P·G·and·E·
OF CALIFORNIA

THE CENTENNIAL STORY OF
PACIFIC GAS AND ELECTRIC COMPANY
1852–1952

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CHAPTER 30

Natural Gas

LATE IN the 1920s, Northern California witnessed the beginning of a remarkable utility development which brought cleaner, cheaper cooking and heating to housewives, low-cost space heating to hotels and office buildings, and the many advantages of a more efficient fuel to industry. This was P. G. and E.'s successful piping of natural gas from distant fields to the principal cities in its service area.

One of the oldest fuels known to civilization, natural gas had already made a grand entrance in other parts of the country, where in Cinderella-fashion it had been transformed from a scorned stepchild of oil field operation into a desirable member of the family of fuels. But despite many explorations over the years, no source of the gas could be found in the P. G. and E. territory near San Francisco.

The Company itself in 1921 drilled to 5,200 feet in the Montezuma Hills of Solano County, where geologists had reported signs of a possible gas structure. But to no avail. While gas wells were multiplying in other sections of the country, a dependable and adequate supply of natural gas remained as elusive in the Company's northern domain as good uranium ore.

As related in Chapter 4, water-well diggers unexpectedly struck enough natural gas in Stockton in 1864 to heat and light the courthouse. Stockton was thus the first California city to establish natural gas service. A small number of private wells were drilled in the area, and in 1888 the Stockton Natural Gas Company came into being to serve the city's business district.

Not until 1907, six years after oil and natural gas were found in quantity near the town of Santa Maria in Santa Barbara

County, was the first natural domestic gas service established by the newly formed Santa Maria Gas and Electric Company.

Two years later, oil-well drillers struck a bonanza in the sands of the Buena Vista Hills of Kern County. The first company to utilize the large-volume, high-pressure production of natural gas was the West Side Gas Company, formed in 1910 to serve the oil-field cities of Maricopa, Taft, and Fellows. At about the same time, the California Natural Gas Company built a pipe line from the Midway-Sunset oil fields and extended it to the city of Bakersfield and the Kern River oil field.

The crowning achievement of this oil-boom period, however, was the construction in 1913 of a pipe line across the steep Tehachapi Mountains to feed some 24 million cubic feet of natural gas daily from Buena Vista to Los Angeles, 107 miles away. The job was done by the Midway Gas Company, founded by William G. Kerckhoff, then president of the San Joaquin Light and Power Company. The Midway company bought the gas at the field and delivered it to Los Angeles and its environs for resale by local distribution companies. Consumers actually received a "reformed" natural gas, a mixture with artificial gas that lowered the heating rating but was more economical for the companies to distribute.

By 1924 Southern California cities were being served by 28 gas and oil fields, but no economical source had yet been found for the San Francisco Bay area. The nearest major wells were at Elk Hills and Ventura. Not only was their production insufficient to provide the reserve and continuous supply necessary, but the fuel could not be piped to distant markets at a low enough cost to enable it to compete with oil, coal, or manufactured gas.

Then in 1926 the picture changed abruptly. Probing for oil in the vicinity of Elk Hills, the Milham Exploration Company, organized and owned by Ogden Mills and John Hays Hammond, brought in a big gas well at Buttonwillow, 28 miles west of Bakersfield and 250 miles southeast of San Francisco. Tests revealed the existence of a large underground supply of "dry" (or oil-free) gas under high pressure and having a heating value of 1,000 to 1,150 British thermal units, about twice

that of gas made from oil. The discovery, plus the "surplus" gas then available from Ventura and the parallel development of electrically welded, large-diameter steel pipe, made it possible for P. G. and E. to consider seriously the introduction of natural gas into its territory.

P. G. and E. President A. F. Hockenbeamer entered into negotiations with the Milham Exploration Company and the Southern California Gas Company for purchase of gas and for construction of a pipe line that would link Ventura, Buttonwillow, and San Francisco. Southern California fieldmen had already surveyed a portion of the projected line and a contract was soon drawn up. But it was destined to remain unsigned. For the very morning the document was placed on his desk, Hockenbeamer opened his newspaper to a one-paragraph item announcing that the day before, October 6, 1928, the Milham company had brought in an apparently bigger gas well in the Kettleman Hills, 49 miles northwest of the one at Buttonwillow.

The contract was held up, and as things turned out, the president's caution was well justified. Within a month, the well, known as the Elliott 1, was completed to a depth of 7,236 feet and was shown by tests to be one of the greatest high-pressure gas producers in the country, with a daily flow of 90 million cubic feet of "wet" gas. "The pressure was so tremendous," reported one well tester, "that the noise of the escaping gas made me deaf for nearly a week."

Hockenbeamer made a tour of the new wells and decided to tap both the Buttonwillow and the Kettleman Hills discoveries —a job that called for initial expenditure of $13,000,000 for the construction of the longest pipe line in the West. In a public announcement the president explained:

"This undertaking will prove the greatest contribution of this generation to the growth and development of the Bay area. Natural gas is a cheap and efficient fuel which will not only attract new industries but keep the old ones here. . . . Domestic consumers will also profit. Natural gas has greater heating value than artificial gas. With increased heating values and with rate adjustments we propose to make, consumers in

the Bay area will save $3,000,000 a year in their gas bills." This promise, as we shall see, was more than well kept, the annual saving proving to be ten million dollars instead of three.

The Company entered into contracts with the Milham Exploration Company, the Texas Company, and the Standard Oil Company of California for purchase of gas from the two fields. In January, 1929, construction of the pipe line was begun. The job was completed seven months later. The pipe line, 250 miles long, consists of a 16-inch main from Buttonwillow to a compressor station in the Kettleman Hills, a 22-inch line to Panoche Junction (west of Mendota) in Fresno County, and a 20-inch line which swings through Panoche Pass to Tres Pinos and thence to the metering station at Milpitas, on the southern tip of San Francisco Bay. At Milpitas, a branch runs along the eastern shore of the Bay to Oakland and Richmond, while the main stem continues 44 miles to San Francisco. Capacity is approximately 100 million cubic feet per day.

During construction of this line, P. G. and E. began to look ahead to expansion in the north. Plans were drawn to build another large transmission line from the oil fields up the west side of the San Joaquin Valley to the oil refinery cities of Martinez and Richmond on the eastern shore of San Francisco Bay. A branch line through the Livermore Valley from Tracy would tie into the station at Milpitas, while another line would serve the cities of Stockton, Lodi, and Sacramento. The entire network would thus not only bring natural gas into all the cities of the Bay area but provide a complete loop which could be tapped to supply all the Company's territory in Northern and Central California.

Work on the Valley line, as it was called, was begun, but plans were changed when P. G. and E. learned that Standard Oil of California intended to build a line of its own to its Richmond refinery. To avoid duplication, the two companies agreed to join forces to construct and operate a line of greater capacity than originally contemplated. This line, which ends at Richmond by way of Antioch and Pittsburg, was completed in 1930, and in July of that year the two companies formed a

new corporation known as Standard-Pacific Gas Line, Inc., which owns and operates it.

Natural gas arrived in San Francisco and Oakland on August 16, 1929, and was first used at the Potrero steam-electric station to fire the boilers. The advent of natural gas had been quiet but it was not unnoticed.

"It passed so silently," commented an editorial in the San Francisco *Chronicle*, "that few were aware of the event. There was none of the shrieking of motor cops' sirens or other manifestations that usually herald the approach of a king, a queen, a grand lodge convention or a movie star. Instead, the visitor came in unobtrusively and it was not until the Pacific Gas and Electric Company announced the fact, that San Francisco knew that at last the Kettleman Hills field had been tapped and natural gas is now in the mains of the city."

Within a few months, however, nearly everyone in San Francisco was to have direct knowledge of the new fuel. Up to then, San Franciscans had been using the services of two manufactured-gas plants supplying approximately 8½ billion cubic feet of artificial gas during 1928. But the physical and chemical characteristics of manufactured and natural gas differ so widely that P. G. and E. faced the considerable task of adjusting the gas appliances of the city's 183,000 consumers, along with thousands of customers in the outside territory reached by natural gas mains.

The San Francisco area was divided into 11 districts, each successively to be cut off from the main gas line by a specially placed valve. The installation of these valves took six months. Standpipes were then erected to draw off the manufactured gas. At the same time, the valve was opened to permit natural gas to flow through the district's lines.

The appliance change-over was handled with military dispatch. The public had been prepared for the event by newspaper stories, but to prevent misunderstanding, every consumer received a letter notifying him when to expect the arrival of natural gas and what to do about it before a P. G. and E. man visited his premises. At the Company offices, 600 men were

given a month's training and divided into crews of 35, each headed by a captain who operated out of a district headquarters.

Crews set out on the morning of February 24, 1930, and the last appliance was adjusted exactly five months later. Most of the domestic cutovers involved only minor adjustments of the stove or water heater to reduce the size of the air openings. But special procedures had to be worked out for firms using more complex equipment. Coffee houses utilizing time-controlled roasters, for example, required special handling to prevent a slight drop of temperature that might spoil the roast. In such cases, the Company installed a new set of burners on days when operation of the plant was suspended. Individual procedures were also worked out for hospitals, newspapers, and canneries. The first establishment (outside of P. G. and E.) to use natural gas was the Illinois Pacific Glass Company, then on Fifteenth and Folsom Streets, where a new 8-inch line was constructed to feed this company's large furnaces.

By the year's end, nearly all of P. G. and E.'s Bay area customers were receiving natural gas, and a $2,000,000 job involving the adjustment of 1¾ million appliances had been successfully completed with scarcely an interruption in service.

And what about the Company's 21 manufactured-gas plants? Eight of the smaller ones were immediately retired and four were used to supply fuel to communities too far from natural-gas distribution facilities. The rest were utilized as stand-bys in case of disruption of service or a sudden unexpected demand for additional gas. Taking advantage of a timely development, P. G. and E. later converted some of the larger plants which had been making gas from fuel oil to the use of Diesel oil, a process that increased the plants' manufacturing capacity and provided a product that can be mixed with or substituted for natural gas.

Seeking further economies in the 1930s, P. G. and E. shared in the Pacific Coast development of gas fuel made by mixing butane or propane with air. Tried first in Grass Valley and Nevada City for stand-by service in 1935, this method proved to be so superior to the oil-gas technique that it was soon adopted in Colusa. In recent years propane air service has been

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The Company now maintains 12 gas plants for service during emergencies and to aid in meeting demand when cold weather causes gas consumption to shoot up by millions of cubic feet. These plants have an aggregate daily capacity of 160 million cubic feet.

Introduction of natural gas brought with it a major problem—how to meet the daily variations in demand. The customer cannot store gas on his premises like oil or coal, to be dipped into at will. He depends entirely on the amount available in the pipe line, and this, in turn, depends on the Company's ability to anticipate the demand. P. G. and E.'s early practice was to consult the U.S. Weather Bureau for forecasts at various points in the system. If these reports indicated the approach of cold weather, an anticipated increase in the demand for heating was met by boosting the pressure on the lines and thereby packing them with more fuel than they normally carried. This method worked so well that in 1938 the Company decided to employ a full-time meteorologist whose job is to predict the weather 36 hours in advance. The importance of the meteorologic function is pointed up by the fact that for each degree's difference in daily mean temperature below 65 degrees—the temperature at which most people begin to heat their homes—the demand for natural gas jumps 26 million cubic feet per day.

The full effect of natural gas was realized just two years after the change-over. "The extent to which retail users have benefited by the introduction of natural gas," said the Company's annual report for 1932, "may be inferred from the fact that the revenue received from commercial and domestic consumers in 1932, while greater than in either of the two preceding years, was still $1,946,519 or 9 per cent less than in 1929, the last year of artificial gas, notwithstanding the enlarged usage reflected in the delivery of 78 per cent more heat units. More than 85 per cent of the $2,539,658 derived from sales of natural gas to industrial consumers represents business added during the last three years which could not have been

secured with manufactured gas. We estimate that the use of natural gas is saving all classes of customers about $10,000,000 per annum at the present rate of consumption."

In 1936 P. G. and E. met an increased demand for natural gas in San Francisco and its environs with an additional 45-mile, 22-inch line from Milpitas, covering a region not previously within reach of the distribution lines. Using natural gas from new fields as well as from the Kettleman line, the Company also expanded its service in the southern part of the San Joaquin Valley. Other extensions of trunk lines were built to serve Stockton, Sacramento, and scores of smaller towns in the Central Valley. Today natural gas is delivered by P. G. and E. to points as far north as Eureka (where gas was found in local wells) and to Marysville, Woodland, Chico, Willows and Healdsburg. Additional lines also supply the counties south and east of San Francisco.

The search for new gas wells was also pressed. Two discoveries in the early 1930s were the McDonald Island field near Stockton and the Ten-Section field in Kern County. In 1937 gas from a group of wells in the Montezuma Hills near Rio Vista proved to be so substantial that the Company invested a million dollars in new transmission lines. Now regarded as one of the most important gas sources in the P. G. and E. system, the Rio Vista field supplies more than 300 million cubic feet a day to the Company.

During World War II the natural gas business skyrocketed. In 1941 defense activities boosted gas sales to over 89 billion cubic feet, almost four times the sale in 1930, and by the end of 1945 this had increased more than 150 per cent. War's end brought the question of future natural gas supply. The tremendous drain during the war had cut deeply into the declining reserves; there had been no discoveries of new major sources within the state.

For the first time the Company turned its attention outside California. On August 11, 1947, after completion of a new 1,000-mile line from the rich oil fields of Texas and New Mexico to Los Angeles, P. G. and E. made a contract with the Southern California and Southern Counties Gas Companies to

purchase 75 million cubic feet of this gas daily in 1948 and 100 million cubic feet thereafter until 1953.

This was followed by a preliminary agreement with the El Paso Natural Gas Company of Texas for an additional 100 million cubic feet of gas per day to be delivered at a point on the California-Arizona border where P. G. and E. would take over with a new line of its own. In November, 1948, the Company began preparation to build the 502-mile main which now connects with the El Paso network at the state line.

The project was an ambitious one. Since economies increase as the size of the pipe is increased, the Company's plan called for construction of the biggest pipe ever used for a gas transmission line—a 34-inch main now generally known as the "Super-Inch." This meant the development of new kinds of construction machinery. The terrain presented another problem, for the line had to cross the Mojave Desert, the Tehachapi Mountains, the San Joaquin Valley, and the Coast Range Mountains. Recently completed, the job cost the Company $62,000,000 for pipe line and compressor stations.

Plates for the pipe line were rolled at the Geneva Steel Company's mill in Utah and formed into pipe at the South San Francisco plant of Consolidated Western Steel Corporation, both subsidiaries of U.S. Steel. A special contracting organization—comprising the Bechtel Corporation of San Francisco, the Conyes Construction Company of San Pablo, Calif., and the H. C. Price Company of Bartlesville, Okla.—laid the line. P. G. and E. engaged in 2,000 transactions to obtain the right of way.

Construction began on June 29, 1949, at the northern end of the line 29 miles south of Hollister. The schedule was arranged to avoid winter rains in the north and to make possible the crossing of the Mojave before the blistering heat of the following summer. An 80-mile section of the main was completed by early December and was joined to the Company's 20-inch Bay area line to transport and store an additional 50 million cubic feet a day from the Kettleman Hills.

Men and machines were then moved swiftly to Topock on the California-Arizona border and the major portion of the line was begun. It was a dramatic operation placed against a

backdrop of sandstorms, burning heat, and steep grades. Bulldozer crews prepared the route by cutting and clearing a 54-foot swath along the right of way to permit the 32½-ton trenching machines to scoop out a 5½-foot ditch a mile a day. Behind these monster machines came "baby" bulldozers, known as "doodlebugs," equipped with drags to brush the bottom and leave it smooth. It was not always that easy. There were stretches of rocky ground where the pipe layers had to drill and blast before the trench could be completed.

Meantime the pipe, delivered to the trench by truck and trailer, was welded into long sections and lifted off the ground by a line of special side-boom tractors each weighted to handle up to 39 tons at a radius of 6 feet. Then came the pipe-cleaning crew with a self-propelled rotary wire brush and pumps to flood the pipe surface with primer paint. In odd contrast to the giant machines all about them, teams of men next preceded the self-propelled wrapping and coating machine, flicking off remaining dust with feather dusters to ensure a clean surface and firm bond when the wrapping of asphalt-impregnated rag felt and paper was applied. Finally the pipe was lowered and the trench backfilled. The fittings were then installed and, as a spectacular windup, the line was purged by flowing gas through at sufficient pressure to whip out the dust. Later a plane reseeded the barren land of the right of way to restore the range grass that formerly had carpeted it.

At the end of 1951, pressure "booster" stations at Topock, Hinkley, and Kettleman Hills, costing $11,000,000, were completed to forge the last link in the giant project that now supplies daily 400 million cubic feet of natural gas from Texas and New Mexico to the populous Northern California area.

In 20 years, P. G. and E., starting with a single natural gas line from the Kettleman Hills, had come to control a network of 14,300 miles of gas pipe line branching into 33 California counties.