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Decision No. \_\_\_\_\_

JAN 29 1980

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BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Re Resolution M-4709 authorizing )  
 San Diego Gas & Electric Company ) Application No. 59280  
 to participate in the Heber ) (Filed November 16, 1979)  
 Binary Geothermal Project. )  
 \_\_\_\_\_ )

Stephen A. Edwards, Vincent P. Master,  
 Bruce M. Rosenberg, by Stephen A.  
 Edwards, Attorney at Law, for  
 applicant.

John W. Witt, City Attorney, by  
William S. Shaffran, Deputy City  
 Attorney, for City of San Diego,  
 interested party.

Ellen Levine, Attorney at Law, for  
 the Commission staff.

O P I N I O N

San Diego Gas & Electric Company (SDG&E) requests that the Commission: (1) endorse SDG&E's proposal to the Department of Energy (DOE) to build a geothermal binary cycle demonstration plant at Heber; (2) authorize special ratemaking treatment for its share of project costs estimated at \$37.6 million spread over seven years of project life; and (3) permit recovery through rates of reasonably incurred expenses, including penalties payable to the geothermal reservoir operators resulting from project failure.

Public hearings were held before Administrative Law Judge B. Patrick at San Diego on December 20, 21, 27, and 28, 1979, and the matter was submitted on December 28, 1979 after oral argument. Testimony was presented by five witnesses for SDG&E and two witnesses for the Commission staff.

Summary of Decision

This decision endorses SDG&E's proposal to construct a 50-MW binary geothermal demonstration plant at Heber, California. Construction is expected to commence in 1980 and last through 1984. The demonstration phase is expected to last through 1985 and 1986.

SDG&E's participation is contingent upon receiving 50 percent funding from DOE and 20 percent from other entities.

Total costs associated with the construction and demonstration phases of the Heber project are estimated at \$128.4 million over 6 1/2 years. Of this total estimated project cost, SDG&E will fund \$37.6 million, of which \$28.2 million is for construction and \$9.3 million for demonstration. The \$128.4 million figure includes the total fuel cost for the two-year demonstration period, estimated at \$27.8 million. It does not, however, include the following, if the project becomes commercial: (1) fuel costs beyond the demonstration period; (2) an estimated \$3 million tax expense incurred during the construction phase of the project; and (3) a return of all or part of DOE's capital contribution during the construction phase, estimated at \$46.7 million. If the project is unsuccessful, SDG&E's portion of construction and demonstration costs could be increased by as much as \$30 million due to liability to Chevron Resources, Inc., the reservoir operator.

Because of its financial condition, SDG&E asked the Commission to grant it special ratemaking treatment whereby it would recover its expenditures on a dollar-for-dollar basis as the expenditures are made. Under this treatment, the ratepayer finances the project up front and directly assumes the financial risks. However, this rate treatment will not result in increased cost to the ratepayer at this time since SDG&E will use its current allowance for research and development to finance the project through 1980.

Since SDG&E will proceed with the project only if the Commission grants this special ratemaking treatment, the issue is whether it is in the interest of the ratepayer to support promising alternative energy technology in this manner. After carefully reviewing the testimony as to the need for such a project and the benefit to SDG&E's ratepayers, we conclude that the project is worthwhile and that SDG&E has a need for such special ratemaking treatment. We emphasize that this does not set a precedent for other projects. ✓

General

The specific relief SDG&E requests in this proceeding is:

- (1) SDG&E is seeking Commission approval to treat the anticipated construction and demonstration expenditures as research, development, and demonstration (RD&D) expenses.
- (2) SDG&E is seeking Commission approval of a mechanism to adjust rates annually to modify SDG&E's authorized RD&D budget to cover anticipated project expenditures.
- (3) SDG&E is requesting Commission recognition of the risks associated with this project and the granting of approval to recover, through rates, any reasonably incurred liability due to project failure.
- (4) SDG&E is seeking authorization to include the costs associated with purchasing geothermal brine for the project as an RD&D expense during the entire demonstration phase of the project regardless of how the Commission might determine to treat such costs for a commercially operating plant as a result of its inquiry in Order Instituting Investigation (OII) No. 56.

In essence, SDG&E is requesting an order providing relief similar to that allowed in Resolution No. M-4709 issued by this Commission on November 6, 1979, with the exception that RD&D treatment of the brine costs during the demonstration period should not be contingent on the outcome of OII 56 (the generic ECAC investigation).

SDG&E expects that the project would be funded in part by DOE and through participation agreements from the Electric Power Research Institute (EPRI) and a number of public and private utilities in California. At the present time, SDG&E's best assessment of participation by others is: DOE 50 percent; SDG&E 31 percent; Imperial Irrigation District (IID) has expressed interest in a 6 percent ownership; Southern California Edison (SCE) has expressed interest in a 3 percent ownership interest; Department of Water Resources (DWR) has expressed interest in a 1 percent ownership interest; and EPRI feels certain it could contribute \$8 million to the project.

Construction of the binary plant is expected to commence in 1980 with completion before the end of 1984.

Two years of initial operation would follow to demonstrate the technology. Should this prove successful, the plant would then be operated commercially and power sales credited back to the participants. However, the plant is conceived as a demonstration project and commercial sales cannot be counted upon.

SDG&E's share of the project cost is estimated at \$37.6 million, spread over seven years. This includes cost of geothermal energy for two years of operation as a demonstration project. Annual expenditures are expected to vary. The lowest annual expenditure is estimated at \$1.3 million in 1980 and the highest \$11.1 million in 1982.

Geothermal reservoir costs to support the power plant are not included in the above figures. These costs will be recovered over the life of the power plant (estimated at 25 to 30 years) through charges for geothermal heat energy. Chevron Resources Company (Chevron) will be the operator of the field. The geothermal leases are owned by: Chevron 61 percent, Union Oil Company 30 percent, and New Albion Resources Company, a subsidiary of SDG&E, 10 percent. ✓

A major area of concern is liability for geothermal reservoir costs if the project is abandoned. Much of the reservoir developer's costs are at the front end of the project. SDG&E's proposal is contingent on liability for these costs being imposed upon the ratepayers. Terms of this contract are currently under negotiation with Chevron. ✓

SDG&E's proposal is also contingent on DOE's providing 50 percent of the funding for the power plant project. DOE will not be liable for any reservoir costs, nor will it have any ownership interest in the plant.

If and when the transition to commercial operation is completed, SDG&E will negotiate, on behalf of all participants, for the return of DOE's capital contribution.

Background

SDG&E has been working for several years toward the development of the capability to produce electricity using the heat in geothermal brine in the Imperial Valley. Much of the geothermal resource in the Imperial Valley is of moderate to low temperature. Current commercial geothermal facilities use flash technology which is more appropriate to higher temperature reservoirs. It is believed that the development of a binary cycle, using a secondary working fluid which vaporizes at a lower temperature, will allow for more power production from lower temperature reservoirs and that this technology would benefit all of California by expanding the available geothermal resource base.

In July 1979 the U. S. Senate/House Conference Committee on DOE's Appropriations Bill directed DOE to choose a site for the development of a 50-MW binary cycle demonstration plant. With this Appropriations Bill in mind, on December 3, 1979 SDG&E submitted to the DOE a proposal for financial assistance for 50 percent of the costs of constructing and operating a binary cycle demonstration plant at Heber. SDG&E states that its participation is conditioned on the endorsement of the project by this Commission, approval of special ratemaking treatment for SDG&E's share of the expense, and insulation of SDG&E from potential liability for geothermal reservoir development costs, if the project is abandoned. ✓

Because the DOE was under tight time constraints for selection of a binary geothermal project, SDG&E, after providing the Commission staff with background information about the project, sought Commission endorsement of its proposal to the DOE. This resulted in the issuance by the Commission of Resolution No. M-4709

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on November 6, 1979. Thereafter, the city of San Diego (San Diego) filed a petition for a public hearing. The petition was granted by Decision No. 91096 dated November 30, 1979, and the matter was assigned Application No. 59280.

Testimony of SDG&E

Gary D. Cotton, vice president of engineering, SDG&E, testified that because of recent escalation in the price of fuel oil, by the 1980's, the cost of geothermal power from the Imperial Valley is expected to approximate that of existing oil-fired generation, and geothermal energy is projected to become less expensive than oil in subsequent years. These trends, coupled with SDG&E's rapid customer growth, enforce its commitment to obtain alternative sources of electric power to meet rising peak demands. He considers the Heber Plant a vital step in the development of geothermal energy as an alternate source of supply for southern California. He said that in July 1978 SDG&E signed two letters of understanding, one with Magma Power Company and one with Republic Geothermal, Inc., for construction of two geothermal power plants in the Imperial Valley. These plants would use the flash conversion process and have nominal 50-megawatt (MW) generating capacities. Republic would design and build a plant at the geothermal reservoir at East Mesa, California. SDG&E would purchase the energy and provide transmission lines for the power. A similar arrangement is contemplated with Magma Power for a plant to be located at the Niland Reservoir, south of the Salton Sea. Both plants are targeted for operation in the early 1980's.

Cotton testified that for the past years, SDG&E has operated a Geothermal Loop Experimental Facility (GLEF) at the Niland Reservoir. This facility was funded equally by the DOE and SDG&E. With the GLEF they had made significant



progress in resolving many technical problems. He said that an 11-MW binary power plant at East Mesa is under development by Magma Power and is now in the start-up mode. SDG&E has committed \$525,000 from its RD&D budget toward the operation of this experimental facility.

He further testified that on December 3, 1979 SDG&E submitted an unsolicited proposal to the director, division of geothermal energy, DOE, to obtain financial assistance from the DOE for the design, construction and operation of the world's first large scale binary-cycle geothermal power plant. He said that the U.S. Government has recognized that the national interest will be served by utilization of geothermal resources for production of electricity in place of imported oil and gas. To expedite the development of a binary-cycle plant, in August of this year, the congressional manager of an appropriations bill directed DOE to "proceed without further delay with the development of a 50 MW binary-cycle conversion geothermal demonstration plant...and to select a site for this demonstration plant within three months." (Energy and Water Development Appropriation Bill, 1980, Conference Report No. 96-388, 96th Congress, First Session, page 22). DOE is thus required by Congress to select a plant site and make an award to begin negotiations for the construction and operation of a binary-cycle plant. In addition, the U.S. Congress is currently considering adoption of HR 4471 and HR 5187, which deal directly with provisions necessary to expedite geothermal development to commercialization. These bills include reservoir insurance, loan guarantees, tax

incentives and other considerations which deal with expediting environmental and regulatory review processes.

As further support for SDG&E's active involvement in geothermal energy, Cotton cited D.88758 dated May 2, 1978 where this Commission ordered SDG&E to "continue to aggressively pursue its geothermal development plans." He considered the proposed Heber Plant part of SDG&E's response to that order. Also, he cited the California Energy Commission resolution dated October 10, 1979 supporting SDG&E's proposed binary-cycle demonstration plant at Heber. In that resolution, the Energy Commission (1) encourages broad-based participation by other California utilities and geothermal developers, and (2) encourages the CPUC to consider appropriate funding mechanisms to allow the project to proceed. He testified that the Electric Power Research Institute (EPRI), which is the center for research and development for the United States electric utility industry representing over 500 utilities, continues to strongly support the Heber Binary Project and EPRI's major near term geothermal objective is a binary-cycle demonstration power plant located on a reservoir which is most representative of moderate temperature, low salinity resources. EPRI studies, which considered many alternatives, resulted in the selection of Heber as the preferred reservoir for such a binary-cycle demonstration plant. EPRI is prepared to offer continued assistance, as required. EPRI's Five-Year Plan has eight million dollars over the 1980-84 period budgeted for a binary-cycle geothermal demonstration power plant. However, he added that funding of the Heber Plant by EPRI must still receive approval of its board of directors.

Cotton specified the objectives of the Heber Plant to be: (1) to demonstrate the potential of moderate-temperature geothermal energy to produce economic electric power with binary-cycle conversion technology; (2) to scale up and evaluate the performance of binary-cycle technology in geothermal service; (3) to establish schedule, cost, and equipment performance, reservoir performance, and the environmental acceptability related to such plants; and (4) to resolve uncertainties associated with the reservoir performance, plant operation, and economics. The scope of the project is to design and construct a 45-MW (net) power plant and to perform a demonstration program during the first two years of plant operation. Given a successful outcome of a demonstration program, Cotton believed that plant operation may be continued on a commercial basis.

In outlining SDG&E's progress made thus far with the Heber project, Cotton testified that because of previous work done on the development of a binary-cycle geothermal power plant at the Heber Reservoir, much of the basic engineering, reservoir investigation, feasibility studies, and licensing activities have already been conducted. Wells have been drilled and tested and the reservoir analysis has been confirmed by independent consultants. It is currently estimated that the Heber Known Geothermal Resource Area (KGRA) can support 500 MW for a period of 30 years. Operating experience from their Geothermal Loop Experimental Facility at the Niland Reservoir and from the binary-cycle pilot power plant projects at the East Mesa and Raft River reservoirs will provide useful data for demonstration of the Heber Plant.

As part of SDG&E's continuing interest in the development of geothermal resources in Imperial Valley, SDG&E had taken steps to insure the availability of a sufficient cooling water supply to support the Heber Plant. The basic water supply for the Heber Plant will be provided by the field operator, Chevron, which has already made application with the State Water Resources Control Board for water to supply the full field development of 500 MW. As a backup supply, SDG&E also has a contract with Imperial Irrigation District to provide water for up to 200 MW of geothermal development at the Heber reservoir.

Turning to environmental concerns, Cotton explained that these have been considered for a demonstration binary-cycle plant at Heber. In June 1978, Imperial County adopted a final Environmental Impact Report, prepared in accordance with the California Environmental Quality Act, to support the issuance of a Conditional Use Permit allowing SDG&E to develop a 45-MW binary power plant. The Conditional Use Permit has been issued. It is expected that additional environmental review will be conducted by DOE to comply with the procedural requirements of the National Environmental Policy Act (NEPA). Since all the substantive requirements of NEPA have already been satisfied, no serious problems are expected following a NEPA review. Further, SDG&E has purchased the property designated for the Heber Demonstration Plant.

As to the current status of the Heber Binary Plant, Cotton testified that the DOE is presently reviewing SDG&E's proposal. It is anticipated that they will select a site in January 1980. If SDG&E's project is selected,

negotiations and consultations will then take place between representatives of SDG&E and the DOE toward the execution of a Cooperative Agreement. He said that various agreements relating to power plant ownership, financial assistance for the project, and operation of the plant need to be negotiated. In addition, agreements will be required to provide technical, construction, and start-up services on the power plant.

Regarding sharing of the project costs, benefits, and attendant risks, Cotton testified that at present the prospective participants are SDG&E, the Southern California Edison Company, the Imperial Irrigation District, and the California Department of Water Resources. He said that solicitations have also been made for obtaining contributions for the project. The contributors will be kept apprised of project status, and they will have complete and timely access to all data developed by the project. Presently, the prospective contributors are the EPRI, other utilities, and California State agencies (other than Department of Water Resources).

In describing the potential risks associated with the Heber project, Cotton testified that as with any demonstration project, risks will exist in the form of unanticipated environmental problems, the uncertainty of plant availability and reliability, as well as the overall economics of power generation. He pointed out that the major risks are failure of the geothermal heat and failure of the binary-cycle plant to perform reliably. He emphasized that the overall objective of this Heber binary-cycle demonstration plant is to deal with and overcome these risks and thus demonstrate the commercial feasibility of the binary-cycle process utilizing a liquid dominated reservoir.

Cotton emphasized that of critical importance to this project is liability for the geothermal brine contract if the plant did not operate. He said that if the plant does not operate as planned and SDG&E were required to terminate the contract with Chevron, SDG&E could be liable for a theoretical maximum of approximately \$30 million. This represents Chevron's investment in the development of the field required for the life of the plant plus a return on that investment. The termination charges are to be based on the unrecovered portion of this investment and return. Negotiations are under way on the issue of appropriate rate of return on that investment to be used in developing termination charges. Real life scenarios would actually result in significantly lower termination penalty than the \$30 million. If the binary facility failed to operate as planned, SDG&E or another party could replace the binary facility with a flash facility and the contract could be assigned. If termination without replacement took place following some period of operation, a portion of Chevron's investment will already have been returned in heat charges. In addition, development of the field will occur over the life of the plant and SDG&E would not be required to compensate Chevron for the investment in development not yet incurred. He said that all of these scenarios point to a significantly lower liability if the project must be terminated.

Regarding the current status of the negotiations to obtain geothermal heat to operate the plant, Cotton explained that negotiations have been under way with Chevron, the operator of the Heber Reservoir, for approximately four months. No definitive agreements have been reached on any points, but he believes SDG&E is reaching an understanding as to certain basic matters. Chevron recognizes the experimental nature of the binary-cycle plant and SDG&E therefore expects to be able to obtain heat for either a two-to five-year demonstration period, or a full 30-year period if the plant is put into commercial operation. SDG&E also has an understanding regarding the price of the geothermal brine and the escalation factors to be applied to that price. SDG&E is currently negotiating with Chevron regarding the termination payments that would be made by the project in the event the plant failed to operate as expected. The termination payments would be a negotiated amount, but would provide a return of Chevron's capital investment and an appropriate return on investment. Another matter being negotiated is the liability of Chevron to the project in the event that the reservoir fails or Chevron is somehow unable to deliver the required amount of brine. He said that SDG&E has reached no understanding on that matter yet. ✓

Turning to the price for geothermal brine currently being discussed, Cotton testified that no firm price has been agreed upon, but the price would range from approximately 70 to 80 cents per million Btu's. The price of geothermal brine is a purely negotiated price. Based on SDG&E's preliminary analyses, the price for brine being discussed could be expected

to yield competitive bus bar costs of electricity in the 1980's. SDG&E has recognized that Chevron considers its portion of this project to be a commercial venture. Therefore, Chevron expects to earn a reasonable return on its investment, or it will simply not sell. Thus, to induce Chevron to proceed with reservoir development, the price of geothermal brine must allow Chevron to earn a reasonable return on its investment. From SDG&E's knowledge of drilling costs and earnings and risks in the geothermal field; it believes the brine costs being discussed are reasonable. ✓

Regarding escalation factors that will be tied to the cost of heat, Cotton testified that most energy contracts entered into today include some provision for inflation. The specific escalation factors to be included in this contract are still under negotiation, but Chevron has indicated a willingness to tie escalation to a combined index based on both inflation in the economy and inflation in the cost of energy rather than inflation in the cost of energy alone. SDG&E has been discussing tying 75 percent of the cost of the brine to general inflation indices and the remaining 25 percent to some energy-related index. SDG&E believes this is a more desirable position for a purchaser because energy inflation indices, which are based on oil prices, have been increasing, and are expected to increase, more rapidly than the inflation of the overall economy. Although the indices have not been agreed upon, the energy index used may be a broad-based index instead of an index based on a more volatile fuel, such as fuel oil.



Robert Y. Lacy, manager of generation engineering for SDG&E and manager of the Heber geothermal project, testified that in the Imperial Valley, where the project would be located, two types of plants may be used: (1) the flash-cycle plant and (2) the binary process plant. In flash plants, the hot geothermal fluid flows under pressure to a vessel where the fluid is allowed to boil or flash to produce steam. The steam then runs the turbines in a conventional manner. The flash plant technology is a proven and commercially used technology. The other method, binary-cycle, uses a heat exchanger to transfer heat from the hot geothermal liquid to another fluid, known as the working fluid. The working fluid, typically a hydrocarbon, is then heated and used to drive the turbines to produce electricity. The binary-cycle technology has been proven in other applications in the petrochemical industry, but has not yet been employed in a commercial size geothermal power plant.

As to why it was necessary to develop the binary system when the flash system has been commercially proven, Lacy testified that the binary system must be developed because hydrothermal geothermal resources are not uniform. Reservoirs are different in size, temperature, dissolved solids, heat content, and chemical composition. Therefore, a single technology will not satisfy the needs of full-scale geothermal development. Dry steam technology, single and multistage direct-flash, and the emerging binary-cycle technology will all be required and will play important roles in geothermal development. To gauge the importance of the binary-cycle process, it is necessary to recognize that about four

out of five reservoirs will be more amenable to binary-cycle than direct-flash development. The importance of the binary-cycle increases with further recognition that reservoir temperatures may decline with production. He added that another way of gauging the relative importance of these cycles is to examine the total energy that can be developed by each. He said that the amount of energy in moderate-temperature reservoirs in the United States is roughly equal to that in high-temperature reservoirs. The direct flash cycle is applicable to high-temperature reservoirs, while the binary-cycle is applicable to reservoirs over the entire spectrum of temperatures, limited only by threshold economics. He concluded that, more importantly, the binary-cycle would allow development of half the geothermal energy that otherwise would not be commercially developed with the direct flash cycle.

Lacy further testified that current direct flash technology is adequate for high temperature, low-salinity resources, but is limited at moderate temperatures. He explained that it is not practical to flash at pressures lower than atmospheric; thus, the geothermal fluid will leave the plant at about 100°C, taking with it much of the heat that could be converted to electricity. A second limiting factor is that more than two stages of flash are generally not cost-effective, and in practice, the geothermal fluid may be rejected at temperatures higher than 100°C. A third limitation is that if the geothermal fluid is flashed at low pressures, the turbines using this low pressure steam must be large and expensive. Finally, noncondensable gases in the flashed steam could impose severe economic penalties.

Lacy pointed out that binary-cycle technology is being adapted from the petrochemical industry for geothermal service. This technology is well suited for development of low-salinity, moderate-temperature geothermal resources. Energy production from binary-cycle technology is limited only by the sink, or ambient, temperature. Another important aspect of the binary-cycle is its flexibility to adapt to changing reservoir conditions by changing the working fluid to optimize performance within different temperature ranges. He emphasized that a binary-cycle plant also provides other potential advantages, such as greater efficiency of energy extraction, elimination of noncondensable gas emissions, and elimination of steam carry-over problems. Such advantages could make the cost of construction and operation of a binary-cycle plant lower than the cost of a similarly sized flash plant.

As to the reason for considering the binary power plant still experimental or RD&D, Lacy said that because a large scale unit has never been built or operated as a commercial power plant, further development of binary power plant components is required. The major component requiring development is the hydrocarbon turbine. Although preliminary designs for binary turbines have been developed, binary turbines of the 50-MW commercial size have never been built or operated. He said that to demonstrate the commercial viability of a binary geothermal plant, components, such as turbines and other systems, must be manufactured, tested, and operated. He added that downhole pumps in the geothermal wells, plant and component reliability, safety, environmental impacts, and plant operating procedures and performance need further development prior to commercial application.

Describing SDG&E's involvement in geothermal energy, Lacy testified that SDG&E has been engaged in geothermal exploration, research, and field test development in the Imperial Valley since early 1971. SDG&E's subsidiary NARCO joined the Magma Power Company of Los Angeles, in drilling geothermal wells at several locations on private lands in the Imperial Valley. As a result of this drilling, and further drilling and testing done in 1976, SDG&E identified three reservoirs with significant promise. These are located at the southern end of the Salton Sea near Niland, south of El Centro near Heber, and east of Holtville at East Mesa.

Describing SDG&E's involvement in binary technology, Lacy testified that SDG&E began conducting field loop tests at Niland in 1973 which are directly applicable to the binary technology. In these tests, small-size heat exchangers, with the hot, highly mineralized brine flowing directly through the tubes, were used to heat the working fluid. These tests revealed the high scaling tendencies of the Niland brines. In 1974, a multistage flash/binary system, in which heat is removed from the geothermal fluid in the form of steam, was designed and tested to overcome the scaling problem. Based upon these field tests, with the support of the DOE, SDG&E built and operated the 10-MW Geothermal Loop Experimental Facility (GLEF) to evaluate the reservoir and the flash/binary energy conversion processes. This facility has provided technical and economic data on the use of the high temperature, high salinity Niland brines.

Commenting on the experience gained by SDG&E of direct benefit to the Heber geothermal project, Lacy testified that valuable experience, of direct benefit to the Heber Geothermal Project, has been gained through the design, construction, and operation of the GLEF. Special construction techniques were employed for the desert soil and ambient weather conditions of the Imperial Valley. Operational problems, such as high injection well pressures, scale deposition, and erosion of plant piping and components, have been uncovered during the 36 months of GLEF operation. The GLEF has also provided additional insights into plant cleaning operations and reservoir performance, and has furthered the development of important plant components.

George H. I. Reiss, supervisor of fuel acquisitions for SDG&E, testified that the pricing formula for geothermal heat now under discussion with Chevron involves a fixed component as well as a variable component. The fixed component could be 50 to 75 percent of the price and was intended to recover some portion of Chevron's cost of reservoir development since a significant portion of Chevron's investment has to be made at the outset of the project. Chevron expects that some portion of these costs should be recovered regardless of whether or not the binary plant functions. He said SDG&E was currently looking at an overall price of 70 to 80 cents per million Btu which, when escalated to the time frame when the project becomes operational, amounts to \$1.36 per million Btu. SDG&E estimates a total cost of \$27 million for geothermal heat during the two-year demonstration program. Reiss reaffirmed Cotton's testimony that based on SDG&E's knowledge of drilling costs and earnings and risks in the geothermal field, the brine costs being discussed are reasonable.

Regarding the question of Chevron's liability if it failed to deliver geothermal brine to the project, Reiss testified that Chevron was willing to be liable in the event the reservoir does fail; however, SDG&E had not reached an understanding on the precise form the liability would take. It was his recommendation that SDG&E not sign any contract that did not provide for this contingency.

Richard Korpan, treasurer of SDG&E, testified that the Commission has directed that SDG&E aggressively pursue the development of geothermal power in California. While SDG&E feels that the Heber Binary Project presents an excellent opportunity to facilitate geothermal development, SDG&E cannot ignore two key limiting factors associated with this project: (1) financial risk and (2) capital constraints. He said that both SDG&E and the Commission are very much aware that SDG&E cannot afford any additional financial liability for unsuccessful projects. In fact, the Commission has put SDG&E on notice in recent decisions that its involvement in capital-intensive projects will be closely scrutinized. Due to the developmental and demonstration nature of the Heber Project, he believed it represents an unacceptable level of financial risk that should not be assumed without Commission approval and adequate shareholder protection.

Describing SDG&E's current financial position and goals, Korpan testified that SDG&E currently has a "BBB" bond rating and is endeavoring to improve that rating. In conjunction with SDG&E's efforts to raise its bond ratings from "BBB" to an "A", SDG&E has developed certain financial objectives:

(1) The most critical of these objectives is to limit the size of the capital budget. Rapid customer growth has placed severe demands on the capital requirements, which precludes the further addition of large projects (such as the Heber Binary Project) to the capital budget without eliminating other projects. The current goal is for construction expenditures to move down toward a maximum of 10 percent of

total capitalization, which is projected at \$1.7 billion for year-end 1979. Forecasted annual cash expenditures for construction projects from 1979 through 1983, without consideration of the Heber Project, are expected to average about \$200 million. He explained that SDG&E has very little flexibility to lower these expenditures because most of the spending is committed to the San Onofre Nuclear Project, the SDG&E/APS Transmission Line Project, and transmission and distribution facilities associated with new customers. ✓

(2) Another major financial objective is to increase SDG&E's cash flow so that the utility can finance about 35 to 40 percent of cash construction expenditures through internally generated funds. Internal generation of funds in this instance is defined as net income, plus depreciation and deferred taxes, less AFDC and dividends. SDG&E has been generating only 10 to 20 percent of construction funds internally for the past few years, which has forced it to place a high reliance on costly external financing.

(3) As a result of large external debt financing, interest coverage levels have been substantially below industry averages. Hence, another key financial objective is to raise SDG&E's interest coverage from a level of about two times interest charges to three times interest charges.

Korpan points out that given SDG&E's current financial situation, the attainment of these objectives hinges on minimizing expenditures and the raising of external capital. He believed that development of any geothermal projects without major financial assistance from other companies or agencies would adversely affect attainment of the financial goals. Accordingly, SDG&E is seeking participation from the



Department of Energy, EPRI, and other utilities to help fund the project. Additionally, SDG&E will require a Commission-approved rate treatment which will eliminate the need to fund its share of the project externally.

Korpan emphasized SDG&E's current cash-flow problem. He said that SDG&E has fuel undercollections exceeding \$20 million, and fuel expenses are continuing to increase substantially. Since total fuel undercollections are likely to increase through 1980, SDG&E's cash-flow problems will be further magnified. In addition, he said that the general financial erosion being experienced by SDG&E is caused by the high rate of inflation affecting most expenses which will likely continue through 1980. To view this cash shortage as a short-term problem which will be cured by the next general rate case is not borne out by the present situation or past history. He pointed out that SDG&E is presently in a period when the full positive effects of the last general rate case are being seen. However, the major expenses of fuel oil, natural gas, and capital costs, which represent over 65 percent of cash expenses, are increasing much more dramatically than was anticipated. As a result, the already small amount of cash remaining to apply to construction is expected to be further reduced. Korpan testified that in 1977, SDG&E experienced a deficit operating cash flow and, in 1978, it funded only 11 percent of construction expenditures with cash remaining from operations. He estimated operating cash flow is likely to be at or below zero for both 1979 and 1980.

In view of SDG&E's current financial situation, the immediate need to commit to the project, and the financial risk associated with it, Korpan said that SDG&E's portion of the funding must be provided by rate recognition which is essentially concurrent. SDG&E's proposal is to redirect, through a rearrangement of priorities, money from its current and future RD&D budgets. In effect, this rearrangement would replace some current and future RD&D projects with the Heber expenditures. From a financial standpoint, SDG&E believes RD&D expense treatment is essential for it to go forward with the project, as it is the only method of providing concurrent recovery of expenditures on a one-for-one basis. This approach does not require SDG&E to increase the amount of capital it must obtain in the capital markets, which is extremely important because of its already large capital requirements in relation to its size and its already poor cash flow situation. He believed that under this proposal the project can be built with minimal, if any, impact on SDG&E's ratepayers.

Regarding liability to the heat supplier if the project is abandoned or does not go into commercial operation, Korpan testified that SDG&E is requesting a determination by the Commission that any liability of SDG&E to the heat suppliers, which is reasonably incurred in connection with the project, is a proper RD&D expense. Since there is a definite risk of failure of the project, this potential liability cannot be ignored.

Frank H. Ault, manager of the accounting services department of SDG&E, testified that SDG&E considers this project to be a research, development, and demonstration project and, as such, proposes that all expenditures related to the project should be expensed for ratemaking purposes. In support of his position he referred to the Federal Energy Regulatory Commission's (FERC) Order 566, issued June 3, 1977, which states the FERC definition of research and development activities. In that order FERC revised the description of research activities to include "research, development and demonstration". The order states that RD&D includes expenditures for the implementation or development of new and/or existing concepts until operations become technically and economically feasible. Demonstration plant costs are to be considered RD&D if a major portion of the new plant is innovative with attendant risks. It was his opinion that an innovative commercial scale plant, proven technically feasible, but not commercially feasible, would also be considered RD&D under the FERC definition.

Ault further testified that treatment of the expenditures on this project as an item of expense was an appropriate accounting treatment and was in accord with the Statement of Financial Accounting Standards No. 2 issued by the Financial Accounting Standards Board (FASB) in October 1974, which states that "All research and development costs encompassed by this Statement shall be charged to expense when incurred." He was of the opinion that projects such as the Heber project would be covered by this Statement because, as defined therein, "It includes the conceptual

formulation, design, and testing of product alternatives, construction of prototypes, and operation of pilot plants." Thus, Heber expenditures during both the construction and demonstration phases, including purchase of the geothermal brine, would qualify for RD&D expense treatment, in his opinion. However, he conceded that FASB did recognize the unique nature of regulated companies and, therefore, permits such companies to treat RD&D expenditures for accounting purposes in a manner consistent with the rate treatment accorded that project by the regulatory authority having jurisdiction.

Regarding the question of accounting treatment of Heber project costs, Ault testified that in D.90405 dated June 5, 1979 the Commission granted SDG&E approximately \$5.8 million in revenues to cover the costs of various RD&D projects for the year 1979. SDG&E plans to reorder the priorities among its various RD&D projects, and to use its "blanket budget" authorization of approximately \$660,000, so that by postponing, eliminating, or reducing its efforts on RD&D projects covered in D.90405, it can proceed with the Heber project in 1979 and 1980, and still stay within the \$5.8 million granted by the decision. SDG&E also plans to charge to expense in 1979 those expenditures currently deferred on its books which were previously made in connection with the Heber project. Thus, SDG&E would not require any increase in rates in 1979 or 1980 to cover the costs of the Heber project.

Turning to the question of how SDG&E proposes to cover the expenses of the Heber project in 1981 and subsequent years, Ault testified that starting in 1981, the Heber expenditures will increase sharply as construction commences and these expenditures are expected to vary significantly from year to year. He, therefore, recommends that an adjustment in rates be made on January 1, 1981, and each January 1 thereafter, to reflect the expected project expenditures for the upcoming year. This increase would be made through a general rate case if one is in progress at that time, or by advice letter filing if a general rate case is not being processed. In order to take care of the situation where SDG&E may spend in any one year more or less than the amount covered in rates, he recommended that commencing on January 1, 1981 a balancing account be established.

Discussing the impact of the Heber project on SDG&E's RD&D budget in 1981 and subsequent years, Ault testified that SDG&E plans to reorder its priorities among existing RD&D projects in 1979 and 1980 to stay at an expense level near the \$5.8 million authorized in D.90405. In 1981 and subsequent years, SDG&E intends to set its RD&D budget at a level approximately equal to one percent of total revenues. However, the witness asserted that this one percent figure would only be a general guideline within which its first priority would be the Heber project, and then whatever other projects could be funded from remaining authorized revenues.

As to the method of accounting for revenues received from sale of electricity, if electric power is generated by the plant, Ault testified that if SDG&E's expenditures associated with the Heber binary project, including the cost of the geothermal brine, are recovered through RD&D expense treatment, then SDG&E proposes to credit its share of direct plant energy sales and revenues against project costs. In this way, the ratepayer will directly receive the benefit of any such sales.

Regarding the manner in which SDG&E proposes to treat project expenditures for income tax purposes, Ault testified that SDG&E proposes to treat the Heber binary project in the same manner as any other project for income tax purposes in setting rates. That is, any income tax benefits or expense would be flowed through to the ratepayer as a schedule M adjustment for ratemaking purposes in the same manner as is done on the income tax return. For income tax return purposes, a portion of the project is expected to be expensed as the costs are actually incurred. However, since SDG&E anticipates that the project will go into commercial operation after the demonstration period, for tax purposes the construction costs will have to be treated as capital and depreciated over a future period of time. He stated that if, however, the project were abandoned at any time during the planning, construction, or testing phases, then all costs incurred on the project which had not been previously taken as a deduction for income tax purposes would be taken as a tax deduction in the year of the abandonment.

Ault further testified that SDG&E expects to generate investment tax credits (ITC) on the project when it goes into commercial operation and to flow that ITC back to the ratepayer. The flowing of the ITC to the ratepayer is conditioned on two things: (1) the plant must be successful and go into commercial operation to generate ITC (if the plant were abandoned, there would be no ITC); and (2) SDG&E must have sufficient earnings to actually utilize the ITC which is available to it in any given year. He added that at the present time SDG&E had about \$30 million in ITC credits and was getting into the position where a fair amount of ITC generated some years ago would be totally lost due to the seven-year carry forward limitation.

When asked to quantify SDG&E's potential additional income tax liability resulting from the Heber project, assuming the requested ratemaking treatment was granted, he estimated the additional income tax liability to SDG&E at approximately \$3 million during the construction phase, but pointed out that there would be tax benefits flowing in the other direction during the operational phase. Assuming the tax laws remain unchanged, the income tax would be zero over the life of the project. Regarding the question of whether this income tax liability should be imposed on the ratepayers on a current basis, as proposed by SDG&E, or should be deferred until the operational phase of the project, as the staff proposed, it was SDG&E's position that the staff's proposal would create a potential cash-flow problem during the construction phase. SDG&E believes that the issue of income tax treatment is complex and should be deferred to its next general rate case, where the Commission would have the benefit of a fully developed record.



Position of Commission Staff Revenue Requirements Division

Ramesh Joshi, Associate Utilities Engineer, testified that the staff has adopted the FERC definition of RD&D and that any project not yet proven commercially feasible should be considered RD&D. He did consider the Heber binary project an RD&D project but pointed out that it is unique since it represents the largest investment in a single RD&D project by any California utility. Based on SDG&E's results with its Niland geothermal project, it is his opinion the Heber project is worthwhile and there is good probability of success. He considers the projected capacity factor of the Heber plant good and the projected bus bar cost of 89 mills per kilowatt-hour of electricity favorable compared with other types of power plants.

Turning to the question of ratemaking treatment, he said that normally an RD&D project involving the construction of a demonstration power plant would be a capital investment by the utility and receive rate base treatment for ratemaking purposes. To determine the impact on the ratepayer, he did a present-worth analysis based on two alternative methods of rate treatment: (1) capitalize and amortize over five years; and (2) expense all costs for ratemaking purposes as proposed by SDG&E. His analysis shows the alternative proposed by SDG&E to be cheaper for the ratepayers.

Discussing the results of a study he did to compare the amounts paid by customers for RD&D expense, he said that SDG&E's customers pay \$7.83 per year compared to \$11.04 for Pacific Gas and Electric Company's (PG&E) customers and \$9.16 for SCE's customers. He believes that the expense-type ratemaking treatment proposed by SDG&E will not have significant effect on the total amount paid by SDG&E's customers for RD&D. ✓

Joshi further testified that the Commission should at this point in time authorize SDG&E to complete the entire project; however, costs should be carefully examined in all future rate case proceedings and if it is found that costs have become unreasonable, then commitment to the project should be withdrawn if further participation will not result in a benefit to the ratepayers. He believes SDG&E should be allowed to expense all reasonably incurred project costs, including the penalty to the reservoir operators if the project has to be abandoned.

Regarding treatment of income tax expense payable by SDG&E, Joshi had no specific recommendation at this time and suggested it be considered in a future proceeding.

James D. Pretti, head of the Revenue Requirements Division's Finance Branch, testified that he agrees with the goals and procedures SDG&E is using to upgrade its bonds from a current rating of triple B to at least an A rating. An A rating would result in lower cost of money to SDG&E and benefit to the ratepayer. He further testified that capitalization of costs of the Heber project would have very minimal impact on SDG&E's financial position and financial ratios. Regarding the question of benefit to the ratepayer, if the Heber project is treated as an expense rather than a capital item for ratemaking purposes, he believes the direct financial benefit to be minimal. However, he agrees that SDG&E's policy of trying to minimize construction expenditures and need for external financing is consistent with SDG&E's long-term objective of having its bonds upgraded, which would ultimately benefit the ratepayer. Summarizing his testimony, he recommends that SDG&E not be allowed to collect in rates any more than the costs incurred on a dollar-for-dollar basis. His recommendation pertaining to SDG&E's income tax liability is that the company be allowed to recover only those dollars necessary to make the company whole once the plant becomes operational.

Ellen Levine, staff counsel, points out that the Commission has never before relied on the FERC criterion that a project may be RD&D if it is primarily designed to demonstrate the commercial feasibility of a particular technology. She further points out that FERC generally places capital costs of RD&D construction projects into rate base. Staff counsel makes these observations to indicate the potential precedent of (1) considering the project as RD&D; and (2) expensing an RD&D project for ratemaking purposes.

Based on the testimony of Mr. Korpan of SDG&E and Mr. Pretti of the Commission staff, the Legal Division believes that inasmuch as capitalization of the Heber project will not adversely impact SDG&E's financial position or financial ratios, that the requested ratemaking treatment be denied. Legal Division does not believe the Commission should bind itself to SDG&E's firm financial policy when SDG&E and staff both acknowledge that SDG&E has the financial ability to capitalize this particular project without detrimental effect. Legal Division is further concerned with the precedential nature of SDG&E's request to finance capital construction projects involving greater than normal risks from expenses recovered from ratepayers.

It was further pointed out that the staff, without independent analysis, accepted the reasonableness of SDG&E's costs estimates. Staff counsel further noted the cost uncertainties due to the absence of a fuel contract between SDG&E and Chevron which would specify the base price of brine, minimum heat charges, fuel escalation clauses, the rate of return on Chevron's investment, and SDG&E's potential liability owed to Chevron in the event of project failure. Counsel also noted that no participation agreements with IID, CDWR, or SCE had as yet been negotiated.

Because of these uncertainties, as an alternative to denying the requested relief, Legal Division, with staff support, recommends that the total dollar exposure to SDG&E's ratepayers be limited to \$37.6 million but that such maximum amount is not necessarily reasonable for ratemaking purposes. This would thus create an incentive for SDG&E to stay below the estimated amounts. Legal Division would further require shareholders to bear the risk of any amounts which exceed the budgeted amount.

Staff counsel, with staff support, further emphasizes that SDG&E consistently represented to the staff prior to hearing that it requested dollar-for-dollar recovery of construction and demonstration expenses associated with the Heber project. Staff at no time assumed any potential additional tax expense could be recovered through rates. Staff counsel thus believes that SDG&E's request to recover any tax expense from the ratepayer during the construction phase of the project significantly alters its original request, and thus should be denied.

Position of the City of San Diego

William S. Shaffran, Deputy City Attorney, stated that San Diego agrees with most of the positions taken by the staff counsel. He said that San Diego is very much in favor of the development of geothermal power. He emphasized that the Commission should clearly state that there is no absolute permanence to any authorization granted either as to RD&D treatment or completion of the entire project. With so many unknowns as to project cost, liability to the reservoir developers, and extent of participation by others, he believes it absolutely essential that the Commission make it clear that when some of the evidence that is not available at this time starts to flow in in the future, the Commission, with proper evidentiary support, may modify whatever action it takes in this proceeding.

Discussion

All parties to this proceeding are in general agreement that the geothermal energy available in California should be developed in a manner that is environmentally acceptable. The testimony in this proceeding is that the development of a binary process to produce electricity on a commercial scale will permit use of the moderate to low temperature geothermal resources available in the Imperial Valley. The testimony indicates that bus bar costs of electricity generated by the binary process will be competitive during the mid-1980's, especially because it is expected that increase in the price of imported fuel oil will continue. Based on the testimony, we therefore have no difficulty in concluding that the Heber binary project is a worthwhile project which could benefit California and the ratepayers of SDG&E in particular.

Regarding the question of whether this is an RD&D project, we are in agreement with staff counsel that the Commission has not exclusively adopted the federal criterion for making such determinations. We will continue to look at each project on an individual basis and rely on our staff to assist us in making such determinations. Also, the question of whether an RD&D project should be expensed for ratemaking purposes or given rate base treatment will be determined likewise.

The Heber binary plant will be a demonstration plant and the first commercial-size generating facility utilizing a liquid dominated geothermal resource and the binary energy conversion process. It is considered experimental because a large-scale commercial unit has never been built or operated. Much work needs to be done to commercialize the binary technology, particularly the development of major components for binary plants. We believe that the RD&D nature of the facility has been clearly demonstrated.

In normal ratemaking practice the construction-related portion of a demonstration project would be treated as a capital investment and financed out of a utility's capital budget. However, SDG&E's position is that it is overextended financially at present due to substantial numbers of new customer hookups, its commitment to completion of San Onofre Nuclear Power Plant, and its plan to improve its bond rating and that it simply cannot afford to go into the capital market to finance a geothermal demonstration project because of the risk involved. It further argues that Electric Exploration and Development Adjustment (EEDA) rate treatment is not an option since the utility must still raise the capital.

SDG&E has requested that, under these circumstances, it be permitted to recover costs incurred in the construction of this project as RD&D expense. It believes that it can finance this by redirecting its currently authorized RD&D budget and directing a large part of its RD&D budget to this demonstration project in future rate cases. SDG&E also wants the ability to receive Commission authorization of Heber-related RD&D expenses on an annual basis, whether in a general rate case, by interim decision, or by advice letter filing. SDG&E further states that it can and will only proceed with the project if the Commission supports this RD&D expense approach.

This is a highly unconventional ratemaking proposal and we are faced with deciding whether it is in the interest of the ratepayer to support promising alternative energy technology in this manner in the case of this company. ✓

The staff does support RD&D expense-type rate treatment on the basis that this worthwhile project would otherwise not be undertaken by SDG&E if the Commission does not adopt the utility's request for special ratemaking treatment. We are in agreement with the staff and will authorize special ratemaking treatment for this project subject to certain conditions and with the understanding that this approval does not constitute a precedent determinative for future RD&D projects.

San Diego has emphasized that there are several unknowns at this time which can significantly increase project costs and requests that the Commission not tie its hands by giving SDG&E carte blanche approval of all future expenditures. We share San Diego's concern and emphasize that project costs will be closely scrutinized in SDG&E's general rate case which will occur every two years. If it is found that project costs have escalated to the point where the project is no longer beneficial to the ratepayer, project authorization will be withdrawn. SDG&E will be compensated only for reasonably incurred project costs, including penalties payable to the reservoir operators, provided SDG&E has made every effort to minimize liability.

Turning to the question of the geothermal brine contract and potential liability to the reservoir developers if the project is abandoned, we are gravely concerned that no contracts have been finalized at this time. However, we recognize that DOE is under tight time constraints for awarding its contract which would support 50 percent of plant expenditures for development of a commercial binary plant. Under normal circumstances, we would not approve any project where expenditures have not been clearly defined. We, therefore, caution SDG&E, first, that we expect the utility to negotiate a contract which minimizes risk and expense to itself and its ratepayers, and, secondly, that project approval will be withdrawn if the contract it negotiates with Chevron appears to impose unreasonable financial risks upon SDG&E and its ratepayers, or in

the event that such contract is not negotiated within a reasonable period of time. We also encourage SDG&E to actively seek participation in the project by all interested parties, including but not limited to those parties which have already indicated support.

SDG&E proposes to redirect its RD&D budget to support the Heber project prior to its next general rate case. This will not involve a rate increase at this time. It is expected that there will be no significant impact on future rates due to the project.

SDG&E requests a determination that geothermal brine costs during the entire demonstration phase be treated as an RD&D expense. Subject to the above-stated caveats regarding liability under the brine contract, we will authorize RD&D treatment of brine costs during the period the plant is not in commercial production of electricity.

SDG&E requests a balancing account for Heber project expenditures effective January 1, 1981. Such a mechanism would assure that ratepayers are not paying more than the actual project costs and that the utility is fully compensated for its expenditures. We, therefore, approve this request.

The additional income tax liability of SDG&E, due to the project, is estimated at \$3 million based on capitalizing \$24 million of construction cost for income tax purposes and utilizing 90 percent ITC. Neither the staff nor SDG&E has made a full analysis of the proper treatment of such tax expense and the record is inadequate to decide the issue at this time. We, therefore, direct this matter to be fully explored in SDG&E's next general rate case. At this time, SDG&E will be permitted to recover no more than actual construction and demonstration expenses on a dollar-for-dollar basis with no additional allowance for potential tax liability related to the Heber project.

In addition, we call our staff's attention to the fact that 10 percent of the geothermal field is owned by New Albion Resources Company (NARCO), an SDG&E subsidiary. The proper treatment of any SDG&E payments to NARCO will be evaluated in SDG&E's next general rate proceeding.



The record indicates that the total costs associated with the construction and demonstration phases of the Heber project are estimated at \$128.4 million over 6-1/2 years. Of this total estimated project cost, SDG&E will fund \$37.6 million, of which \$28.2 million is for construction and \$9.3 million for demonstration. The \$128.4 million figure includes the total fuel cost for the two-year demonstration period, estimated at \$27.8 million. It does not, however, include the following, if the project becomes commercial: (1) fuel costs beyond the demonstration period; (2) an estimated \$3 million tax expense incurred during the construction phase of the project; and (3) a return of all or part of DOE's capital contribution during the construction phase, estimated at \$46.7 million. If the project is unsuccessful, SDG&E's portion of construction and demonstration costs could be increased by as much as \$30 million due to liability to Chevron Resources, Inc., the reservoir operator.

We do not, at this time, make any assessment as to whether or not SDG&E's potential financial exposure is reasonable. As soon as SDG&E has negotiated contracts with DOE, Chevron Resources, Inc., and other participants, SDG&E should furnish copies of such contracts to the Commission staff for their review of the reasonableness of all terms and conditions. Clearly, SDG&E should negotiate all contracts so as best to serve the interest of SDG&E and its ratepayers by minimizing to the greatest extent possible the degree of risk, expense, and liability.

Findings of Fact

1. The development of the binary-cycle geothermal technology would further stimulate the utilization of moderate temperature geothermal resources located in Imperial Valley, California, for the production of electric energy.

2. The binary-cycle geothermal technology is the subject of national interest as evidenced by the Congressional directive to the U.S. DOE to "proceed without further delay with the development of a 50-MW binary-cycle conversion geothermal demonstration plant."

3. The Commission, in Decision No. 88758, issued on May 2, 1978, ordered SDG&E to "continue to aggressively pursue its geothermal development plans." The Heber project is part of SDG&E's response to that order.

4. The Heber binary-cycle demonstration plant, as proposed by SDG&E, is supported by the California Energy Conservation and Development Commission as evidenced by a resolution adopted by that Commission on October 10, 1979.

5. The U.S. electric utility industry, as represented by the EPRI, supports SDG&E's proposed Heber binary project and is currently considering SDG&E's request for a contribution of approximately \$8.4 million to the project.

6. Geothermal power generation could provide a significant new fuel resource option that would diversify the fuel requirements of SDG&E and ease its dependence on fuel oil.

7. SDG&E has been extensively involved in the development of geothermal energy and has engaged in geothermal exploration, research, and field test development in Imperial Valley since 1971.

8. Binary-cycle technology has been employed in small scale geothermal power plants but has never been demonstrated in a commercial-size power plant.

9. SDG&E is proposing to design, construct, and operate a 50-MW binary-cycle geothermal demonstration power plant to be located at the Heber geothermal reservoir in Imperial Valley, California.

10. The estimated total project cost for construction and demonstration is \$128.4 million. It is anticipated that: (1) 50 percent of the cost (\$67 million) would be funded by the U.S. DOE; (2) approximately 7 percent of the cost (\$8.4 million) would be funded by the EPRI; and (3) approximately 2 percent of the cost (\$2.5 million) would be contributed by other utilities and agencies. The remaining costs of approximately 41 percent would be shared, by the participant owners: SDG&E, SCE, IID; and DWR. The expected share of each of the participant owners is:

<u>Party</u>	<u>Amount Contributed (\$ millions)</u>	<u>% Contribution</u>
SDG&E	37.6	31
IID	7.2	6
SCE	3.6	3
DWR	2.0	1

11. SDG&E's participation in the project is contingent upon funding from DOE and the various participant owners and contributors set forth above in the approximate amounts as noted.

12. Further, SDG&E's participation is contingent upon the negotiation of satisfactory contracts with the various participant owners; the contributors, including DOE; the heat suppliers; the architect engineer; and the constructor.

13. The design and construction period of the project is expected to require approximately 4-1/2 years and would be followed by a two-year demonstration period.

14. Much of the basic engineering, reservoir investigation, feasibility studies, environmental reviews, and licensing activities for the Heber project has been conducted due, in large part, to SDG&E's previous work on the development of a binary-cycle geothermal power plant at the Heber reservoir.

15. The objectives of the Heber plant are: (1) to demonstrate the potential utility of moderate temperature geothermal reservoirs for economic electric power generation; (2) to scale up and evaluate the performance of binary-cycle technology in geothermal power plants; (3) to demonstrate the performance of the plant and reservoir and the environmental acceptability of binary-cycle geothermal power plants; and (4) to resolve uncertainties of reservoir performance, plant reliability, and the economics of plant operation.

16. Staff has not made an independent analysis of the construction and demonstration costs and has only assumed the reasonableness of the total costs as specified by SDG&E.

17. It is reasonable in this case for the Commission to expand its criteria to determine whether or not a project is RD&D to include those projects solely designed to demonstrate the commercial feasibility of a particular technology. As such, demonstration of the commercial feasibility of the binary geothermal cycle would be an RD&D project.

18. SDG&E asserts that its participation in the Heber project is contingent upon the Commission's assurance of expense-type ratemaking treatment during the construction and demonstration phase.

19. Capital construction costs associated with RD&D projects are normally given rate base treatment, such that the shareholder invests capital and earns a rate of return thereon. It is unusual for the Commission to authorize expense-type treatment of capital construction costs whereby the ratepayer pays these costs up front

and assumes all the risk. Departure from this procedure constitutes unusual ratemaking treatment.

20. SDG&E is currently not in a healthy financial condition in terms of its capital ratios, times interest coverage, bond rating, and cash flow. Thus, as a matter of company policy, SDG&E has adopted a firm principle to limit the size of its capital budget to reduce costly external financing. SDG&E has very little flexibility to lower capital expenditures because of its commitment to the San Onofre Nuclear Project and the need to provide hookups for new customers.

21. Special ratemaking treatment for the Heber project is consistent with SDG&E policy to upgrade its financial condition.

22. Special ratemaking treatment in the form of RD&D expense treatment for Heber project expenses during the construction and demonstration phase is reasonable under the circumstances. Such unusual ratemaking treatment will not constitute a precedent for similar treatment in the future.

23. Since the demonstration plant is an RD&D facility, there are risks of project failure. The risks include a failure of the geothermal field to produce adequate and sufficient geothermal heat, failure of the plant to perform reliably, and failure of the plant to operate economically.

24. It may be necessary for the project participants to assume some liability to the heat suppliers for failure of the plant to operate. Any liability must be minimized and, if incurred, should be assigned to participants in proportion to their levels of participation. This liability could be as much as \$30 million.

25. Since such liability is directly related to SDG&E's pursuit of the project, any reasonably incurred cost is a proper RD&D expense which should be recovered through rates. For such liability to be recoverable through rates, SDG&E would be required to demonstrate that it has achieved the best contract reasonably attainable with its high supplier, that any liability incurred was reasonable, and that it had pursued all reasonable means of minimizing such liability.

26. Any electric power generated by the Heber plant would be allocated to the participant owners in accordance with their respective ownership interests in the plant. Any revenues from sales by SDG&E will be credited back to offset project costs.

27. Reasonable expenditures, including the construction and demonstration costs of the project, should be treated as RD&D expense for ratemaking purposes.

28. RD&D expense treatment will not have significant impact on the overall cost of the project to the ratepayer.

29. The Commission's Decision No. 90405, in SDG&E's last general rate case, allowed approximately \$5 million for RD&D expenses.

30. It would be appropriate to permit SDG&E to reorder the priorities among its various RD&D projects authorized in Decision No. 90405 and to redirect revenue sufficient to offset Heber project expenditures for 1979 and 1980. An amount up to \$2 million per year would appear sufficient to cover anticipated expenditures for those years.

31. SDG&E should be authorized to establish a Heber project balancing account, effective January 1, 1981, to record project expenditures on and after that date. Such an account will protect the ratepayer by ensuring that authorized funds are spent on the project and will allow full reimbursement to the company for expenditures made.

32. Commencing January 1, 1981, and annually thereafter, the Commission may, upon application or advice letter filing, authorize rates which will allow the receipt of revenues: (1) to cover anticipated reasonable costs for the year; and (2) to reflect the balance in the Heber project balancing account at that time. If such a request is part of a pending general rate case, the Commission may issue an interim decision therein concerning this matter, or may permit the filing of an advice letter as of January 1 of each year.

33. In the event that the project becomes commercially viable, it is expected that DOE will seek to recover some portion of its capital contributions. Any return of DOE's capital contribution to the Heber project by SDG&E should not exceed SDG&E's proportionate share of DOE's historical cost less depreciation.

34. SDG&E may have an additional income tax expense estimated at \$3 million due to capitalizing Heber plant construction costs for income tax purposes. This is a complex matter and the record was not sufficiently developed to support an informed decision. This matter should be resolved in SDG&E's next general rate case, and such tax expense shall not be recovered pending such resolution.

35. SDG&E should minimize its share of risks, expenses, and potential liability by actively seeking participation of all interested parties, including but not limited to those parties which have already indicated support. SDG&E should be required to furnish monthly reports to the Commission staff on the status of efforts to obtain additional participation.

36. SDG&E should negotiate all contracts related to the project in order to minimize its expenses, risks, and potential liability so as to limit its total financial exposure. SDG&E should be required to furnish to the Commission staff copies of all contracts between SDG&E and DOE, Chevron Resources, Inc., and other participants in order for the Commission to review the reasonableness of SDG&E's financial exposure created thereby.

Conclusions of Law

1. The Heber Geothermal Project is an RD&D project.
2. Inasmuch as the Commission staff did not have an opportunity to review the reasonableness of the construction and demonstration budgets submitted by SDG&E in its proposal to DOE, and inasmuch as the Commission does not have the opportunity to review the SDG&E-Chevron contract at this time, SDG&E's costs designated in SDG&E's proposal to DOE should be considered maximum but not necessarily reasonable ratemaking costs. Accordingly, SDG&E must justify all costs for reasonableness regardless of the amounts contained in the DOE proposal, and any amounts which exceed those contained in the DOE proposal must be justified by a strong compelling showing.



3. It is reasonable to allow expense-type ratemaking treatment of the Heber project, limited to a five-year construction and two-year demonstration period. Such ratemaking treatment is unusual, and does not hereby set a ratemaking precedent determinative ✓ for any other project by SDG&E or any other utility.

4. Reasonably incurred liability to the reservoir operator is a proper expense for rate relief, but should be the subject of further hearings at the time such expense is incurred.

5. It is reasonable to limit SDG&E to a dollar-for-dollar recovery in rates for construction and demonstration expenses incurred.

6. The cost of purchasing the geothermal brine may be proper ✓ RD&D expense for the demonstration phase of the project. Therefore, ✓ the cost of the brine should be recoverable through rates upon a showing of the reasonableness of the purchase contracts and the charges contained therein without regard to the outcome of OII 56 regarding ECAC matters.

7. Since the record in this proceeding was not fully developed on possible income tax expenditures by SDG&E due to the Heber project, this issue should be resolved in SDG&E's next general rate case.

8. Because SDG&E's proposal to DOE is subject to approval by the Commission and the DOE must decide on a suitable plant site early in 1980, this order should be made effective on the ✓ date of signature.

O R D E R

IT IS ORDERED that:

1. San Diego Gas & Electric Company (SDG&E) is authorized to treat as research, development, and demonstration (RD&D) expense its share of the construction and demonstration costs of the Heber project, including its share of the costs associated with purchasing brine for the project during the demonstration period.
2. SDG&E must justify all costs for reasonableness regardless of the amounts contained in its Department of Energy (DOE) proposal.
3. SDG&E must justify with a strong compelling showing all amounts which exceed the estimates shown in the DOE proposal totaling \$37.6 million for its share.
4. Commencing January 1, 1981, and annually thereafter, SDG&E is authorized to file an application or advice letter to obtain rates which would allow the receipt of revenues to cover reasonable project costs during the current year. If such request is part of a pending general rate case, the Commission may consider issuing an interim decision regarding that matter as of January 1 of each year.
5. SDG&E is authorized to offset Heber project expenditures for the years 1979 and 1980 in an amount up to \$2 million per year by redirecting revenue being received for RD&D expenses authorized in Decision No. 90405.
6. To account for project expenditures and revenues received during each calendar year, SDG&E is authorized to establish a Heber project balancing account, commencing January 1, 1981.
7. In view of the recognized risks inherent in this project, SDG&E is authorized to recover, through rates, any reasonably incurred liability due to project failure, including any liability to the geothermal heat suppliers. Such expenditures will be the subject of a public hearing and SDG&E will be required to show it took all reasonable steps to reduce liability.

8. SDG&E shall furnish copies to staff of all contracts between SDG&E and DOE, Chevron Resources Company, and all participants, as soon as such contracts are negotiated.

9. SDG&E shall furnish semiannual reports to the staff which detail and justify actual and estimated expenditures, and describe progress made. ✓

10. In addition, SDG&E shall furnish monthly reports to the Commission staff on the status of efforts to obtain additional participation in the Heber project until further notice.

11. In the event that SDG&E has failed to negotiate participation contracts with DOE, Chevron Resources Company, or other participants within six months from the effective date of this order, SDG&E shall be required to show cause why it should proceed further.

12. SDG&E and the Commission staff are directed to address the income tax expense consequences resulting from this project in SDG&E's next general rate proceeding to insure the utility will not recover more than dollar for dollar for the RD&D project authorized herein.

The effective date of this order is the date hereof.

Dated JAN 29 1980, at San Francisco, California

John E. Bryan  
President

James L. Stappan  
Richard W. Hoyle

[Signature]  
Commissioners