APPENDIX 8.3G

South Bay Power Plant Evaluation Report

MEMORANDUM

February 24, 2006

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Subject: California Energy Commission (CEC) Cultural Resources Compliance for Demolition of the South Bay Power Plant, Chula Vista, San Diego County, California

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As part of the California Energy Commission's efforts to comply with Section 106 of the National Historic Preservation Act (codified in 36 CFR Part 800) regarding the demolition of the South Bay Power Plant in Chula Vista, San Diego County, California, JRP Historical Consulting Services conducted a study of the property that included documentation of its physical setting, recordation of its history, and evaluation of its historic significance for the National Register of Historic Places and for the purposes of the California Environmental Quality Act ((Section 15064.5 (a)(2)-(3)), (CEQA). JRP conducted field reconnaissance of the South Bay Power Plant property on February 14, 2006.

JRP evaluated the building's historic significance of the South Bay Power Plant and recorded the property on the attached DPR523 form using considerations outlined in 36 CFR Part 800.4 (c)-(d). JRP found that the South Bay Power Plant property, consisting of the four-unit power plant and over 25 support structures located at 990 Bay Boulevard in Chula Vista, does not appear to meet the criteria for listing in the National Register of Historic Places, and is therefore also not a historic resource for the purposes of the California Environmental Quality Act ((Section 15064.5 (a)(2)-(3)), (CEQA).[1]

[1] The NRHP and CEQA both require that historic properties be identified and evaluated by following standardized guidelines and applying significance criteria. Because CEQA guidelines are based on those of the NRHP, the two are nearly identical. For the sake of clarity, this report outlines the NRHP evaluation process; nevertheless, both NRHP and CEQA guidelines were applied in the preparation of this report.

The first unit of the South Bay Power Plant was completed in 1960, and additional units were added incrementally thereafter. The property, therefore, is less than 50 years old, and only one of the plant's four units is 45 years old. In order to be eligible the property would need to qualify under the exacting standards for evaluation as an exceptionally significant property (Criteria Consideration G). This evaluation finds that the South Bay Power Plant does not appear to represent an exceptionally significant property, whether considered within the context of the history of San Diego Gas & Electric Company, the history of steam electrical generation, or the more limited context of steam plants built during the post-war era. Its dominant characteristic is its typicality rather than its exceptionality.

Research for the preparation of this report was conducted at the California State Library, Sacramento, University of California, San Diego, and San Diego Public Library. General information about the plant was provided by Jim Nylander, South Bay Power Plant plant manager, and historic photographs and building plans for the plant were provided by Joseph Otahal, Electric Modernization Manager. Following are the detailed results of this study, which are provided in greater detail on the attached DRP 523 form, which includes historic and contemporary photographs, maps, and other data.

General History of Steam Plants in California

Steam plants comprised the first generation of electric generating facilities in California. British designer Sir Charles Parsons built the first steam turbine-generator in 1884, and almost immediately others began making improvements upon his original concept. The earliest steam generating plants were little more than steam engines converted to drive a generator rather than a locomotive. By the beginning of the twentieth century, power plants with steam turbines began to replace the original steam engine power plants. Aegidius Elling of Norway is credited with creating the first applied method of injecting steam into the combustion chambers of a gas turbine engine in 1903-04. Within a relatively short time, the technology of engines capable of supplying power and electricity grew by leaps and bounds. New and better methods and designs helped to spread electricity to a wide range of commercial buildings and residences.[2]

The materials needed to withstand the high temperatures of modern turbines were not yet available in the beginning stages of development of steam turbine power plants. Technology and improvements for steam turbine engines continued to advance throughout the 1920s and 1930s,

[2] Heinz Termuehlen, *100 Years of Power Plant Development: Focus on Steam and Gas Turbines as Prime Movers*, (New York: ASME Press, 2001), 11; Douglas Stephen Beck and David Gordon Wilson, *Gas Turbine Regenerators*, (New York: Chapman & Hall, 1996), 30; William A. Myers, *Iron Men and Copper Wires: A Centennial History of the Southern California Edison Company*, (Glendale, CA: Trans-Anglo Books, 1984), 8.

leading to a generation of more efficient turbine power plants in the 1950s. By this time, utilities retired or replaced many of the older steam-electric plant generating units following the construction of more modern units. While the technology of turbine power plants peaked in the 1950s, it appears to have remained relatively unchanged until the 1980s, despite the availability of newer technology that would allow an increase of pressure and heat for the systems.[3]

Steam power generation has been an import part of California's power production throughout the twentieth century, although the importance of steam diminished considerably during the 1920-1940 era, when massive hydroelectric generating capabilities came on line throughout the state. In 1920, hydroelectric power accounted for 69% of all electrical power generated in California. In 1930, that figure had risen to 76%; it rose again to 89% in 1940. Rapid construction of new thermal, or steam-electric generating units, however, accounted for most of the new power capacity in the state after 1941. By 1950, hydroelectricity accounted for only 59% of the total, a figure that fell to 27% in 1960. Some new hydroelectric plants were built during the 1960s, chiefly associated with federal and state water projects, but by 1970, hydroelectric plants accounted for only 31% of all electricity generated in California.[4]

These statistics, however, mask an attempt by both Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE), California's largest electrical utility providers, to build large-scale steam generation plants as early as the 1920s. James Williams, a historian of energy policies and practices in California, noted that the decision by PG&E and SCE to build steam plants may be attributed to several converging trends in the mid- to late-1920s. First, a persistent drought in California caused the major utilities to begin to question the reliability of systems relying so heavily upon hydroelectricity. This drought began in 1924 and continued, on and off, for a decade. At about the same time, new power plants on the East Coast (where steam had always played a more important role than in California) achieved far greater efficiencies than had previously been possible. Between 1900 and 1930, for example, the fuel efficiency of steam plants, measured in kilowatts per barrel of oil, increased more than nine-fold. In addition, new natural gas lines were completed which could bring new supplies to both Northern and Southern California in the late 1920s, tapping large reserves in the San Joaquin Valley. Natural gas has always played an important role in steam electric power generation in California.[5]

The confluence of these various factors – a drought, new steam generator technologies, and new supplies of natural gas – induced PG&E, SCE, and other utilities to begin construction of large steam plants during the late 1920s and early 1930s. In 1929, the Great Western Power Company (which would be absorbed by PG&E in 1930) built a large steam plant on San Francisco Bay,

[3] Termuehlen, *100 Years of Power Plant Development*, 21-28.
[4] James C. Williams, *Energy and the Making of Modern California* (Akron, Ohio: University of Akron Press, 1997), 374.
[5] Williams, *Energy and the Making of Modern California*, 278.

near the Hunters Point shipyard, fitted with two 55 MW generators.[6] PG&E built a steam plant in Oakland in 1928, called Station C. SCE had an even longer history of steam generation, having operated its large facility at Long Beach on Terminal Island throughout most of the 20th century. By World War II, the Long Beach plant was huge, with eleven units on line that were constructed in stages beginning in 1911. In Southern California, the Los Angeles Department of Water and Power (LADWP) constructed a steam station at Seal Beach consisting of two units installed in 1925 and 1928. These steam plants proved to be both profitable and reliable for the various utilities. In 1930, the PG&E vice-president for engineering wrote: "Under the circumstances which now prevail, it is natural to question the future of hydro in California."[7]

The post-World War II era was a time of rapid growth in Southern California. Housing and populations swelled along with the business and industrial concerns. Fueled by wartime defense industries, southern California grew rapidly, spreading out into suburbs and into areas outside the original city limits of the communities around Los Angeles and San Diego. The need to generate power was imperative and PG&E, SCE, Los Angeles Department of Water and Power (LADWP), and San Diego Gas & Electric Company (SDG&E) expanded their systems along with the rest of California's energy industry. Since most of the more favorable hydro sites in California had already been developed, and the cost of steam generating facilities had been reduced by technological developments in design and abundant natural gas resources, steam plants became the more favorable option. Steam turbine power plants were cheaper and quicker to build than hydroelectric plants and utilities companies moved away from hydroelectricity, establishing steam turbine power as the generator of choice. Such plants conserved water and kept costs down for the business and the consumer. The "momentum for steam had been established by war, by drought, and," observed historian James Williams, "by a positive history of increased thermal power plant development."[8]

Dozens of new steam generation plants were built throughout California, chiefly by PG&E and SCE, although LADWP and SDG&E built a few as well. The plants relied upon proven technologies but were assembled quickly and inexpensively, relative to earlier plants. In a detailed article in 1950 in *Civil Engineering*, I. C. Steele, Chief Engineer for PG&E, summarized the design criteria that went into construction of four major steam plants the company had under construction at that time, at Moss Landing, Contra Costa, Kern, and Hunters Point in San Francisco. These plants had much in common with each other, he argued, and with other steam

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6 This plant still exists, although it was fitted with new units in the early 1950s, at the same time that the Kern Power Plant was being constructed. Coleman, p. 298.

7 "1928 Steam Plants Account for 45 Percent of New Generating Capacity," *Electrical West*, February 2, 1929, pp. 80-81; R.W. Spencer, "Cooling Water For Steam Electric Stations in Tidewater, " *Transactions of the American Society of Civil Engineers* 126 (1961): 294, 300; Williams, *Energy and the Making of Modern California*, 279.

8 Myers, *Iron Men and Copper Wires*, 200; James C. Williams, *Energy and the Making of Modern California*, 277-78, 282-83.

plants under construction in the state. The design criteria were the same in all cases: to build the facility close to load centers to reduce transmission costs; to be close to fuel supplies; to be near a water supply; and to be on a site where land was cheap and could support a good foundation. In another article in *Transactions of the ASCE*, Walter Dickey, an engineer from Bechtel, detailed the economics of steam plant design from this era. These plants, he argued, could be built economically by minimizing the structural material, chiefly by creating "outdoors" turbo-generator units. Virtually all of these plants were designed to be expanded if market conditions warranted; most of them were. [9]

The decades between 1950 and 1970 were the peak expansion of steam generating capacity for both the SCE and the PG&E, as well as for smaller utility companies. During this period, SCE built a series of very similar steam plants in the Los Angeles Basin and in San Bernardino County. In 1952, the company began work on Redondo No. 2, which was adjacent to an earlier plant at Redondo Beach. In 1953, the Etiwanda plant went online, followed in 1955 by El Segundo, Alamitos in 1956, and Huntington Beach and Mandalay in 1958. By 1960, all SCE plants either had multiple units or had additional units in the planning stages. In 1950 PG&E operated 15 steam electric plants in California, and during the following decade added several new plants and expanded older ones. Chief among these were the Kern plant (1948-50), Contra Costa (1951-53), Moss Landing (1950-52), Morro Bay (1955), Hunters Point (addition 1958), Humboldt Bay (1956-58), and Pittsburg (1959-60). The Pittsburg plant was at the time of its construction the largest steam station in the west, with a capacity of over 1,300,000 kW in 1960. The LADWP system was much smaller than those of SCE and PG&E, consisting of five steam plants by 1962. In addition to its Seal Beach Plant (1925-28), and Harbor Plant on Los Angeles Harbor (1943) these included the Valley Plant (San Fernando Valley, 1954), Scattergood (1958), and Haynes (1961). SDG&E had three steam-electric power plants, Silver Gate (1943), Encina (1954), and South Bay (1960). By the late 1970s, there were more than 20 fossil fuel thermal plants in California, clustered around San Francisco Bay, Santa Monica Bay, and in San Diego County, along with a few interior plants in San Bernardino County and Riverside and Imperial Counties, as well as a few plants on the Central Coast. [10]

Most of the oil- or gas-fired steam plants currently in use in California were installed in the period from about 1950 through 1970. After 1970, the major utilities began to look for

[9] I. C. Steele, "Steam Power Gains on Hydro in California," *Civil Engineering* (January 1950): 17-21; Edgar J. Garbarini, "Design Saves Construction Dollars on Contra Costa Power Plant," *Civil Engineering* (May 1953): 31-33; Walter L. Dickey, "The Design of Two Steam Electric Plants," *ASCE Transactions* (1956): 253-273.
[10] Annual Reports of the Southern California Edison Company, various years. R.W. Spencer, "Cooling Water For Steam Electric Stations in Tidewater," *Transactions of the American Society of Civil Engineers* 126 (1961): 280-302; I. C. Steele, "Steam Power Gains on Hydro in California," 17-19; Walter L. Dickey, "The Design of Two Steam Electric Plants," 253-255; *Southwest Builder and Contractor*, "Haynes Steam Plant Will Grow With Demand," *Southwest Builder and Contractor* (October 12, 1962): 24-27; Williams, *Energy and the Making of Modern California*, 257.

alternative energy sources, ranging from nuclear power to wind, geothermal, and other "green" energy sources, other than hydroelectric. Despite these efforts, however, fossil fuel steam generation remains the backbone of electrical generating capacity in California. Information from the California Energy Commission (CEC) states that there are currently 34 steam turbine power plants in California of a variety of ages and locations.[11]

History of San Diego Gas and Electric Company

The history of the San Diego Gas & Electric Company mirrors the general history of steam-electric power plant development outlined previously. The utility initially formed during the 1880s and over the next century slowly increased its service area, customer base, and generating capacity, with most of the company's development occurring during World War II and the decades immediately following. Throughout its existence SDG&E has relied on steam-electric generated power as its primary power supply.

On April 18, 1881 a group of San Diego citizens incorporated the San Diego Gas Company to serve a small city with a population of approximately 3,000. With 89 charter subscribers located along it three miles of gas mains, the small company began making gas at its gas plant on June 2, 1881, and began service two days later. The initial plant had a capacity of 25,000 cubic feet of gas per day, which was considered sufficient for a population of 20,000. The plant made oil gas from crude petroleum, but was modified for coal in 1883.[12]

The completion of the California Southern rail line from San Diego to Barstow in 1885 to connect with the Atchison Topeka and Santa Fe's Atlantic & Pacific Railroad, issued in a land boom in San Diego as the population climbed to approximately 35,000 inhabitants. In 1887 the San Diego Gas Company consolidated with the Coronado Gas and Electric Company into the San Diego Gas and Electric Light Company. The new company enlarged its gas plant and built its first electric generating plant (later named Station A) on the adjacent property. The capacity of the gas plant had been increased to 400,000 cubic feet per day, sufficient for a population of 100,000, and the new steam electric generating plant supplied 770 kW of power through four

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[11] The California Energy Commission retains figures on the fuel type for all electricity used in the state, even if the power is generated out of state. In 1999, natural gas-fired generators were responsible for 31% of all electricity used in the state, compared with 20% for hydroelectricity. Coal-fired steam plants, all of them out of state, accounted for 20% of the total. "Green" sources accounted for 12%. The percentage of in-state natural gas-fired steam electricity is much larger than 31%, since all of the coal and much of the hydroelectric power is generated out of state. See www.energy.ca.gov/electricity/system_power.

[12] Except where otherwise noted, the following history of the San Diego Gas & electric Company was taken from the following sources: San Diego Gas & Electric Company, *San Diego Gas & Electric Company: A Review of its Origin, Growth and Corporate History From 1881 to 1962* (San Diego: San Diego Gas & Electric Company, 1962); and Iris Engstrand and Kathleen Crawford, *Reflections: A History of the San Diego Gas & Electric Company 1881-1991* (San Diego: San Diego Historical Society and the San Diego Gas & Electric Company, 1991).

steam driven generators. During the 1890s, however, the population boom waned and the company's costumer base grew modestly, but steadily.

In April 1905 the company was sold to H.M. Byllesby & Company of Chicago reincorporated as the San Diego Consolidated Gas & Electric Company (SDCG&E). At this point, the company was serving 2,168 gas and 1,258 electric customers. The new owners began replacing the old equipment at Station A in 1906, when its first steam turbine generator with a capacity of 500 kW was installed. Other improvements followed, including the addition of a 2,000 kW turbogenerator in 1909, followed by 4,000 kW turbogenerators in 1912 and 1914. The company also made improvements at its gas plant, including switching from coal burning back to oil in 1906, following advances in oil production that made it economically feasible. By 1920 six new gas generators were online and the plant had a capacity of approximately 6,250,000 cubic feet per day. Construction during this period also included extending the gas and electric distribution systems beyond the San Diego city limits to the surrounding communities, including National City, La Jolla, Chula Vista, La Mesa, Imperial Beach, and San Ysidro.

In 1918, the company further extended its system with the construction of its first high voltage transmission line, a 66 kV line extending 75 miles north from San Diego to Del Mar, Oceanside, and San Juan Capistrano where it tied into the transmission system of SCE. This interconnection gave the smaller SDCG&E access to a source of hydroelectric power to supplement the capacity of its own steam generating plant in times of need. However, the first transfer between the two companies occurred the following year when severe drought caused a shortfall in the SCE system, and SDCG&E sent its surplus power north. Today, the SCE-SDG&E interconnection provides for the exchange of 100,000 kW and functions as the company's main tie with other members of the statewide energy pool.

By 1920 the company was serving 115,000 electric customers and its energy needs had outgrown Station A. In 1921 the company purchased the 8,200 kW San Diego Electric Railroad power plant, renaming it Station B. In 1923 the company installed a 15,000 kW generator, which surpassed the entire generating capacity of Station A, followed by a second 15,000 kW generator in 1927, and a 28,000 kW generator in 1928. These improvements, known as Station B, increased the capacity of the system from 46,000 kV to 74,000 kV. In addition, the company began upgrading its transmission lines from 11 kV to 66 kV, beginning the development of today's expansive transmission system. By 1930, the company was serving over 70,000 customers.

However, during the decade of the 1930s customer gains dwindled as did company investment in its electrical system. In 1932 the company changed over from manufactured gas to natural gas, which increased the capacity of its gas system to 22 million cubic feet per day. While natural gas was found for be 50 percent more efficient than manufactured gas, gas sales increased by 110 percent during the 1930s. The San Diego area received renewed economic stimulus in 1938-39, with pre-World War II defense expansion leading to a revival in employment at aircraft manufacturing plants and increased activity at the area's naval installations. In 1939 the company installed a new 35,000 kW generator at Station B, increasing its total capacity to 99,000 kV, and took Station A offline.[13] Station B carried the entire load of the company's service area until 1943 when another interconnection was made so that the SDCG&E could purchase surplus power from other systems, and the company brought a new power plant online.

The World War II years were a period of tremendous growth for the San Diego metropolitan area and for SDCG&E. Between 1940 and 1945 the population of the area increased 90 percent, to 550,000, and SDCG&E added over 17,000 gas and 21,000 electric customers. Peak loads exceeded the company's generating capacity, forcing the company to rely heavily on purchased power. In 1941 the Standard Gas & Electric Company, which had a few years earlier succeeded H.M. Byllesby & Company as owner of SDCG&E, decided to divest the company's stock and the company became an independent organization, renamed the San Diego Gas & Electric Company (SDG&E). In 1941 the reorganized company began construction of a new power plant at Silver Gate on San Diego Bay, with the first 35,000 kW generator online by 1943. However, the company's annual peak load was 169,000 kV in 1945, forcing a continued reliance of purchased power.

Growth continued at an extremely rapid rate in the post World War II years. By 1950 SDG&E had added over 37,000 new electric and 21,000 new gas customers, but because of shortage in materials and manpower the company was unable to keep up with growing demand. Silver Gate Unit 2 came online in 1948, adding 50,000 kW to the system, but the company still relied heavily on purchased power. During the 1950s, San Diego's population passed the one million mark, and the company invested over $190 million in construction of new power plants. The company planned to bring a new steam-electric generating unit online every two years to meet continually increasing demand beginning in 1950 with Silver Gate Unit 3, followed in 1952 by Silver Gate Unit 4, both 66,0000 kW units. With four units in operation, the capacity of the Silver Gate site was expended, and the company began construction of its Encina Plant, 34 miles north of San Diego near Carlsbad. Three 106,000 kW Encina units went on line in 1954, 1956 and 1958. Though the company tripled its generating capacity during the 1950s to 672,000 kW, demand had doubled to just over 600,000 kW. In order to keep ahead of demand, the company continued its expansion program with the construction on the South Bay Power Plant in Chula Vista. Construction began in 1958, and unit 1 went online in 1960, and Unit 2 in 1962, each adding 142,000 kW to the system. In 1964 Unit 3 came online, pushing the total capacity of the

[13] The subsequent history of Station B is not detailed in the historic record. It was taken offline at an unknown date.

SDG&E system to 1,166,000 kW. South Bay Unit 4, however, would not come online until 1971.[14]

During the 1960s, the decade of the company's most explosive growth, SDG&E became involved in several new ventures, pieces of a four-part long term plan designed to meet ever-increasing energy demands. In 1961, the company entered into agreement with SCE to finance and operate a nuclear-fueled steam-electric generating plant at San Onofre, along the ocean shore at the northwest corner of San Diego County near the Orange County border. The San Onofre Nuclear Generating Station was completed in 1965. Designed by Bechtel Corporation and Westinghouse, the plant was larger than other such plants constructed by the federal government and private utilities during the previous decade. In another innovative turn, the company also completed the first liquefied natural gas (LNG) plant at SBPP for converting natural gas to liquid in 1964-65. This project was the first of its kind in the west, and one of only five worldwide. The company's plan also included becoming a member of the California Power Pool and participating in the Pacific Northwest Intertie, a combination of public and private transmission lines that linked surplus hydro resources of the Pacific Northwest with the power systems in Oregon, California, Arizona, and Nevada. The company also participated in the Kaiparowits Plateau project in Utah during this period. Also in 1965, the federal Department of the Interior built the west coast module of a nationwide seawater conversion program at the SBPP. It was the extension of research and experimental projects between SDG&E and General Atomic Division of General Dynamics Corporation to obtain an economical seawater conversion platform. The seawater conversion plant, along with the LNG facility were removed from SBPP during the mid-1970s. [15] Nothing remains of the desalinization plant; tank and building foundations are all that remain of the LNG facility, which is outside of the study area of this project.

During the 1970s, declining demand led to some delays in the company's plans for expansion, but SDG&E proceeded with its plans to add three more units to SBPP in future years. The company served 500,000 electric customers in 1972, and its existing facilities were adequate to handle the load. In 1975 the Public Utilities Commission granted the company permission to construct the units, but after re-assessing its power needs SDG&E puts its expansion program on hold. Addition power to the SDG&E system later came from the development of geothermal sites in the Imperial Valley and additions to the San Onofre nuclear plant, where the company owned a 20 percent interest in three generating units. During this period, the company spent

[14] *San Diego Union*, June 6, 1948, February 16, 1958, October 18, 1958, October 11, 1959, November 15, 1959, May 1, 1960, June 22, 1962;

[15] *Southwest Builder and Contractor*, "Deep Hole Being Dug For Atomic Plant" *Southwest Builder and Contractor* (August 14, 1964): 14-16; *San Diego Union*, September 17, 1964, January 24, 1965, September 28, 1966, February 18, 1967, May 30, 1968, July 30, 1970, May 9, 1971. Personal Communication with Jim Nylander, South Bay Power Plant Manager, February 14, 2006.

large sums on environmental control programs to reduce nitrogen and sulfur emissions from its plants, and on converting much of its overhead electrical distribution system to an underground system. During the 1980s, the Silver Gate plant had been taken offline. By the end of the decade, SDG&E served approximately 2.5 million customers in a service area that encompassed over 4,000 square miles of San Diego County and the western section of Orange County, with power supplied primarily from plants at Encina, South Bay, and San Onofre. In 1988 SDG&E merged with Southern California Edison, and is now a part of Sempra Energy. [16]

History of South Bay Power Plant

As discussed above, construction of the SBPP was part of SDG&E's plans to accommodate post war growth in its service area by bringing new steam-electric generating units online in two-year increments beginning in 1950. Physical planning for the development of the SBPP, to be sited on the eastern shore of San Diego Bay in Chula Vista, began in 1957 with construction of Unit 1 beginning in 1958. The site was laid out so that addition units could be added as needed. The plant's four units went online in 1960, 1962, 1964, and 1971. The plant's major facilities were constructed during this period. SDG&E owned and operated the plant until 1996, when it was sold to the Port of San Diego, and subsequently leased to Duke Energy, which continues to supply power to the San Diego metropolitan area.[17]

The site selection and construction of the plant was consistent with general engineering practices of the day, and the plant had much in common with other steam-electric power plants constructed during the post war period. As outlined above, the general design criteria for power plants included building the facility close to load centers to reduce transmission costs, in proximity to fuel and water supplies for ease of operation, and locating the plant on a site where land was cheap and could support a good foundation. The plant was also constructed to be a semi-outdoor type, in order to reduce construction cost and provide for ease of expansion. SDG&E had the SBPP designed and constructed without any enclosures over the equipment, creating a more cost-effective plant in terms of maintenance, cleaning, and ventilation. SDG&E was able to build the plant in this fashion because of the usually mild temperatures and dry weather conditions in Southern California. SDG&E built the SBPP near the tidewaters of San Diego Bay to obtain water for feeding the boilers and turbines, and to provide for cooling in the large condenser units.[18]

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[16] *San Diego Union*, May 15, 1970, January 11, 1972, February 15, 1972, January 9, 1973, March 16, 1974, January 3, 1975, October 17, 1975, April 4, 1988, December 2, 1988, April 21, 1989.
[17] San Diego Gas & Electric Company, South Bay Power Plant construction photographs; Pioneer Service and Engineering, "San Diego Gas & Electric Company, South Bay Power Plant Unit No. 1, San Diego, California, Plot Plan," May 31, 1957, revised through August 9, 1971; San Diego Gas & Electric Company construction photographs of the South Bay Power Plant (retained by Duke Energy).
[18] I. C. Steele, "Steam Power Gains on Hydro in California," 17-21; R.W. Spencer, "Cooling Water For Steam Electric Stations in Tidewater," 280-305; Walter L. Dickey, "The Design of Two Steam Electric Plants," 253-273;

SDG&E began construction for the SBPP in 1958 and had Unit 1 in full operation by July 1, 1960. Initial construction included the power plant structure, including a 142,000 kW turbo generator unit, boiler, and associated equipment, as well as many of the associated buildings and structures that would comprise the plant. These additional buildings included a construction office, warehouse, stores and shops building, fuel oil storage tanks, control structures, wastewater treatment facility, and other buildings located throughout the 149-acre site. The estimated cost of construction for Unit 1 plant and site, which included infrastructure for Unit 2, was $22,500,000. Pioneer Service & Engineering Company of Chicago, the firm that designed the company's Encina plant, designed the SBPP. Principal subcontractors on the project included General American Transportation Corporation for erecting the fuel oil storage tanks, Midwest Piping Company, Inc. for installing the piping, C.C. Moore & Company for erection of the boiler, Franks Dredging Company for dredging, and Bethlehem Pacific Coast Steel Company supplied the structural steel for the plant. General Electric Company manufactured the turbine and generator, and Babcock & Wilcox manufactured the boiler. Most of the construction, however, was accomplished by the company's own forces, under the supervision of H.A. Noble, vice- president of operations for SDG&E, and by Walter Zitlau, mechanical engineer.[19]

Because of its location in a low, flat marshy area once occupied by saltwater evaporation ponds, the plant site required extensive planning and the use of alternative construction methods for its foundation, detailed in a 1961 *Civil Engineering* article by Vernon A. Smoots and Phillip H. Benton. Whereas major power plants and other large structures normally required sturdy foundations founded on rock or piles, the authors contend, the SBPP was one of several plants constructed on earth fill, representing the expanding use of soil compaction techniques for heavy structures. Typically, steam power plants were located near bodies of water where soft soils are prevalent, and firm soil or bedrock is often 100 feet or more below ground. Because power plants are extremely heavy and settlement of the foundation must remain small, such an environment creates the problem of foundation support. Costly piles or caissons were generally used in order to reach suitable foundation materials. After considering several methods of pile foundation construction and other alternative methods, SDG&E chose the compacted-fill method for the SBPP as a matter of cost and expediency. This method involved excavating a 380' x 310' x 20' deep area to remove unsuitable soil and replace it with a more suitable backfill. This fill consisted of a layer of crushed rock, followed by a layer of pea gravel and fine to coarse sand. Fine beach sand imported from the Silver Strand was then laid in one-foot layers that were then compacted under close supervision of engineers. The foundation sub-grade for the first two units

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Southwest Builder and Contractor, "South Bay Generating Plant Will Augment San Diego Power Supply" *Southwest Builder and Contractor* (July 10, 1959): 26-32, 37.

[19] Pioneer Service and Engineering, "San Diego Gas & Electric Company, South Bay Power Plant Unit No. 1, San Diego, California, Plot Plan," May 31, 1957, revised through August 9, 1971; *Southwest Builder and Contractor*, "South Bay Generating Plant Will Augment San Diego Power Supply" *Southwest Builder and Contractor*, 26-29.

of the plant was laid at the same time, at a cost of $94,000 per unit. Before the second unit was constructed beginning in 1960, the fill for future units 3 and 4 was placed as a slightly lower cost. The SCE Huntington Beach plant, the City of Burbank's Burbank plant, and California Electric Company's Daggett plant were among earlier plants also constructed on compacted fill foundations.[20]

The building pad and turbogenerator deck for Units 1 and 2 was 110' x 250'. The pad had a minimum thickness of four and one half feet and was reinforced by a double mat of #11 rebar on one foot centers. Concrete for the site was prepared in a batch plant located onsite, with aggregate supplied by H.G. Fenton Material Company of San Diego. Following the construction of the pad and turbine generator deck, 1,475 tons of structural steel was required for the frame of Unit 1. Similar amounts were needed for the subsequent units. The steel members arrived partially assembled from Bethlehem Pacific Steel, and were erected onsite with high tensile strength bolts. As part of the preparation for the construction of the facility, a railroad spur was extended approximately 2,500 feet from the main north-south San Diego & Arizona Eastern Railway tracks that skirt the eastern boundary of the SBPP property to the east side of the power plant building site in order to facilitate construction. This spur was used to bring in the mammoth boilers, turbines and generators units and other large components of the facility.[21]

Another major portion of the construction of the plant involved excavating channels from the power plant out into San Diego Bay for cooling water intake and discharge. The design of the plant included a concrete screening and pumping structure constructed on the south side of the power plant, from which a fifteen-foot deep intake channel was dredged a distance of 6,000 feet into the bay for cooling water. A similar channel for the discharge of warm water was constructed adjacent the intake channel, separated by a 1,000 foot long earth and rock dike. Two 48-inch concrete pipes conducted water from the intake structure to the plant, and a single 72-inch pipe returned the water after use to the discharge channel. The first screen house / intake structure was constructed for Units 1 and 2, and two additional smaller structures were constructed in association with Units 3 and 4, when the channels were also extended. Small pre-stressed concrete bridges were constructed across the channels to conduct fuel oil piping and conduits for control cables to the plant. The pre-stressed concrete beams for the bridges were cast by Southwest Structural Consolidated Concrete Company and delivered to the site by barge and floated into position on piers.[22]

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[20] Vernon A. Smoots and Phillip H. Benton, "Compacted Earth Fill For a Power-Plant Foundation" *Civil Engineering* (August 1961): 54-57; *Southwest Builder and Contractor*, "South Bay Generating Plant Will Augment San Diego Power Supply," 27.
[21] *Southwest Builder and Contractor*, "South Bay Generating Plant Will Augment San Diego Power Supply," 27-29.
[22] *Southwest Builder and Contractor*, "South Bay Generating Plant Will Augment San Diego Power Supply," 29-32.

Immediately after Unit 1 (142,000 kW) went online in July 1960, SDG&E began construction of Unit 2 (142,000 kW), manufactured by Westinghouse, which was completed and online by mid 1962. These units were later upgraded to 147,000 kW and 150,000 kW, respectively. As noted above, the structure for Unit 2 including turbine generator deck and cooling water system was constructed as part of the Unit 1 construction. In the years that followed, the company added two more units: Unit 3 (General Electric, 171,000 kW) in 1964, and Unit 4 (Westinghouse, 222,000 kW) in 1971. In 1966 SDG&E installed a small 2,300 kW peak load or emergency generator near its switchyard located on the north side of the power plant. This unit, comprised of a 72' x 29' x 26' high turbojet generator was manufactured by Pratt & Whitney and resembled an aircraft turbojet powerplant. The turbine, generator, transformer, and control room for the peaker plant was enclosed in a weatherproof, soundproof enclosure. A JP5 fuel tank to for the jet engine turbine was located nearby. The peaker plant was designed to reach full load capacity in three minutes to assist with peak load emergencies. In all, the SBPP was capable of generating 706 mW of electricity.[23]

As mentioned above, during the mid-1960s the SBPP became the site of two additional ventures subsidiary to power generation: the site of a liquefied natural gas (LNG) plant, and a seawater conversion installation. In 1965 SDG&E completed its LNG plant at SBPP, located in the southern portion of the power plant site. Based on cryogenic technology, this project was the first of its kind in the west, and one of only five worldwide. The purpose of the plant was to convert natural gas to liquid form so that it could be stored for peak season use, thus avoiding paying "demand charges" for gas during the peak winter months from its gas supplier, Southern Counties Gas Company. At an approximate cost of $2.8 million, the plant was projected to enable the company to save $10 million over ten years. The plant could handle 25 million cubic feet of "feed gas" daily, which it would clean up, liquefy, store, and re-gasify as needed. The primary facility was a 127 foot tall, 117 foot diameter "thermos jug" (storage tank) that could store 175,000 barrels of gas. In 1965, the US Department of the Interior built the west coast module of a nationwide seawater conversion program at the SBPP. This project was an extension of research and experimental projects between SDG&E and General Atomic Division of General Dynamics Corporation to obtain economical seawater conversion. Both the LNG plant and the saltwater conversion facility were removed from the SBPP site during the mid-1970s.[24]

[23] Vernon A. Smoots and Phillip H. Benton, "Compacted Earth Fill For a Power-Plant Foundation," 54; *San Diego Union*, July 20, 1966, October 5, 1966; California Energy Commission, Power Plant Data Base, July 1, 2004; Pioneer Service and Engineering, "San Diego Gas & Electric Company, South Bay Power Plant Unit No. 1, San Diego, California, Plot Plan," May 31, 1957, revised through August 9, 1971.
[24] *San Diego Union*, January 24, 1965, February 18, 1967, May 30, 1968; Iris Engstrand and Kathleen Crawford, *Reflections: A History of the San Diego Gas & Electric Company 1881-1991*, 186; Personal Communication with Jim Nylander, South Bay Power Plant Manager, February 14, 2006.

In addition to the power plant structure and cooling water channels and associated features, most of the buildings and structures at the SBPP site were part of the original construction. These included the Administrative building, originally a smaller change room and office building that was later expanded, the Stores and Shops building located on the southwest corner of the power plant, the Waste Water Operations Building, two 131,500 barrel capacity fuel oil storage tanks, the Tank Farm Control Buildings, Office Building, Warehouse, and the Wire Storage Building. The location of these buildings is depicted on a map included in the attached DPR 523 form. Alterations to the plant include the construction of a waste water tank farm on the south side of the Waste Water Operations Building on the former site of the seawater conversion facility, the construction and subsequent removal of several oil storage tanks and wastewater ponds.

Evaluation

The South Bay four-unit steam generating power plant does not appear to meet the criteria for listing in the National Register of Historic Places (NRHP) and is not a historic resource for the purposes of the California Environmental Quality Act ((Section 15064.5 (a)(2)-(3)), (CEQA).[25] Furthermore, the property is less than 50 years old, and only one of the plant's four units is over 45 years old. Therefore, in order to be eligible it would need to qualify under the exacting standards for evaluation as an exceptionally significant property. This evaluation finds that The South Bay Power Plant is neither exceptionally significant in the context of the development of SDG&E, nor as an example of a steam power plant from the post-war era.[26] Lacking such significance, the property does not appear to meet the criteria for listing in the National Register and is not an important historic property under CEQA.

The SBPP is not importantly associated with an event significant within the broad patterns of our history (Criterion A). While this property is a component of a larger power generating and delivery system operated throughout most of its lifetime (1960-1996) by SDG&E, it does not appear to represent a particularly significant property within the context of the development of power generation capacity of SDG&E or within the broader context of post-war power development in southern California. Rather, it was one of several such similar plants built in the region after World War II.

As discussed above, SDG&E built new steam plants between the 1950s to about 1971, the time period in which the four SBPP units went on line. These included units at the Encina Power

[25] The NRHP and CEQA both require that historic properties be identified and evaluated by following standardized guidelines and applying significance criteria. Because CEQA guidelines are based on those of the NRHP, the two are nearly identical. For the sake of clarity, this report outlines the NRHP evaluation process; nevertheless, both NRHP and CEQA guidelines were applied in the preparation of this report.
[26] NPS, "Guidelines for Evaluating and Nominating Properties that Have Achieved Significance Within the Past Fifty Years," *National Register Bulletin No. 22* (Washington, D.C.: GPO, revised 1996).

Plant, located in north of the City of San Diego near Fallbrook. The regular addition of steam plant units helped the company survive through a period of great economic and demographic growth. The plants also helped sustain the local economy and population. In this sense all power plants have an important place in local history, which without understanding the over-all context of the system might lead to an over-broad conclusion that all such plants are significant. Within its context, however, this plant did not make an exceptionally important contribution to the history of SDG&E, or within the context of post war power development in southern California. The SBPP currently generates a base load of 706 mw, and was but one of several steam plants that helped the company accommodate the great growth of electrical demand in the San Diego region during the post-war era. Other plants in the SDG&E system included Station A (approximately 15 mw, offline since 1939), Station B (approximately 99 mw, offline since the 1980s), and Encina (909 mw). Since both Station A and Station B have been taken offline, SBPP is the smallest and last of the steam-electric plants in this group. It was, in fact, a typical power plant constructed during the period: it was built in the 1960s; was built sequentially, with the company adding the units in phases; had a substantial power generating capacity; and was sited to be near the major power load centers as well as near water sources that could be used for cooling.

In considering the impact of this power plant on the local economy, it is necessary to appreciate the property in the context of similar resources. It is in the nature of public utilities, as with public works projects, that the benefits of these improvements are widely distributed. Every power generating facility delivers a useful product to a broad market or serves a useful public purpose, as does every highway, airport, sewer system, hospital, school, and other utility and public works undertakings. Analyzed at face value, every improvement made by a utility or public works agency may be seen as having made an important contribution to the community it serves. These types of properties, however, must be appreciated in the context of like properties, to avoid trivializing the elements of what constitutes significance for the property type. The question is not whether the SBPP made a useful contribution to the local economy; it obviously did. The question rather is whether the station made a contribution that is significant within the context of other properties of its type.

In the universe of steam turbine powerplants in California, many are older than SBPP. Duke Energy, the current operator of SBPP, is currently listed as owning two other steam turbine power plants in California, Morro Bay (1955) and Moss Landing (1950), both of which are older than SBPP. Older steam turbine facilities also include Burbank's Magnolia Plant (1943), Glendale's Grayson Plant (1953), PG&E's Contra Costa (1951-53) and Pittsburg (1958) plants, LADWP's Harbor (1943) and Valley plants (1954), and SCE's Redondo Beach (1948), Etiwanda (1953) and El Segundo plants (1955). The CEC also lists a steam turbine co-generating facility in Watsonville with a construction date of 1901. The first unit of the SBPP plant at Chula Vista was built in 1960 and contains a single steam turbine-driven generator. This facility contains the technology from the 1950s that made power plants more efficient.[27]

In this context, the SBPP is by any reasonable measure a typical example of its type. According to the records of the California Energy Commission, the plant has a capacity of 706 mw. In this regard, it is a large but not an exceptional part of the power generating capacity of SDG&E and is a typical but not exceptional steam plant from this period. The steam plants built by SCE, for example, between 1945 and 1965 range in their capacity from about 1,000 mw to about 2,100 mw. The Alamitos station in Long Beach is by far the largest of these, with a capacity of 2,120 mw. Other plants from this era include Redondo Beach, with a capacity of 1,310 mw, Etiwanda at 1,049 mw, and Ormond Beach at 1,500 mw. It appears that the SBPP is actually one of the smaller of the various plants built during this era. The facility's capacity, however, is less important than the general similarities among the various elements of the SDG&E steam generating system. The SBPP was one of several plants the company brought on line during this period and is typical of these plants, albeit having a different capacity than the others. In terms of its role in the history of the company, this plant does not appear to have made an exceptionally significant contribution.

In addition, it does not appear that the plant is exceptionally significant within the context of steam generation plants in California, whether seen in the long history of the area, or in the more limited context of steam plants during the immediate post-war era. As noted above, steam generation of electricity dates to the late 19th century. Among the earliest power plants of SDG&E were small steam plants, Station A, constructed in 1887, and Station B, constructed in 1921, both of which are currently inactive. Steam generation, however, fell out of favor during the period from about 1900 through the 1940s, as many California utilities built numerous low-cost hydroelectric facilities to take advantage of the high-head capabilities in the mountainous regions of the state.

The resurgence of steam power generation in California after 1945 reflects a simple fact: all of the best hydroelectric power generation sites had already been taken, either by other power companies, or the various state, federal and local water development agencies, who were in the midst of a massive program of dam development throughout the 1940s, 1950s, and 1960s. These public projects brought a great deal of new hydroelectric power online that supplemented the SDG&E system somewhat through transfers between utilities. Between 1945 and 1970, the amount of hydroelectric power generated in the state more than tripled, from eleven million

[27] California Energy Commission, Power Plant Data Base, July 1, 2004; R.W. Spencer, "Cooling Water For Steam Electric Stations in Tidewater," *Transactions of the American Society of Civil Engineers* 126 (1961): 280-302; I. C. Steele, "Steam Power Gains on Hydro in California," 17-19; Walter L. Dickey, "The Design of Two Steam Electric Plants," 253-255; *Southwest Builder and Contractor*, "Haynes Steam Plant Will Grow With Demand," *Southwest Builder and Contractor* (October 12, 1962): 24-27; Williams, *Energy and the Making of Modern California*, 257.

kilowatt hours to nearly 38 million kilowatt hours.[28] Most of this new hydroelectric capacity, however, was associated with the power plants of the huge dams that were completed during this era, by local, state, and federal water development agencies. The investor-owned utilities were denied access to these dam sites and most of the economical upstream sites had already been developed. There were a few privately built hydroelectric facilities constructed during the post-World War II era, but these were relatively unimportant compared to other types of power stations.

SDG&E, LADWP, PG&E and SCE built dozens of steam plants during the first two decades after the conclusion of World War II. Primary and secondary literature suggests that these plants were quite similar to each other. Many — South Bay, Contra Costa, Pittsburg, Kern, Moss Landing, Hunters Point, Magnolia, Etiwanda, El Segundo and Long Beach, for example — were built in the outdoor and semi-outdoor design. This design is so characteristic that such plants, whatever the company that built them, appear to be closely identical, even though they often include different sizes of boilers and generators. Most of these plants were located in proximity to water and fuel supplies, and all were built sequentially as the need for expansion arose. In a previously cited article in *Civil Engineering*, PG&E engineer Steele noted the similarities of four major steam plants — Kern, Hunters Point, Moss Landing, and Contra Costa — that the company had under construction in 1950, just a few years before work at the SBPP started. His article emphasized economical measures that were taken to hold down costs on these enormously expensive projects and hinted at cooperation between the PG&E and SCE, both of which were faced with the same types of problems. For example, the saltwater intake at the PG&E Moss Landing power plant was patterned after an intake already under construction by SCE at its Redondo Beach facility.[29] The extent to which SDG&E's plans were influenced by the experience of other companies was not revealed in the research for this project; however, the similarity of SDG&E's plants to others of a similar age around the state is strong.

The SBPP, like other similar aged and designed plants, utilized equipment that was essentially "off-the-shelf." As discussed earlier, it was a substantial project, but was by no means the largest steam station constructed in the San Diego or Southern California region during the post-war era. It does not appear that the station represented a new departure in the technology of steam generation of electrical power. Neither does it appear that the plant represented an important departure in the areas of plant siting, foundation work, or any other aspect of power plant construction techniques. While the foundation work for the plant as discussed above involved a less tried-and-true method of foundation support, it was not revolutionary in terms of construction technology, technique, or accomplishment. The station, therefore, does not appear

[28] Williams, *Energy and the Making of Modern California*, 374.
[29] I.C. Steele, "Steam Power Gains on Hydro in California," 21.

to meet Criterion C, because it does not embody the distinctive characteristics of a type, period, or method of construction.

Neither does the power plant appear to be associated with the life of a historically significant person (Criterion B), nor is it significant under Criterion D, which addresses "information potential" of a property. In rare instances, buildings and structures can serve as sources of important information about historic construction materials or technologies under Criterion D; however, this property is otherwise well-documented and does not appear to be a principal source of important information in this regard.

If a property meets any of the significance criteria, it is then evaluated for its degree of historical integrity. In this case, the station does not appear to meet any of the significance criteria, rendering the status of its physical integrity irrelevant. Despite the fact that the plant appears to largely retain integrity to its original design, the station lacks overall historic significance.

In summary, the South Bay Power Plant does not appear to represent an exceptionally significant property, whether considered within the context of the history of SDG&E, the history of steam electrical generation, or the more limited context of steam plants built during the post-war era. Its dominant characteristic is its typicality rather than its exceptionality.