The Future of Electricity Based on Coal

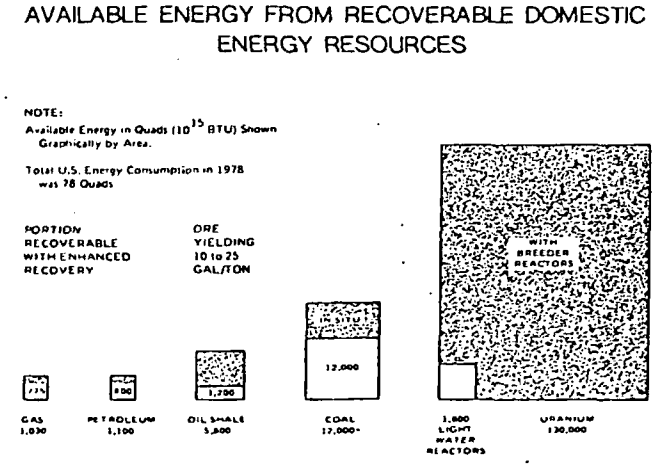
There is a serious energy problem in the United States today, and it is sure to worsen. This situation is directly attributable to default of national leadership and a betrayal of the public trust. The danger signals have been clear for several years. Serious threats to the national security and economy related to dependence on foreign oil were dramatized in the oil embargo of 1973, yet we have continued to increase this dependence without regard for the consequences. Furthermore, we have had viable alternatives which could have been implemented if there had been more responsible energy leadership in the Congress and in the White House throughout the past decade.

Coal our only abundant energy resource

Let us examine some of the facts which motivate the foregoing remarks, and then perhaps we can see a direction which this nation should take. Regardless of which of several credible energy resource and energy use estimates we judge to be most accurate, it is clear that there is a gross mis-match between our domestic supplies and our uses of oil and gas. We use oil and gas for about 75 percent of our energy requirements, though they represent less than 10 percent (some say less than 3 percent) of our domestic energy resources, not counting the possibility of a nuclear breeder which would make the percentage much smaller. Also not counting the possibility of a nuclear breeder, it is apparent that coal is the *only* energy resource we have in abundance.

It is interesting to compare relative magnitudes of these resources as shown in fig. 1, which is based on information prepared by the former Energy Research and Development Administration (now the Department of Energy). The area of each box is supposed to be proportional to the amount of energy represented by each fuel resource.

Fig. 1. Quads (10^{15} Btu) of available energy from recoverable domestic energy resources, depicted graphically by area



The most conspicuous feature of fig. 1 is the size of the area for energy from uranium with the use of breeder reactors, in comparison with the energy from the same uranium reserves using today's light water reactors. Even with today's technology, domestic uranium resources are about equivalent to resources of oil and gas combined. It is important to recognize that the potential to be realized with breeder reactors diminishes each year as the uranium supply is depleted with conventional reactors. Thus, there is a time period during which breeder technology must be developed or else the domestic uranium supply will be so depleted that the major advantages of breeder technology cannot be realized for lack of uranium. It is unfortunate that the U.S. leadership in the nuclear energy field has been abandoned to the extent that if we later decide to develop the breeder option, we may have to depend on the French or the Russians for the technology.

Disregarding the breeder, which is now a matter of national policy, consider that the size of the coal resource is very large compared with all others put together.

Oil imports forecast to treble

Having noted the relationships between resources, let us now examine energy uses. A forecast produced in the early '70s for energy use in the United States in 1985 is shown in fig. 2. Recent trends make it clear that conservation efforts and rising energy costs have combined to make this forecast high for 1985 but credible at a later time, perhaps 1990. Though no claims are made for accuracy in this forecast it may be used to illustrate a point.

The forecast presumes that no effective initiatives will be implemented to change present day uses of natural gas and oil and that new technology will not be available to allow substitution of other energy resources for natural gas and oil in large amounts. The scenario on which this figure is based assumes that natural gas and oil will provide about 70 percent of national energy needs in 1985, about 5 percent less than they now do. Even so, imported oil would then account for over 56 percent of expected oil requirements in contrast with about 28 percent dependence on foreign oil during the oil embargo of 1973. The larger percentage is also based on a larger total, such that actual yearly amounts of imported oil in 1985 will be about three times the amounts imported in 1973.

The credibility of the forecast is enhanced by the observation that dependence on foreign oil reached about 50 percent in 1979 at a cost of more than $50 billion. President Carter's announced limit on imports appears to be the only force at work, other than market price, to significantly alter the trend. It is also conceivable that, if the recent trend were permitted to continue through the 1980-1990 time period, the dollars exported for oil in that decade would be the same order of magnitude as the total present assets of the 500 largest corporations in the United States, almost $900 billion, as reported in Fortune in 1979.

Dependence on foreign oil contrary to national interest

In view of the threat imposed on national security as well as the related threat to the national economy, many people now seem to recognize that such dependence on foreign oil is contrary to the national interest, but few offer viable alternatives.

The problem is to devise a scenario which is relatively independent of energy imports and see if it is feasible to plan a national strategy accordingly. One effort toward that end is depicted in fig. 3. In order to construct it, total energy demands have been held at the same values and for the same uses as in fig. 2. Obviously, to the extent that conservation measures are successful, these demands may be reduced, but they would still be reached somewhat later in time. It is difficult to see how major reductions can be realized, however, in the face of other major national factors and objectives which demand increasing amounts of energy—growing population, increasing affluence in lower income sectors of society, required industrial productivity increases, industrial and municipal pollution abatement goals, employment goals, etc.

Natural gas and oil imports have been eliminated in fig. 3, but the domestic supplies have been retained as shown in fig. 2. It is further assumed that the use of oil primarily will be limited to transportation and petrochemical uses for which it is uniquely suited, and gas primarily will be limited to domestic heating and use as a raw material in chemical processing for which it is uniquely suited. Already gas and oil are disappearing from the electric utility marketplace and this trend is

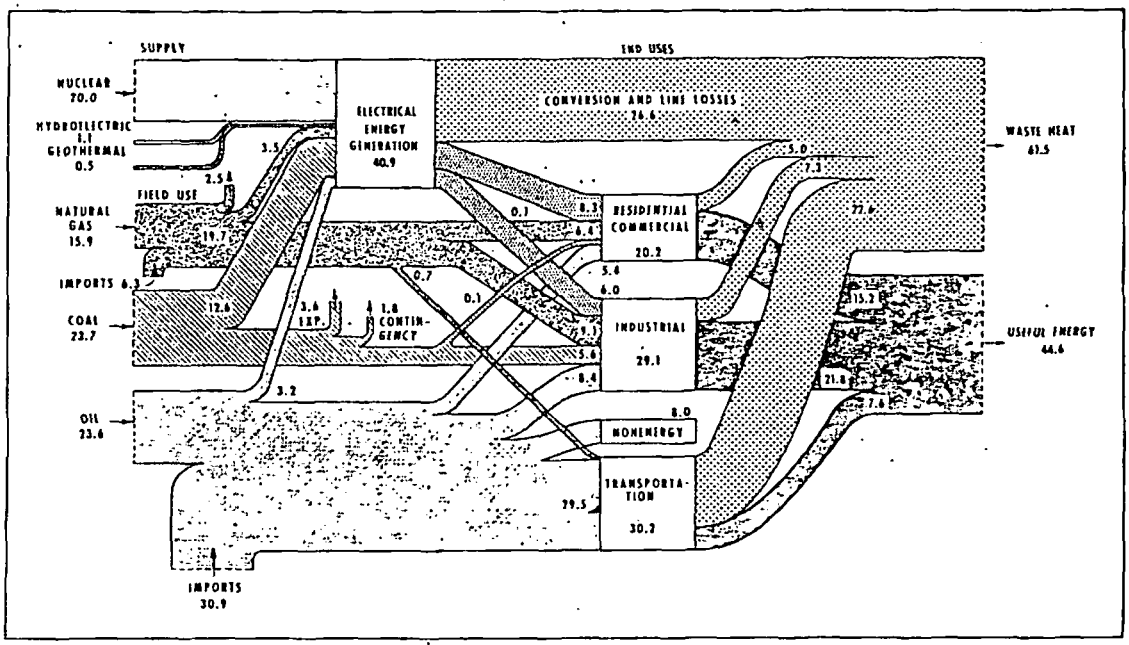


Fig. 2. U.S. energy flow patterns—1985

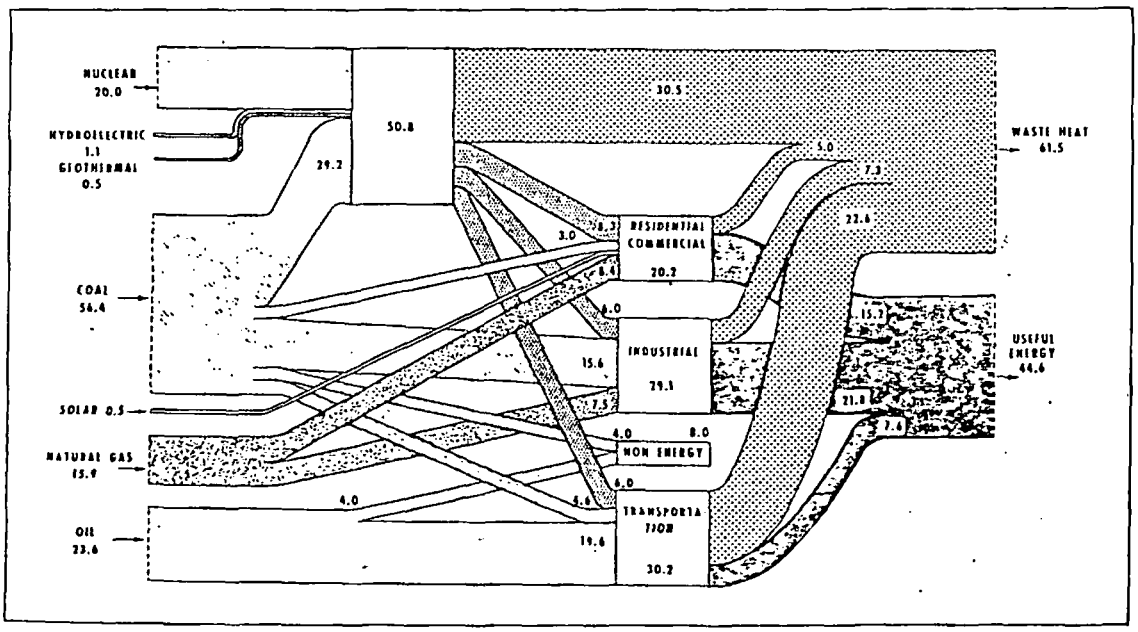


Fig. 3. An alternative energy flow pattern—1985