

## **NOTICE CONCERNING COPYRIGHT RESTRICTIONS**

This document may contain copyrighted materials. These materials have been made available for use in research, teaching, and private study, but may not be used for any commercial purpose. Users may not otherwise copy, reproduce, retransmit, distribute, publish, commercially exploit or otherwise transfer any material.

The copyright law of the United States (Title 17, United States Code) governs the making of photocopies or other reproductions of copyrighted material.

Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specific conditions is that the photocopy or reproduction is not to be "used for any purpose other than private study, scholarship, or research." If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that user may be liable for copyright infringement.

This institution reserves the right to refuse to accept a copying order if, in its judgment, fulfillment of the order would involve violation of copyright law.

BEGINNINGS OF GEOTHERMAL IMPACT ON COUNTY POPULATION AND LEADERSHIP, IMPERIAL COUNTY, CALIFORNIA

James B. Pick and Edgar W. Butler

University of California  
Riverside, California 92521

ABSTRACT

A major geothermal energy development scenario is about to begin in Imperial County. Initial energy-socioeconomic interactions in the areas of population and county leadership structure are discussed. These include immigration of energy company workers, a sewage plant dispute, conflict over union affiliation of geothermal laborers, and a transmission corridor routing dispute.

INTRODUCTION

The present study is partly based on prior studies of the relationship of geothermal energy development in Imperial County to demography (Pick et al., 1977; Pick and Butler, 1979c); public opinion (Butler and Pick, 1977); and leadership (Butler and Pick, 1979). Summaries of the series of NSF/DOE-funded studies by the authors and other researchers are presented in several reports (Pasqualetti et al., 1979; Pick and Butler, 1979a).

IMPACT ON POPULATION

In the population area, initial geothermal impacts appear limited to migration into the county of small numbers of energy company workers and their dependents. For example, in 1979, Westec Services, Inc., a geothermal contractor and consulting company had about 60 workers located in the county. About half were county residents trained locally. The remainder were Westec employees, largely managers and professionals relocated from the San Diego area. The impact of thirty immigrating workers to a county labor force of 38,525 is minimal. However, there is greater impact if only the skilled employment sector, professional/managerial, is considered. In 1970 this sector numbered 4,889 so that the addition of 30 Westec workers represents about a 0.6 percent sector increase. The county labor force is low-skilled by statewide trends. Thus, the training in geothermal job skills of the thirty locally-recruited Westec workers is important relative to a small skilled sector. As the advent of production in the North Brawley geothermal field draws closer, Union Oil Company has increased the number of employees located in Brawley from 5 to about 50. In Union's case, nearly all workers are immigrants. Most are

either professional/managerial or highly skilled. When the employees of other geothermal companies, such as Magma Power, Republic Geothermal, and Chevron Resources are considered, a total of several hundred skilled immigrant workers plus dependents have so far migrated into the county for geothermal development reasons.

Will most of these workers leave the county after geothermal production is achieved? The answer relates partly to alternative power plant capacity sequences. If plant capacity is rapidly increased, such workers may be maintained by their employers as longer term county residents.

IMPACT ON LEADERSHIP STRUCTURE

Several incipient geothermal developments have involved county leadership, including a dispute over the location of the Brawley sewage plant, conflict over the union affiliation of geothermal labor, and conflict over the routing of a high voltage transmission corridor. The origin of the sewage plant dispute antecedes the decision by Union Oil to develop the North Brawley geothermal field. The City of Brawley built a crude primary sewage plant in the 1950s. Because of lack of regulation, wastes could be dumped directly into the New River. By chance, the sewage plant location happened to coincide exactly with what subsequently has become a prime area for geothermal development. Several years ago, a plan was established by the City of Brawley to put in a \$3 million sewage plant with ponding and aeration in place of the previous primary treatment. It was also the intent of the City Plan to use treated sewage effluent as fertilizer in the farming of non-edible crops.

For this purpose, an action was started by the City of Brawley with respect to four hundred acres of land near the proposed sewage plant. This was based on an economic analysis, which included the alternative of secondary treatment. The City favored doing the farming itself. Another city alternative of installing more advanced secondary sewage treatment was ruled out because of equipment depreciation and maintenance costs. The parties of the dispute are the landowners of the land proposed for condemnation and the City. The dispute almost reached the stage of legal steps in a San Diego courtroom. The

landowners sought to regain ownership of this prime land, while the City hoped to realize its original plan, regardless of geothermal potential. One pending solution involves Southern California Edison Company's using the effluent as make-up water for geothermal cooling purposes. The lawsuit is not being pursued, but if SCE's use of the make-up water falls through, the legal issue will be reviewed again. Meanwhile, the Regional Water Quality Board has laid out a timetable for a firm contractual agreement to use the effluent for geothermal purposes. For the present, the City plans to put the effluent in holding ponds, with a 30-day water supply, which are necessary no matter which way the dispute is resolved.

Another leadership dispute surfacing in 1978 involved union affiliation of geothermal workers. Although geothermal workers have special training requirements, geothermal power contracts involving at least one utility, San Diego Gas and Electric Company, require geothermal workers to belong to the International Brotherhood of Electrical Workers. The dispute involved a vocational training program for geothermal workers which was initiated by CETA, under DOE sponsorship. This program was conducted by Westec Services, Inc., in conjunction with Imperial Valley College. Its goal was to train ethnic minorities and other economically disadvantaged workers in geothermal job skills. Such a goal coincides with one stated in the Geothermal Element of the Imperial County General Plan. This dispute has involved the question of which group, union or disadvantaged minorities, should be favored in filling geothermal jobs. By 1979, Westec Services had withdrawn as job trainer, leaving a stalled training program. Nearly all local geothermal jobs are being filled by union workers.

A third geothermal-related leadership dispute has developed over the location of transmission line corridors. This conflict is of greater significance to the county's geothermal development process than the two preceding disputes, and is perhaps the most important limiting factor on geothermal development (Pick and Butler, 1979b).

Why are the corridors so important? An existing 640 mile network of Imperial Irrigation District transmission corridors already is in place to transmit the fossil and hydroelectric energy produced from the existing 350 megawatts of IID energy capacity. A stark fact of the existing network is that even under the best of circumstances, a maximum of about 300 MW of geothermal electricity can be transported out of the county into either Los Angeles or Arizona. Under realistic conditions, such a maximum would likely be lower, because of the transmission requirements of present fossil- and hydro-generated electricity over the network.

In terms of power plants, a maximum of only six standard 50 MW geothermal plants can be accommodated in the Imperial Valley without the construction of new power corridors and

transmission lines. The Jet Propulsion Laboratory medium growth scenario of projected County geothermal electrical generating capacity would exceed 300 megawatts five years after commencing, and would rise to a 3500 MW level over a 30-year period. Thus, for this average scenario, a limiting factor occurring almost immediately is the necessity for construction of a new corridor or corridors.

From its beginning, the geothermal transmission corridor dispute has been linked with related disputes over nuclear energy. The fundamental cause of this linkage is the small amount of potential geothermal capacity and geothermal's technical unreliability relative to nuclear. Transmission lines for a nuclear plant in or running through the County could also carry some geothermal power. One proposed nuclear project adjacent to the County, was the Sun Desert nuclear plant, sponsored by San Diego Gas and Electric Company (SDG & E).

In January, 1977, representatives of SDG & E and Imperial County public agencies, municipalities, and interest groups formed the Transmission Corridor Selection Committee (hereafter called Selection Committee) which met for nine months to decide on the best route alternatives through the County from Sun Desert to San Diego. In May, 1978, the State Energy Commission declined SDG & E's Sun Desert site permit request on environmental grounds, especially with respect to nuclear waste disposal. From the present standpoint, it is unlikely the Sun Desert nuclear plant will ever be built because of this rejection. However, consideration is being given to locating a fossil fuel plant, perhaps coal, at the Sun Desert site.

Many of the issues and conclusions of the Transmission Corridor Selection Committee are relevant to present corridor siting because of the recent development of a major site for nuclear energy in Arizona. A nuclear plant complex of 4000 MW capacity is under construction near Phoenix. Since its capacity could serve the energy needs of an area of about four million persons, Arizona cannot use all of this nuclear energy. As a result, the California Public Utilities Commission has mandated to SDG & E the installation of a high capacity 500 kV line to bring energy from Phoenix to the utility's San Diego service area.

High capacity transmission routes through the County are under current consideration. Two sets of routes were chosen as optimal in October, 1978 by the Utility Technical Committee of the Imperial Valley Action Plan. This committee, consisting of representatives of the major utilities, was appointed by the State Energy Commission to advise on corridor siting studies. The southern route, passing just above the southern border of the county, is the old SDG & E Sun Desert route--now intended to link with Arizona. The northern routes would carry energy from a fossil plant at Sun Desert or from the Arizona nuclear grid across the northern agricultural area of the

county, up both sides of the Salton Sea to tie into the Los Angeles basin and across the West Mesa to tie into San Diego.

The earlier discussions and conclusions of the Transmission Corridor Selection Committee are valuable in bringing out the leadership dispute on corridor selection. The Selection Committee was composed of one representative from each of the following organizations: San Diego Gas and Electric Company, Imperial County Farm Bureau, Imperial County Planning Commission, Cities of Brawley, Calexico, Calipatria, El Centro, Holtville, Imperial, and Westmoreland, unincorporated areas of Ocotillo and Salton City, Imperial Irrigation District, American Association of University Women, and National Parachute Test Range. The 1977 Selection Committee discussed issues and reached conclusions related to the present Arizona-to-California transmission requirements. Transmission corridors may have impacts on geotechnical features, ecological resources, cultural resources, land uses, and scenic-visual resources. In evaluating alternative corridor routes based on the different interests represented, the wide range of potential impacts evoked different responses among participants.

As Committee meetings progressed, each group presented its selection criteria and interests on a preferred route. In many cases, criteria and interests of several groups were in direct opposition. Several committee representatives, as well as some not on the committee, compiled lists of specific routing objections. The Bureau of Land Management, which manages most of the land on the East and West Mesas, expressed concern for avoidance of many ecological and scenic areas on the Mesas, but had no objections in the Central Section, while the State Department of wildlife sought corridor avoidance of many state parks and areas. The concerns of the Naval Parachute Test Range (NPTR) were entirely different. NPTR sought preservation of security in areas on the Salton Sea and Mesas and maintenance of airport safety at its El Centro landing strip.

Three important local groups, the IID, the County Farm Bureau, and the County Planning Department, also expressed concerns. The IID voiced concerns about encroachment of existing power transmission lines on its irrigation canals, especially the All American Canal. These concerns were based on IID's desire to insure expansion prerogatives for its existing distribution networks. The Farm Bureau was concerned about effects on farm land prices and on agricultural operations, such as on night spraying activities. The objections of the County Planning Department echoed many concerns of the above groups--agricultural, park and recreational, airport, and ecological. In addition, the county stressed avoidance of cities. The latter objection was in response to the threat of the SDG & E primary route, which was to run 1 1/2 miles north of the City of Calexico. As Calexico is bounded to the south by the international border and to

the east by the All American Canal, a northern delimitation would presumably cramp city growth. This issue becomes especially sensitive, because 31 percent of the county's Spanish-American population is located in Calexico.

By the end of the Committee deliberations, eleven alternative routes had been proposed. Each representative on the Committee voted on all eleven routes by giving a rating on a scale of 0 (full disapproval) to 3 (full approval). The following table indicates the top four choices from this vote:

Route	Agency Proposing	Rating (out of 150)
Route G	City of Imperial	92.0
Route I	City of Holtville	65.0
Route B	American Assoc.Univ.Women	65.0
Route 1	SDG & E	62.2

The four routes are shown in Figure 1. Route G, which was overwhelmingly preferred, loops widely to the north and west avoiding the agricultural central part of the county. Another similar route, Route B, goes widely north and west, but cuts under the Salton Sea. Neither of these routes were recommended by the Imperial Action Plan Committee.

For Route G, there would be problems with establishing geothermal interconnections. For Route B, the extra length would be a problem since current construction costs of transmission corridors are about \$800,000/mile. Routes I and 1, on the other hand, are closely duplicated in the Action Plan recommendations.

This discussion has emphasized a multi-faceted political conflict already emerging on a critical geothermal issue. There are undoubtedly many other latent leadership issues. The surfacing of these as real conflicts will depend on the sequence of geothermal development events. Such events may have an erratic and/or chance origin. Although still untested, the same conclusions would seem to apply to latent public opinion issues.

#### CONCLUSION

The first large scale (50MWe) geothermal power plant in Imperial County is scheduled to be operational in 1983-84. From that time onwards over a period of at least twenty-five years, geothermal power capacity is likely to be incrementally added, to reach an eventual county capacity estimated at 2000-6000 MWe. Beginning in the 1980s, direct use applications will be implemented.

More difficult to estimate is the timing and forms of socioeconomic effects which will accompany the technical development process. Earlier reports by the authors have estimated, from a predevelopment perspective, possible socioeconomic features of potential importance to geothermal development. The present field study has detailed examples, in the population and leadership areas, of socioeconomic effects already present, as full commercial development is beginning. Over the 25+ year development period, numerous additional

socioeconomic interactions will undoubtedly occur. Recognition and monitoring of such developments, and correlation of these with baseline studies, may assist in mitigating untoward social and political events, and in enhancing and streamlining the development process.

REFERENCES

Butler, Edgar W. and James B. Pick, 1977, Opinion About Geothermal Development in Imperial County, California: 1976. Final Report to NSF/ERDA, Grant AER 75-08793: University of California, Riverside, California, 65 p.

Butler, Edgar W. and James B. Pick, 1979, Leadership, Community Decisions, and Geothermal Energy Development: Imperial County, California. Final Report to Lawrence Livermore Laboratory, Contract No. 4679303: Livermore, California.

Imperial Valley Action Plan, Utility Technical Committee, 1978, Transmission Planning Corridors for 2,000 MW Geothermal Development, Imperial Valley Action Plan: El Centro, California.

Pasqualetti, Martin J., James B. Pick, and Edgar W. Butler, 1979, Geothermal Energy in Imperial County, California: Environmental, Socioeconomic, Demographic, and Public Opinion Research Conclusions and Policy Recommendations: Energy, v.4, p. 67-80.

Pick, James B. and Edgar W. Butler, 1979a, An Overview of Socioeconomic and Environmental Studies of Geothermal Development in the Imperial Valley, Handbook for Annual Conference, Geological Society of America, p. 77-81.

Pick, James B. and Edgar W. Butler, 1979b, Limiting Factors on Geothermal Development, Imperial County, California, U.S.A.: Transactions of the Geothermal Resources Council (Davis, California), v.3, p. 535-538.

Pick, James B. and Edgar W. Butler, 1979c, Sociological Setting and Impact. In Edmunds, Stahrl and Adam Rose (eds.), Geothermal Energy and Regional Development, Praeger: New York, p. 122-161.

Pick, James B., Tae Hwan Jung, and Edgar W. Butler, 1977, Population Analysis Relative to Geothermal Energy, Imperial County, California, Final Report to NSF/ERDA Grant AER75-08793: University of California, Riverside, California, 110 p.

Transmission Route Selection Committee, Imperial County, 1977, Committee Proceedings, Transmission Route Selection Committee: El Centro, California

Figure 1. Transmission Corridors from Sundesert Nuclear Plant Favored by a County Selection Committee in 1977 (see text for symbol key)

