NB

Decision No. 59407

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 at its Humboldt Bay Power Plant Unit No. 3, an atomic power unit. (Electric)	)))))))	Application No. 41212

F. T. Searls, John C. Morrissey and Philip A. Crane, Jr., for applicant.
William L. Knecht, for California Farm Bureau Federation; Arthur C. Werden, Jr., for Southern California Edison Company; R. F. Denbo, for Greater Eureka Chamber of Commerce and Humboldt County Board of Trade; and Albin J. Gruhn, for Central Labor Council of Humboldt and Del Norte Counties AFL-CIO and Building and Construction Trades Council of Humboldt County and Vicinity, interested parties.
William R. Roche and Carol T. Coffey, for the Commission staff.

O P I N I O N

Applicant's Request

Pacific Gas and Electric Company filed the above-entitled application on June 9, 1959, requesting an order of the Commission, pursuant to Section 1001 of the Public Utilities Code, granting and conferring upon applicant all necessary permission and authority to construct, install, own, operate, maintain and use at its Humboldt Bay Power Plant, Unit No. 3, an atomic power unit, together with transmission lines and related facilities as described in the application; and issuing to applicant a certificate declaring that the present and future public convenience and necessity require and will require that such work be done and such construction be made by applicant.

Public Hearing

After due notice, public hearing on this application was held before Commissioner Theodore H. Jenner and Examiner William W. Dunlop in Eureka on October 29, 1959. Applicant presented 11 exhibits and testimony by two witnesses in support of its request. The Commission staff, represented by counsel and the Commission's electrical engineer, took an active part in the hearing through cross-examination of the applicant's witnesses for the purpose of developing a full record, particularly with respect to the cost and safety features of the proposed facility, to aid the Commission in deciding this matter. A representative of the California Farm Bureau Federation also cross-examined applicant's witnesses and presented a statement in support of applicant's request. The application was also supported by testimony and an exhibit presented by the Manager of the Greater Eureka Chamber of Commerce and Humboldt County Board of Trade and by testimony presented by the Secretary-Treasurer and Business Representative of the Central Labor Council of Humboldt and Del Norte Counties AFL-CIO, and of the Building and Construction Trades Council of Humboldt County and Vicinity. No protest to the granting of applicant's request was made by any party. The matter was submitted at the close of the day's hearing and now is ready for decision.

Humboldt Bay Power Plant

Pursuant to the certificate of public convenience and necessity issued by Decisions Nos. 50945 and 53280, dated January 4, 1955 and June 26, 1956, respectively, in Application No. 35789, Pacific Gas and Electric Company constructed Humboldt Bay Power Plant on a 141-acre site on Buhne Point located approximately four miles southwest of Eureka, Humboldt County, and installed two conventional

type steam-electric generating units designated Unit No. 1 and Unit No. 2. Unit No. 1 was placed in commercial operation on December 26, 1956 and Unit No. 2 on December 18, 1958. These units have a total gross normal operating capacity of 100,000 kw. The record reveals that in the construction of Humboldt Bay Power Plant, applicant made provision for expansion or additions to reach an ultimate four-unit plant.

Proposed Additions

Applicant now proposes to construct, operate and maintain at its Humboldt Bay Power Plant a nuclear-fueled single cycle boiling water type reactor electric generating unit, to be designated Unit No. 3. It is planned that the turbine, designed to accommodate steam at approximately 1,000 psi pressure and 550 degrees Fahrenheit from the nuclear reactor, will be a 50,000 kw (guarantee) 3,600 rpm, tandem-compound, double flow, condensing unit connected directly to a 70,588 kva hydrogen-cooled generator. A gross electrical output of at least 60,000 kw is expected.

To integrate Unit No. 3 with applicant's Humboldt Division resources, applicant proposes to rearrange, install and place in operation certain transmission facilities which are described in the application and which may be summarized as follows:

A. Reconnect the existing Humboldt Bay-Humboldt Substation steel tower line circuit No. 2 now operating at 60 kv for 110 kv operation to receive power at 110 kv from Unit No. 3.

B. Install approximately 19 miles of 110 kv double circuit steel transmission line with one circuit strung for initial 60 kv operation between Humboldt Bay Power Plant and Rio Dell Junction.

C. Install certain facilities at points of connection at Humboldt Substation, Rio Dell Junction, and Humboldt Bay Power Plant.

The evidence reveals that General Electric Company will design and furnish the turbine and generator, design the reactor and

reactor vessel and the appurtenant facilities that go with the reactor, and fabricate the core. The remainder of the plant will be designed by Bechtel Corporation in cooperation with applicant's engineers.

According to applicant's plans, construction of Unit No. 3 is scheduled to commence in 1960 with completion scheduled for the summer of 1962, and commercial operation expected in October 1962.

Load Growth and Resources

Applicant predicates its need for additional generating capacity in the Humboldt Division on the basis of the past trend of load growth in that Division projected into the future. During the past seven years, 1952-1959, the load grew at an average annual rate of 11.7 per cent and for the purpose of this proceeding applicant has estimated future growth at this same annual rate.

Applicant represents that the capacity demands on its Humboldt Division have shown a similar pattern of growth. For the years 1959 to 1963 applicant estimates its winter peak demands will increase at an average annual rate of 10 per cent.

Present resources available for the supply of power to applicant's Humboldt Division consist of 195.5 megawatts. In May 1960, applicant plans to abandon the 59-year-old 14.5 megawatt Eureka Power Plant for economic reasons, although applicant does not seek authority for such abandonment in this application. The evidence reveals that with an outage of the largest single source of power, with the abandonment of Eureka Power Plant and without Unit No. 3, the capacity available would be 131 megawatts. Applicant estimates that the winter peak load in Humboldt Division will exceed 131 megawatts before the end of 1962 and, accordingly, proposes the construction of Unit No. 3 to assure continued adequate service to the public.

The over-all effect of the proposed Humboldt Bay Steam Plant Unit No. 3 and the electric loads and resources above discussed are illustrated by the following tabulation.

Estimate of Loads and Resources

HUMBOLDT DIVISION

Item	Megawatts					
	Actual:	Estimated				
	1958	1959	1960	1961	1962	1963
Resources						
Eureka Steam Plant	14.5	14.5	-	-	-	-
Cottonwood-Humboldt Line No. 1	32.0	32.0	32.0	32.0	32.0	32.0
Cottonwood-Humboldt Line No. 2	49.0	49.0	49.0	49.0	49.0	49.0
Humboldt Bay Steam Plant, Unit No. 1	50.0	50.0	50.0	50.0	50.0	50.0
Humboldt Bay Steam Plant, Unit No. 2	50.0	50.0	50.0	50.0	50.0	50.0
Humboldt Bay Steam Plant, Unit No. 3	-	-	-	-	60.0	60.0
Total Resources	195.5	195.5	181.0	181.0	241.0	241.0
Maximum Demand Peak	95.0	104.0	114.0	126.0	139.0	152.0
Gross Margins						
All Resources	100.5	91.5	67.0	55.0	102.0	89.0
Largest Source Out	50.5	41.5	17.0	5.0	42.0	29.0

Estimated Plant Costs

The estimated cost of constructing proposed Unit No. 3 and associated facilities is $21,180,000 based on prices prevailing in the first quarter of 1958. These estimated costs compared with the plant costs of a conventional 60 megawatt steam unit as revealed by Exhibits Nos. 3 and 6 may be summarized as follows:

Item	Estimated Plant Costs	
	60 MW Nuclear Unit No. 3 (Exhibit 3)	60 MW Conventional Unit (Exhibit 6)
Steam Production	$19,500,000	$10,700,000
Substation	1,140,000	1,140,000
Transmission	540,000	540,000
Total Project	21,180,000	12,380,000

Applicant has an agreement with Bechtel Corporation whereby Bechtel will provide the proposed nuclear steam production facilities

for a price not to exceed $17,200,000 subject only to adjustments for changes in cost of labor and materials. The contract amount of $17,200,000, together with $2,300,000 of overhead and miscellaneous costs, gives the total of $19,500,000 for the nuclear steam production facilities as shown in the tabulation above.

Financing of the cost of this project is proposed from treasury funds presently on hand, the cash available from internal sources, from short-term bank loans and from the sale of additional securities as the Commission shall, hereafter, upon proper application, authorize for that purpose.

Annual Operating Cost

Applicant's estimate of the annual cost of operation of nuclear Unit No. 3 of Humboldt Bay Power Plant, exclusive of transmission and substation costs, compared with a 60 megawatt conventional steam unit follows:

Item	Estimated Annual Costs, Exhibit 8: 60 MW Nuclear: Unit No. 3	Existing System Plus 60 MW Conventional Unit
Fixed Charges - 13.1%[1]	$2,555,000	$1,402,000
Operation	80,000	60,000
Maintenance	100,000	80,000
General Expense	20,000	20,000
Additional Insurance	250,000	-
Annual Fuel Use Charge	180,000	-
Oil Storage Inventory	-	29,000
Total, Excluding Fuel Cost	3,185,000	1,591,000
Annual Fuel Cost[2]	710,000	2,193,000
Total Annual Cost	3,895,000	3,784,000
Average Cost, Mills per Kwhr	8.23	8.00

1 Return, 6%; Depreciation, 0.73%; Taxes on Income, 3.18%; Property Taxes, 3.10%; Insurance, Injuries and Damages, 0.10%.

2 Based on 90% capacity factor operation of nuclear Unit No. 3.

Applicant plans to operate nuclear Unit No. 3 at about a 90 per cent capacity factor because the plant is anticipated to be a reliable facility and because the cost of incremental energy from the nuclear unit (less than 1.5 mills per kwhr) is estimated to be less than the cost of producing additional killowatt hours from any conventional steam plant on applicant's system.

In developing its estimates of fuel costs, applicant used a credit of $30 per gram for plutonium and assumed a fuel oil cost in 1962 of $3.28 per barrel delivered to the Humboldt Plant. The record reveals that the present delivered price of oil in Eureka is $2.33 per barrel compared with a present cost of gas approximating 36 cents per thousand cubic feet, or $2.03 per equivalent barrel of oil. An increasing trend in oil prices over the period 1940 to 1959 was cited as justification for use of the $3.28 figure for the year 1962.

Several areas in which reductions in fuel costs for the nuclear unit could be anticipated in the future were shown by the testimony. These included lower core costs with improvement in fabrication techniques, longer burn-up rates, reduction in the basic cost of uranium and lower costs for fuel cladding materials and for chemical processing. It appears that applicant is continuing its investigation into the possibility of operating Unit No. 3 at a higher output, perhaps in the range of 64,000 kw or even 70,000 kw, as a means of achieving still lower unit costs.

While it is applicant's position that the cost of electricity to be furnished from the proposed Humboldt Bay Atomic Plant will be competitive with the cost of electricity from a conventional steam-electric plant, applicant urged that construction of Unit No. 3 should be authorized even if the costs for the nuclear unit were

considerably higher, in order that experience necessary to build more economical nuclear units in the future may be obtained to the benefit of all people in applicant's service area as well as throughout the nation.

Insurance

Applicant has included in its cost studies an amount of $250,000 annual cost of additional insurance for liability and property damage. This amount includes up to $60 million of insurance from private insurance groups and up to $500 million of liability protection through the Atomic Energy Commission (AEC).

Licenses and Permits

In addition to securing a certificate of public convenience and necessity from this Commission, the evidence reveals that applicant must secure licenses and permits from at least six other governmental agencies prior to constructing and operating the proposed new facility. Applicant must secure a construction permit and five licenses from the AEC to assure, among other things, that the nuclear unit can be constructed and operated without undue risk to the health and safety of the public. Applicant also must secure a county building permit from Humboldt County, a dredging permit from the U. S. Army Corps of Engineers, a waste discharge permit from the North Coastal Regional Water Pollution Control Board, approval from the Department of Fish and Game for a circulating water system and approval from the Federal Aviation Agency for stack marking.

Upon completion of construction of the facility, applicant must notify the California Department of Public Health of this source of radiation, in accordance with Section 25780 of the Health and Safety Code.

Although applicant has applied to the AEC for a construction permit, such permit had not been granted as of the date of hearing herein.

Atomic Fuel and Waste

In accordance with applicant's plans, the proposed reactor core would contain 30,500 pounds of uranium dioxide enriched with 2 per cent Uranium 235 when the fuel first enters the core. It is estimated that the average inventory of fuel in the proposed reactor and in storage would be 45,000 pounds. This fuel will be owned by the AEC. Official notice is hereby taken of the nuclear transformations which occur when portions of Uranium 238, enriched with Uranium 235, are transformed into plutonium.

The evidence reveals that any liquid wastes discharged to Humboldt Bay will be held to a radioactive level below that prescribed in regulations of the AEC for ordinary drinking water. No liquid wastes will be discharged to the ground. Low level radioactive solid wastes will be stored in leakproof underground storage tanks or vaults. High level radioactive wastes contained in the spent fuel will be stored in a pool of water until radioactivity diminishes to a level low enough so that the spent fuel can be shipped in shielded shipping casks to the AEC for reprocessing and disposal.

It is applicant's plan to provide continuous monitoring at various locations to assure that the liquid wastes entering Humboldt Bay and the air released from the 250-foot ventilating stack are within safe limits in accordance with AEC regulations.

Safety Measures

A considerable portion of applicant's evidence dealt with safety measures to minimize atomic hazards. In the design of Unit No. 3 there are provided three physical lines of defense against the accidental release of excessive radiation. These are fuel element cladding, reactor pressure vessel with associated piping and reactor

containment. The fuel will be enclosed in zirconium tubes to prevent the radioactive products which are generated from escaping from the fuel. In addition, the reactor will be placed below ground level and enclosed in a pressure vessel designed to withstand the maximum pressure which might be developed by released steam. A new type of reactor containment is proposed called "pressure suppression." In it, any steam and water that would escape, for example, through a broken main pipe connected to the reactor vessel,[3] would be led through large vent pipes into a pool of water where the steam would be quenched and its energy absorbed by the water.

In addition to its being an inherently safe type of reactor which tends to shut itself down upon a potentially dangerous increase in its power, the proposed unit, according to the testimony, will contain safety devices that will shut down the reactor automatically under any of six operation conditions. These are: (1) high containment pressure, (2) low reactor water level, (3) high reactor pressure, (4) high neutron flow, (5) short period, and (6) loss of auxiliary power. The testimony also reveals that applicant anticipates the proposed operation of Unit No. 3, as embodied in this application, will in all respects and under all eventualities be safe for all elements of the public.

Competition

Applicant represents that its proposed addition of Unit No. 3 to Humboldt Bay Power Plant will not compete with any person, firm or public or private corporation engaged in the public utility business of furnishing or supplying electric service to the public in or adjacent to the territory in which the additional electric production and transmission project is to be constructed.

---

3 Considered by applicant to be the "maximum credible accident."

Findings and Conclusions

Based upon the evidence of record, it appears that the construction and operation of nuclear Unit No. 3 of Humboldt Bay Power Plant should give applicant additional valuable experience in atomic power plants that will enable it to construct and operate future nuclear plants with improved efficiency. We find that the new facility will be needed when scheduled to help provide adequate capacity for the future public demands for electric energy in the Humboldt Division and further find that the estimated unit cost of power from this new unit is not unreasonable.

It is our opinion that applicant has the financial means to construct the proposed new facilities and that such construction will not be adverse to the public interest.

The Commission finds that public convenience and necessity require and will require the construction, operation and maintenance of Humboldt Bay Power Plant Unit No. 3, an atomic power unit, together with transmission lines and related facilities, as proposed by applicant in this proceeding, and that an order should be issued granting such authority.

The certificate hereinafter granted shall be subject to the following provision of law:

> That the Commission shall have no power to authorize the capitalization 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.

O R D E R

The above-entitled application having been considered, a public hearing having been held, the matter having been submitted and now being ready for decision; therefore,

IT IS ORDERED that a certificate of public convenience and necessity be and it is hereby granted to Pacific Gas and Electric Company for the construction, operation and maintenance of the aforesaid Humboldt Bay Power Plant Unit No. 3, an atomic power unit, together with transmission lines and related facilities, as proposed by applicant in this proceeding.

IT IS FURTHER ORDERED that Pacific Gas and Electric Company shall file with this Commission a detailed statement of the capital costs of the project within six months following the date of completion.

The authorization herein granted will expire if not exercised within three years after the date hereof.

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

Dated at San Francisco, California, this 15th day of December, 1959.

President

Commissioners