ELECTRIC ENERGY DEMAND AND SUPPLY PROSPECTS FOR CALIFORNIA

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I. RECENT HISTORY OF ELECTRICITY FORECASTING IN CALIFORNIA

The debate over forecasts of electricity demand in California has been going on before the California Energy Commission for over two years, and before the Public Utilities Commission and State Legislature for over five years. This debate on electrical demand forecasts was engendered by the strong environmental protection sentiments of the late 1960's, most notably spurred on by the Santa Barbara Channel oil spill. There was further a belief in some quarters that California utilities were overexpanding and might fill the coastline with nuclear power plants. The adoption of the Federal Clean Air Act Amendments, the National Environmental Policy Act (NEPA), and the California Environmental Quality Act, all in 1969, and the establishment of the California Coastal Zone Commission in 1972, signalled a major environmental movement to regulate utility growth.

The debate over the rate of growth in electricity demand in California, where some noted that high projections are potentially self-fulfilling, led to the establishment of the California Energy Commission in 1975. The debate over electrical forecasts has not been eliminated. However, the California Energy Commission prepared statewide electricity demand forecasts with assistance and critical review from the State's five major utilities: Pacific Gas and Electric, Southern California Edison, Los Angeles Department of Water and Power, San Diego Gas and Electric, and Sacramento Municipal Utility District. The Commission officially adopted a "most likely" forecast for use in approving new generation facilities. While the forecast remains controversial, it is the first fully documented electricity demand forecast officially adopted as a basis for approving on a statewide basis proposals to construct new generation stations.

Since the methods and significance of forecasting are poorly understood by the layperson, there is more often than not a somewhat confused intuitive reaction to forecasts and the question of forecasting. Before describing the historic and current electricity demand and supply situation in California, I would like to make a few brief observations on this complex subject.

Why should we concern ourselves with forecasting? Besides, as most observers must be aware, aren't forecasts almost inevitably wrong? It is commonly believed and claimed that our rate of economic growth and the current level of economic activity are intimately tied to the use of energy. Thus, forecasting well and providing adequate energy supply is essential to our economy. Although there is almost no disagreement on the basic importance, there is substantial controversy about what the exact relationship has been or needs to be in the future.

Trends in foreign countries' energy use per capita and energy/GNP ratios are often used to attempt to generalize that less energy intensive patterns are compatible with rising standards of living and are feasible for the United States. However, these comparative assessments are often flawed by a failure to properly recognize basic economic, geographical and natural resource differences, such as the large, inexpensive hydro resources in Norway and Swedea, which allowed energy intensive industries to be developed. We can also observe that proportionally less energy is utilized where energy prices are high relative to the costs of other inputs such as capital and labor. For example, a recent study of European electricity pricing and load management experience by the Rand Corporation* showed that the European utilities selling electricity at rates reflecting daily and seasonal supply cost differentials affected significant changes in both the intensity and time of electricity use.

Accurate forecasting is important because it determines the magnitude and lead time of major energy investments. The high cost of new baseload generation stations (a 1,000 Mw nuclear station now costs up to $1.5 billion; a coal station, $1.3 billion) and the extended time horizon over which these expenditures are made (now well over 10 years), means that economically optimum investment decisions can only be made if we have accurate forecasts.

Accurate forecasts are also important to assess the financial feasibility of utility supply plans. In the Energy Commission's recent examination of the feasibility of financing the proposed Sundesert Nuclear plant of San Diego Gas and Electric, it was determined that financing the expansion proposed by SDG&E would cause a severe strain for that utility unless substantially higher rates were approved by the California Public Utilities Commission. The demand forecast is a major factor in determining rate of return.

What is our historic experience with electricity demand growth in California? Historically, electricity demand has grown at rates above 7 percent, with sales doubling in less than ten years. Major factors influencing this growth have been the cheapness and convenience of electricity. The real cost of electricity relative to other goods and services has declined steadily since the 1920's. Also contributing have been promotional

* "Electricity Pricing and Load Management: Foreign Experience and California Opportunities," B. Mitchell, Rand Corporation, March 1977.

pricing and declining block rates for industrial power. These latter two factors have been major targets for critics of the utility industry, especially where the rates have not reflected marginal costs of service. Believers in the logic that utility forecasts are self-fulfilling prophecies have noted that declining block rates which do not reflect the true marginal cost of supplying power provide an uneconomic stimulant to demand growth.

The sharp jump in the price of oil in 1973-1974 has resulted in higher electricity prices, reduced electricity demand growth rates, and increased public awareness of the need to conserve. The economic recession which followed also contributed to the sharp drop in the rate of demand growth in California.

The declining rates of growth in demand contributed to the view that tighter regulation of utilities was necessary to prevent overbuilding. In addition, the scarcity of good sites and water at inland sites, and air pollution in urban centers were cited by proponents of tighter regulation. On the other side, many utility analysts claim today that the utilities are tending to under capitalize, and under build, reflecting the high cost and difficulty of raising capital in the face of stringent CPUC rate policies.

The current excess capacity situation for the Los Angeles Department of Water and Power and the deficit in required reserves for Pacific Gas and Electric,* as demonstrated by the reserve margins in Figure 1, support our belief that there are grounds for improving our forecasting and planning applications.

The important task at hand is to learn from the past and establish public goals which provide for future economic growth. This is the responsibility facing the California Energy Commission, Public Utilities Commission, Air Resources Board, and other State regulatory agencies concerned with energy matters.

What has been our experience with post-embargo electric growth? As noted above, our historic electricity growth rate of more than 7 percent has dropped substantially in the last few years. Two years ago, in their official ten-year forecasts, the five major California utilities forecasted a growth rate of approximately 5.1 percent for energy sales, and 4.8 percent for peak demand (1976-1935). Figure 2 shows the peak demand forecast and the adopted Energy Commission forecast which provides the basis for Commission approval of new facilities. The Commission's lower growth rate forecasts were approximately 4.5 percent for energy and 4.3 percent for peak demand. Actual experience to date has shown that sales grew at approximately 2.5 percent in 1977, and peak demand by only 0.5 percent. A one percent difference in the forecasted rate of growth translates into roughly a 3,500 Mw capacity difference statewide by 1935.

* The delay in the licensing of PG&E's Diablo Canyon's 2200 Mw nuclear station, and hydroelectric capacity lost in the 1976-77 drought, contributed to their low reserve margin.

Based on the utilities' March 1978 forecast submittals, shown in the table below Figure 2, one can see a general lowering of the utilities' previous peak demand forecasts from 4.8 percent to 4.1 percent per year between 1976 and 1985. It should be noted that a related change has been a much more explicit measuring of the effects of conservation measures, such as mandatory State building and appliance standards and utility conservation programs.

How do the forecasts displayed translate into capacity needs? Forecasts of peak demand dictate required new capacity to provide reliable peak demand service, as well as to meet baseload energy needs. It is also important to recognize that capacity is added to a utility system for reasons in addition to simply accommodating demand growth. Economic considerations, for example, may cause the addition of new plants and decreased use or placement on standby of old plants. Further, reliability considerations and rising fuel costs may lead to the addition of plants with different fuel requirements.

How is electricity generated in California today? The fuels picture in California has changed dramatically over time, as shown in Figure 3. Cheap and abundant natural gas has been the dominant electrical energy source, with hydroelectric energy placing second. Beginning in 1970, natural gas availability dropped drastically, replaced by increased fuel oil use. In the 1976 and 1977 drought years, California's hydroelectric output was more than halved. In 1976 this loss was offset by increased imports of Northwest hydroelectricity; this supply was also lost in 1977, as the drought hit the Northwest. Our thermal generation in 1977 was supplied 55 percent from oil, 28 percent from natural gas, 12 percent from out-of-state coal, and 10% from nuclear and geothermal sources.

In their 1976 planning submittals to the Energy Commission, the five major utilities proposed a large increase in nuclear generation, expecting that fuel type to account for 36 percent of expansion from 1976 to 1985; oil to account for 24 percent; coal 18 percent; and geothermal approximately 8 percent. In the following 10 years, 1986 to 1995, nuclear generation plants were anticipated to account for 75 percent of all additions.

In their most recent planning submittals (March 1978), the utilities reflect the uncertainties facing them in the choice of baseload generation technology. They have cut plans for new nuclear generation and PG&E now does not specify type of plant after 1987. This is essentially the driving force behind the coal conference today.

Coal use for California electricity generation is now limited to out-of-state facilities. California utilities currently own jointly with other utilities three out-of-state coal facilities; namely, Mojave, Navajo, and Four Corners. The Los Angeles Department of Water and Power owns 790 Mw and Southern California Edison owns 1650 Mw of this out-of-state coal capacity. (Additional energy is derived from out-of-state coal by contract.) Planned out-of-state coal expansion is

very important for Southern California at this time - the Utah Intermountain Power Project is considered an important resource in meeting future electrical needs along with the Nevada Warner Valley Project.

To date we have only one firm plan for in-state coal generation: PG&E's proposed Fossil 1 and 2 facility which would provide 1600 Mw of capacity beginning in 1985. The Energy Commission is currently reviewing PG&E's proposal, and will also be reviewing a small coal gasification project proposed by SCE.

Other coal facilities specifically identified as potential resources by the State utilities, but with widely varying levels of uncertainty at this time, are as follows:

SCE: East Desert Coal - 5000 Mw
SDG&E: Coal 1 and 2 - 2000 Mw
State Department of Water and Power: Three 330 Mw Coal units

II. DEALING WITH FORECAST AND REGULATORY UNCERTAINTY

The often quoted prescription to cure capacity planning uncertainty often referred to as the "utility view," has been to argue for:

- Reduced regulatory review time
- Accelerated siting of conventional non-oil power plants
- Increased forecasts or reserve margins to compensate for uncertainty

While these arguments have a place, they fail to adequately reflect the value and potential of:

- Conservation as an option to new capacity expansion
- The benefits from better interstate and statewide system integration

And most important to this conference, these arguments do not address the need for a fuels policy introduction of new fuels and technology, most notably for the demonstration and use of conventional coal with advanced cleanup and advanced coal combustion or clean fuels from coal for California.

In summary, several of the points made above need to be reinforced; specifically, these are:

1. It is not apparent that electrical energy demand growth will be substantially lower than we or the utilities thought only two to five years ago. General acceptance of this fact is essential to establish a sound basis for supply policy discussion.

2. Coal combustion utilizing our abundant supplies in western states and Alaska is necessary in and for California, but there are insufficient utility proposals at hand for conventional or advanced coal systems.

3. Conservation effects, although difficult to predict, have a substantial potential to further reduce energy needs, and should be a part of all resource development strategies.

4. Government regulatory agencies share an obligation for meeting energy demands and need to provide adequate policy direction. At the same time, the utility industry must recognize the reality of current economics and constraints to conventional fuel options, both oil and nuclear, and assist the State in developing a realistic program to use coal cleanly in California.

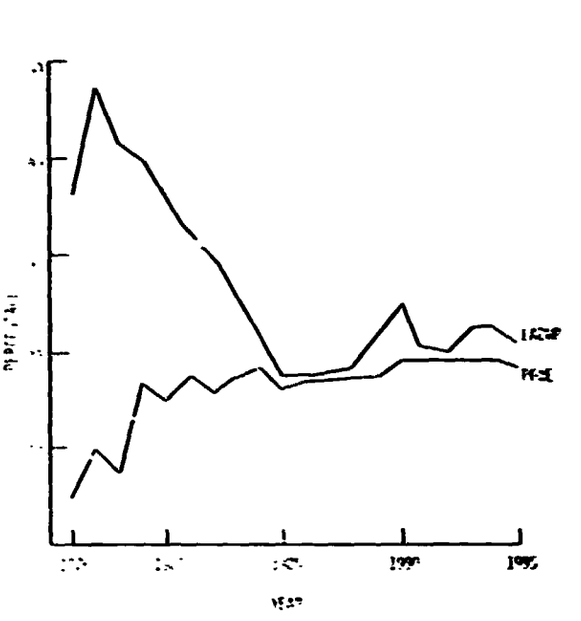


Figure 1

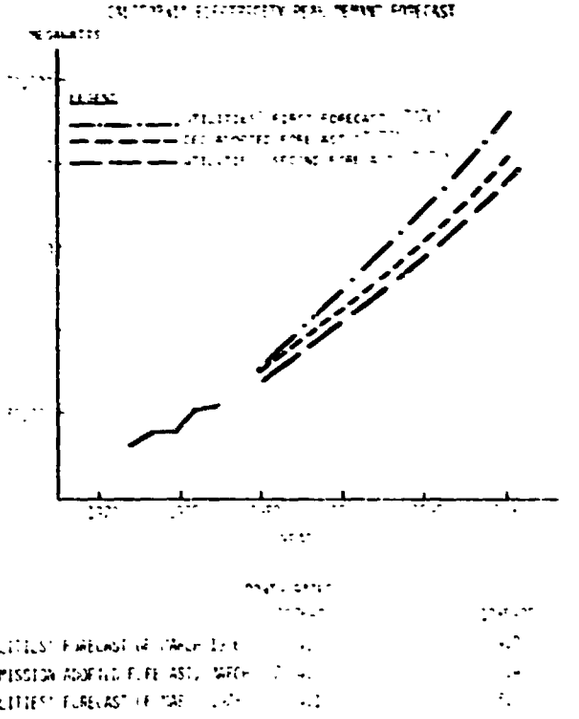
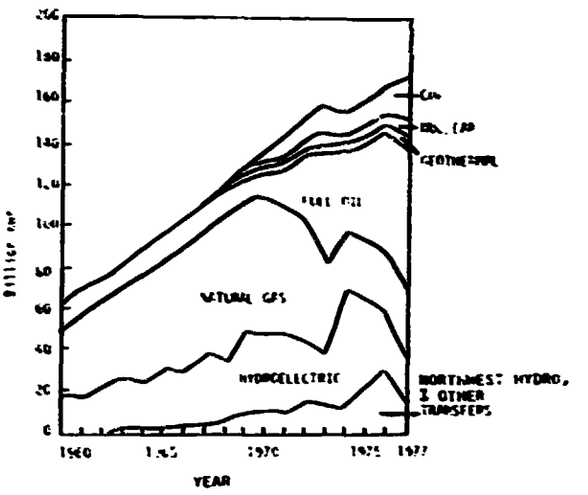


Figure 2

CALIFORNIA ELECTRICITY PRODUCTION
BY SOURCE



SOURCE: CALIFORNIA ENERGY COMMISSION'S 1977 BIENNIAL REPORT, VOL. I, FIGURE C, P. 7.

Figure 3