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An Interim Look at Energy

Progress toward an effective energy policy in the United States can best be described as mixed. Interest in energy problems and solutions has increased, and a sampling of the resulting activity in the research community can be found in the accompanying articles. But 4 years after the oil embargo, imports account for nearly 50 percent of the nation's oil supply, compared to 30 percent then. Much of the public sees no connection between the huge flow of oil-purchase money abroad and unemployment at home, to say nothing of the economy's vulnerability to any serious disruption of the oil supply. Political leaders have for the most part shown little willingness to get very far ahead of their constituencies on energy. Even the modest steps proposed in the Carter Administration's National Energy Act have succeeded in tying up Congress in indecision for nearly a year.

The country's technological preparedness to begin moving to new sources of energy is on the whole not much further along than its political or economic readiness. Despite exhortations to move to coal, for example, the major energy shift of the past year has been from natural gas to oil. Industries experiencing plant closings because of wintertime gas cutoffs have switched in substantial numbers to fuel oil, propelling a 14.5 percent increase in the demand for residual oil. Coal gasification is not yet a commercial industry. Scrubbing exhaust gases from coal-fired combustors to make them environmentally acceptable is a technology that is only marginally commercial—under the threat of the regulator's pen. The lack of proved means for storing radioactive wastes continues to hamper public acceptance of nuclear power.

But the picture is not all one-sided. Sales of insulation are at an all-time high and the mileage efficiency of the U.S. car fleet is slowly improving. Even more encouraging are indications that public and private investment in energy research is beginning to have some effect—in new ideas and in promising technologies for the future, if not yet in additional supplies of energy. The articles in this issue provide some perspective on the energy sources and transitions yet to come.

The eventual and inevitable shift away from oil and natural gas as the predominant sources of energy to coal, to nuclear power, and to solar energy may take some unexpected forms, if history is any guide. Just a century ago wood was still the dominant fuel in the United States. It gave way to coal in the last half of the 19th century and coal gave way to oil in the first decades of the 20th. Charles Berg reminds us that the relative cost of two competing fuels was not the sole force governing these transitions, and may not be in the future. Rather, he suggests, the combination of new energy sources and the scientific and technological talent attracted to them led to novel applications of energy and new industrial processes that ultimately proved more important. This point of view might imply, for example, that energy research should focus on creating not just replacement sources of energy but also fundamentally new ways to accomplish a given task. What would an all-electric steel mill look like, and would the savings in cleaner and more efficient steelmaking processes justify the use of higher-quality and more expensive energy? What does the prospect of solar heating suggest for the redesign of buildings?

Thinking about one class of industrial processes is already well advanced. For the petrochemical industry, higher prices and the growing unavailability of natural gas are more than an inconvenience—they threaten the supply of basic raw materials. Ronald Wishart shows how one company is preparing for the transition—to oil in the interim, to coal, and to biomass feedstocks.

Liquid fuels are perhaps the most critical element of the energy supply picture—it is hard to imagine how our present economy could function without them. But after oil what, and when? In Canada, oil is now being produced commercially from tar sands, but the extent to which the technology can be applied to U.S. deposits of this material is not yet known. There is new optimism about and activity in oil shale, but uncertainties persist about the scale that the industry could attain. Liquids from coal would tap a far larger source of energy. In the past year and a half two significant government-industry cooperative projects to test the H-Coal and Donor Solvent processes have gotten under way which could add coal liquefaction to the nation's energy options by as early as 1990. L. E. Swabb, Jr., describes the problems—not just technical ones—that must be overcome before additional energy from this source becomes a reality.

The more the energy problem is carefully examined, the clearer the constraints on unlimited expansion of energy supplies become. A key constraint will be water. John Harte and Mohamed El-Gasseir provide new and more quantitative information on the implications of variability in water supplies for the siting of energy facilities.

Solar energy is not yet a significant contributor to U.S. energy supplies, but it has emerged as a growth area of research in the past few years. The abundance and variety of new ideas being put forth is a strong signal of the scientific talent being attracted to work on solar technologies and of the richness of the field itself, both of which suggest that solar energy may contribute substantially in the foreseeable future. Henry Kelly surveys the explosive development of photovoltaic technologies. Edward Lipinsky proposes an integrated approach to the production of food, fiber, and biomass fuels that offers wider markets to the farmer and more diverse sources of biomass. James Howe and Norman Brown discuss the potential near-term impact of solar technologies on rural life in the developing world.

Nuclear power in the United States is going through a period of reassessment and redirection of research efforts. J. A. L. Robertson offers a perspective on a different approach to nuclear power—that of Canada.

Energy research now occupies tens of thousands of scientists and engineers in this country, and the R & D budget for the federal government alone exceeds $3 billion a year. So there is good reason to hope that technological aspects of the nation's energy dilemma will become increasingly tractable in coming years. Still lacking are the willingness to face up to an era of more expensive energy and a political consensus on how to deal with our changed energy circumstances.

—ALLEN L. HAMMOND