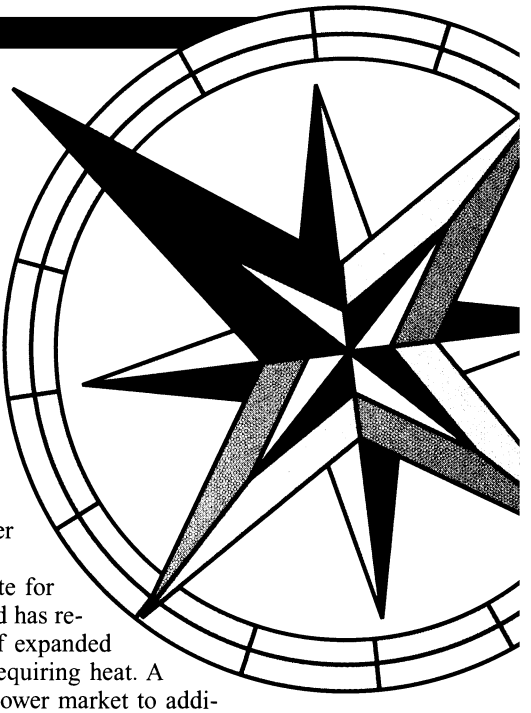

Decreasing Reliability of Energy

Philip H. Abelson

The reliability of energy supplies is decreasing because of political instability and increasing demand, at a time when many countries are becoming more dependent on those supplies. In future, expenditures on petroleum, natural gas, and electricity are likely to increase, and depending on the extent of their natural resources, many countries will face energy problems. An example is the United States: At one time it was a major exporter of oil, yet in 1999 it imported more than half of its needs.

In the United States, domestic supplies of natural gas have been adequate for many years. However, a sudden doubling of natural gas prices at the wellhead has recently occurred. At least two factors were involved. One is the prospect of expanded use of natural gas as an alternative to heating oil for industrial processes requiring heat. A second is a change in federal regulations, which have opened the electric power market to additional competition—and the fastest way to create a new substantial source of power is to use gas-fired combustion turbines.

Overall consumption of electric power is increasing. It currently represents about 40% of energy use in the United States and appears likely to rise to as much as 70% by 2050. Will adequate and reliable power be available during the next few decades? Those times seem far away, but the question is relevant because the electric power system cannot be quickly modified to meet future needs.

The reliability of the energy transmission system is one area where trouble is certain if present trends continue. This problem has its roots in the 1990s. Federal regulations to enhance competition among electric power suppliers helped to reduce rates, but the reliability of the electric power system suffered as a consequence. A transmission system designed to meet the needs of the 1950s was unequal to the task of carrying vast flows of electricity between distant areas. Furthermore, during the current decade, the demand for electric power is expected to grow by 20%, but the planned growth of the transmission system is only 3.5%. At one time the refrigerator was the major household consumer of electricity; now other devices, including TVs and computers, add to the load. The creation of the Internet has led to further expansion in the use of electricity, which is powering the digital age.

"Will adequate and reliable power be available during the next few decades?"

Another cause of lack of reliability could follow from federal regulations affecting coal-fired plants. These generate more than half of all electric power in the United States but are threatened with dire future problems. They are one of the larger sources of CO_2 emissions and some also emit SO_2, NO_x, and fine particulates. Furthermore, the combustion of coal has recently been identified as a major source of atmospheric mercury. The costs of construction to control pollution from existing coal-fired plants will be substantial, and gas-fired power plants produce less CO_2 and much less pollution than most of the coal-fired plants now in service. However, although the price of other energy sources has jumped, the price of coal has not changed materially nor is it expected to, in view of huge existing reserves. The potential reserves of natural gas are limited, and further fluctuations in its price are likely. The choice between coal and natural gas for power generation will largely be decided by political considerations. Given time, the efficiency of power generation and the quality of emissions from coal-fired plants could be greatly improved, but the construction of large numbers of these new types of plants would probably entail many years. If political authorities were more zealous in providing attention and funds, advances in technology could ameliorate energy deficiencies. But the utilities involved in transforming the electric power system are likely to be slow to act unless their long-term investments are treated more fairly than is now fashionable.

During the next decade, the role of renewables, particularly wind and biomass, will increase, but not nearly enough to fill present requirements. The United States and other developed countries will find it necessary to devote far more attention, including increased R&D, to multiple risk and energy trade-offs involving coal, nuclear energy, petroleum, natural gas, and electric power. Because global realities will change, energy policies will need continuous monitoring and periodic revision.

EDITORIAL
LETTERS
ESSAYS ON SCIENCE AND SOCIETY
POLICY FORUMS
BOOKS *ET AL.*
PERSPECTIVES
TECH.SIGHT
REVIEWS