the cost on an area-wide basis. Consequently, we estimate the benefits occurring to the geothermal development process to be a low to medium reduction of the time involved, a low reduction in money, and a low to medium reduction of the trouble. We rate the overall effectiveness of this proposal as +1 and think its effects would occur in the long term.

Proposal 14.8.15: Increase Staff of Lead Agencies to Give Them More Time to Review EIRs Before Public Hearings

This proposal is most concerned with the counties that have very few environmental experts available to review EIRs. We estimate that the adoption costs of this proposal would be medium in time, money, and trouble. Adding staff

to a government agency is always hard because of the budgetary implications involved. In this case, it would also be hard to find people with adequate expertise. We estimate the changes the proposal would produce in the geothermal development process as a low reduction in the time involved in geothermal development, a zero reduction in money involved, and a low increase in the trouble involved. With respect to the proposal's overall effectiveness, there are two viewpoints. Several participants in the process have cited the danger of a Parkinson's Law problem: the more people that are available to review EIRs, the longer the review process would take. On the other hand, the additional staff might be able to spot errors that would otherwise go unnoticed, so that the developers could correct the errors before public hearings were held. From this viewpoint, the proposal could be seen as improving the quality of EIRs. We think that the two sets of effects would tend to balance out; therefore, we rate the overall effectiveness of this proposal as near 0. In any case, the effects would occur in the relatively short term.

14.9 The California Energy Resources Conservation and Development Commission (CERCDC)

As discussed in detail in Chapter 10, CERCDC is a new state agency that is in the process of defining its operating procedures and policies. It is hoped that by the time CERCDC

becomes formally involved in the regulation of the geothermal development process, the outcome will have been decided for many of the currently unresolved issues.

At present, the commission is moving to work out its operating procedures, to develop standards, and to promulgate regulations. However, since CERCDC is not yet directly involved in the licensing process, proposals concerning its actions are based primarily on problems that are anticipated rather than problems that currently exist.

Proposal 14.9.1: Resolve the Ambiguity over the Energy Commission's Possible Mandate to Control the Permitting of All Geothermal Wells

The statute creating the energy commission gave it the power to site power plants and related facilities. Some participants have raised the question as to whether the commission's power to site "related facilities" could make it the permit-granting agency for all geothermal wells. There are at least two possible interpretations of this mandate: (1) CERCDC is to control siting of all wells; and (2) it is to control siting of production wells only. The first interpretation would undoubtedly be challenged in the courts; consequently, we would estimate its adoption costs as high in time, money, and trouble. We estimate that its effect on the geothermal development process would be to create a high increase in the amount of time involved, a low increase in money, and a medium increase in trouble. These cost increases would stem from the political resistance

of the counties to giving up all of their power over geothermal development. We rate the overall effectiveness of this interpretation as -2, and think that its effects would occur in the short term.

If the commission interprets its mandate as covering production wells only, however, the practice is less likely to face a court challenge. Therefore, we would estimate its adoption costs as low in time, low in money, and medium in trouble. We would estimate the changes it would bring about in the geothermal development process as a zero reduction in the time involved, a zero reduction in money, and a low increase in trouble. This increase is due to the greater difficulty of considering production wells at the same time as the power plant--as opposed to the current practice of considering the production wells first and then using this information in power plant decisions.

Unlike the permitting of exploratory wells, the permitting of production wells is very much a part of the permitting of a power plant. We suspect that whether the county or the energy commission does the permitting of production wells will, in the long term, have little effect on the process. As the energy commission gains experience in the geothermal area and the impacts of the power plants are better understood, we think that the counties may be willing to give up what has been a substantial administrative burden, particularly when they still control the placement of the initial exploratory wells. However, such a

transfer will probably have to come about gradually, with the full participation of the counties along the way, and any unilateral action by the energy commission is not likely to be well received. Therefore, we rate the overall effectiveness of the second interpretation at near 0, and think that its effects will show up in the short term.

Proposal 14.9.2: Have CERCDC Conduct Hearings Jointly with State, Regional, and Local Agencies with Which It Shares Power

CERCDC has extensive powers to resolve many issues that currently are being handled by other agencies--(for example, APCDs). One option for accommodating these agencies' concerns and responsibilities would be to conduct hearings jointly on Notices of Intent and Applications for Certification. This proposal argues that such a "panel" or consolidated forum would provide the best method because it would give the other agencies a voice in the proceedings, would reduce potentially volatile political tension, and would give CERCDC a chance to absorb the knowledge of the other agencies. These benefits should help reduce opposition to CERCDC decisions.

The alternative to this practice would be to use a unitary agency procedure in which the other agencies, if they appeared at all, would appear as parties or would be asked to comment on drafts of CERCDC's decisions. Because it is likely that CERCDC will in fact choose the first option, we estimate adoption costs of this proposal as low

in time, money, and trouble. We think the changes that the proposal would bring about in the geothermal development process would be a zero reduction in time and money, but a medium reduction in trouble. We give the proposal an overall assessment of +1 and think its effects will occur in the short term.

Proposal 14.9.3: Raise the Limits on the Minimum Size of Plants whose Site Must be Approved by the Energy Commission

Some participants have suggested that the geothermal development process could be speeded up by exempting most geothermal plants from CERCDC siting control. Currently, all plants producing 50 MWe or more must have their site approved by the energy commission. Most geothermal plants will probably have a capacity of less than 150 MWe. Consequently, if this limit were raised to something like 150 MWe, no geothermal plant would have to be approved by the energy commission. Applicants would then have the option of obtaining approval from either the energy commission or the county and CPUC, according to their preference.

Because this proposal would require a controversial legislative change, its adoption costs would be high in time, low in money, and high in trouble. The changes it would bring about in the geothermal development process are apt to be a low reduction in time involved, a low increase in money, and a low reduction in trouble. The reason that time and trouble are likely to decrease is that presumably

the applicant would choose whichever option was faster. The money, however, would be likely to increase, since the scheme would involve two plant siting procedures--state and local--instead of one. We rate the overall effectiveness of this proposal as 0 to +1 and think that its effects would occur in the long term.

Proposal 14.9.4: Build Plants Smaller than 50 MWe in Order to Have a Choice of Approval Procedures

This proposal is a variation on the previous one. In this case, by building a plant smaller than 50 MWe, the applicant would have the option of determining which set of approval procedures he would follow. However, applicants contemplating building larger plants in the future would be well advised not to annoy the energy commission by trying an end run with the first plant of a field.

Aside from this caveat, the adoption costs of the proposal would be low in time, money, and trouble. The value of this proposal to the plant builder is that it gives him the ability to choose the approval process most favorable to his application. The benefits would be roughly the same as those of the previous proposal: a low reduction in the time involved, a low increase in money, and a low reduction in trouble.

However, there are two major drawbacks to this proposal. First, it would require that the state operate two separate approval procedures. Second, if the energy commission were to resent entities that choose to avoid its

procedures, the proposal would only be appropriate to applicants such as government agencies, which would never want to build a power plant over which CERCDC would have jurisdiction. Consequently, we rate the proposal's overall effectiveness as near 0 and think its effects, if any, would occur in the short term.

Proposal 14.9.5: Have CERCDC Provide R&D Support for Geothermal Development

The R&D branch of CERCDC could aid the development of geothermal power in the state by funding research on the most immediate problems surrounding geothermal development. CERCDC could also encourage ERDA to conduct demonstration projects dealing with short-term problems--particularly those related to hot water systems. Although ERDA currently is conducting some projects of this nature, much of its R&D effort is focused on technologies and resources that may become available only in the long term (e.g., geopressurized zones and hot dry rock).

Implementation of this proposal would primarily involve internal policy decisions. Nonetheless, many of these decisions would be of concern to outside parties, such as legislative committees and research firms, some of which have the legal or political power to exert pressure on CERCDC. Therefore, we rate the adoption costs as low to medium in time, medium to high in money (because some long-term projects would lose support), and medium in trouble. Because the demonstration of solutions to problems surrounding

mitigation and technologies for hot water resources are so important, we think the changes that the proposal could bring about in the process would range from medium to high in all categories. The overall effectiveness is +2 and the effects should begin emerging in the short term.

14.10 Rules for New Sources of Air Pollution

As noted earlier, permits from local APCDs are required at more than one stage of the geothermal development process. An "authority to construct" and a "permit to operate" are required for both wells and power plants. While local APCDs issue permits and enforce the rules, the ARB establishes the standards. The recently promulgated ARB standards could have significant impact on future geothermal development.

Proposal 14.10.1: Continue Existing Review Rules for New Air Pollution Sources Rather than Adopting ARB's Proposed Review Rules

ARB's proposed review rules for new air pollution sources were intended to remedy inadequacies in the APCDs' ability to review new sources of air pollution. However, ARB's proposed rules may be unworkable, as the South Coast Regional Air Basin Coordinating Council has stated.[9]

We estimate the adoption costs of this proposal to be low in time, low in money, but medium to high in trouble, since the failure to implement the originally proposed rules is very apt to be challenged by environmental groups. We estimate the changes that the proposal would bring about in

the geothermal development process as a low to medium reduction in time, low to medium reduction in money, and a low to medium reduction in trouble. The reason for this assessment is that the new rules as stated would in fact cause serious problems with granting permits for construction and operation of some geothermal power plants. We rate the effectiveness of this proposal as +1, and we think its effects would occur in the short term.

Proposal 14.10.2: Raise the Maximum Emission Limits That Trigger Review

The maximum limits in the original draft of ARB's proposed rules were five pounds per hour; these were raised to 15 pounds per hour or 150 pounds per day of nitrogen oxides, organic gases, or any air contaminant for which there is a state or national air quality standard (with the exception of carbon monoxide). This change was a compromise with the majority of APCDs that preferred 25 pounds per hour or 250 pounds per day.

We estimate the adoption costs of this proposal as low in time, low in money, and medium in trouble, because it is fairly likely to be opposed by environmental groups. It should be noted that, at least in Lake County, the emission levels were raised to 20 pounds per hour or 200 pounds per day. We estimate the benefits that the proposal could produce for geothermal development as a low reduction in the time, money, and trouble involved, since the proposal concerns only recommended standards for local APCDs. We

give it a rating of 0 to +1, and think its effect would occur in the short term.

Proposal 14.10.3: Change the Limit from a One-Time Hypothetical Maximum Emission to an Average or Limit not to be Exceeded more than X Days Per Year

The ARB's proposed new source review rules use one-time emissions by hour or day as a trigger of requiring review. This proposal calls for either using some kind of average or allowing a new source to exceed the limit a fixed number of times before review is required.

This proposal is already being discussed in the regional air basin coordinating councils. We estimate its adoption costs to be low in time, low in money, and medium in trouble, because setting new standards always generates controversy. We think that its benefits to geothermal development would be a low reduction in time, a low reduction in money, and a low to medium reduction in trouble. Since the procedures would be concerned with an average rather than what might happen once or twice, a shorter monitoring time would be required for approval; however, the dispersion model would still be needed to assess the effects of the emissions. We rate this proposal at 0 to +1 and think its effects would occur in the short term.

Proposal 14.10.4: Make Permitting Easier in Good Air Quality Regions

In areas where ambient air quality standards are being routinely violated, granting variances may be difficult; but

in remote areas, where geothermal resources are generally located, a minimal degradation in the quality of air that is already good could be acceptable.[10] This proposal is rated the same as the previous one: adoption costs would be low in time and money and medium in trouble; its benefits would be a low reduction in time and money and a low to medium reduction in trouble; its overall effectiveness is rated at 0 to +1, and its effects are seen as occurring in the short term.

Proposal 14.10.5: Consider Balancing Benefits of Air Quality Improvement With Other Factors

The ARB's proposed rule allows consideration of only air quality factors in granting or denying permits, and excludes any social or economic hardships that would be created. Furthermore, by law, any appeal of a permit denial cannot consider economic or social factors.

The South Coast Regional Air Basin Coordinating Council has already indicated that it would like the power to consider other types of factors in granting or denying construction and operation permits. Therefore, we rate the adoption costs for this proposal as low in time, low in money, and medium in trouble, since once again, environmental groups would legitimately raise the charge that such considerations could lower the stringency of air pollution control. We rate the proposal's effects on the geothermal development process as a low reduction in time and money and a low to medium reduction in trouble. We give the proposal an

overall rating of +1, and think its effects would occur in the short term.

Proposal 14.10.6: Adjust Maximum Limits According to the Relative Risk Posed by the Pollutant

This proposal calls for the amount of emissions that would trigger review to vary according to the risk of the pollutant. Its adoption would result in a higher limit for some pollutants and a lower one for others.

We estimate the proposal's adoption costs to be medium in time, money, and trouble, due to probable controversy over the specific amounts to be allowed for each pollutant. Both time and money would be required for reaching a satisfactory resolution of the controversy.

Assuming that the results of the proposal would be to raise limits of the geothermal emissions, such as hydrogen sulfide, we estimate the proposal's effects as a low to medium reduction in the time, money, and trouble involved in geothermal development. We give the proposal this rating because control on hydrogen sulfide and some of the other emissions could cause significant problems for the expansion of geothermal development in some areas. We rate the overall effectiveness of the proposal as +1 and think its effects would occur in the short term.

Proposal 14.10.7: Change Rules to Allow Trade-Offs Between Pollutants

The ARB's proposed rules A and B do not allow local agencies to consider reduction of one pollutant as compensation

for an increase of another. This proposal argues that since pollutants differ in how harmful they are to specific air basins, the agency for an air basin should be able to trade a more harmful pollutant for a less harmful one. We rate this proposal the same as Proposal 14.10.5: that is, its adoption costs would be low in time and money and medium in trouble; its benefits would be a low reduction in time and money and a low to medium reduction in trouble; its overall effectiveness is +1; and its effects would occur in the short term.

Proposal 14.10.8: Include Benefits Outside the Basin

Under the ARB's proposed rules, the APCD may balance increased emissions at one point within the basin against the resulting reduction in emissions at another point; however, it may not consider emission reduction in another basin. That is, it may not consider the possibility that hydrogen sulfide emissions at The Geysers could reduce sulfur emissions elsewhere as geothermal plants substitute for oil-burning plants. This proposal would include statewide air quality benefits in the analysis of a new source.

We rate this proposal the same as Proposal 14.10.5: that is, its adoption costs would be low in time and money and medium in trouble; its benefits would be a low reduction in the time and money involved in geothermal development and a low to medium reduction in trouble; its overall effectiveness is +1; and its effects would occur in the short term.

Proposal 14.10.9: Shorten or Eliminate ARB Review of APCD Decisions on New Sources

The proposed new source review rules A and B call for a 90-day delay while ARB decides whether to review individual permits. This proposal calls for review on appeal only, and allows less than 90 days to file an appeal. We estimate the adoption costs of this proposal as low in time and money but high in trouble. ARB is caught between EPA on one hand and its local APCDs on the other. EPA wants more time for appeals, and argues that more time is required by the Clean Air Act; local APCDs want their permits to become effective as soon as possible. This proposal suggests that APCDs could include enough time for public comments before granting the permits that EPA would not require extended time for an appeal afterwards.

We estimate the effects of this proposal on the geothermal development process as a low to medium reduction in time, a low reduction in money, and a low reduction in trouble. We rate its overall effectiveness as between 0 and +1, and we think its effects would occur in the short term.

Proposal 14.10.10: Retrofit Emission Controls on Plants in The Geysers Region by Starting with Those with the Highest Emission Levels and Proceeding in Decreasing Order of Emissions

Right now, the schedule for retrofitting plants at The Geysers proceeds in numerical order. This proposal argues that an improvement in air quality could be brought about

easily by retrofitting in the order of emission level. Data from PG&E show that the emissions from units 3, 4, and 5 contribute over 41 percent of the total emissions at The Geysers.

We estimate the adoption costs of this proposal to be low in time and money and low to medium in trouble. Apparently, since the local APCD has already set the schedule for retrofitting, it would have to approve any change in the schedule. We estimate the effects of this proposal on the geothermal process to be a low to medium reduction in time, money, and trouble. The proposal rates a +1 in overall effectiveness and we expect its effects to occur in the short term.

14.11 Political Economies of Counties

The social and economic impacts of geothermal development have emerged as one source of political controversy on the local level. The issues lead first of all into questions of whether the local residents want the growth associated with geothermal development. If the residents generally favor the idea of geothermal development, the local issues are related to tax compensation and local management of the growth that does occur.

Proposal 14.11.1: Have Applicants and Governments Provide More Compensation to Individuals Who are Uniquely or Unusually Affected from Local Impacts of Development

One set of proposals has argued that the resisters should be squeezed out of the approval process. Another set

of proposals has argued that the sources of their resistance, such as emissions, ought to be removed or controlled. This proposal suggests that the local areas ought to be compensated for the causes of their discomfort. Of course, the county already receives compensation in the form of an increased tax base, perhaps more jobs, the attraction of industry, and so forth. This proposal, however, calls for assisting uniquely impacted individuals with measures such as funds for relocation.

We estimate the adoption costs of this proposal to be medium in time, low in money, and medium in trouble. The time and trouble would be involved in finding out which compensations would in fact lessen political opposition to geothermal development activities. The proposal might, unfortunately, create more demands for compensation than could reasonably be met, and resolution of such demands could be quite high in terms of all three cost parameters.

We think the effects of the proposal on the process would be a low to medium reduction in the time involved in geothermal development, a low increase in the money involved, and a low to medium reduction in trouble. The basic idea of the proposal is that by providing this compensatory money, the geothermal developers would reduce the time and trouble involved in getting local governments to accept geothermal development activities. We rate the overall effectiveness of this proposal at between 0 and +1 and think its effect would occur in the short term.

Proposal 14.11.2: Use "Expediters" from the State and Federal Government to Help Smooth the Process of Local Accommodation to Geothermal Development

We foresee a major problem with this proposal: the possible reluctance of both private developers and local governments to work with such expediters. Developers consistently complain that too much government interference exists already; and local officials, particularly those with experience in dealing with geothermal development, feel fully capable of managing the problems that do arise. Therefore, the presence of yet another government official may actually slow the process of accommodation rather than accelerate it. However, some examples of successful expediters do exist, such as the federal mediators in labor disputes. In those cases, both sides appear to recognize the legitimacy of the expediter's position.

The ability of this proposal to work really depends on two factors: the knowledge and skill of the expediter, and the attitudes of the local officials and developers. Because we think that there is a low probability that both sets of requirements will be met, we estimate the proposal's adoption costs as low in time and money but medium in trouble. Its effects on geothermal development would be near zero in time, money, and trouble. We rate its overall effectiveness as 0 and think any effects would occur in the short term.

Proposal 14.11.3: Allow Counties Increased Levels of Continuing Control of Geothermal Operations in Return for Faster Initiation of the Process

We rate the adoption costs of this proposal as low in time and money and medium in trouble. The trouble would be involved in determining exactly what kind of continuing control counties would in fact want and could exercise. We estimate the effects of the proposal on the geothermal development process would be a low reduction in time, a zero reduction in money, and a low increase in the trouble involved. The reason for the increase in trouble is that whether the developers would be better off or not is very unclear. They may find it easier to achieve agreement with the counties at the initial stages of geothermal development than to satisfy them on a continuing basis. In addition, the counties may be unwilling to give up much control at the initial stage, even in exchange for substantial levels of increased control at later stages. Although they may well want enforcement of the conditions they write into permits, they may be just as happy to have others enforce those conditions. Therefore, we rate the overall effectiveness of this proposal as 0 and think its effects, if any, would be in the short term.

Chapter 14

FOOTNOTES

1. Geothermal Steam Act 1970, Public Law 91-581, Section 7. See also 43 CFR Part 3201.2.

2. Geothermal Steam Act, Section 6(a).

3. Ibid., Section 2(e). See also 43 CFR Part 3200.0-5 (k).

4. Ibid.

5. Litigation is over language of Section 4 of the Geothermal Steam Act which says: ". . . they [KGRA lands] shall be leased to the highest responsible qualified bidder. . . ."

6. 30 CFR 270.17 (6).

7. The NCPA contract, however, gives NCPA the option of either purchasing on the basis of all steam taken (the PG&E model) or on a "take or pay" basis with a minimum of 8000 hours a year of plant operation (NCPA-RFL contract of April 13, 1976).

8. 88 Stat. 1079. Since loans under the program are to be at normal interest rates, the large corporations which can borrow at premium rates are not apt to be drawn to the program.

9. South Coast Regional Air Basin Coordinating Council, The Impact of New Source Review Rules, June 4, 1976.

10. However, continuing uncertainty as to the federal Clean Air Act's "no significant deterioration" provisions results in doubt about this proposal's feasibility.

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c. Miscellaneous

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E. Interviews

1. Government Agencies

a. United States

Bureau of Land Management, Sacramento Office.

ERDA, Division of Geothermal Energy, Policy Research Branch.

U.S. Forest Service.

U.S. Geological Survey, Area Geothermal Office.

U.S. Senate, Office of Senator Cranston.

U.S. Senate, Office of Senator Tunney.

b. California

Attorney General's Office.

California Energy Resources Conservation and Development Commission. Commissioners, Research and Development Division, Siting Division, Legal Department. Biennial Report.

California Public Utilities Commission. Commissioners, Environmental Impact Branch, Examiner Division, Staff Counsel, General Counsel.

State Lands Commission, Legislative Liaison.

State Lands Commission, State Land Division.

State of California, Air Resources Board.

State of California, Assembly Committee on Resources, Land Use, and Energy, Staff.

State of California, Clearing House.

State of California, Department of Fish and Game.

State of California, Department of Forestry.

State of California, Department of Water Resources.

State of California, Division of Oil and Gas, Geothermal Unit.

State of California, Office of the Lieutenant Governor.

State of California, Office of Planning and Research.

State of California, Water Resources Control Board.

c. Local

City of Burbank, Geothermal Project Manager.

Imperial County Geothermal Project Research Administrator.

Lake County Planning Director and Commission members.

Napa County Planning Department.

Sonoma County, Chief Appraiser's Office.

Sonoma County Planning Department.

2. Developers

Burmah Oil.

Chevron Oil.

Coopers & Lybrand.

Diablo Exploration.

Getty Oil.

Imperial Magma.

Magma Power Company.

Natomas Company.

Pacific Energy.

Republic Geothermal.

Thermal Power Company.

Union Oil Company of California.

3. Utilities

Los Angeles Department of Water and Power.

Northern California Power Agency.

Pacific Gas and Electric.

Sacramento Municipal Utility District.

San Diego Gas and Electric (including New Albion Resources Company).

Southern California Edison (including Mono Power Company).

4. Others

Electric Power Research Institute, Geothermal Research Division.

Energy and Environment Division, Lawrence Berkeley Laboratory.

Geothermal Energy Institute.

Jet Propulsion Laboratory.

Program Officer, Geothermal Program, Battelle Pacific Northwest Laboratories.

Renewable Energy Resources Project, National Conference of State Legislatures.

Senior Research Associate, Division of Humanities and Social Science, California Institute of Technology.

Sierra Club.

William Warne, consultant.