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MEMORANDUM

TO: Interested Persons

FROM: David Roe

The enclosed, from the Los Angeles Times, is an extensive analysis of utility financial problems, aggravated by commitment to large coal and nuclear power plants. The potential benefits of alternatives are also discussed.

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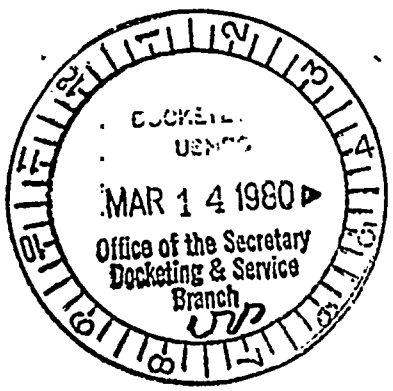

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Stalled Nuclear Plant: PG&E Feels Powerless

14-Year, $1.6 Billion Investment Is Symbol of Critical Squeeze on Nation's Electric Utilities

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Electricity for the '80s: Where will it come from? How much will it cost? Will there be enough? These are difficult questions at a time when nuclear power has fallen from favor and many other electricity sources seem too expensive or pollution prone, or both. This is the fourth and final article in an intermittent series on the extent of the problem and California's potentially pathfinding role in efforts to solve it.

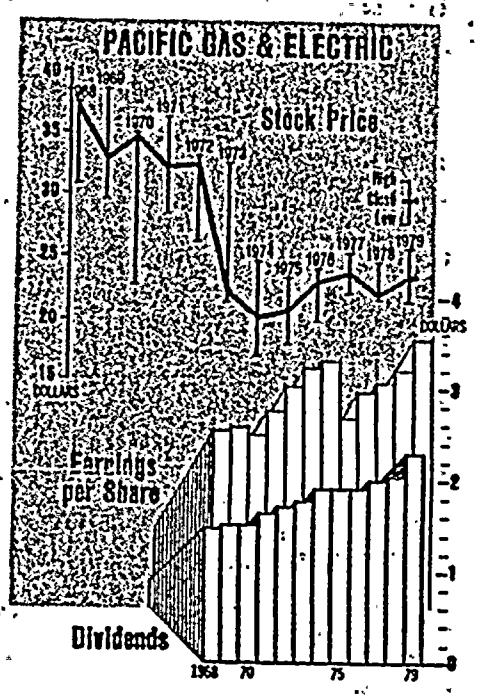
By TOM REDBURN
Times Staff Writer

SAN FRANCISCO—After more than 14 years and $1.6 billion invested in the Diablo Canyon nuclear power plant, there is nothing much that executives of Pacific Gas & Electric Co. can do now but wait. And wait.

Ever since PG&E acknowledged, in 1973, the existence of a major earthquake fault close to the facility, Diablo Canyon has been at the center of controversy. The debate over the plant's safety delayed its start-up. Then, in reaction to last March's Three Mile Island accident, the Nuclear Regulatory Commission imposed a general licensing moratorium on all new nuclear plants. The moratorium will continue, many observers believe, at least until after the November election. This will delay even further a resolution of the safety issue at Diablo Canyon.

"Every month the cost of Diablo Canyon, from the financing charges alone, goes up $10 million," said Stanley Skinner, a PG&E executive vice president. "In the end, our customers will be the ones who pay that bill."

Until the plant is operating, however, PG&E pays the bills. A refusal by the NRC to issue an operating license for the nuclear facility, unlikely as that may be, would plunge PG&E into the greatest crisis in its 100-year history.



If PG&E were forced to write off its entire investment in Diablo Canyon overnight, its common stockholders' equity of about $3.3 billion would be slashed by 50%. The company, according to a PUC staff report to the California Energy Commission, would barely generate enough cash to cover its dividend and debt payments. PG&E would not be able to continue a 15-year, $20 billion construction program.

"It would be a case of extreme financial distress," said Ray Czahr, one of the Public Utilities Commission's chief financial examiners. "PG&E'S only real alternative would be to drastically reduce its construction program . . . The major forecasted expenditures for a large number of additional supply projects would have to be substantially reduced, if not eliminated, over the forecasted period 1980-1993."

PG&E officals argue, that since state regulators approved the plant back in the late 60s, the only realistic option in the event Diablo Canyon never operates would be to include the cost in electricity rates spread out over a long period of time.

None of the other choices is any less bleak for consumers. Even if PG&E could rapidly build two so-called combined cycle plants, designed to run on oil or natural gas, the price the company charges for electricity would still jump substantially. And if the PUC allowed the company to include the unusable Diablo Canyon plant in its rate base—thus violating present policy—prices would increase even more.

The PUC staff estimates that with Diablo Canyon operating normally, average electricity rates would increase from about 4.6 cents per kilowatt/hour in 1980 to 6.5 cents in 1985. Allowing PG&E to charge customers for the costs of the unusued nuclear facility would boost rates to 5 cents per kilowatt hour this year and to 7.6 cents by 1985.

Although that difference seems small, it translates into hundreds of millions of dollars in additional expense for PG&E's customers.

Nor would excluding Diablo Canyon from the company's rate base shelter Northern California from big runups in electricity costs.(PG&E serves over 4.9 million people in California north of the Tehachipis but does not operate in Southern California.)

A financially weakened PG&E would have to pay much higher interest rates for borrowed money, thus increasing its costs and eventually, its rates.

PG&E is not alone in its precarious situation. Roughly $50 billion has been invested by the nation's utilities in uncompleted nuclear power plants. "It is quite likely," Harvard energy experts Robert Stobaugh and Daniel Yergin recently wrote, "that some of the 90 or so (nuclear plants) in various stages of planning and construction will never operate."

Sitting useless on the coast near San Luis Obispo, Diablo Canyon is only the most visible symptom of an underlying illness which plagues not only PG&E but the entire industry. The electric utilities have lost control of their own destiny.

Diablo Canyon is so important to PG&E that executives have made winning a NRC license for the plant the company's No. 1 corporate goal. Yet so sensitive is the issue that company officials are reluctant to discuss the possibility that the 2,200 megawatt nuclear plant may never operate.

Behind PG&E's public wall of unanimity, however, an internal debate rages. The issue is not Diablo Canyon itself, but how to avoid in the future the endless and costly delays that plague any kind of power project and which threaten to undermine PG&E's entire investment program.

"Building a new power plant is a billion-dollar gamble based on uncertain information about the future," said Andrew Ford, a researcher at the Los Alamos Scientific Laboratory. "There is no way to entirely eliminate the risk,

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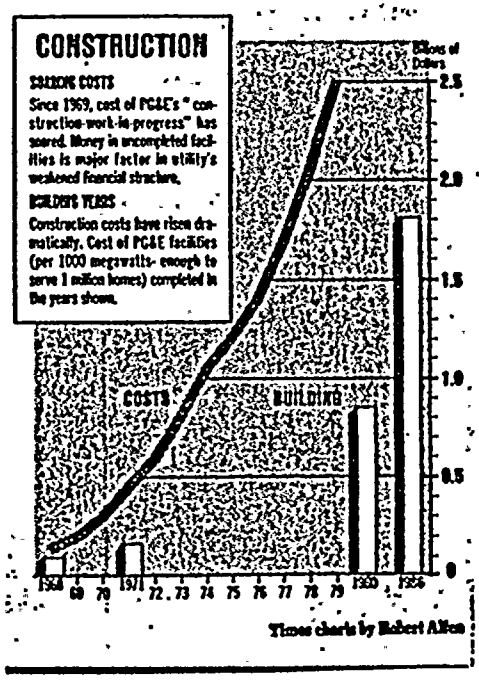

Times charts by Robert Allen

Stalled Nuclear Plant: PG&E Feels Powerless

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yet making the wrong choice can lead to devastating consequences."

PG&E is one of the strongest electric utilities in the nation. Yet from interviews with company executives, government officials, financial analysts and others, it is clear that the San Francisco-based utility simply cannot afford another experience like Diablo Canyon.

The debate over how to survive the future has split PG&E down the middle. Traditionally, PG&E has been run by its engineers, who built the company into the largest privately owned energy utility in the United States during a period when electricity was cheap to produce and demand for power grew at a rapid, predictable rate of about 7% to 8% a year.

Today, the viewpoint of the engineers, from whose ranks president Barton Shackelford came, continues to exert a powerful influence over the company's operations. PG&E has no choice over the rest of the century, advocates of this point of view contend, but to rely primarily on about a dozen new, large baseload power plants—both coal and nuclear—to meet its own projections of rising demand and replace some existing oil-fired power plants.

Another viewpoint, however, is gradually emerging inside PG&E, coming mostly from lawyers and financial experts, from whose ranks chairman Frederick W. Mielke Jr. rose. From this viewpoint, PG&E can no longer be sure that what worked in the past will continue to work in the future.

These officials are not convinced that the alternative technologies recommended by industry critics will solve their problems. They still hold out hope for a nuclear power resurgence. Nevertheless, the increasing financial hazards of traditional big power plant construction programs is leading to a questioning of the engineering strategy. And within PG&E, it is argued that pressure from regulators, environmentalists and others requires the utility to adapt to changing circumstances, particularly by trying to control demand for electricity and by developing strategies to reduce the risks of relying so heavily on the traditional technologies.

Mielke, the chairman, said there is no fundamental rift at PG&E but adds that the difficult problems facing the company have led to some major changes in decision making.

"There are so many more uncertainties today than there ever were in the past," Mielke said. "There are great uncertainties as to what growth will be, great questions about costs, yet we are faced with decisions that require much bigger investments than we used to make. We have had to systemize our decision making far more than before."

"PG&E is in a box," contends Irvin C. Bupp, a utility industry expert from the Harvard Business School and one of the authors of the recent book, "Energy Future." "They cannot continue with business as usual without drastic rate increases on the order of 25% per year higher than historical increases. That is both so undesirable and so unlikely that some of the company's executives are beginning to recognize the dilemma the company faces."

There are several indications that PG&E is reexamining its original plans. For instance:

—Last month, PG&E announced it would delay the application for its first proposed coal units, Montezuma 1 and 2, in favor of a three-month study of energy alternatives, including increased conservation, power plants which could run on different fuels, industrial cogeneration, and building smaller rather than larger coal facilities.

—Late last year, Mason Willrich, a lawyer who has written a book with nuclear scientist Theodore Taylor on the dangers of nuclear proliferation, was hired to fill a new post as vice president for corporate planning. Willrich's appointment raised eyebrows both inside and outside PG&E, for he brings a new outlook to a company that has not brought an outsider into such an important position in decades.

—In 1978, when the California Supreme Court said the PUC could not require utilities to offer 8% loans to customers for home insulation purchases, PG&E, unlike some other utilities, said it wanted to continue to offer the below-market loans anyway. (The state Legislature last year gave the PUC expanded powers to require energy-efficiency investments.)

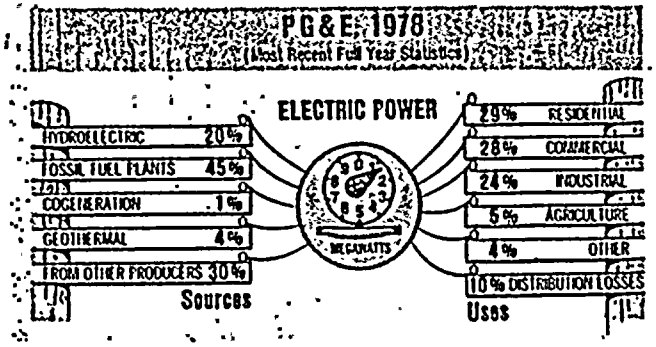
—In September, when PG&E submitted its latest supply plan, the company substantially increased its proposed development of cogeneration, an energy-saving method of producing useful heat and electricity at industry sites. It also included plans for expanding use of load management during periods of peak demand as well as accelerating development of solar heating and wind power. All such measures tend to reduce the need for new central power plants.

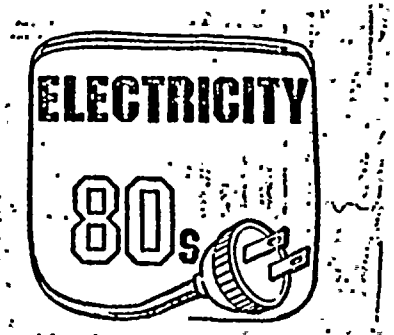
"I'm very encouraged by the changes at PG&E," said John Bryson, president of the PUC and one of the key individuals in state government pushing to improve energy efficiency and develop new energy sources. "I think some of the people in top management are recognizing the risks of the traditional methods and the financial advantages of investing in improved energy efficiency."

None of these has been easy for PG&E. It has not moved in this new direction without tough prodding from the PUC, nor have its executives given up their serious trepidations.

"A utility is different from any other business," said Nolan Daines, PG&E's vice president for planning and research, "and I'm not sure most people understand that. We are required to serve the entire market whether it is to our advantage or not. At the same time, we have a product that cannot be stored, yet we have to be ready at any moment to meet demand. In planning for electricity supplies, we can't afford to come up short."

So far PG&E hasn't come up short. But its reserve margins have dipped to dangerously low levels at peak periods in recent years. There is an





intense fear within the company that because it is so dependent on hydropower, an unusually dry winter and hot summer could combine to force unexpected blackouts on its customers.

Even this potential disaster pales in comparison, however, with the accumulation of problems that PG&E, like the electric power industry nationwide, confonts today. "The electric power industry has difficulties that threaten to shake the foundations of the nation's economy," wrote Sheldon Novick in "The Electric War." "Economic realities have changed, and the new high prices of fuel and capital, which seem to be permanent features on the landscape of the next few years, may mean that the central-station monopolies are traveling the course of rail passenger service—a necessary service that becomes increasingly unprofitable as competitors absorb the more lucrative industrial business. The utilities' long fight against public ownership may end in defeat—through receivership, as in the case of Penn Central, rather than socialism—unless the power companies take aggressive action to adapt themselves to changing conditions."

When Novick wrote that in 1976, he detected almost no sign of adaptation. Indeed, as their troubles have mounted, many PG&E officials have tended to blame everyone but themselves for the company's problems.

This is not to say that environmental restrictions and regulatory obstacles have not created serious problems. But many PG&E executives have simply blamed the industry's critics for the company's troubles, arguing if outsiders would get out of the way, the problems would disappear.

A 1979 best-selling novel by Arthur Hailey "Overload," which was written with the help of a PG&E public relations executive, provides a revealing glimpse at this attitude. In the novel, a mythical "Golden State Power & Light Co." is beset by an environmental group, the "Sequoia Club," which is secretly financing an irresponsible consumer advocate, who, in turn, is in league with a terrorist whose bombs kill company officials and create severe blackouts by destroying power equipment. When this far-reaching conspiracy is finally discovered by a reporter, opposition to GSP&L's power projects vanishes.

"Some of us were awfully disturbed by the implication in that book that the Sierra Club was involved with terrorists," said one PG&E official. "But I'm afraid that there are many people here who see the outside world that way."

It doesn't take a conspiracy theory, however, to account for PG&E's problems. But it is necessary to understand the power industry's tremendous past successes to recognize why it has failed so badly in dealing with its present traumas.

For the first seven decades of the 20th century, real electricity prices

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PG&E's Nuclear Plant Still Stalled

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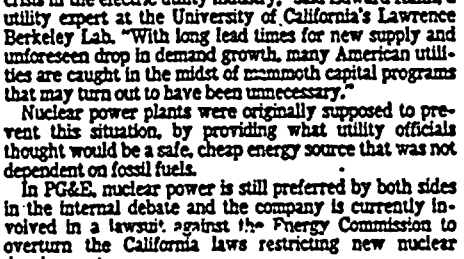
fell steadily, primarily because technological advances and advantages of scale from building larger power plants insured that each additional power project produced electricity at a lower cost than past facilities. And because electricity was seen as a undeniably useful product, growth in demand was taken for granted.

As utilities invested increasing sums to build new central stations and distribution systems, the size of their "rate base" grew along with it. Regulators simply permitted the utilities to earn a profit on that growing rate base, which meant that growth in sales assured growth in profits —without the need for higher rates to consumers.

Now all that has changed. Inflation has helped cause construction costs and borrowing expenses to soar, while the 1973 Arab oil embargo and the subsequent OPEC price hikes pushed energy costs through the roof. The U.S. utility industry, which had continued to order dozens of new power plants, mostly nuclear, in the early 1970s on the expectation that construction costs would be relatively stable and demand would continue to grow rapidly, was unprepared for the turnaround. And most executives did not expect higher prices to measurably reduce electricity demand.



"Forecasting problems lie at the heart of the present crisis in the electric utility industry," said Edward Kahn, a utility expert at the University of California's Lawrence Berkeley Lab. "With long lead times for new supply and unforeseen drop in demand growth, many American utilities are caught in the midst of mammoth capital programs that may turn out to have been unnecessary."

Nuclear power plants were originally supposed to prevent this situation, by providing what utility officials thought would be a safe, cheap energy source that was not dependent on fossil fuels.

In PG&E, nuclear power is still preferred by both sides in the internal debate and the company is currently involved in a lawsuit against the Energy Commission to overturn the California laws restricting new nuclear development.

But the experience with Diablo Canyon has privately soured many company executives. "Being practical men," said one financial analyst for a Wall Street firm, "they recognize that it would take a fundamental shift in the political climate to make nuclear investment sound again. I can't believe they are prepared to go through another Diablo Canyon experience."

The slowdown in growth of electricity use has provided a welcome breathing spell for PG&E during the time that Diablo Canyon has been delayed. Yet its investors, while continuing to supply much of the money for new spending programs, are demanding higher and higher interest rates and dividend payments to compensate for the increased risk and deteriorating balance sheet.

Because electric utilities are the most capital intensive of all industries and are so heavily dependent on borrowing to finance new construction, investors' attitudes are critical.

Despite steady dividends and relatively good earnings, PG&E's stock price has fallen in the last decade from nearly $40 per share and a price/earnings ratio of 15 to less than $25 a share, with investors willing to pay only seven times annual earnings for its common stock. Instead of selling well above book value, as its stock did in the 1950s and 1960s, PG&E is now selling about 20% below book value, which means its existing shareholders' stake is substantially diluted each time the company issues more stock to raise capital.

Inflation, of course, has hurt many other companies in the stock market as well. But it has a particularly harmful effect on utilities like PG&E, which must now pay very high interest rates to borrow money over long periods of time, meaning that many new power plants end up costing nearly as much in interest payments as in actual construction expenses.

The quality of PG&E's earnings, the amount of internal cash flow, are at historic lows," said the PUC's Ray Czahr in recent testimony, "and this is directly attributable to the investment in Diablo Canyon. Considering that there is great uncertainty as to when and if the plant is included in the earnings base of PG&E by the PUC, additional expenditures on capital intensive projects which require long lead times would only exacerbate PG&E's current financial position."

When Diablo Canyon was originally proposed—the first unit in 1966 and the second in 1968—the estimated cost was about $320 million, or approximately $147 for each kilowatt of installed capacity. In 1971, the estimate was re-

ready spent nearly $1.7 billion and it will have to continue to pay the $10 million a month borrowing charges until the plant is approved for operation.

In the meantime, the federal government has forbidden greater oil use by electric utilities and said it will ban the burning of natural gas in utility plants after 1990. Earlier this month, the U.S. Department of Energy notified PG&E that an oil-fired power plant that was on the drawing boards before the rules were imposed would not be permitted to be built. At the same time, the California Energy Commission has stopped any new nuclear units in the state and suggested that existing air quality rules will prevent PG&E from building more than one major coal plant in California.

"We've seen a tremendous buildup in the regulatory environment in a very short time," said Willrich, the new PG&E vice president. "There is no reason it should take 14 years to complete a power plant—but it does. In this environment, PG&E has to be extremely careful about any investment in a future power project."

From the testimony PG&E executives have given, it is clear that some officials are not particularly enthusiastic about huge coal plants as an alternative to nuclear power.

"The only alternative, other than nuclear, which is available, is coal," said Mielke, PG&E's chairman, in a deposition for the company's suit against the California Energy Commission. "It was our desire to avoid using coal ... There are many more uncertainties now as to what will be required to get a coal-fired plant built in this state. (It is) something which has never been done, and (we must) meet a changing array of air pollution control requirements of very uncertain nature, and do so with technology that is not fully proven."

The Environmental Defense Fund, one of PG&E's critics, has proposed what it sees as a way out of this dilemma for the company. It has developed an economic analysis that suggests PG&E would be better off if it diverted nearly all its planned spending on big power plants to smaller projects which can be developed more quickly, such as cogeneration, and to investments by the utility to reduce demand, such as solar water heating and residential weatherization.

"We're not out to hurt PG&E," argued David Roe, EDF's West Coast counsel on utility issues, "we're out to help them *and* improve the environment at the same time. We want to help them recognize that investing in the demand side can be better than an exclusive focus on supply and

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After 14 Years, PG&E's Nuclear Plant Is Still Stalled

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that small, quickly-developed projects provide financial advantages the utility and its ratepayers can't get if it has to wait 10 years to bring any power plant on-line."

EDF, unlike most other environmental and consumer activists, has never opposed utility involvement in home insulation and solar energy. "PG&E should be authorized to make a profit on those things just like it does when it builds a central-station power plant," Roe said. "That's the only way to insure that the most cost-effective investment is made."

The PUC has responded to this critique by conducting a wide-ranging investigation into PG&E's supply plan, one of the first such examinations ever by a regulatory agency in the United States.

In the first ruling to come out of that investigation, the PUC last year found that PG&E had not actively pursued cogeneration as a major supply option and imposed a $7 million profit penalty against PG&E to induce greater cogeneration development.

Instead of appealing the decision, as it probably would have in the past, PG&E will attempt to meet the PUC's goal of contracting for 600 megawatts of new power from cogeneration within the next year or so. If successful, that would restore the lost profit to the company.

"Losing that money certainly got our attention," said Stanley Skinner, a PG&E executive vice president and the top financial man at the company. "But it also produced a lot of worries because cogeneration is not dependent just on our efforts but also requires the cooperation of others."

What worries some of PG&E's executives even more about cogeneration is that is enables industrial users, shopping centers and other large energy users to produce their own electricity instead of relying on the utility. "Why should we pay someone to compete with us?" questions one PG&E official.

But others see advantages to PG&E from cogeneration. "It may well be that (cogeneration and other untraditional power projects) are just as capital intensive," said Willrich, "but on the other hand the company could benefit from shifting some investment into different firms and not have to shoulder these tremendous costs itself."

Smaller projects that can be developed faster than traditional power plants are also viewed by some executives as a way to ease the company's financial squeeze. "It's a real broad generalization, of course, but as a rule the faster you get a return on investment, the greater financial advantage there is," said Skinner. "What we are exploring is the total context of whether the alternatives will ultimately produce the amount of generating resources in the time frame needed."

At the same, time, the traditional industry trend toward building larger and larger generating units is being challenged within PG&E's executive offices.

"We are going to examine the whole assumption that big power plants are better," said Willrich. "Perhaps there are some real financial gains from having units of 600 megawatts or less. A lot depends on the financial environment and a lot depends on the regulatory environment." At the present, PG&E's Montezuma coal plant is supposed to be built in 800-megawatt units. By comparison, Diablo Canyon's two nuclear units are about 1100 mw each, while PG&E's oil plants are generally smaller. (A 1000-megawatt plant will serve the needs of more than a million homes.)

A recent study by Los Alamos Lab's Andrew Ford supports the argument in favor of small coal units. "Because larger power plants cost less to build for each kilowatt of capacity, it is often thought that the trend towards larger power plants makes good economic sense," Ford wrote in a forthcoming article. "Economy of scale is not always sufficient to justify the choice of larger plants. Large plants suffer from reliability problems which can negate their apparent cost advantage. They also take longer to approve and construct, making demand forecasting and system planning more difficult. For many utilities, it may well be that a collection of smaller power plants would lead to a lower price of electricity for their customers and fewer planning headaches for their executives."

For the first time since statistics have been kept, the U.S. utility industry last year reversed the trend to larger units and ordered new plants that were somewhat smaller, on average, than those ordered the previous year.

That may have only been a temporary aberration, though, and the debate is certainly not settled. "There are still economies of scale but they will not permit us to lower rates as we once did," PG&E president Shackelford said. "They may not be as apparent as in the past but they are still there."

The PUC has followed up its PG&E investigation by an equally important study of solar energy financing which recommends that all of the state's utilities be required to finance cost-effective installation of solar water heaters in residences. Already, the PUC found, it is cheaper to reduce electricity demand by replacing electric water heaters with solar units than it would be to finance a new power plant to produce more electricity. And solar water heat is nearing the competitive point with natural gas as well, given the dramatic and continuing natural gas price hikes of recent months.

Moving in this direction is not likely to eliminate the need for every new base-load power plant, even under the best of circumstances. But many of these profound changes may well have to work their way inside utilities like PG&E if the industry is ever going to be restored to economic vitality.

As it stands today, PG&E plans to nearly double its existing capacity of about 15,000 megawatts by 1996, a goal company officials admit may be impossible to achieve. About 75% of the capacity additions are supposed to be coal and nuclear facilities, with the largest chunk of other power coming from PG&E's innovative geothermal project in the Geysers area north of San Francisco.

But, recently the company has significantly increased the amount of generating capacity it expects to get from cogeneration and small hydro and wind projects to more than 1,000 megawatts by 1990.

Even more significantly, new policy directions from the PUC suggest that PG&E will become much more active in limiting peak demand by financing home insulation, load-management devices and other decentralized technologies to help avoid the need for massive commitments to big power projects.

"We don't really see any difference in objectives between PG&E and the PUC," PG&E's chairman, Fred Mielke, said. "We are trying to maximize conservation in every way and we are encouraging our people to be innovative. Any supply policy now depends on that."

If these new directions prove successful, analysts and energy officials say PG&E may need less that half as many power plants, with the gap being filled by improved energy efficiency and smaller generating units, such as cogeneration facilities. If they are not particularly successful, PG&E and its customers will be faced with a real crunch.

"I would like to see a whole lot more cooperation among utility managers, regulators and environmental groups in dealing with the profound problems of the utility industry," said Harvard's Chip Bupp. "The whole planning process needs to be inverted and demand can no longer be treated as something that has a life of its own. The risk of having too much or the wrong kind of capacity has simply become too great for that old system to continue.

"PG&E and the other California utilities are among the few utilities actually grappling with these problems, but the rest of the industry is going to have to start soon. Otherwise, the situation for all of us is going to get worse and worse."