Academy Energy Report Stresses Conservation

But two social scientists in the study indicate that behavioral aspects of energy policy were slighted

The National Academy of Sciences' Committee on Nuclear and Alternative Energy Systems (CONAES) has concluded, in a report finally issued after more than a year's delay, that conservation efforts to reduce the growth of energy demand "should be accorded the highest priority in national energy policy."

But the CONAES report, prepared for the Department of Energy at a cost of $4.1 million, looks to coal and nuclear power as necessary near-to-mid-term energy sources. It is already drawing fire from some who see conservation and solar energy as offering the socially and environmentally benign solution to the energy problem.

Ralph Nader, a leader of the anti-nuclear movement, accuses the academy of engaging in heavy-handed "self censorship." He says CONAES took no account of the "deeper levels of assumptions" about possible changes in social and political behavior that could bring about an early transition to reliance on renewable energy sources.

Jack Hollander, the physicist who served as study director during the first 2 years of the CONAES study, says Nader overstates the case but he acknowledges that the one social scientist appointed to CONAES generally found himself much in the minority and finally resigned. The former CONAES member, Otis Dudley Duncan, a professor of sociology at the University of Arizona, says he quit in frustration about 2 years ago. "I found I couldn't have any influence on the study, and B didn't want to make people uncomfortable by staying any longer," Duncan told *Science*.

The report, *Energy in Transition, 1985-2010*, says, in what may be the study's most important conclusion, that over the next 30 to 40 years technical efficiency measures alone could reduce by half the present ratio of energy consumption to Gross National Product (GNP). This finding, first made public in the 14 April 1978 issue of *Science*, indicates that the rate of energy growth is only loosely coupled to growth of the GNP and can be reduced substantially without endangering economic prosperity.

But the report adds that reducing the growth of demand will, even with the help of rising energy prices, be a slow process. A vigorous effort at increasing energy supplies is held to be necessary. In particular, the report says a synthetic fuels industry should be developed to increase domestic supplies of fluid fuels and thus mitigate what the committee foresees as severe strains on world petroleum supplies beginning in the 1980's from cartel actions and political disruptions.

A "balanced mix of coal and nuclear generated electricity" is also recommended, with the observation that as use of fluid fuels for the generation of power is phased out, coal and nuclear will be "the only economic alternatives for large-scale application in the remainder of this century." After 1990, the report says, coal will be increasingly needed for production of synthetic fuels. The amount of nuclear capacity required will depend on the growth of demand for electricity, for which the committee sets forth various low-growth to high-growth scenarios.

Harvey Brooks, professor of technology and public policy at Harvard and cochairman of the academy committee (along with Edward L. Ginzton of Varian Associates), told a news conference on 14 January that his committee was unanimous in feeling that nuclear power should be part of the energy mix. But he added that, while some CONAES members regarded nuclear energy as highly attractive, others viewed it as a "necessary evil" acceptable only as a transitional energy source.

According to Brooks, CONAES was also unanimous in the view that breeder reactor technology, which is still under development with no breeder now operating in this country, should be retained as an option for the end of the century and beyond. As the report puts it, the higher the growth in electricity demand, the greater the attractiveness of the breeder, "all other things being equal." But Brooks said that CONAES was divided on whether the Clinch River Breeder Reactor project should be terminated, as President Carter wants to do to discourage other nations against a premature commitment to the breeder and a "plutonium economy." According to Brooks, a bare majority favored termination.

According to the report, solar energy, apart from hydropower, will "probably not contribute much more than 5 percent to energy supply in this century unless there is massive government intervention in the market to penalize the use of nonrenewable fuels and subsidize the use of renewable energy sources." In the committee's view, while such intervention could find justification in solar energy's lower social costs, it might "lock us into obsolete and expensive technologies with high materials and resource requirements, whereas greater reliance on 'natural' market penetration would be less costly and more efficient over the long term." The report calls for an increased research effort to develop novel solar concepts, and urges that much of that effort be directed at producing fluid fuels.

John P. Holdren, head of the energy and resources program at the University of California at Berkeley and one of the CONAES members who put nuclear power in the necessary evil category, took exception to the majority's view that the prospect for continued development of coal and nuclear fission was more favorable than the prospect for a large development of solar over the next three decades. Development of coal and nuclear energy faces environmental and sociopolitical obstacles that are "neither less real nor more easily circumvented" than the economic and technical obstacles that confront development of solar energy and other renewable sources, said Holdren in a dissenting footnote.

It was the growing debate over the breeder reactor and plutonium recycle which, more than 4 years ago, led the Energy Research and Development Administration (DOE's predecessor agency), to ask the academy to do the energy study. The study contract first called for delivery of the report by mid-1977 at a cost of about $2 million. The contract was later amended to postpone delivery to the end of 1978 and increase the budget to $3.6 million.

CONAES was not only a year late in completing the study but ran a half mil-

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lion dollars over its budget (the academy is paying $300,000 toward the study out of its endowment funds). Why was the report so late? And is Nader correct in asserting that CONAES gave short shrift to social scientists who wanted, as he expresses it, to go to deeper levels of assumptions about human behavior and its influence on energy demand?

At least two social scientists connected with CONAES believe, though some of their colleagues may not agree, that their views have had little or no influence on the work of the committee. Sociologist Dudley Duncan resigned from the committee. Laura Nader, professor of anthropology at Berkeley (and sister of Ralph Nader), describes her experiences with CONAES as frustrating. She is the chief author of a CONAES panel report on consumption, location and occupational patterns still awaiting academy approval for publication.

Former staff director Hollander says he tried to have material prepared by Duncan incorporated into drafts of the CONAES report but found it mostly a losing battle. Hollander considers, nevertheless, that Duncan did have some influence on the committee, and wishes Duncan had stuck it out.

Hollander, now back at the Lawrence Berkeley Laboratory, sees two main causes for the delay in getting out the CONAES report. One is that the committee was a highly diverse group, made up of people who varied greatly both in their attitudes to nuclear power and in their professional backgrounds and knowledge about energy issues. It took a full year just to educate the academy's committee and establish a sufficient base of common understanding to allow the work to proceed effectively, says Hollander.

A second problem, in his view, lay with the Academy's report review committee, whose membership also included many individuals with little prior knowledge of energy issues. The report review committee, according to Hollander, raised so many questions and criticisms of the draft report, which was submitted to it nearly two years ago, that the writing and circulation of new drafts went on and on with only marginal improvements being gained. There resulted such a loss of momentum that during 1978 a "malaise," he says, developed in CONAES, with some members fearing that the report would never come out.

Academy president Philip Handler attributes the delay to the magnitude of the task involved. Preparing a broad spectrum analysis of so large and controversial a subject was a much larger undertaking than anyone had imagined, Handler observes. If the Academy had such a job to do again, he says, he would do only a few things differently, perhaps such as appointing the chairman of the study to serve full-time and expediting the work of the panels and subgroups.

Whatever the reasons for the unusual length of gestation, CONAES has now at last been delivered of its brainchild. The report is available, all 783 pages of it, to be judged either as a weighty contribution to the energy debate, or as Ralph Nader chooses to see it, as a culture-bound artifact of America's technological society at the start of the 1980's, or perhaps as something in between.—LUTHER J. CARTER

On Managing the Transition

The following are excerpts from the CONAES report:

In the very near future, substantial savings can be made by relatively simple changes in the ways we manage energy use, and by making investments in retrofits of existing capital stock and consumer durables to render them more energy efficient.

The most substantial conservation opportunities, however, will be fully achievable only over the course of two or more decades, as the existing capital stock and consumer durables are replaced. There are economically attractive opportunities for such improvements in appliances, automobiles, buildings, and industrial processes at today's prices for energy, and as prices rise these opportunities will multiply.

This underscores the importance of clear signals from the economy about trends in the price of energy. New investments in energy-consuming equipment should be made with an eye to energy prices some years in the future. Without clear ideas of the replacement cost of energy and its impact on operating costs, consumers will be unlikely to choose appropriately efficient capital goods. These projected cost signals should be given prominence and clarity through a carefully enunciated governmental pricing policy. They can be amplified where desirable by regulation; performance standards, for example, are useful in cases (such as the automobile) where fuel prices are not strongly reflected in operating costs.

Although there is some uncertainty in these conclusions because of possible feedback effects of energy consumption on labor productivity, labor-force participation, and the propensity for leisure, calculations indicate that, with sufficiently high energy prices, an energy/GNP ratio one half of today's could be reached, over several decades, without significant adverse effects on economic growth. . . .

No Overall Scarcity of Resources

It is important to keep in mind that the energy problem does not arise from an overall physical scarcity of resources. There are several plausible options for an indefinitely sustainable energy supply, potentially accessible to all the people of the world. The problem is in effecting a socially acceptable and smooth transition from gradually depleting resources of oil and natural gas to new technologies whose potentials are not now fully developed or assessed and whose costs are generally unpredictable. This transition involves time for planning and development on the scale of half a century. The question is whether we are diligent, clever, and lucky enough to make this inevitable transition an orderly and smooth one.

Thus, energy policy involves very large social and political components that are much less well understood than the technical factors. Some of these sociopolitical considerations are amenable to better understanding through research on the social and institutional characteristics of energy systems and the factors that determine public, official, and industry perception and appraisal of them. However, there will remain an irreducible element of conflicting values and political interests that cannot be resolved except in the political arena. The acceptability of any such resolution will be a function of the processes by which it is achieved.