
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, own,
operate, maintain and use a nuclear
fueled power plant in the County of
San Luis Obispo, together with trans-
mission lines and related facilities.
(Electric)

Application
No. 49051

Opening Brief of Applicant

F. T. SEARLS
JOHN C. MORRISSEY
PHILIP A. CRANE, JR.
ROSS WORKMAN

245 Market Street
San Francisco 94106
Tel. 781-4211

*Attorneys for Pacific Gas
and Electric Company*

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2. Power plant

PGandE proposes that the power plant be nuclear because such a plant will produce the added electric power needed by PGandE at lower cost than a thermal power plant using fossil fuels. Specifically the proposed plant, operating at a 90% capacity factor, will produce electric power at 4.04 mills/kwh, which will be the lowest cost of any thermal plant on PGandE's system. For comparison power produced by a gas/oil fueled unit of comparable size at Diablo would cost 21% more, or 4.89 mills/kwh, or \$7.1 million more each year.⁴ Some pertinent facts and figures relating to the proposed power plant follow:

Capacity⁵

Gross thermal output 3,250,000 kw
 Gross electrical output 1,090,216 kw
 Net electrical output 1,060,000 kw

Transmission line miles⁶

500 kv:

Diablo-Gates, 79 mi.
 Diablo-Midway, 84 mi. Total 163 mi. single circuit

230 kv:

10 mi. double circuit

4. Nutting, Tr. 252

5. Perry, Tr. 127.

6. Perry, Tr. 757, 838-839.

Cost⁷

Production facilities	\$153,633,000	
Step-up substation	8,910,000	
	<u> </u>	
Total at plant....		\$162,543,000
Terminal substation	\$ 6,277,000	
Transmission	19,593,000	
	<u> </u>	
Total		25,870,000
Total investment		<u>\$188,413,000</u>

Production cost of power per kwh⁸

4.38 m/kwh @ 80% capacity factor;

4.04 m/kwh @ 90% capacity factor.

Acres of land in site:⁹

585 acres south of Diablo Creek

100 to 200 acres north of Diablo Creek

Gallons of water per minute required for cooling,¹⁰
 approximately 820,000

Temperature rise of cooling water,¹¹ about 18° F

Construction schedule:¹²

 Beginning date:

 Access roads and utilities, fall 1967

 Excavation, grading, foundations, fall 1968

 Containment, winter 1968-69 to summer 1970

 Superstructure, summer 1969 to summer 1971

 Equipment installation, between fall 1969 and fall
 1971

7. Perry, Tr. 136.

8. Perry, Tr. 138.

9. Exhibit 12, p. 1, Sec. 1A.

10. Shackelford, Tr. 166.

11. Cheney, Tr. 1800.

12. Perry, Tr. 448; Shackelford, Tr. 165.

Completion date:

Completed and on the line, fall 1971

Reliable operation, spring 1972

Labor force for normal operations:¹³ 59Miles of road to be built to site:¹⁴ 10Cubic yards of concrete in plant:¹⁵ about 100,000Cubic yards of gravel in road:¹⁶ about 25,000Cubic yards of earth to be moved:¹⁷ about 3 millionDistances (airline)¹⁸ to:

Nearest public road: 4 miles north

San Luis Obispo: 12 miles east

San Francisco: 190 miles north

Los Angeles: 150 miles south

3. Transmission lines

To connect its proposed power plant with the rest of its electric system, PGandE proposes two 500 kv single-circuit transmission lines and a single 230 kv double-circuit line. One 500 kv line would extend eastward from the plant some 84 miles to Midway substation; the other 500 kv line would extend generally northeastward from the plant some 79 miles to Gate substation. Both of these lines would connect at these substations to PGandE's other 500 kv lines. The single 230 kv line would

13. Nutting, Tr. 289.

14. Exhibit 19.

15. Shackelford, Tr. 1412 (Reply to question about gravel in the road. Later corrected, Tr. 1432, to 25,000 yards for road.)

16. *Ibid.*

17. Shackelford, Tr. 1459, 1460, 1461.

18. Exhibit 12, p. 1.

landowner's long range plan.⁷² That the proposed plant is compatible with these plans is shown by the landowner's willingness to lease the site to PGandE. The landowner to the north of the creek has not made public his plans, if any, for future use of his land. There is no known inconsistency between the location of the plant at Diablo Canyon and his uses of the land adjacent to the site.

No inconsistency exists between the county's master plan and the proposed plant. The master plan⁷³ calls for a road along the coast and contemplates eventual subdivision of the land. Neither would be precluded by the plant.

8. The site is geologically and seismologically well-suited to the proposed use.

No major faults exist in the area.⁷⁴ The elaborate series of trenches, which were excavated at the site and examined in great detail, revealed conclusively that the bedrock at the site contains only minor, inactive faults of no significance insofar as earthquakes are concerned.⁷⁵ Since there is no evidence of any movement along these faults reflected in the overlying materials, and since the overlying material was laid down about 100,000 years ago,⁷⁶ it can be stated conclusively that there has been no movement along these faults for at least 100,000 and perhaps millions of years.⁷⁷ For this reason the possibility of movement along these minor faults at the site is so re-

72. Shackelford, Tr. 150.

73. Exhibit 30.

74. Jahns, Tr. 335, 336; Marliave, Tr. 361.

75. Shackelford, Tr. 156; Jahns, Tr. 334.

76. Jahns, Tr. 332.

77. Shackelford, Tr. 156; Jahns, Tr. 342, 347; Marliave, Tr. 361, 362.

mote that it may safely be disregarded.⁷⁸ Landslides are not significant relative to the plant.⁷⁹

Drs. Stewart W. Smith and Hugo Benioff were retained by PGandE to undertake a seismic evaluation of the site.⁸⁰ The evidence indicates that the seismic activity in the San Luis Obispo region has been very low.⁸¹ Based on a variety of data they determined the largest possible earthquakes that might be expected to affect the site. These are described in their report.⁸² Based upon these earthquakes, PGandE's seismic design consultant, Dr. John A. Blume, has prepared a report setting forth the amount of ground shaking to be expected at the site and the structural design criteria to withstand this shaking.⁸³

In short, based upon the investigations conducted by PGandE and its consultants, and the conclusions drawn therefrom, it is clear that the site is geologically and seismologically well suited to the proposed use.

9. The ocean at Diablo Canyon will provide ample cooling water and will not itself be detrimentally affected by the plant.

The ocean in the vicinity of Diablo Canyon is turbulent, and this will provide good mixing of the warmed water discharge with the ocean.⁸⁴ Although a very large amount of warmed water will be discharged (820,000 gallons per minute), only a relatively small area of the sea along the Pt. Buchon-Pt. San Luis coast will experience any signifi-

78. Shackelford, Tr. 156; Exhibit 15A, p. 16; Exhibit 16, p. 8.

79. Jahns, Tr. 347, 348; Marliave, Tr. 362.

80. Smith, Tr. 367; Shackelford, Tr. 157.

81. Smith, Tr. 368.

82. Exhibit 16.

83. Shackelford, Tr. 161-164; Blume, Tr. 376, 378-385.

84. Shackelford, Tr. 872.

cant degree of warming. The area warmed to a temperature ten or more degrees Fahrenheit above ambient fifty percent of the time will only be two acres, all within fifteen feet of the surface. About thirty-two acres, to a depth of less than ten feet, will be four or more degrees Fahrenheit above ambient fifty percent of the time.⁸⁵

The introduction of the warmed water into the ocean at the shore will not detrimentally affect the marine environment. What is expected is that some of the cold water species unable to tolerate the warmer water will cease to live there, and some warm water species will replace them. The site is less than fifty miles from Point Conception, which is the approximate dividing line between warm and cold waters, so new immigrant warm-water species are readily available for colonization.⁸⁶

The only sea life in the area used by man in significant quantities are red abalones. Since they cannot be commercially fished in less than twenty feet of water and since the warmed water will not go below fifteen feet, commercial abalone fishing will not be directly affected. Fishing might be affected if a temporary imbalance develops in the abalone's ecological food chain, but, because of the limited area (less than 2% of the coast line between Point Buchon and Point San Luis⁸⁷) involved, the fishing industry would not be significantly affected.⁸⁸ Additionally, the ocean area around Diablo Cove is a less pro-

85. Cheney, Tr. 397; the annual variation in ocean water temperature at a depth of 10 to 15 feet along this section of the coast is about 9 degrees Fahrenheit. Joseph L. Reid, Jr., "Physical Oceanography of the Region Near Point Arguello," a technical report on Environmental Studies in the Vicinity of Point Arguello Under AEC Contract AT (II-I)-34, Project III, Inst. of Marine Resources, Univ. of Calif., July 1965, figs. 27 through 29.

86. North, Tr. 406-409.

87. North, Tr. 409.

88. North, Tr. 410.

ductive abalone ground than other areas to the north and south.⁸⁹

In addition to warmed water, the plant will release a certain amount of radioactive waste products into the cooling water discharge from time to time. The Atomic Energy Commission will fix the amount of such releases at the time it grants an operating license.⁹⁰ Knowing what radioactive isotopes may be released and assuming the limit is similar to that fixed for PGandE's nuclear plant at Humboldt Bay near Eureka⁹¹ it can be stated that the release of radioactive wastes will have no detectable effect on the marine population in the cove or surrounding waters.⁹²

10. No significant risk of tsunami damage exists at Diablo Canyon.

A thorough analysis of tsunami potential at the Diablo Canyon site indicates that the highest expected tsunami occurring simultaneously with a high tide and average swells would result in water elevations up to fifteen feet above mean lower low water for a duration of five to fifteen minutes. During that time intermittent swells would raise the water to a level of eighteen feet for periods of a few seconds.⁹³ Such water heights represent no threat to the plant, as it will be constructed eighty-five feet above sea level.⁹⁴

The general response of the area to tsunami is more often a downsurge rather than an upsurge. Superimpos-

89. Exhibit 31-K, p. 8.

90. Nutting, Tr. 2546. In addition PGandE conforms to the standards set by the State Regional Water Quality Control Board. See California Water Code § 13053.

91. 10^{-7} microcuries per milliliter. Nutting, Tr. 2546.

92. Salo, Tr. 2443.

93. Shackelford, Tr. 164; Horrer, Tr. 389.

94. Shackelford, Tr. 871.

PGandE's system to meet load growth. Even if a nuclear unit could be added at the Morro Bay plant, it would be only a short time before it would be necessary to find and develop a new site for succeeding units.¹⁰³

12. The South Moss Landing site would not be a satisfactory location for new generation to be installed in 1972.

By 1968 the existing Moss Landing plant will have over 2,000 megawatts of generating capacity. It will probably be eight to ten years before additional generation will be needed in this area.¹⁰⁴ If a power plant were to be built at South Moss Landing to serve loads in the southern part of the system, the power would be more costly and less reliable.¹⁰⁵

13. A coal-fired plant in Utah would be an unacceptable alternative.

A preliminary study indicates that the cost of delivered power from a coal-fired plant in Utah would be approximately 6 mills per kilowatt hour.¹⁰⁶ This compares with a delivered cost of 4.61 mills for Diablo.¹⁰⁷ This study understates the cost of power from Utah because it ignores problems associated with obtaining adequate cooling water, assumes straight line transmission distances and gives no consideration to the added risk of locating a large source of generation so far from the Company's service area.¹⁰⁸

103. *Ibid.*

104. Perry, Tr. 141.

105. Perry, Tr. 1483-1507, 1508-1510; also cf. Exhibits 10 and 28A.

106. Perry, Tr. 144.

107. Exhibit 8, Line 21.

108. Perry, Tr. 144.

Appendix

Exhibit 26

PACIFIC GAS AND ELECTRIC COMPANY

Agreement Between the Resources Agency

State of California

and

Pacific Gas and Electric Company

AGREEMENT

THIS AGREEMENT, entered into in the City of Sacramento, State of California, this 6th day of December, 1966, between the State of California acting through its Resources Agency, and Pacific Gas and Electric Company (hereinafter called Pacific),

WITNESSETH:

WHEREAS, Pacific proposes to construct and operate a thermal electric generating station at a coastal site near Diablo Canyon in Rancho Canada de Los Osos y Pecho y Islay in San Luis Obispo County; and

WHEREAS, Pacific plans to construct a compacted fill across Diablo Creek to provide level areas for plant switchyard facilities; and

WHEREAS, Pacific plans to utilize sea water from the Pacific Ocean as condenser cooling water; and

WHEREAS, Pacific recognizes its responsibility to the general public to assist in the protection of the natural resources of the State of California; and

WHEREAS, the Resources Agency in its statement of policy dated June 30, 1965, has defined its objectives and principles regarding the location and operation of power plants,

Now, THEREFORE, it is mutually agreed as follows:

1. The Resources Agency agrees that with respect to matters covered by this agreement or by Resources Agency's said statement of policy, it will not oppose Pacific in its applications for a certificate of public convenience and necessity for said plant, in proceedings before the Public Utilities Commission of the State of California, or other pre-operational permits or operating licenses required by the Atomic Energy Commission or any other body having jurisdiction, and will indicate thereto that all matters covered by this agreement have been resolved to the satisfaction of the Resources Agency.

2. Pacific agrees that it will not deposit any surplus material excavated from the plant site in the Pacific Ocean or its tidelands, or in any bays, rivers, streams or inlets in the State of California, without first obtaining written authorization from the Resources Agency.

3. Pacific agrees that any fill to be constructed across Diablo Creek about 4,000 feet east of the mouth of Diablo Creek will be provided with adequate by-pass facilities to pass flood waters of said creek and will be placed, graded, compacted, and provided with surface drainage facilities so as to minimize erosion of said fill.

Pacific further agrees to make any required application to the Central Coastal Regional Water Quality Control Board for construction of said fill.

4. Pacific agrees that any spoil material deposited on the land will be placed, graded, and compacted so as to minimize any transfer by erosion of the material to the beaches and ocean waters.

5. Pacific agrees that vehicular access, retaining walls, fences, buildings, and equipment will be located and designed in such a way that the physical appearance

of the entire installation will be aesthetically compatible with the surroundings.

6. Pacific agrees that this agreement does not constitute approval of the State Lands Commission, the Central Coastal Regional Water Quality Control Board, or the State Water Quality Control Board if its jurisdiction is invoked, with respect to construction or operation or other activities of Pacific at the plant site, and Pacific further agrees that it will make appropriate applications to those agencies whenever reviews or approvals from such agencies are required for any activities in connection with the said plant. The Resources Agency agrees that it will not oppose Pacific in its seeking of required pre-operational reviews or approvals from such agencies with respect to matters covered by this agreement, and will indicate thereto that all matters covered by this agreement have been resolved to the satisfaction of the Resources Agency.

7. Pacific agrees to conduct or support investigations as outlined in the attachment titled "Ocean background investigation for proposed power plant site near Diablo Canyon, San Luis Obispo County, Pacific Gas and Electric Company", and to establish mutually acceptable design criteria for the protection of aquatic life in the waters which may be affected by the proposed facility or its operation. Resources Agency agrees to participate in these investigations and assist in the coordination with other agencies on studies which may yield desirable information.

The ecological study outlined under paragraph 7 "Specifications for Study" of the above-mentioned attachment will be conducted by Department of Fish and Game at Pacific's expense. Department of Fish and Game

may conduct said study using its own personnel or by subcontracting with other groups.

Resources Agency and Pacific will jointly evaluate the data and from time to time during the course of the investigation may agree upon modifications of the investigation to achieve the objectives set forth in the attachment.

In the event critical problems relating to aquatic life or recreational uses occur after and as a result of plant installation, Pacific agrees to continue its cooperative investigations with the objective of modifying plant operation or design to eliminate these problems. In the event that adverse effects accrue to aquatic life or recreation uses due to plant construction or operation, Pacific will provide reasonable mitigation for losses incurred, provided such mitigation will not interfere with the construction or operation of the plant unless otherwise agreed.

8. Pacific agrees to conduct such water quality and radiological surveillance programs, both pre-operational and post-operational for the life of the plant, as may be developed in accordance with statutory authority of the State and Regional Water Quality Control Boards and the State Department of Public Health.

9. Pacific agrees to conduct a comprehensive geologic survey to determine the geologic conditions of the site—with particular reference to the nature of the foundation materials and seismic activity.

10. Pacific agrees that it will continuously evaluate the additional geologic information that is revealed during preparation of the site for construction, and take the appropriate steps in design and construction of the plant recognizing the geologic conditions.

11. Pacific agrees to furnish the Resources Agency with copies of all geologic reports pertaining to the site filed with other governmental agencies.

12. A copy of this agreement will be filed with the California Public Utilities Commission for its information.

IN WITNESS WHEREOF, the parties have executed this agreement the day and year first hereinabove written.

PACIFIC GAS AND ELECTRIC COMPANY

By /s/ JOHN F. BONNER

JOHN F. BONNER

Senior Vice President

STATE OF CALIFORNIA

By /s/ HUGO FISHER

HUGO FISHER, *Administrator*

Resources Agency

On Behalf of the:

Department of Conservation

Department of Water Resources

Department of Parks and

Recreation

Department of Fish and Game

Department of Harbors and

Water Craft

*Ocean Background Investigation for
Proposed Power Plant Site Near
Diablo Canyon, San Luis Obispo County
Pacific Gas and Electric Company*

OBJECTIVES

The general objective of the investigation consistent with requirements of Central Coastal Water Quality