When will America's lights go out?

by Marsha Freeman

Not once in the history of this nation has there been a condition where inadequate electric power supply with extended shortages had to be faced by electric power users—not even in wartime. But today, according to sobering estimates by the National Electric Reliability Council (NERC) and studies done by industry organizations, the United States is facing an "inevitable shortfall of electric generating capacity."

The shortfall could hit as early as this year or, at the latest, in the mid-1980s. It is the result of extraordinary delays in bringing new generating capacity on line, delays caused by environmentalist interference and a growing, more complex maze of governmental regulation. The end of reliable, adequate electric power will signal the end to U.S. standards of living and industrial quality.

The U.S. economy's ability to grow has been directly dependent on the shift from burning fossil fuels to the production of universally usable electric power. While total energy consumption growth in the U.S. has averaged under 3 percent per year since 1920, the rate of growth in the consumption of electricity has averaged 6.6 percent per year over the same period, with rates as high as 8 percent per year over the decade of the 1960s.

Since the 1960s, the pacing technology for the rate of growth of electric power has been nuclear energy. As direct electric power production replaced burning fossil fuels, nuclear power replaced the use of those same finite fuels in a cheaper, more efficient process to produce electricity. Between 1968 and 1976, fossil fuel plants went from 233 gigawatts of capacity to 415 GW, or a 78 percent increase over 8 years. In the same period nuclear capacity went from 2.8GW to 42.9GW—a *fifteen-fold increase.*

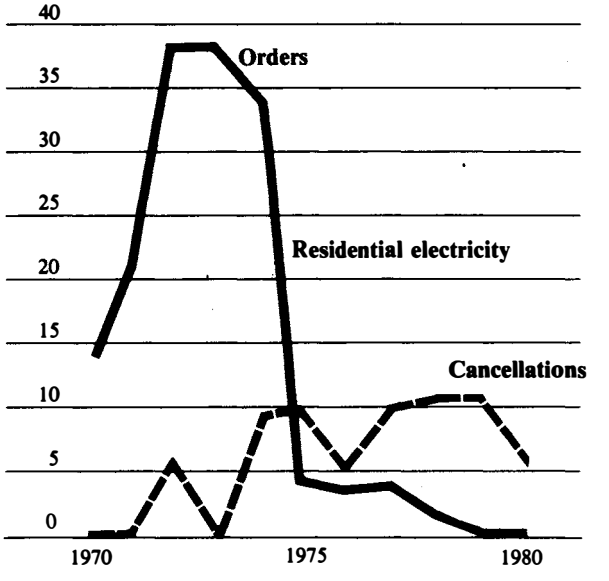
The 1970s destruction of nuclear power

Beginning in the early 1970s, just at the point when the oil embargo was to make the point that nuclear power was critical for the economy's health, environmental interference and regulation-gone-wild began to strangle the utilities. In 1968, a utility applying for a construction permit to build a nuclear plant was required to answer about 120 questions from the government.

Ten years later the number of regulatory questions to be answered had mushroomed to over 700. Estimates by the industry indicate that if the government had instead encouraged the development of standardized plants, the questions would number about 200, cutting licensing delays substantially.

In the early 1970s, the 700MW H.B. Robinson nucle-

Nuclear plant orders and cancellations since 1970



Source: Department of Energy.

ar plant was brought into operation in 54 months from the date of announcement to fuel loading. Latest estimates from the utilities point to *17 year* lead times. Due to the unstable economic situation over the past decade, load forecasting has become a game of Russian roulette for the utilities, and now they are forced to project needed capacity into the early 1990s in deciding whether or not to begin the procedures for building a nuclear power plant.

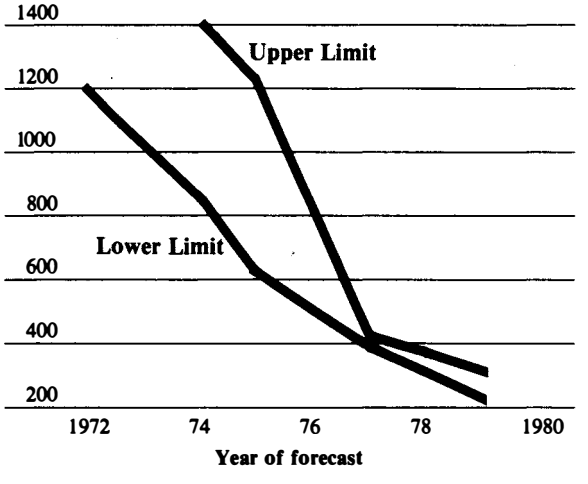
As is common knowledge, some of the utilities have almost given up. Consider the state of nuclear orders and cancellations since 1970. One would assume that since orders remained healthy until 1974 serious problems would not arise until the mid-1980s when the fall-off in orders from the mid-1970s would begin to hit. Over 1979, however, eight reactors ready for operation did not receive operating licenses from the Nuclear Regulator Commission, as the result of hysteria over the Three Mile Island incident. Since only 13 plants were ordered since 1975 and 53 were cancelled, it is clear that many units scheduled for operation in the early to mid-1980s will not be built.

The effect of government "forecasts" is of equally critical importance in the electrical industry. Especially when utilities have to plan more than a decade in advance, and unlike steel or shoes, a shortfall due to faulty predictions cannot be temporarily made up through imports and government predictions serve as guidelines for the industry.

The trend of government predictions since 1970 of needed capacity in operation by the year 2000 shows

The government forecasts nuclear capacity

(Gigawatts in commercial operation by 2000)



Source: The Atomic Energy Commission, the Energy Research and Development Administration, and the Department of Energy.

dramatically the government's complicity with the environmental movement, essentially agreeing that the "climate" of public acceptance for nuclear energy changed drastically from the 1960s. Looking at government figures, no utility executive in his right mind will believe there will be a growing, developing nuclear industry by the end of the century.

How it happened

Load forecasting by the utilities has never been an exact science, contingent as it is on government policy that affects economic growth and hence electric power needs. In the decade of the 1960s, the industry found itself caught short as the Apollo space program brought whole new high-technology industries into existence.

But in the past decade the only thing that kept electric power shortages from already taking place is the *slowdown* in real economic growth. For example, the map published by NERC in its 1977 annual report projected shortfalls in the grid area covering the TVA in 1979. This did not materialize because of a drop in peak load demand growth to 4.7 percent from the projection of 5.2 percent made the previous year.

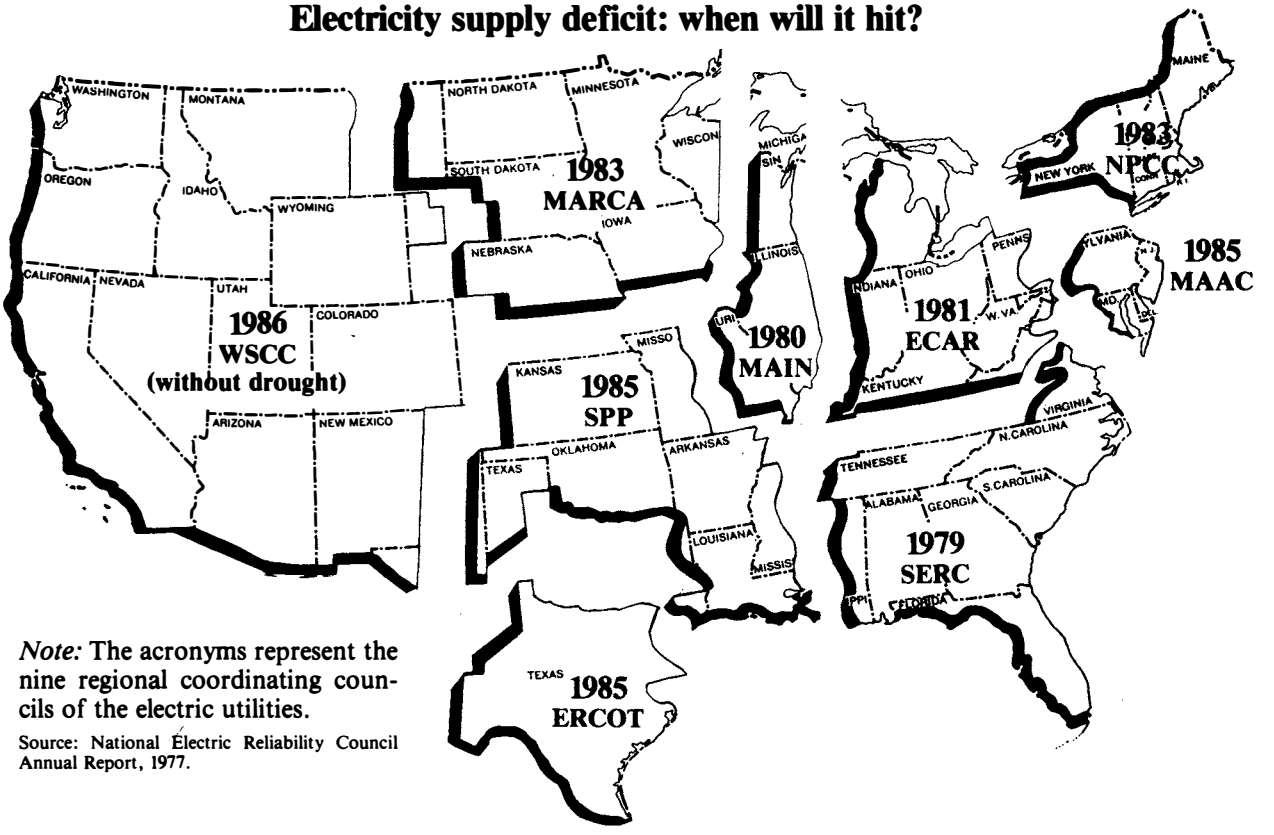
NERC has projected that problems in providing adequate service are already inevitable; daily the situation is getting worse. During the year 1978, 55GW of nuclear capacity experienced some amount of delay, with an average of one year per unit. Licensing procedures alone can now take up to six years, which was the time needed to complete the entire project a few years ago!

NERC estimates that even if load growth over the next decade is only 50 percent of the historical trend of a ten-year doubling time, the capacity needed to meet this lowered demand is not likely to be completed on time. Of the 250GW now projected to begin operating by 1988, 107GW are slated to be nuclear. Most of the coal capacity of 125GW is under construction, but according to the NERC's 1978 annual report only 60 percent of the planned nuclear capacity for service during 1984-1988 is under construction.

The NERC report states that "the implementation of the coal and nuclear programs forecasted by the utilities face serious obstacles. It is highly probable that the completion of many of these units will be delayed—in some cases for at least three years. Also, there are likely to be outright cancellations of some projects. . . . The likelihood of delays in the completions of the projected generating capacity program raises serious concerns regarding the adequacy of bulk power supply in the United States during the next ten years."

The impact of an unreliable and inadequate electric grid on the economy as a whole is clearly stated by the utilities. "The overriding concerns of NERC at this time are the discernible and disturbing trends which point to a future bulk power supply system which will be unable

Electricity supply deficit: when will it hit?



Note: The acronyms represent the nine regional coordinating councils of the electric utilities.

Source: National Electric Reliability Council Annual Report, 1977.

to maintain an adequate and reliable electric power supply for the United States—a requirement which NERC believes is essential to maintain a viable economy and to provide for the well-being of society."

In January, the energy committee of the Computer and Business Equipment Manufactureres Association (CBEMA) completed a study entitled "Electrical Energy in the 80s." They felt it necessary to assess the future of the electric power supply system because "electrical energy is the life blood of the computer." Current installed computer capacity in the United States represents an investment of over $50 billion, with a continued growth of 12-14 percent forecasted, according to the report. "Since every major industry and business is now computerized, the business and economic climate of the U.S. is dependent on the reliable operation of these equipments. Some businesses, such as airlines, essentially are helpless if their computer system network is nonfunctional."

The report explains that the "redline" or reserve margin for the electrical utilities is that level of reserve below which brownouts are likely to occur. Until the mid-1970s that "redline" capacity reserve was considered to be 15 percent. After that, the "redline" was placed at 20 percent because economies of scale had made larger power generating units the favored option for new capacity.

At the time of the 15 percent redline, average utility capacity was 850MW. Today, that average is 1,000 MW. Consequently, when a unit is taken out of service for maintenance or becomes unavailable, the percentage reduction in the entire system is greater. The report states that, in 1978, General Electric asked Data Resources, Inc. to do an analysis of the impact if no nuclear plants were added between 1981-1985 and only half of the President's coal targets were met.

The analysis indicated that the nation's reserve margin would drop to about 13 percent under those circumstances—way below the "redline." The report also projects that electrical energy shortages can be expected by 1985, with some regional shortages likely by 1983. If the weather is worse than now projected, some regional shortages could appear in the 1981-1983 time period. All of these projections assume load growth to be half of their historical rate.

The CBEMA report ends by stating that "any shortfall of the anticipated magnitude would affect the growth rate of CBEMA-represented businesses by 50 percent." That is, the fastest growing sector of the economy (com-

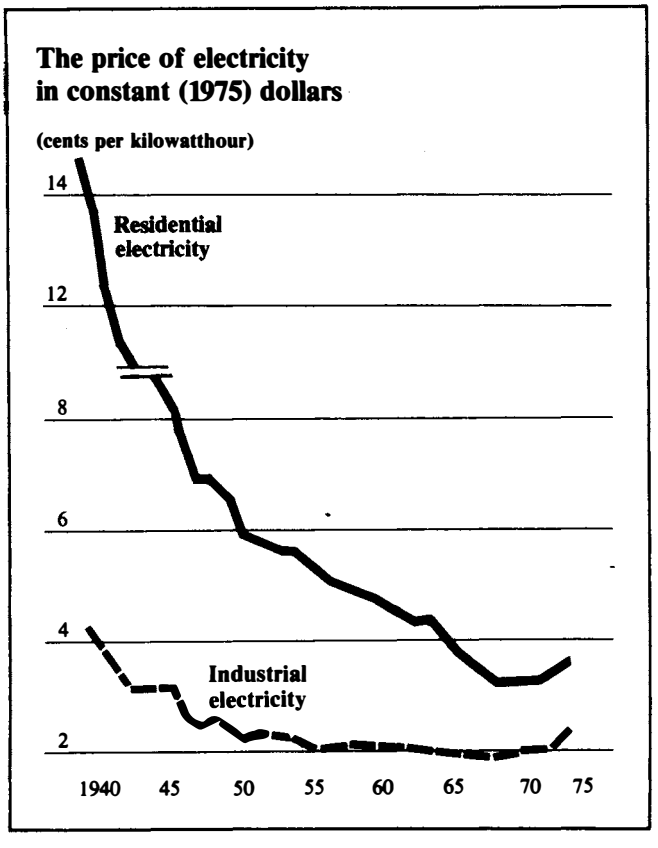
puters and electronic data processing), will be slowed down by the lack of available electric power!

The computer and electronics industries represented by CBEMA consume less than 1 percent of total energy in the United States. As they are the first to point out, the really electric intensive industries, such as aluminum and other specialty metals, will be hit much harder. The aluminum industry has been forced to do research and development into new energy sources on their own because they have already experienced shortfalls in electric power availability.

If, through some miraculous act, you could keep U.S. industry going despite a lack of reliable and adequate electrical power, the labor demands on the economy would be astounding. It also becomes clear in a negative way how our economy was able to progress at unimaginable rates after the commercial introduction of electrical energy.

No worker using his muscles alone can produce the energy represented by one kilowatt of electrictiy. In 1974, a factory worker used on average almost 48,000 kilowatthours of electricity—or the energy equivalent of 715 men. The ability of industry to substitute technology for human labor was dependent upon one primary parameter—an exponentially decreasing cost of delivered electric power.

This cost trend is shown in the graph on electricity



prices for residential and industrial customers from 1940 until the quadrupling of primary energy costs in 1974. Industrial users have always been given a lower per kilowatt hour rate since they are bulk users. The decrease in cost of delivered power was a function of improvements in technology and in economies of scale.

The transition from fossil fuels to nuclear continued the downward price trend. Even with today's 12-14 year lead-time for nuclear power plant completion and the millions of dollars incurred by utilities in legal fees to defeat environmental interference, nuclear power is cheaper than the energy it replaces—oil.

Virginia Electric & Power Company, for example, announced in March 1980 that even though the North Anna nuclear Unit 2 will add $46 million to the rate base, fuel savings are estimated to be $78 million. this will result in a 3 percent rate decrease for VEPOC customers.

But this trend of cost reduction is not immune to the government's economic policy decisions, like those of Federal Reserve chairman Paul Volcker. In September 1979, the Department of Energy released their National Power Grid Study, in which they discuss the fact that the electric power supply industry is the most capital intensive industry in the U.S. economy, requiring one fifth of all national construction expenditures and one third of all long-term financing. This means that the industry is highly affected by the cost and availability of credit for expansion, and declines in rates of construction and expansion in general affect the total employment picture for the country.

In the same study, after reviewing some of the stern warnings of the recent NERC reports, the DOE admits that "both public and private utilities are encountering serious difficulties in bringing into service planned new generation and transmission capacity...this situation could conceivably lead to shortages implying blackouts and brownouts or managed power curtailments to consumers."

It is difficult to imagine what life would be like without reliable, available, and affordable electric power—except for those populations of the developing sector that have virtually no education, no industrial or agricultural technology and a life expectancy 25 years less than the advanced sector.

Among the "economic planners" in the Club of Rome, the Council on Foreign Relations and the United Nations there is a policy for economic collapse and a "controlled disintegration" of the advanced industrial societies like the United States to the status of worse than a Third World nation. If the 17-year nuclear plant lead times are reversed right now and power plants are built as fast as possible, power brownouts may be avoided.

If not, the coming of a New Dark Age will no longer be a metaphor, but reality.