Energy Realities for Tomorrow

by ROBERT C. SEAMANS

No limited mix of energy technologies can provide our country with the flexibility to meet our needs ....

IT'S UNDERSTANDABLE that we've long taken energy for granted, because it was not until the 1950's that we lost our self-sufficiency. Our reaction to this development was simply to import what we needed — mostly crude oil and petroleum products, but gradually some limited amounts of gas as well. By 1970 we were spending about $3 billion a year on imported oil; $7.5 billion in 1973, and — in the face of post-embargo OPEC price rises — an astounding $27 billion in 1975. This massive outflow of dollars not only aggravates our balance of payments, but eventually can also influence the global balance of power. Here at home, it translates into jobs lost and higher rates of inflation.

Internationally, our percentage of world oil production has dropped precipitously. Before World War II we were producing about 60 percent of the world's crude. Last year we accounted for a mere 16 percent. By 1974 the Soviet Union had overtaken us as the world's Number One producer. And their production curve is moving upward as ours slopes downward. During 1974 and 1975 they boosted oil production by a little over 7 percent, reaching a peak daily output last December of more than 10 million barrels. We have not seen that kind of production for six years in this country, and we are now down about 16 percent from that peak value.

Reduced to its barest essentials, America's energy problems (some prefer to call it "crisis") are that we are now 75 percent hooked on oil and gas energy; domestic production is dropping while necessary imported supplies are costing us dearly; and at the same time both domestic and foreign supplies are destined to run out in the early decades of the next century. That is only 30 to 40 years away, which is not much time for making fundamental changes in the production and utilization of energy to run our economy.

I always like to take a short look at history and point out that in 1850 we relied almost entirely on wood for fuel; in 1910 we relied for most of our energy on coal; and now it's oil and gas. So in the past we've been dealing in 60-year cycles. We don't have 60 years in the future to shift to other forms of energy. To correct this situation, the President has proposed a comprehensive program to move toward energy independence. A major part of this program deals with energy research, development, and demonstration, as reflected in the national plan that the Energy Research and Development Administration (ERDA) first issued at the end of June last year and recently updated. One of the fundamental conclusions of the updated version is that no single or limited mix of energy technologies can provide our country with the flexibility required to meet our growing needs. A large part of the problem is that we must increase the use of energy in the next 25 years by the equivalent of 25 to 45 million barrels of oil per day. The higher figure results from a growth rate of 3 percent per year, which will be needed to satisfy our population growth by the year 2000 — unless we can mount a major conservation effort. These figures are based on statistics from the Department of Commerce, on looking at our population growth curves, and on information from groups in our country that are not satisfied with the status quo and so are trying to build in some hope for economic growth.

To reduce our needs in the year 2000 by 20 million barrels a day, we have singled out conservation for greatly increased attention. Each barrel of oil saved is one less that has to be imported. Furthermore, it often costs less to save a barrel than to import one, and conservation usually reduces the burden on our environment while at the same time preserving for future generations the limited, irreplaceable legacy of fossil fuels and uranium left us by nature.

The primary responsibility of bringing into use new technology for energy conservation and for expanding domestic energy production rests with the private sector. The federal government's responsibility is to assist the private sector in the development of new energy technologies and markets for them by establishing appropriate policy environments, sharing risks, and conducting complementary research and development.

Along with our conservation efforts, we must increase the utilization of major existing resources of coal and uranium. We must also seek further yields from so-called depleted oil and gas fields, using new, enhanced extraction technologies.

This is a fascinating area. Not long ago I went to Bartlesville, Oklahoma, where we have a small research lab. I went into Osage County — the home of the Osage Indians — and met there with the chief, with whom I went to the area where we're going to try some new techniques that involve drilling down several miles, and pumping in certain solvents (which have been tested in the lab but never on a large scale) to see if they will penetrate and loosen up the oil that still remains in the sandstone at those depths.

I asked the chief where all the Indians were, and he told me that this particular tribe was very clever; they occupied that land back in the 1880's, and they struck oil there in 1920. Since then, they have been quite prosperous because they get a seventh of all the profit from those fields. It's very difficult, the chief said, to actually screen all those who claim they're Osage Indians to make sure that only the genuine Osages get payments.

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American energy problems, serious though they may be, pale beside those of other industrial nations. We have vast coal deposits, many of outstanding quality; most of those countries do not. We have adequate uranium resources; others have none. We possess numerous geothermal sites waiting for exploitation and new technologies; most countries don't. And we still enjoy extensive, though dwindling, oil and natural gas reserves — a luxury in the eyes of our friends overseas.

A little over a year ago President Ford spoke of America's commitment to an interdependent world and of the vital importance of cooperating with other nations in the field of energy. At the same time he warned that the fate of all cooperative international energy programs depends crucially on what we do at home. The energy interdependence and cooperation the President is talking about comes down to shared responsibility. No nation, however well endowed, can face the world alone. We all share the planet and its resources, and we all share responsibility for them. When traditional energy sources no longer suffice, new ones must be developed, and as this happens, producers and consumers alike must cooperate to be sure of their adequacy, their safety, and their environmental suitability.

Many nations are making heroic efforts to locate oil in increasingly inhospitable places. Just last fall I took a helicopter two hundred miles out to the middle of the North Sea to view one of the very large operations being run there by Phillips Petroleum. They have four very large platforms from which they drill, and there are drill rigs around them at a radius of about 20 miles that feed in to this central location. From there, the pipe goes under the floor of the North Sea to England. And when they really get going, they plan to deliver of the order of a million barrels a day. One of the things that really fascinated me was the catwalk from one platform to the next about 110 feet above the surface. The waves of the previous winter, they said, on occasion hit those catwalks. So we're learning how to operate under very stringent and difficult conditions.

Despite all that can be done to locate offshore oil, limitations do exist. It's going to become more and more difficult to carry out the drilling and the operation. International surveys of supply and demand tell us that nuclear energy must play an increasingly important role.

For many nations nuclear energy offers the most plausible route toward energy independence. Among such nations are even those of the Middle East. Recently, when I visited Iran, the Shah emphasized to me that "oil is a wasting asset." Recognizing this fact, he is determined to utilize many of his petroleum dollars to build a nuclear capability in anticipation of the time when Iran's oil reserves become depleted. The Shah and many others are also questioning whether we should be burning our irreplaceable oil for fuel rather than conserving it for use as a feed stock for tomorrow's petrochemical industries. The French have determined to go ahead in a major way in electrifying with nuclear energy. So have the Japanese and many others.

When the U.S. inaugurated the atoms-for-peace era in 1953, we offered to share our atomic know-how with the rest of the world. At the same time this country took the lead in developing controls designed to minimize the possibility of diversion of nuclear materials for

unauthorized uses. In the early years of this program the International Atomic Energy Agency was also established as a result of our initiative. In this agency we strongly advocated the development of an international safeguard system to encourage other nuclear nations to provide for safeguards during the course of their nuclear transfers to other nations. We also called upon the users to voluntarily submit their nuclear programs to international surveillance. Persuaded that a universal safeguard system was both preferable to and more credible than a multiplicity of bilateral arrangements, the U.S. progressively transformed its bilateral agreements into safeguard arrangements, using the IAEA as the responsible agent.

With the advent of the U.S.-inspired treaty for nonproliferation of nuclear weapons in 1968 we took further steps to universalize the concept and application of international safeguards. Among other things we offered to place all of our commercial nuclear activity under IAEA safeguards. Today we have with the IAEA an international system that covers the nuclear program of over a hundred nations.

Now in view of the fact that certain stages of the nuclear fuel cycle are more vulnerable to proliferation, or theft, than others — in particular reprocessing of spent fuel — the U.S. government has been exploring ways to limit reprocessing centers. This includes the concept of developing multinational reprocessing and enrichment centers that could reduce the potential spread of weapons capability.

Disposal of radioactive wastes accumulated as a normal by-product of the generation of nuclear energy must also be considered. We know it is scientifically and technically feasible to manage these radioactive wastes in a safe manner. This assurance is based on the know-how and technology we have amassed through research, development, and demonstration, and have documented in a recently issued report. This document explains the technological options available to achieve multiple-barrier isolation.

The record in managing radioactive wastes over the last 30 years in our weapons program includes both favorable experience and instances where problems have occurred. But there have been no discernible health or safety ill effects on the public from this activity, and the experience gained has benefited future planning and should minimize problems when large-scale commercial operations begin. We estimate that, given the estimated growth of nuclear power by the year 2000, the total cumulative high-level solid waste from all nuclear stations would fill a cube 70 feet on a side. This, we think, is an entirely manageable volume.

The IAEA is already a useful forum and an important audit agency, accounting for nuclear materials worldwide. We are also active participants in the International Energy Agency (IEA), which includes all European countries, Canada, Japan, New Zealand, and Australia. Our objective in the IEA is to be mutually supporting in a variety of ways, including research and development. We have 17 different R & D program areas to which the members can contribute, ranging from the use of peat (in which Ireland has the lead) to solar, geothermal, and direct coal combustion. In this latter area, we have a joint experimental project in Great Britain, funded by the United Kingdom, Germany, and the U.S., in which all members of the IEA can participate.

Separate from these two international organizations (IAEA and IEA), we have bilateral programs with over 25 nations, including the Soviet Union. And we are studying ways to work more closely with underdeveloped countries. As we work for a better balance between our domestic supply and demand for reasons of our own economy, we will also reduce our demand on world energy markets. It is essential that we recognize the interdependence of all nations in the requirement to satisfy world energy needs if we are ever to approach world stability.

In summary, to help us achieve these national and international objectives, we will be looking to the university community, which can assist us with basic research and with creative and innovative ideas, and in educating the scientific and technical leaders who will be coping with these complex problems in the years ahead. We are not going to solve these problems soon; they are going to be with us for tens of years.

We are also counting on the universities to provide broad analysis and counsel regarding the social, economic, legal, regulatory, cultural, environmental, behavioral, esthetic, managerial, and other aspects of the transition from dependence on oil and gas to alternate sources of energy. The nontechnical issues turn out to be even more difficult in my mind to resolve than the admittedly complex scientific and technical problems that we are addressing today.

Let us resolve to participate thoughtfully and responsibly in domestic and worldwide energy commerce. Let us recognize that all energy sources have risks and benefits. Each has environmental factors that must be thoroughly addressed. Let us use and share all appropriate technologies for energy generation and conservation, since no one approach can satisfy our needs. Only in this way, I believe, can we have optimism for man's survival in the world of tomorrow. □