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FUTURE PROSPECTS FOR GEOTHERMAL ENERGY DEVELOPMENT IN CALIFORNIA

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I want to thank Paul Kruger for the opportunity to address this workshop on the subject of geothermal energy development in California.

When I was invited to speak at this conference, I gladly accepted because I believe this type of interaction between all levels of government and industry organizations is important. It is the application of your collective skills and resources that makes the geothermal industry work. Therefore, any governmental or market action that affects the value or the contribution of geothermal energy to meeting the state's needs is of vital interest.

Foregoing any discussion of where the industry has been or what it has accomplished, I would like to focus on the present and mention some new opportunities that you may not have previously considered.

First, the present. The two state regulatory agencies that will largely influence the future of geothermal energy development in California are the Public Utilities Commission and the California Energy Commission.

As you are aware, the Public Utilities Commission suspended the signing of any new Interim Standard Offer 4 contracts back in 1985. The lucrative terms and prices offered in these contracts provided the impetus for the growth of the independent geothermal energy industry today. At the time of the suspension, independent geothermal developers had signed contracts totalling 1,055 MW.

Since then, contracts accounting for 156 MW have been terminated while projects totalling 334 MW have been developed, leaving 565 MW that have not yet been developed. Since most of these contracts will not expire until 1990, these remaining MWs represent the near-term market potential for geothermal development in California.

The Energy Commission is currently preparing its biennial Electricity Report. This report will include a forecast of the demand for electricity over the next 5-, 12-, and 20-year horizons. The report also will present a forecast of the supplies of electricity that will be available to meet this demand. One of the key issues in this, our seventh, Electricity Report, will be the forecast of generating capacity that will be developed between now and 1992 from the remaining standard offer contracts. The forecast in the draft final report shows that only 295 MW of geothermal energy are expected to come online between now and 1992.

Looking to the future, the Energy Commission's forecast will directly affect the determination of the need for additional generation resources by the investor-owned utilities and thus new potential market opportunities for the geothermal industry. The availability of future long-term power purchase contracts during the next eight years will be determined by a bidding process adopted by the Public Utilities Commission. Under this plan, the utilities will be allowed to build new facilities or to purchase capacity and energy from independent producers that can supply it at the least cost.

In a recently-completed report entitled the Energy Technology Status Report (ETSR), the Energy Commission conducted a detailed assessment of over 220 electric generation, nongeneration, and automotive transportation technologies. This report serves as the technical basis for the state's energy research and development policies and provides input to certain power plant siting case evaluations.

What the geothermal industry should learn from this report is that geothermal technologies, particularly flashed-steam and binary-cycle, presently cannot compete with technologies such as gas-fired

cogeneration on a cost basis. Therefore, the industry must find ways to reduce exploration and production costs, or the contribution of geothermal to future generation additions in California may be limited. Further limiting future opportunities is the recent revelations about the long-term productivity of The Geysers steam resource and the decision by PGandE to shelve plans for 3 new plants in The Geysers. Up to this point, electrical energy from The Geysers was one of California's least expensive sources.

The problem, though, with the PUC's bidding process is that the least-cost technologies, which may likely be fossil-fueled facilities, will only exacerbate California's air quality problems, and may adversely affect the long-term security and costs of energy supplies in the state.

However, it is California's inability to meet federal air quality attainment standards that is leading to ever-tightening constraints on the combustion of fossil-fuels. The most comprehensive are the proposals by the South Coast Air Quality Management District (SCAQMD). The most extreme provisions of the SCAQMD proposals may prohibit the combustion of fossil fuels within the basin, requiring complete electrification of all industrial, commercial, and transportation functions. This would have obvious implications regarding the need for new, nonpolluting generation sources. And, as the Energy Commission does not favor the export of pollution from nonattainment areas to attainment areas, greater preference would be given to clean sources.

In addition, both the Energy Commission and the Public Utilities Commission are now being urged to incorporate the effects of nonprice externalities in their need determination process. Recently, the California Legislature passed Assembly Concurrent Resolution No. 160 which requests both the Energy Commission and the Public Utilities Commission to take into account the benefits of nonprice factors when conducting our respective resource supply assessment and standard offer proceedings. This, of course, would place greater emphasis on noncombustion technologies such as geothermal energy. The resolution further requires the two commissions to inform the Legislature on or before December 1, 1989, on how these factors will be taken into account in our respective proceedings.

Although such regulatory actions would enhance the marketability of geothermal energy, your industry still may find strong competition from out-of-state power sources. All this points to an uncertain future for geothermally-produced electrical energy, and the need for a stronger partnership between the state and federal government and the geothermal industry to focus limited research and development dollars into those areas that will make geothermal energy more competitive in the market place. From a government perspective, however, this goal must also be balanced by the need to develop other new technologies that offer promise for the next century.

In the last few years, the Energy Commission has begun new programs that are intended to address near-term market and environmental issues as well as long-term research and development goals. We are strengthening our programs that provide energy end users with economic options to fossil fuels both for electric generation and thermal applications. We are providing cost sharing for projects that focus on longer-term research and development issues. We are providing assistance to California's advanced energy technology companies in both domestic and foreign markets. And, we will be stepping up our efforts to ensure that environmental factors are given stronger consideration in our regulatory actions.

Through our Geothermal Grant and Loan Program, the CEC is providing grants and loans as well as technical assistance to local governments for the exploration and development of the state's vast low- and moderate-temperature geothermal resources for direct-use applications. Given the uncertainties of the market for electrical energy in California, your industry must begin to consider this opportunity that, in the past, may not have been considered enough of a lucrative market for major private investment.

The energy potential from low- and moderate-temperature resources in California is substantial. And, despite the currently-depressed oil market, direct-use applications remain a reasonably good investment for many local governments and private developers. For example, many heating and air conditioning systems require electricity. The retail price for electricity has not been affected by the drop in oil prices as have natural gas and distillate oil prices. In fact, retail electricity prices have

increased, making the use of low- and moderate-temperature resources to displace electrical energy reasonably cost effective.

However, high exploration costs has kept many local governments and private investors out of the direct-use market. The role of the CEC's Geothermal Program, therefore, is to provide technical and financial assistance to overcome these impediments.

Perhaps the best example of this effort is the geothermal district heating system in the City of San Bernardino. Owned and operated by the San Bernardino Municipal Water Department, the system presently uses low-temperature geothermal water, about 135 °F, for space and water heating in twelve downtown buildings. This number should expand to 27 by the end of 1989, making this system the largest of its kind in the United States. The cost thus far for this project is $6.7 million, of which the Energy Commission has provided $4.7 million.

To date, the Energy Commission has provided more than $13 million for resource exploration and development projects throughout the state. Many of these projects have included geochemical, geophysical, and hydrological analyses as well as temperature gradient, production, and injection well drilling.

Our newest funding effort, the Energy Technologies Advancement Program (ETAP), is an energy research and development program that was begun by the Energy Commission three years ago. Through the ETAP, the Energy Commission provides research contracts and loans for projects to make a wide range of energy technologies more efficient and cost- effective in California. Unlike the Geothermal Grant and Loan Program, which does not fund technology research, through ETAP the CEC can provide funding for projects along the entire energy research and development spectrum, from basic laboratory research through final testing and demonstration of full-scale energy systems applications.

The ETAP is fully funded from State resources. We currently have twenty-six active research contract and loan projects costing over $35 million, and funded with $8.4 million from the Energy Commission.

Several of these projects demonstrate technologies near to commercialization, while others focus on laboratory or pilot-scale research and development of components of new technologies that have commercialization horizons of from five to fifteen years. For example, work is underway for the development of a new process to gasify high-ash, high-moisture biomass byproducts such as paper pulp residues. Under another contract, a family of low-cost catalysts are being developed to reduce NOx air emissions from electrical generating facilities. Another contractor is performing laboratory research and field testing of a proprietary process to directly generate steam for use in solar thermal power plants, a process which will eliminate the need for costly, and sometimes hazardous, heat transfer fluids. Still another is developing new low-cost semi-conductor materials for higher cell efficiencies in photovoltaic power generation systems.

Unfortunately, none of these are specifically related to geothermal technologies. We have received only a few applications out of more than 125 in the last three years relating to geothermal energy technologies. We strongly encourage applications from this industry that will lead to improved and more cost effective exploration techniques and electrical and thermal energy conversion processes. These types of improvements may be important to the future success of the geothermal industry in the California energy market.

Another program, the Energy Technologies Export Program, was established three years ago to assist California's energy industry in promoting their products in the international markets. This program complements the mission of the Department of Energy's Committee on Renewable Energy, Commerce and Trade (CORECT), which coordinates federal efforts to encourage exports of renewable energy products.

Through our Export Program, the Energy Commission acts as a broker to introduce foreign buyers to domestic equipment vendors, technical consultants, and other service contractors interested in expanding their business to foreign markets. We also conduct activities to evaluate international market opportunities, identify sources of financing and assistance available for both parties, and assist California firms to overcome export barriers.

Since the Export Program began, the Energy Commission has conducted two reverse trade missions in which representatives from 31 countries were brought to California to meet with representatives from domestic geothermal and wind energy companies. These missions have resulted in equipment sales of $3.4 million. An additional $70 million in power plant sales is under negotiation.

Another issue that may indirectly affect the geothermal industry is global warming. The CEC is presently involved in a comprehensive study to assess the implications of global warming on California. This multi-agency effort was initiated in response to the mounting scientific evidence pointing to global warming trends. The participants include other state agencies, the University of California as well as federal and private research groups. This work will culminate in a report to the California Legislature in June 1990. The report will focus on determining the potential magnitude of global warming impacts and provide recommendations that will help California prepare for any such eventuality. It also will recommend ways the state can participate in national and international efforts to slow global warming trends. The possibility of global warming could have implications in future power plant siting proceedings and strengthen the Energy Commission's policy actions regarding nonfossil-fuel technologies such as geothermal energy.

Already, the Energy Commission is incorporating global warming issues in its assessment of appropriate energy technologies. For example, many new alternative technologies which emit little or no carbon dioxide are being given priority in the Energy Commission's Energy Development Report. This represents the first steps towards addressing the implications of the greenhouse effect in public policy decision making.

In closing, it is clear that your industry has been quite successful in developing this state's geothermal energy resources. But, as we enter the 1990s, the industry is confronted with new challenges that may dictate its future. Today, I have briefly discussed some of the challenges facing the industry in California and some options available from the Energy Commission to assist you in meeting them. I look forward to working with you and to the continued development of this valuable energy resource.