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Decision No. 80479

ORIGINAL

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the Matter of the Application of PACIFIC GAS AND ELECTRIC COMPANY for a certificate of public convenience and necessity to construct, install, operate, maintain, and use Unit 11 at The Geysers Power Plant together with transmission lines and related facilities.
(Electric)

Application No. 53127
(Filed February 4, 1972
Amended June 30, 1972)

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Martin McDonough, Attorney at Law, for Northern California Power Agency, and Hamilton Hess, for himself and Lake County Geothermal Control Council, interested parties.
Vincent V. MacKenzie, Attorney at Law, and Arthur C. Fegan, for the Commission staff.

O P I N I O N

Applicant's Request

In this proceeding Pacific Gas and Electric Company (PG&E) seeks an order of the Commission issuing to it a certificate under Section 1001 of the Public Utilities Code of the State of California and the Commission's General Order No. 131 declaring that the safety, health, comfort, and convenience of the public and the present and future public convenience and necessity require or will require the construction, installation, operation, and maintenance of Unit 11 (the Unit) at The Geysers Power Plant, together with transmission lines and related facilities. The original application was filed February 4, 1972. An amended application was filed June 7, 1972. The amendment was filed to reflect a change in the location of the Unit.

A prehearing conference was held in San Francisco on April 7, 1972. At that conference the issues to be considered and developed in the proceeding were stated to be as follows:

1. Does the present or future public convenience and necessity require the installation of Unit 11 in compliance with the terms of the geothermal steam sale agreements?
2. Does the proposed new project compete with any person, firm, or public or private corporation in the public utilities business, including particularly NCPA, for furnishing or supplying electric service to the public in or adjacent to the territory in which PG&E's geothermal steam electric generating unit operates?
3. Does the proposed construction of Unit 11 have the effect of limiting or preventing the generation by others of electricity from geothermal steam produced in The Geysers area, including particularly by NCPA?
4. The economics of Unit 11.
5. The requirements of the Commission's General Order No. 131.

Hearings were held on June 14 and 15, 1972, at San Francisco before Examiner Gillanders and the matter submitted subject to the concurrent filing of proposed findings of fact and conclusions of law June 30, 1972 and concurrent reply documents July 10, 1972. The matter is now ready for decision.

PG&E's Proposal

In this proceeding PG&E seeks a certificate for an eleventh unit at The Geysers Power Plant. This unit is to consist of one 106,000 kw (net) capacity turbine designed for steam at 100 pounds per square inch gauge and 355 degrees Fahrenheit, one 132,000 kva, 13,800 volt, hydrogen-cooled generator, one direct contact condenser with gas ejectors and condensate pumps, and one cooling tower, together with related facilities. Transformation will consist of one 132.0 mva, 13.8 - 230 kv, 3-phase transformer. The Unit will be provided with a steam supply of not less than

2,000,000 pounds of steam per hour at a pressure of 100 pounds per square inch gauge and a temperature of approximately 355 degrees Fahrenheit.

The Unit 11 turbine generator is twice as large as the turbine generators for Units 5 through 10. PG&E states that it purchased the larger turbine generator to permit it to take advantage of the economies of scale.

Various alternate cooling systems were considered and rejected by PG&E primarily on grounds of unwarranted additional expense or infeasibility.

The general location of the Unit is planned to be about one mile north of the site of Units 7 and 8 on land to be provided by Union Oil Company of California (Union), Magma Power Company (Magma), and Thermal Power Company (Thermal). The exact site of the Unit will be selected by and be mutually agreeable to Union, Magma, Thermal, and PG&E.

With the completion of Unit 11, the total net normal operating capacity of The Geysers Power Plant will be 502,000 kilowatts.

Commercial operation of Unit 11 was scheduled for August 1, 1974, when the Unit will be required to assist PG&E in meeting the system loads estimated for that year and thereby promote the safety, health, comfort, and convenience of the public. Exhibits E, F, and G to Exhibit 2 show PG&E load and resource data, actual and estimated, for the years 1967-1981. A condensed design and construction schedule for the Unit is as follows:

Item	Unit 11
CPUC Certificate Effective	July 15, 1972
Major Equipment Purchases Confirmed	July 15, 1972
Start Site Grading	August 1, 1972
Start Construction	November 1, 1972
Initial Turbine Operation	June 1, 1974
Commercial Operation	August 1, 1974 (Exhibit D to Exhibit 2)

The estimated cost to install Unit 11, including related substation and transmission facilities, is $13,338,000. The estimated additional cost for escalation is $1,066,000. Details of this estimate are shown in Exhibit H to Exhibit 2.

The estimated average cost of power from the Unit, based on various capacity factors, is as follows:

Capacity Factor (%)	Present Cost Basis Mills per kwh	Escalated Cost Basis Mills per kwh
70	6.46	6.74
80	6.05	6.30
90	5.74	5.95

The details of this estimate are shown in Exhibit I to Exhibit 2.

Site and Environmental Factors

Unit 11 will be located at a site about one mile north of Units 7 and 8 in the remote, sparsely populated, mountainous area of northeastern Sonoma County. The nearest towns, Cloverdale and Middletown, are located, respectively, about 14 miles westerly and 10 miles southeasterly of the proposed site.

The specific site for a unit at The Geysers Power Plant is determined principally by the location of producing wells which are to supply required steam. The Unit must be located centrally among the wells in order to minimize the length of the steam supply lines. The primary objectives are to minimize steam pressure

losses, steam piping costs, and effects on the environment, and to maximize the power potential of the steam supply.

The facilities for Unit 11 will be designed to be compatible with the environment of the mountainous terrain in which they will be located.

Safety considerations are an integral part of plant design requirements. The design of the Unit incorporates appropriate seismic requirements, and the Unit will have an adequate fire fighting water supply system. The Unit is designed to operate unattended and will be provided with numerous control devices to shut down the plant in the event of emergency or abnormal operating conditions. Because this Unit will be connected to the integrated transmission system, system reserves will provide adequate power to loads served by the Unit during periods when it is on forced or scheduled outage.

Unlike conventional thermal units which return condensed steam to boilers to be recycled, some disposal must be made of the condensed geothermal steam. Most of the condensate steam is evaporated in the cooling towers. The remainder, which only amounts to about one-fifth of that delivered as steam, will be returned to the steam suppliers (Union, Magma, and Thermal) for disposal. The steam suppliers will inject the returned condensate in deep wells back into the steam zone, as is their current practice. The steam suppliers have obtained a permit for this work from the State Division of Oil and Gas. There is no indication of communication between the steam reservoir and surface waters, and the injection scheme appears to be working satisfactorily. In addition, all well casings are cemented in accordance with California Department of Oil and Gas regulations.

Since no fossil fuel is burned, the Unit will produce no products of combustion. The geothermal steam includes a very small percentage of noncondensable natural gases. Normally, over 80 percent of these gases consist of carbon dioxide, with smaller

percentages of hydrogen, methane, ethane, nitrogen, hydrogen sulfide, and ammonia. At present essentially all of the gases from the units are released to the atmosphere. PG&E has no plans to alter current methods of releasing the noncondensable gases other than hydrogen sulfide. Except for hydrogen sulfide, and ethane, which is biologically inert, none of the other gases released from The Geysers in the minute concentrations shown in Exhibit 3 is covered by state ambient air quality standards, and therefore they are presumed to be harmless.

Periodic measurements of ambient air concentrations of hydrogen sulfide at The Geysers have consistently shown values well below the maximum permitted for continuous occupational exposure, viz., 20 parts per million as set forth in American National Standard 9Z 37.2-1966 and incorporated into the most recent revision of Occupational Safety and Health Standards of the Department of Labor, Part 1910 (29 CFR 17). This standard applies in places of employment. However, the observed concentrations of hydrogen sulfide within and around the boundary of the property controlled by PG&E's steam suppliers have at times exceeded the ambient air quality standard of 0.03 parts per million established by the California Air Resources Board. This is an odor standard rather than a health standard. A report prepared by the Technical Advisory Committee of the State Air Resources Board in conjunction with the State Department of Public Health, dated May 21, 1969, indicates that slight damage to certain species of vegetation may begin at concentrations of 20-40 parts per million, and slight effects on man become apparent at 50-100 parts per million. These concentrations are well above the state ambient standard of 0.03 parts per million, and above any ambient air concentrations measured within the site boundaries. In addition, no damage to plants, animals, or humans attributable to noncondensable gases at the site has been observed since the start of PG&E's operations at The Geysers in 1960.

Northern Sonoma County has a separate air pollution control district. The district has adopted new air pollution control regulations for the northern county area in which The Geysers Power Plant is located which have been accepted by the State Air Resources Board. Operations at The Geysers Power Plant comply with these new regulations, which presently exempt hydrogen sulfide developed from geothermal power production.

PG&E has had a research project underway for some time to develop a feasible method for minimizing the release of hydrogen sulfide from its units at The Geysers. PG&E's current research project, which is based upon a sulfur dioxide injection process, has developed a method which, on a "bench-scale" basis, can reduce some, but not all, hydrogen sulfide releases. A reduction of up to 40 percent of hydrogen sulfide has been attained, but this is not necessarily indicative of what a full scale system could accomplish. Further test work and subsequent cost studies remain to be undertaken. Actual success of any developed method would probably not be known until after "pilot-plant scale" tests, which in turn would only be pursued if present work is successful and if a scheme for scaling-up the procedure to pilot plant size can be developed.

This research project has not been limited to the one method mentioned above. Several other possible approaches have been and are continuing to be evaluated and will be tested if they appear to be promising. In addition, PG&E is continuing to consult with the research staff of Union and other companies to investigate the feasibility of applying hydrogen sulfide removal methods developed for refinery or chemical industry processes at The Geysers Power Plant. Because this project is a pioneering effort it is not possible at this time to estimate when it will be completed or how successful it will be. Presently, there is no process known to PG&E by which hydrogen sulfide can be removed at the wellhead without significantly degrading the quality of the steam.

A representative of the State Air Resources Board who introduced a letter to the Commission (Exhibit No. 8) testified that the Commission should not approve applications for additional geothermal units at The Geysers until adequate information is presented to permit a determination to be made as to the adequacy of controls on present and proposed units for reasonable achievement of the State air quality standard for hydrogen sulfide. At the hearing the witness made it clear that he was not appearing as an adversary of the project but rather to take advantage of the unique opportunity to assess a potential environmental problem before it becomes an actual problem. The Board has taken no position as to whether exclusion of the geothermal hydrogen sulfide at The Geysers from the local air pollution control district regulations will be acceptable. PG&E indicated that it would cooperate with the Air Resources Board in informing the Board of its various experiments and results of its research, and that it would be willing to confer with the Board with a view to reaching a solution of the problem and developing the required information. The Board in turn indicated it would cooperate with PG&E.

An additional witness appeared as an interested party on behalf of himself and the Lake County Geothermal Control Council. He described himself as a concerned citizen and not as an expert on geothermal matters. He testified that geothermal power had relative advantages as compared to fossil fuels and nuclear fuels, and complimented PG&E for its pioneering efforts in developing this new resource. However, he testified that residents in the area have become increasingly annoyed by the hydrogen sulfide odor. He also testified that in his opinion the removal of hydrogen sulfide must be accomplished at the wellhead. He also mentioned the increasing visual impact of the units and steam gathering lines on the environment as the field is developed and comes into view of more populated areas. He also questioned whether reinjection of the steam condensate was working satisfactorily. He testified he cannot see any of the existing or proposed units from his home.

The noise level of The Geysers plants is about the same as that of a conventional fossil-fuel-fired generating plant. The steam suppliers have reduced and are continuing their efforts to reduce sound levels from their phase of operations. The generating units are remote from residential areas, and there should be no significant increase in ambient sound levels from the operation of future generating units. The California Division of Industrial Safety, the U. S. Department of Labor, and the U. S. Department of Health, Education, and Welfare have regulations governing noise levels and other matters within the plant. In certain areas the noise levels exceed applicable standards. These areas are marked and personnel in these areas are provided with and required to use ear protection devices.

Because of the unusual nature of the geothermal steam resource no meaningful comparisons can be made with respect to alternative sources of power in lieu of Unit 11 except other geothermal units in The Geysers area. With regard to alternate sites and justification for the site selected, location of the geothermal units depends upon the location of the wells drilled to furnish steam for the units.

Transmission Line

The transmission facilities will consist of about 2 miles of 230 kv double circuit tower line with one circuit strung from the site of the Unit to a junction near Units 5 and 6. The towers will be essentially the same design as used for other transmission lines at The Geysers, which blend into the natural environment better than would single, steel pole-type structures.

The line will traverse privately owned, unimproved lands consisting of remote, uninhabited, mountainous terrain. Some mining activities are conducted within the general area. The lands are not adaptable for development for any other purpose than mining, limited grazing, wildlife habitat, and watershed purposes. The lands are presently zoned unclassified with no change in zoning comtemplated. The route of the proposed transmission line will not

conflict with the provisions of any adopted general plan of the County of Sonoma. There are no parks, recreation areas, scenic areas, settled areas, nor are there any known areas or objects of historical or archaeological significance within one mile of the proposed route of the transmission line.

A description of the proposed transmission line is as follows:

Length	2 miles
Type of Conductor	61-strand aluminum cable
Size of Conductor	1113 MCM
Capacity (MVA)	318 Summer normal 387 Summer emergency
Type of Structures	Conventional square-base self-supporting, lattice type, double circuit steel towers
Height of Structures	110 feet (average)

For a line as short as the line here under review, the principal influence on the route selected is the termini of the line, in this case Unit 11 and the tap point on the line from Units 5 and 6. The route of the proposed transmission line was selected to utilize best the topography of the area to provide for the optimum blending of the line with its environment. Transmission towers will be placed on the sides of the hills so as to blend them into the background rather than on the tops of the hills. The route selected, which is shown on Exhibits A and B to Exhibit 2, will have minimal effect upon the environment and is economically feasible. Other alternate routes would lengthen the line without offering any environmental or economic advantages.

The schedule for right-of-way acquisition and construction of the transmission line is as follows:

Route Approval (Sonoma County Planning Commission)		7-1-72
Acquisition to be completed by		12-1-73
Construction to be completed by		5-1-74
	Start	Complete
Construction schedule		
Foundations	2-1-74	3-15-74
Tower erection	3-1-74	4-15-74
Conductor stringing	4-1-74	5-1-74

Government Agencies

The only governmental agencies from which approvals are required for Unit 11, including the transmission line, other than this Commission are the Sonoma County Planning Commission and the Sonoma County Department of Public Works. The Sonoma County Planning Commission is expected to approve the route of the proposed transmission line about July 1, 1972. A building permit for the facility will be sought from the Sonoma County Department of Public Works approximately one month prior to initial construction.

Steam Supply

By agreement of the parties, a portion of the record in the certificate proceedings for Units 7 and 8 (Application No. 51892)[1/] was incorporated by reference into this proceeding along with the Commission's decision on Units 7 and 8 (No. 79402) and 9 and 10 (No. 79403). The portion of the record so incorporated dealt in general with the steam purchase contracts between Union and PG&E and Magma-Thermal and PG&E, the steam supply situation, the ownership of lands in The Geysers area, and the plans and proposals of NCPA. No new evidence on any of these matters was introduced at the hearing on Unit 11, except as indicated below, and those portions of the decision granting the certificate for Units 7 and 8 referring to those matters are pertinent here.

1/ Tr. pp. 37 through 230; Exhibits 8 through 16.

PG&E now purchases steam from Union and from Magma-Thermal under parallel contracts dated May 11, 1970. These contracts were introduced as Exhibits 8 and 9 in the Units 7 and 8 proceeding (Application No. 51892). PG&E's expert testified in that proceeding that in his opinion there is presently available steam to support an additional 200,000 to 300,000 kilowatts beyond Units 7 and 8. In the Unit 11 proceeding Exhibit 7 was a letter from Professor Ramey, dated June 13, 1972, in which he indicated that in his opinion the lands controlled by PG&E's steam suppliers contained sufficient steam to support at least 800 mw of capacity. PG&E's operating experience with Units 1 through 4 has been, and is, satisfactory. Exploratory wells have been drilled in the area in which it is planned to install Unit 11. Additional wells to supply steam to this Unit will be completed fourteen months prior to its commercial operating date. Magma-Thermal and Union will indemnify PG&E if there is insufficient steam to supply Unit 11.

PG&E desires to proceed with the installation of Unit 11 to comply with the terms of the geothermal steam sale agreements, to provide an additional economic source of power for its North Bay Division, and to promote the conservation of fossil fuels through utilization of geothermal steam.

The financial ability of PG&E to construct and operate the proposed Unit is shown in PG&E's Annual Report to the Commission for the year ended December 31, 1971, filed with the Commission on March 27, 1972. PG&E proposes to finance the construction of the Unit by using to the extent available its working capital, moneys in reserve, funds not required for immediate use, and the proceeds of the issue and sale of such stocks, bonds, notes, or other evidences of indebtedness as the Commission shall hereafter, by proper application, authorize for that purpose.

Rates to be charged for service to be rendered by means of the construction proposed herein are the PG&E system electric rates now in effect or as may be authorized by the Commission in the future.

General Order No. 131

PG&E states that the filing of the application for Unit 11 was deliberately delayed in order that it not complicate Commission action on applications for Units 7 through 10 at this same power plant. There was also some delay in establishing the location of the Unit. In addition, except for the size and location of the proposed Unit, the facts are generally the same as for the previous ten units approved by the Commission. Finally, the proposed transmission line for Unit 11 is very short and located in a remote area. PG&E has complied with the notification requirements of Section 6 of General Order No. 131.

Northern California Power Agency (NCPA)

As stated, a large portion of the record of the Units 7 and 8 proceeding was incorporated by reference in this proceeding. Accordingly, that part of the Units 7 and 8 decision (Decision No. 79402) dealing with the matters raised by NCPA is herein repeated in full:

"Northern California Power Agency (NCPA)

"Northern California Power Agency is a public agency created by agreement under the statute authorizing such action as an exercise of joint powers, under Section 6500 et seq. of the Government Code. The members of the Agency are the cities of Alameda, Biggs, Gridley, Healdsburg, Lodi, Lompoc, Palo Alto, Redding, Roseville, Santa Clara and Ukiah, each of which owns and operates a municipal electric distribution system. The purposes of the agreement are stated in it, as follows:

> '...acquiring and disposing of ownership and use of revenue producing facilities, including electric generating and transmitting facilities, and making more efficient use of the common powers of individual member public agencies comprising the NCPA to acquire, purchase, generate, transmit, distribute, sell, interchange, and pool electric energy and capacity...'

"NCPA's powers include:

> '...any and all powers authorized by law to all of the parties hereto, and separately to the agency

herein created, relating to the acquisition, construction, disposition, use, operation and maintenance of works for the generation and transmission of electric power and energy to such area by contract with owners of such facilities including federal and state agencies and public utilities.'

"Issues Raised in the Proceeding by NCPA

"In the view of NCPA, the following issues are presented in this proceeding:

"1. Do the contracts for geothermal steam supply on which PG&E relies give PG&E exclusive control over the entire steam supply covered by the contracts?

"2. Do those contracts give PG&E the right to prevent geothermal steam supplies from being developed at all during the lifetime of those contracts?

"3. Are the steam supplies so controlled by PG&E a significant and important part of the steam supplies available to Northern California?

"4. Is the effect of the contracts substantially to lessen competition in the development of geothermal steam, and to tend or attempt to create a monopoly, and to restrain trade in electric power generated from such steam, which electric power is a part of trade or commerce among the several states?

"5. Is the public interest, as represented by NCPA, adversely affected by those contracts?

"Position of NCPA

"NCPA contends in its brief that the answer to each of the above issues is affirmative, and that the Commission should refuse to issue the certificate requested herein until PG&E renegotiates the contracts to eliminate the objectionable exclusive features.

"NCPA states that it will be happy to participate in the negotiations to revise the present contracts, in order that PG&E may be able to construct its units under a proper contract in the public interest at the earliest date.

"Position of PG&E

"PG&E, in its brief, declares that objection raised by NCPA is neither in the general interest of the public nor is it basically fair.2/

"Position of Magma-Thermal

"According to Magma-Thermal,

'If Pacific Gas and Electric Company be prevented from installing the facilities necessary to carry out the terms of said contract, it would result in the following:

'(a) Magma-Thermal would suffer irreparable injury in the permanent and complete loss of geothermal steam sales and the proceeds therefrom, none of which could ever be recovered.

'(b) Magma-Thermal would be deprived of its market for geochermal steam and still have the continuing obligation under the existing leases without a source of income for the sale of geothermal steam, to its irreparable loss and damage.

'(c) The public would be forever deprived of the electric energy which would be produced from the current steam supplies produced on Magma-Thermal land.

"2/ To this statement PG&E in the Units 9 and 10 proceeding would add that the steam supply contracts are designed to give PG&E reasonable assurance that an adequate supply of steam is available, the provisions in the contracts of which NCPA complains are reasonably necessary to secure the development and use of the resource, and that in any event an adequate supply of steam is available to NCPA at The Geysers from lands not controlled by PG&E's steam suppliers.

'(d) The property and contract rights of Magma-Thermal would be impaired immeasurably to its irreparable damage without due or any process of law and without any compensation.'"

Findings of Fact

Based upon a consideration of the record herein, the Commission finds as follows:

1. Undisputed evidence demonstrates the need for the new electric generation to be provided by Geysers Unit No. 11.

2. PG&E is a publicly regulated utility engaged, inter alia, in the generation, transmission, and distribution of electric power in Northern and Central California. PG&E generates electric power in hydroelectric plants, nuclear plants, fossil fuel plants, and geothermal plants.

3. Development of the available supplies of geothermal steam which are known to be of practical value for the generation of electric power is in the best interest of the State.[3/]

3/ PG&E submits that all energy sources must be developed in order to meet the growing power needs of the public, and that is premature to say that preference should be given to one resource over another.

4. The Geysers steam field was discovered as early as 1847. Since the early 1920s it has been known that steam could be produced from a well drilled a few hundred feet below the earth's surface.

5. Magma drilled its first steam well at the Geysers in 1955.

6. In 1958 PG&E entered into its first contract to purchase geothermal steam from Magma and from Thermal.

7. In 1967 Magma and Thermal entered into a joint venture with Earth Energy, Inc., a subsidiary of Union Oil Company, whereby each assigned to the other an undivided one-half interest in its holdings within a specified area at The Geysers, and Earth Energy became the operator of those holdings. Earth Energy later merged into Union. When the 1970 steam sale contracts were negotiated, at Union's suggestion, the area of the joint venture was adopted by the parties as the area within which PG&E obtained initial exclusive rights to purchase geothermal steam produced by the joint venture. This area was referred to in the hearing held on Units 7 and 8 proceeding as the "red line area." The 1970 steam sale contracts replaced the 1958 PG&E, Magma-Thermal steam sale contract as amended.

8. The lands leased by Union, Magma and Thermal which are located within the red line area at The Geysers are the only lands covered by the contract. The Geysers area is only one of various sources of hot water and steam, either separately or combined, available for use in the production of electric energy, the availability of which has already been demonstrated in some instances and in others are in the process of exploration and development. Significant geothermal discoveries have been made at Niland (Salton Sea) and Casa Diablo (Mammoth, Long Valley). Potentially significant geothermal areas are Surprise Valley (Lake City), Mt. Lassen area, Mono Lake area, Coso Hot Springs, Imperial Valley, Calistoga, and Clear Lake.

9. The red line area shown on Exhibit A, attached to Exhibits 8 and 9 in the hearing on Application No. 51892, encompasses approximately 113,000 acres.

10. As of the time of the hearing on Application No. 51892, Union and Magma-Thermal held leases to about 15,000 acres within that area.

11. Union and Magma-Thermal are under no obligation to PG&E to obtain additional leases to lands within the red line area. There appears to have been no significant increase in the amount of land leased by Union and Magma-Thermal since September, 1970.

12. Union, the operator at The Geysers steam field for the Union-Magma-Thermal joint venture, does not contemplate, under the PG&E steam sale contracts, acquiring any additional lands.

13. The presently known geothermal steam field at The Geysers includes about 19,100 acres within which steam may reasonably be expected to be found. About 54 percent of this area is not subject to the Union and Magma-Thermal contracts with PG&E.

14. Estimates of the electric generating capacity which can be supported by geothermal steam at The Geysers vary considerably. These estimates range from an admittedly conservative 800 MW up to a possible 4800 MW or more. PG&E's consultant estimates that the lands controlled by PG&E's suppliers contain sufficient proven steam for 800 MW. His estimate is based upon actual wells drilled and producing. Thus it appears that ample steam remains at The Geysers to meet NCPA's stated plans.

15. Union has drilled at least one productive steam well in the Clear Lake vicinity at a location which is outside of the red line area. The 1970 steam sale contracts with PG&E do not apply to steam from that well.

16. Included in available sources of geothermal steam are lands in The Geysers area which are not subject to the steam sale contract. Among these are lands, leased and held by Signal Oil Company and Pacific Energy Corporation, with established steam production presently available for generation of electric energy. Pacific Energy Corporation is the successor in interest to Geothermal Resources International (GRI) in The Geysers area. In addition, as noted in Finding 8, there are other areas within the State with hot water and steam energy now subject to exploration and development.

17. Signal Oil Company and GRI each has drilled several active steam wells in the vicinity of The Geysers. The present steam sale contracts with PG&E do not apply to those wells.

18. Goethermal steam has some advantages as a power source for electric generation over other forms of energy:

a. Its use produces a minimal adverse effect on the environment, as no combustion exists by which combustion by-products may be released into the atmosphere.

b. The power plants are proving to be highly reliable since need for a boiler system is eliminated.

c. Its use conserves other forms of natural resource energy, especially fossil fuels.

19. Geothermal steam has some disadvantages as a power source for electric generation in comparison with other forms of energy:

a. The technology for use of the steam and for estimation of steam reserves is still in the pioneering stage, and thus risks associated with making large capital expenditures in order to use the steam are greater than those associated with constructing more conventional power plants.

b. Shutting down steam wells can damage the wells. Thus it is best not to use geothermal plants for peaking (low load factor) operation, and such plants are better used for base load (high load factor) operation.

c. Since geothermal steam can only be transmitted economically for a maximum of about one to one and one-half miles, and the generating plants have no boilers which can be converted to other energy fuels, the plants are especially vulnerable in the event a local steam supply fails.

d. In generating electricity at The Geysers certain noncondensible gases which are contained in the steam are released into the atmosphere, thereby adding to noncondensible gas emissions in the area which result either naturally or through steam well production. One of these gases is hydrogen sulfide, the odor of which is found disagreeable by many persons. As yet there is no proven process for reducing or preventing emissions of hydrogen sulfide in the generation process, although PG&E is endeavoring to develop a process which will do so.

20. Production of geothermal steam is still a developing technology. After years of actual production at The Geysers, it is still not known whether such production is from one field or more than one field. There are conflicting data on this point.

21. Union and others are actively exploring for geothermal steam throughout California.

22. PG&E's installations at The Geysers have been and are expected to be as follows through 1974:

Unit	Size (Net MW)	Year Installed or to be Installed
1	11	1960
2	13	1963
3	27	1967
4	27	1968
5	53	1971
6	53	1971
7	53	1972
8	53	1972
9	53	1973
10	53	1973
11	106	1974
	502	

23. Under the contracts with PG&E, The Geysers steam field has been steadily developed at a pace set by the gradually developing technology of geothermal steam production. Development of a geothermal steam field must be done with care.

24. Union has not asked PG&E whether it would install generation at a rate greater than 100 MW per year, and PG&E has made no decision in that regard.

25. Since geothermal steam appears to be a depleteable resource, if there is but one pool of steam at The Geysers, use of that steam by anyone other than PG&E might affect availability of steam for PG&E's plants.

26. Most of the existing wells at The Geysers have been drilled expressly for PG&E by Union and Magma-Thermal in order to produce steam for generating units installed by PG&E. These wells would not have been drilled absent the existence of a market for their output, and the steam purchase contracts provide that market. The effect of these wells on the capacity and productivity of The Geysers field is unknown, although as previously stated geothermal steam is believed to be a depleteable resource. The development of geothermal steam resources by Union, Magma, and Thermal in the area subject to the contracts is made feasible by those contracts.

27. Development of a geothermal steam field involves risks and difficulties. In any steam purchase contract PG&E would want to have sufficient rights with respect to such development to give reasonable assurance that the steam for which it contracts will be available as needed and thereby protect its investment. The Union and Magma-Thermal contracts represent a form of contract which provides PG&E such rights. Future contracts by PG&E for geothermal steam will be the product of negotiation and may take a different form. Any such contract will come before this Commission in a future certification proceeding for authorization of a unit which will use steam purchased under such contract.

28. PG&E is interested in all types of prime energy resources which can help it in its continuing need for increased electric generation in order to satisfy the public's growing demand for electric power. It is interested in obtaining additional steam supplies at The Geysers from suppliers other than Union, Magma and Thermal. PG&E has no preference as to who supplies the steam for its generators in meeting its continuing need for additional energy sources.

29. The long-term and the exclusive dealing provisions of the steam sale contracts are reasonable and in the public interest. They are necessary to assure a reliable supply of steam for the full life of the generation and transmission equipment installed to utilize it, and thus give PG&E an opportunity to recover the investment made in pioneering the development and use of geothermal steam as a source of energy for electric power generation.

30. The provision of the steam sale contracts that, in the event PG&E does not exercise its right to purchase steam within a specified length of time, the steam supplier can sell the steam to others or use it itself for "process, chemical, or manufacturing purposes", does not preclude sale or use of the steam for generating electricity.

31. The long-term nature of the contracts is not unreasonable in view of the large investment required to construct the generating plants and necessary transmission lines and the continuing need of the public for electric power.

32. The provision of the steam sale contracts that the suppliers compensate PG&E, if they sell steam to others and thereafter steam supplies for PG&E plants are reduced, is not unreasonable in view of the large investment required to construct the generating plants and necessary transmission lines, the need of the public for a reliable, long-term source of electric power, and the newness of the technology of production of geothermal steam.

33. The steam sale contracts assure the continued long-term availability of geothermal steam at a reasonable price for generating electric power.

34. Development of the ability to use geothermal steam for electric power production at The Geysers might not have been possible if PG&E had not participated in the pioneering by constructing generating plants.

35. If PG&E had not entered into the present contracts with Union and Magma-Thermal, the developers would have had no market for their steam, and no funds with which to continue their development of the new resource, until some speculative time in the future.

36. PG&E's obligations under the steam sale contracts to construct generating plants and purchase steam are conditioned upon its obtaining certificates of public convenience and necessity from this Commission. This Commission has the jurisdiction and authority to consider any possible anticompetitive effects of these contracts each time a certificate is sought and can protect the public interest in free trade, as circumstances in the future may warrant.

37. The steam sale contracts commit PG&E to operate the geothermal steam plants at a high load factor (i.e., base load operation).

38. The cost of electric energy produced at The Geysers under the contracts is approximately equal to the cost of electric energy now produced by PG&E at its other modern generating plants.

39. PG&E load forecasts demonstrate that PG&E will have a retail and wholesale market for the electric power which will be produced at The Geysers Unit No. 11.

40. NCPA's plans for using geothermal steam are vague and speculative. It made no showing that it is capable of carrying out its plans to build geothermal electric generating plants.

41. PG&E steam supplier, Union Oil Company, attempted unsuccessfully to contract with NCPA, but determined NCPA had no present or foreseeable ability to use steam thereafter "dedicated" by contract to PG&E.

42. NCPA could not utilize to capacity the steam from wells controlled by Union if it had purchased this steam, thus requiring the shutting down of wells with consequent stress and economic loss.

43. NCPA did not show that any party to the steam contract refused to sell steam to it.

44. Union and Magma-Thermal contracted with PG&E in 1970 only after Union, acting for the three suppliers, negotiated with NCPA and concluded that a timely sale contract with NCPA could not be obtained.

45. PG&E has no policy of standing in the way of negotiations between NCPA and steam suppliers, or of opposing the installation of facilities by NCPA, or of attempting to influence potential suppliers of geothermal steam not to contract with NCPA.

46. PG&E competes in the market for new steam reserves. In contracting for new reserves of steam PG&E seeks to assure itself of an adequate supply of geothermal steam for each new electric generating unit it plans to install.

47. NCPA is free to contract with steam suppliers at The Geysers other than Union and Magma-Thermal, for a steam supply adequate to meet its stated plans. It has already negotiated with Signal Oil in an apparent effort to do so.

48. NCPA made no showing that it could use geothermal steam practicably. NCPA may be unable to use geothermal steam for generating electricity because prudent operation of the steam wells requires continuous, high load factor operation and a minimum of shutdowns, whereas NCPA's needs would be for peaking generation and thus would require low load factor operation.

49. It appears that NCPA has failed diligently to pursue other geothermal resources readily available to it. At the hearing held in September, 1970, on Geysers Units Nos. 7 and 8, Application No. 51892, NCPA's sole expert witness did not even know that developers other than Union and Magma-Thermal had geothermal steam holdings at

The Geysers, prior to learning of them at the hearing. Since then NCPA has apparently negotiated with Signal Oil Company, but has not arrived at a contract with Signal.

50. PG&E is the only willing and able purchaser of geothermal steam at The Geysers. For reasons which NCPA chose not to disclose at the hearing, NCPA has not yet contracted for any such steam.

51. Any impact of the steam sale contracts on freedom of trade is remote and speculative.

52. It is in the public interest to encourage the development of the technology for the use of geothermal steam for the production of electric power.

53. The 1970 steam sale contracts promote the development of the technology for such use of geothermal steam.

54. PG&E does not have the power to exclude other potential users of geothermal steam from wells at The Geysers which are not under contract to PG&E.

55. Steam developers are showing great interest in The Geysers steam field. PG&E has recently been approached by several developers interested in producing and selling steam: Getty Oil Company, Pacific Energy Corporation, Shell Oil Company, and Signal Oil Company. PG&E has met with all of them, but the discussions have not yet reached a point where consideration of contract terms has begun.

56. PG&E is obligated to sell wholesale power to NCPA's member cities at reasonable rates which are subject to Federal Power Commission regulation.

57. PG&E is presently supplying all or part of the wholesale electric power needed by several of NCPA's member cities. The balance of the power needed by those cities is supplied by the Bureau of Reclamation.

58. NCPA has not contended that any of its member cities has experienced a power shortage or that PG&E will be unable to meet their future needs for wholesale electric power.

59. The purpose of the 1970 steam sale contracts is not anti-competitive. The restrictive provisions and lengthy term of contracts were and are necessitated by the unique characteristics of geothermal steam, the present state of knowledge of geothermal steam production and the need of PG&E as a public utility to obtain reliable power sources for its generators.

60. The 1970 steam sale contracts have had no anticompetitive effect in the relevant market. The contracts do not foreclose competition in any measurable share of the relevant market. More than sufficient energy sources, including geothermal steam, remain available to NCPA and others to allow such entities to generate electricity if they choose to do so.

61. The 1970 steam sale contracts do not unreasonably foreclose competitors from The Geysers steam field. PG&E presently has under contract about 46 percent of the land under which steam may reasonably be expected to be found. PG&E's contractual rights over this portion of The Geysers field do not constitute monopoly power in the revelant market.

62. Considering all the evidence introduced concerning the 1970 steam sale contracts and their competitive effects, it is clear that they are consistent with the public convenience and necessity.

63. NCPA cities and all other wholesale and retail customers of PG&E will benefit from electric power generated by geothermal steam at The Geysers pursuant to PG&E's contracts with Union and Magma-Thermal and sold at reasonable, nondiscriminatory rates established by this Commission and by the Federal Power Commission.

64. Exceptional circumstances exist making appropriate this Commission's authorization of less than a twelve-month period between the filing of the certificate application and the required date of decision as provided for in Section 4 of General Order No. 131.

65. The evidence shows that the construction of Unit 11 and its associated facilities and transmission lines will have no effect on community values, recreational and park areas, historical and aesthetic values nor will it have any undue influence on the environment.

Conclusions of Law

Based on the foregoing, the Commission concludes that:

1. The public safety, health, comfort, convenience and necessity require the installation, maintenance, operation and use of Unit 11 together with transmission lines and related facilities at The Geysers Power Plant in compliance with the terms of the geothermal steam sale agreements, and that the requested certificate be issued.

2. The proposed new project does not compete with any person, firm, or public or private corporation in the public utilities business, including particularly NCPA, for furnishing or supplying electric service to the public in or adjacent to the territory in which PG&E's geothermal steam electric generating unit operates.

3. The proposed construction of Unit 11 does not have the effect of limiting or preventing the generation by others of electricity from geothermal steam produced in The Geysers area, including particularly by NCPA.

4. PG&E is actively pursuing a test program designed to minimize emissions of hydrogen sulfide. PG&E will furnish the results of these tests to the Air Resources Board and will otherwise cooperate with the Board. As a matter of law, PG&E must comply with applicable air quality regulations lawfully adopted. Thus, there is no need to delay the issuance of a certificate of public convenience and necessity for Unit 11.

5. The construction of the proposed facility:

   A. Is reasonably required to meet area demands for present and/or future reliable and economic electric service; and

   B. Will not produce an unreasonable burden on natural resources, aesthetics of the area in which the proposed facilities are to be located, public health, and safety, air and water quality in the vicinity, or parks, recreational and scenic areas, or historic sites and buildings or archeological sites.

6. The features of the contracts referred to in the findings of fact which give PG&E exclusive control over the areas described in those contracts are not against the public interest, necessity, convenience and welfare; in such respects such contracts are not in restraint of trade or commerce among the several states; they do not monopolize or attempt to monopolize a part of the trade among the several states; they do not propose a combination of acts to create and carry out restrictions in trade or commerce within this state, and do not prevent competition in manufacturing, making, transportation, sale or purchase of electric energy in this state, and thus are not in violation of the Cartwright Act.

The certificate of public convenience and necessity which will issue herein is subject to the following provision of law:

> The Commission shall have no power to authorize thecapitalization of this certificate of public convenience and necessity, or the right to own, operate or enjoy such certificate of public convenience and necessity in excess of the amount (exclusive of any tax or annual charge) actually paid to the State as the consideration for the issuance of such certificate of public convenience and necessity or right.

The action taken herein is for the issuance of a certificate of public convenience and necessity only and is not to be considered as indicative of amounts to be included in proceedings for the purpose of determining just and reasonable rates.

O R D E R

IT IS ORDERED that:

1. A certificate of public convenience and necessity is granted to Pacific Gas and Electric Company to construct, operate, maintain and use geothermal steam-electric generating Unit 11 of The Geysers Power Plant together with transmission lines and related facilities as described in the application and the evidence adduced thereon.

2. Pacific Gas and Electric Company shall file with this Commission a detailed statement of the capital cost of The Geysers Power Plant Unit 11 together with transmission lines and related facilities within one year following the date Unit 11 is placed in commercial operation.

3. The authorization granted shall expire if not exercised within three years from the effective date hereof.

4. Pacific Gas and Electric Company shall within ninety days after the effective date of this order file a detailed statement describing its testing, plans and schedule for a program to reduce hydrosulfide emissions at Geysers Power Plant, Unit No. 11.

5. Pacific Gas and Electric shall within one hundred eighty days after the effective date of this order, and quarterly thereafter, file a report describing its progress under the program required under ordering paragraph 4 hereof.

6. On completion of its program, but not less than one year after the effective date of this order, Pacific Gas and Electric Company shall furnish a report describing the cost and operation, or the plans therefor, for modification of Unit No. 11 to mitigate hydrosulfide emissions resulting from the operation of this Unit. Such report should include the development of the effect from the hydrosulfide mitigation program upon the average cost of power of Unit No. 11.

The effective date of this order shall be twenty days after the date hereof.

Dated at San Francisco, California, this 12th day of SEPTEMBER, 1972.

President

Commissioners

-2- Commissioner J. P. Vukasin, Jr., being necessarily absent, did not participate in the disposition of this proceeding.