Energy: Ford Foundation Study Urges Action on Conservation

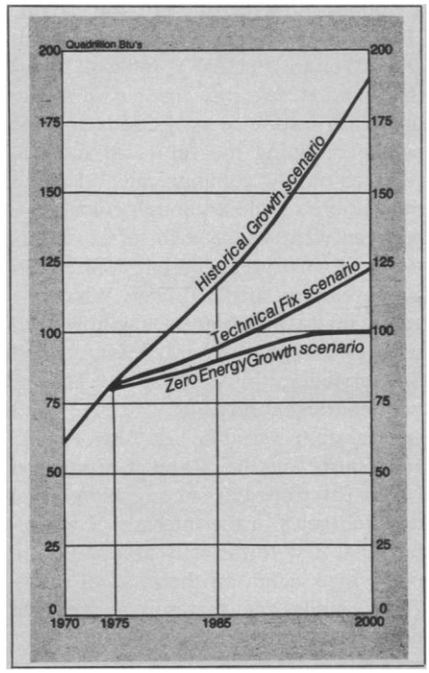
The Ford Foundation Energy Policy Project has proposed sweeping conservation measures as an alternative to an all-out drive for greater energy production. Citing the "bankruptcy" of present policy and the failure of the "do nothing or voluntary approach," Project Director David Freeman calls for vigorous federal intervention to make energy conservation a reality. The Project's final report, capping a 2-year study, recommends measures that it says would cut energy growth to less than 2 percent per year, or half the recent rate. Conservation, the report concludes, will buy time—at least a decade—before the country needs to proceed in a major way with strip mining of western coal deposits or drilling for oil off the Atlantic and Pacific coasts, and it can be implemented without affecting overall economic growth. Slowing energy growth would be a major anti-inflation weapon, in that some $300 billion in capital investments for energy-producing facilities could be avoided between now and the year 2000.

The report is unusual in that it comes pre-reviewed, with critical opinion from the Project's Advisory Board of environmentalists, scientists, and industry executives already appended. This commentary makes it clear that the report's logic is not convincing to all and may in some respects be seriously flawed or naive. But flaws notwithstanding, it is an articulate, well-documented call for energy conservation.

The core of the report* is the analysis of three different scenarios of how America's energy future might develop—scenarios that were to reflect in a rough way the differing views of the energy industry, the technical community, and the environmentalists. The scenarios comprise historical growth (at 3.4 percent per year), technical fixes that achieve conservation largely through more efficient use of energy (reducing growth to 2 percent per year), and more fundamental changes that would gradually level off consumption and achieve zero energy growth (Fig. 1). The Ford Energy Project outlined these scenarios in an earlier report (*Science*, 12 April 1974). Here the scenarios are fleshed out with more details and recommendations are made. In essence the report downgrades historical growth, describes zero energy growth as worthy of serious additional study, and lights upon the technical fix scenario as the embodiment of reason and prudence.

The great bulk of the energy savings postulated in the technical fix scenario would arise from improvements in the efficiency with which automobiles, buildings, and industrial plants use energy. To achieve these savings the report recommends:

► Mandatory and gradually increasing standards for automobile fuel economy, supplemented by taxes and tax credits to encourage purchase of more efficient cars, so that by 1985 the average for all vehicles will be 20 miles per gallon (compared to the present 12 or 13 percent). At 25 to 30 miles per gallon, the report finds, automobiles would be as efficient as present mass transit systems.



Scenarios for U.S. energy use in the remainder of the century. [*Source: Energy Policy Project*]

► Providing incentives for more efficient heating and cooling of buildings. Because those who construct new buildings and those who must pay the heating bills have divergent interests, the report believes that market incentives are not sufficient. Instead it proposes a federal loan program to help homeowners and small businessmen finance insulation, heat pump installation, and other energy-saving investments. Federal Housing Administration standards for insulation and for heating and cooling equipment in new construction should be revised upward.

► Revision of regulatory and tax policies to eliminate promotional rates and subsidies. Electricity rates, for example, should no longer include discounts for large users and should, in fact, reflect the additional costs of generating extra power during peak hours. Depletion allowances, "unwarranted" use of foreign tax credits, and what the report calls "cut-rate" government accident insurance for nuclear power should be eliminated. A major revamping of the Interstate Commerce Commission to provide railroads with more flexible regulations so they can compete with other modes of transport is called for. And imported oil should carry a tariff large enough to pay for the cost of a 90-day emergency stockpile.

► Direct action by the government to encourage energy conservation by shifting a significant portion of energy R & D funds to the now-neglected areas of conservation technology, by becoming a major consumer itself of the most advanced energy-saving technologies—from more efficient cars to recycled materials—and by setting explicit guidelines for national conservation goals by region and by industry.

The report points to four "troublesome" energy sources—imported oil, nuclear power, western coal and shale, and oil from offshore fields on the East and West coasts and the Gulf of Alaska—that cannot be heavily exploited at present in a socially acceptable way. These could be avoided for the next decade, the report finds, and thereafter only two of the four need receive major emphasis, if the proposed conservation program were to be put in effect. The report makes a major indictment of federal management of the more than 50 percent of domestic fuel

* *A Time To Choose: America's Energy Future* (Ballinger, Cambridge, Mass., 1974. The book, with an initial printing of 30,000, will be available in bookstores at $3.95 paperback and $10.95 hardcover).

resources that are publicly owned, citing giveaways of more than 22 billion tons of coal and plans for rapid and probably uneconomical leasing of offshore gas and oil lands. Federal R & D programs should give more emphasis to solar and other renewable energy technologies and to pollution control, while federal participation in funding demonstration plants, such as in the breeder reactor program, should be greatly reduced.

Clearly, the most controversial aspect of the Project's recommendations is their heavy reliance on federal intervention. The Advisory Board generally agreed that more emphasis should be given nationally to conservation, that the federal government needs to put its own house in order in the area of managing energy resources, and that the report gave inadequate attention to the finite nature of fossil fuels, especially oil and natural gas. But they disagreed on nearly everything else, from the effectiveness of conservation measures to the federal government's role.

Predictably, the industry representatives on the Board largely viewed a reliance on government action as naive and impractical in the light of past performance and vouchsafed a free market faith with little charity toward slowing energy growth. D. C. Burnham of Westinghouse, for example, said the report is misleading in asserting that decisions on commercial development of new energy sources can be delayed a decade or more and that conservation will not affect economic well-being. He criticized the report's estimates of future demand because, among other things, they made no provision for new energy-consuming devices. Minor Jameson, a consultant to the Independent Petroleum Association of America, criticized the report for anti-industry bias. And William Tavoulareas of Mobil Oil called the report "an unabashed primer for regimentation." He characterized the conservation approach as risky and attacked Freeman for public statements that prefigured the main outline of the report before the studies on which it was supposed to be based were even completed.

In contrast, the Sierra Club's Michael McCloskey defended the report, noting that industrial critics are selective in their opposition to government intervention, since they still want special tax concessions and a host of existing government policies that encourage energy consumption. Harvey Brooks of Harvard University and Karl Kaysen of the Institute for Advanced Study, Princeton, agreed that relying chiefly on the workings of the marketplace is not an adequate way to deal with the energy problem. But they found the report unsophisticated in dealing with political issues, and McCloskey faulted it for hedging its critique of unrestrained energy growth. Dean Abrahamson of the University of Minnesota found the report timid and too defensive in discussing reductions in energy consumption. Despite a variety of objections to specific points, many of the academics and environmentalists, and some of the industrialists, on the 21-member Board seemed to credit the report with having successfully accomplished its main objective—outlining a coherent set of alternative policies to deal with the energy problem.

It is fair to note that some of the report's recommendations (such as that government should encourage builders to use energy-saving designs) are vague and provided with no persuasive evidence that they can be put into effect. There may be, moreover, some substance to the criticism that Freeman has used the Project as a launching pad for his own ambitions, which seem to include becoming Mr. Energy in any Democratic Administration. [He is now a consultant to the Senate Commerce Committee at the behest of Senator Magnuson (D–Wash.)]. But the main thrust of the report—that conservation is not only feasible but an essential and still unrealized component of national policy—does not depend on the details of its recommendations or on the ambitions of its authors.

The disagreement over conservation and how to put it into practice is evidence that the major debate and the major decisions on the energy future of the United States are still to come. The Energy Policy Project would appear to have made a significant contribution to that debate. Overall, it will amount to 20 volumes, and the six that have already been published, although of varied quality, include some landmark studies (such as Mason Willrich and Theodore Taylor's analysis of nuclear safeguards). In view of the relative neglect of energy conservation in federal energy planning and the leisurely pace of that planning, the Freeman report and its sense of urgency are very timely.—ALLEN L. HAMMOND

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RESEARCH NEWS

Laser Spectroscopy: A New High Resolution Technique

A new high resolution spectroscopic technique based on the simultaneous absorption of one photon from each of two oppositely directed, highly monochromatic, tunable dye laser beams has been demonstrated by scientists at several laboratories in the United States and France. The application of this two-photon absorption method is expected to yield new and highly detailed information on the electronic structure of atoms and on the electronic, vibrational, and rotational structure of molecules. Such information was heretofore either unavailable or obtainable only with great difficulty. The new laser technique may also find application in such diverse fields as metrology and photochemistry.

Unraveling the details of the quantum mechanical structure of atoms and molecules has been hindered both by the limited resolving power of the best spectrometers and by effects within the atomic or molecular system itself which tend to broaden spectral lines. An important example of the latter is the Doppler effect, whereby the frequency of light seen by a moving atom or molecule is shifted by an amount proportional to its longitudinal velocity (the velocity component in the direction of propagation of the light). Thus, the frequency of light that can be absorbed or emitted is dependent on the velocity of the particle. Since the par-