

Electricity Supply Crisis

Colorado need not repeat California's problems

by Albert A. Bartlett

It was simply outrageous to read that the U.S. Secretary of Energy had come to Colorado (December 2000) to ask western states to sell electric energy to California to help bail out Californians from a big utility problem that appears to have been created by California's officials.

What seems to have happened in California follows this pathway:

1) The population of California has been growing rapidly for decades.

2) Population growth causes growth in the demand for electricity.

3) It is apparent that the utility companies in California have failed to construct new electrical generating capacity sufficient to keep up with the growth in demand.

4) If these statements are correct, it can't come as a surprise to learn that there is an electrical energy crisis in California.

5) The surprise is that Californians are surprised by the shortage of electricity.

Why Didn't they Build Sufficient Electrical Supply?

In answering the question of why the California electrical utilities apparently have not been constructing generating capacity to keep up with projected and observed demand, certainly the high cost of purchasing new electric generators is a factor. Let's look at some ballpark figures.

The purchase price of electric generators is something like \$1 per watt. Coal plants may cost more, nuclear plants will cost a lot more, while natural gas turbines cost perhaps half of this. Let's use \$1 per watt as the basis for some very simple calculations. As a rule of thumb, utilities need about 1000 watts of capacity for

one person. This means that for every person who moves into the service area of an electrical utility, the utility must spend about \$1,000 in capital costs for the purchase of new electric generators. (This does not include fuel and other operating costs, nor does it include the costs of expanding the electrical distribution system that conveys electricity to the consumer. This is simply the cost of purchasing and installing the hardware that generates the electricity.)

Add a million people to the population of the service area of a utility, and the utility must find \$1 billion to spend purchasing a billion watts (one gigawatt) of new electric generators. *The only place this \$1 billion can come from is the customers in that service area.*

COSTS OF GENERATING FACILITIES VS RATES OF POPULATION GROWTH

Expressed in terms of *growth rates*, one can say that if the population of the service area of an electric utility grows by one percent in a period of time, then in that period of time, every person in the service area must pay one percent of \$1,000, or \$10. This is the person's share of the cost of the electrical generating equipment that must be purchased in order to supply the electricity needs of the population growth that took place in that period of time. That's roughly \$10 for every man, woman, and child in the service area! If the population of California is growing two percent per year, then every man, woman, and child in California has to pay approximately \$20 a year to fund the purchase of new electric generating plants. (Note: financing costs are not included in this estimate. If bonds are issued to pay the costs, the total costs, including interest on the bonds, may double the total cost cited here.)

These numbers suggest one reason why, over recent decades, the electric utilities in California appear to have been reluctant to invest in the purchase of new electrical generating capacity. They did not want to sock their customers with these high costs. Perhaps they were not allowed to charge these costs to the customers.

There are certainly other reasons for this reluctance, having to do with regulation, pollution, etc.

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The population of the United States is growing approximately one percent per year. Thus, to purchase the needed electrical generating equipment, each person in the U.S. must pay approximately \$10 a year!

THE CONSERVATIVE CAPACITY CUSHION

A few decades ago the conservative management of electric utilities called for a utility to have about twenty percent more generating capacity than the expected peak load. This conservative management would allow a utility to have one of its generators out of service because of accident, or for maintenance, without there being any loss of service to the customers.

It appears that the electric utilities in California have abandoned this conservative management criterion and have let demand grow until the margin between peak demand and maximum supply is razor thin. The utilities have counted on being able to purchase needed power from neighboring utilities whenever they wished. Now it turns out that, with de-regulation, it costs an arm and a leg to purchase outside power, and the outside power may not be available when it is needed.

The Role of the Public Utilities Commission

Question: What has the California Public Utilities Commission been doing all these years when the California electric utilities have allowed their spare electric generating capacity (the excess of maximum supply over peak demand) to decline to close to zero?

I know nothing of the laws governing the Public Utilities Commissions (PUC), but it would seem logical to expect that one of the responsibilities of a PUC would be to monitor and report on this aspect of the performance (the available capacity cushion) of the utilities for which the PUC is responsible. It would further be expected that if a PUC learned that one of its utilities was not keeping maximum supply comfortably ahead of peak demand, and was not planning to develop sufficient supply to keep ahead of projected peak demand for the future, then that PUC should have the responsibility for reporting the facts to the state Executive and Legislative branches and to the public. If the reported situation continued to deteriorate, it would be expected that there would be strong executive and legislative remedies.

Without knowing events in detail, one is led to conclude that quite possibly the California PUC has been derelict in its duty.

In the present crisis, it is reasonable for other states to be asked to help California in California's electric energy crisis, but only if the Executive and Legislative branches in California have taken strong steps to correct the actions or lack of actions of the California officials.

And where was the U.S. Department of Energy? In any reasonable world the DOE would be monitoring the supply and demand developments throughout the country and would be in the forefront of calling for corrective actions whenever projections showed that demand was growing more rapidly than supply. As far as one can tell, the California crisis seems to have caught the DOE by surprise.

Outlook for Bringing Supply Up to Meeting Demand

The California shortage of electrical energy will not be "solved" until there is, within California, or within the control of the California PUC, electric generating capacity of about greater than the expected peak demand in California. This will undoubtedly require the construction of several gigawatts of electric generating capacity at a cost of several billion dollars. (A gigawatt of electric generating capacity will cost about a billion dollars and will serve about a million people.)

With zero population growth, the planning, financing, and construction of the needed electrical generating capacity could easily take five to ten years. If California's population growth continues, this will significantly increase the time needed to relieve the problem.

So once you get into a California-style electrical energy shortage, there is no quick fix.

THE EFFECT OF A PROLONGED SHORTAGE OF ELECTRICITY

The high-tech world and the world of high-tech industries are totally dependent on a reliable uninterrupted supply of electrical energy. The present unreliability of the California electrical energy supply, and the long time it will take to remedy the shortages, could have profound effects on California's high-tech industry.

One expected effect will be the migration of some of that industry to parts of the country with reliable electric power.

Summary

Put in its simplest terms, *population growth in California is probably the principal factor in the present electrical crisis in California.*

Reports lead one to believe that population growth in Colorado is creating the same growth of demand in excess of supply which will shortly give us a California-style electrical energy crisis. Colorado has experienced enormous population growth recently, and some of the utility shortages reported from California are showing up in Colorado. Yet groups in Colorado, both governmental and private, spend enormous sums of money each year in advertising, seeking to get more people and more companies to move to Colorado.(1) The success of this campaign can only increase the demand for electrical energy, so unless strong corrective matters are taken now, these promotional efforts could cripple the economy of Colorado.

But there is a double whammy. *The escalation of electrical demand is the major factor in the recent astronomical increases in the price of natural gas in Colorado.*

Some new electrical generating plants are being built in Colorado, but most, if not all, are gas turbines that burn natural gas. The enormous gas consumption of these plants is certainly a major factor in creating the shortages of natural gas that are responsible for the recent large increase in the cost of natural gas to heat our homes and buildings. As this is written the news tells of a third large increase in natural gas rates that is being submitted to the Colorado PUC. The evening news has featured Colorado families that are very hard hit by these enormous increases in the gas rates. Many more such news stories can be expected.

The benefits of population growth accrue to a few, but the costs have to be borne by everyone.

RECOMMENDATIONS FOR COLORADO

If the population of Colorado is going to continue to grow, the electric utilities in Colorado should be required to keep, at all times, a margin of generating capacity in excess of demand of about twenty percent.

The utilities should be required to build coal-fired plants with all of the emission clean-up technologies, so that the remaining supplies of natural gas can be saved to heat homes and buildings.

MORATORIUM ON POPULATION GROWTH

A good case can be made for calling for a moratorium on population growth in both California and Colorado until the states' residents can be assured that electricity and natural gas supplies are adequate for at least ten years without any need for further big increases in the prices of electricity and gas.

The last U.S. President who was concerned about population growth in the U.S. was Richard Nixon, whose Rockefeller Commission concluded that it could find no benefit to the U.S. from any further U.S. population growth.

In spite of this timely warning, the population growth rate of the United States is approximately one percent per year. If Colorado's population growth rate exceeds one percent per year, then we are being asked to accept more than our share of the burden. Electricity shortages are a part of that burden.

Conclusion

It seems most urgent that the Colorado Governor and the Legislature address these electric generating capacity situations as soon as possible. By being honest in assessing the problem, we may be able to find solutions that avoid the crisis that the public officials of California have allowed to happen in their state. •

NOTE

(1) A twenty-four-page special advertising section calling for people and industries to pack up and move to Colorado appears in the October 2, 2000 issue of *Forbes Magazine*. Because of targeted advertising, this section has not been found in issues of *Forbes* delivered to Colorado addresses.