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NEWS AND COMMENT

Energy Research: A Harsh Critique Says Federal Effort May Backfire

The Energy Research and Development Administration (ERDA) is pursuing "a narrow, hardware-oriented approach" that overemphasizes the importance of increasing energy supplies through complex, new technologies and largely ignores the possibilities of conservation and small-scale technical solutions. As a result, the agency's programs could, ironically, lead to "an increased dependence on foreign energy sources" between now and the year 2000 —the very opposite of the goal enunciated by President Gerald Ford and by ERDA itself.

That surprising conclusion and sharp indictment comes from the congressional Office of Technology Assessment (OTA), which has just completed a comprehensive review of the energy agency's national plan for energy R & D and of the programs launched to achieve the plan's objectives.

The review was requested by the House Committee on Science and Technology, later joined by the Senate Interior and Insular Affairs Committee and the Joint Committee on Atomic Energy. All three have major responsibilities for portions of the ERDA budget.

The analysis was carried out for OTA by six panels of experts drawn from academic, industrial, and nonprofit institutions; environmental and public interest groups; and professional societies.* These panels were backed up by staff members drawn partly from OTA itself, and partly from three universities with active centers for energy policy analysis, namely the Massachusetts Institute of Technology, the University of Oklahoma, and the University of Texas at Austin. In addition, critiques and background papers were solicited from outside groups and individuals. It was unquestionably the most thorough look yet taken at the fledgling energy agency's goals and programs.

In ERDA's defense, it should be pointed out that the agency only became operational on 19 January of this year, and that it was required to submit to Congress by 30 June a national plan for energy research, development, and demonstration. That was barely enough time to find new quarters and hire some key personnel, let alone develop an imaginative, pathfinding plan to solve the much-deplored "energy crisis." Thus it is perhaps not surprising that much of the ERDA effort consists of warmed-over programs inherited from the predecessor agencies that were merged into ERDA, notably the Atomic Energy Commission and the energy portions of the Interior Department. But the OTA evaluators, while sympathizing with the difficulties confronting the new agency, nevertheless pulled few punches because of the immense importance of the agency's task.

The evaluators focused much of their attention on the documents known as ERDA 48, volumes 1 and 2—the "national plan" that was submitted to Congress a few months ago. Volume 1 articulates goals and priorities, while volume 2 sets forth programs to achieve those goals. In general, the evaluators found volume 1 "a significant milestone in the evolution of a long-term national energy policy," though some of the goals were poorly analyzed and appeared to conflict with one another. However, volume 2 was judged markedly inferior and "does not appear adequate to achieve the stated goals," the OTA group concluded.

The evaluators also went beyond the "national plan" and analyzed the President's amended budget, interviewed senior ERDA officials, and talked with key energy staff members from the Environmental Protection Agency, the Federal Energy Administration, and the Office of Management and Budget as well.

They found scores of "deficiencies" which generally fell into two broad categories. One involved an overemphasis on complex, costly technology—the sort of fancy gadgetry that tends to appeal to scientists and engineers, who are often bored by "low technology" approaches to a problem. In OTA's opinion, ERDA has downgraded the less complex technologies that might improve efficiency of energy use, and it has largely ignored such "non-technological" issues as incentives for commercial application, environmental constraints, competition for the use of scarce resources, and public resistance.

The evaluators warn that ERDA might well be successful in developing new technologies, but that these might do little to solve energy problems. As an example, they call it "questionable planning . . . for ERDA to pour large amounts of funds into the development of a commercially fea-

*The overview panel, which prepared a summary of the conclusions to be drawn from the work of the other panels and outside contributors, was chaired by Paul Craig, director of the University of California's Council on Energy and Resources. Other members were Elizabeth Mann Borghese, Center for the Study of Democratic Institutions; John H. Gibbons, University of Tennessee; Jerry Grey, independent consultant; Stanford S. Penner, University of California at San Diego; David J. Rose, Massachusetts Institute of Technology; Robert Socolow, Princeton University; Alvin M. Weinberg, Institute for Energy Analysis; and Wendell H. Wiser, University of Utah. The staff was headed by Jon M. Veigel. Separate panels dealt with fossil programs; nuclear energy; solar, geothermal, and advanced technologies; conservation; and environment and health.

Solar Reports Evoke Cloudy Response

Sunny, cloudless skies should not be a major criterion for determining where to locate the new Solar Energy Research Institute, according to two advisory reports submitted to the Energy Research and Development Administration.

Both the National Academy of Sciences and an industry group assembled by The Mitre Corporation agreed that easy access to transportation and the kind of environment that would attract topflight personnel are the two most important factors to consider in siting the facility, which is rapidly becoming the most sought-after pork-barrel prize on the scientific scene.

Sunlight, on the other hand, is not such a necessity, as much of the institute's work will involve policy analysis or simulation experiments, while field stations can be established for work that must be carried out under particular climatic conditions.

The two advisory reports are sure to cause consternation among states that hoped a high degree of sunlight would help them snare the new facility, and in locales where living conditions and cultural amenities might be deemed insufficient to attract a high-caliber staff.

The two reports are intended to assist the energy agency in developing site criteria and in defining a role and management organization for the new institute, which was mandated under legislation passed by Congress last year. The agency plans to issue a formal solicitation for proposals in November, after which interested parties will have at least 45 days to submit site proposals. A final selection is expected to be announced next April or May.

The initial site evaluation will be administered by a new office established for that purpose; it is headed by Robert P. McGee, a senior engineer who previously helped establish the Los Alamos Meson Physics Facility and the Fermi National Accelerator Laboratory. The final choice is to be made by agency administrator Robert Seamans, Jr., through procedures not yet fully developed.

Detailed Recommendations

The two advisory reports were presented to Congress at a hearing of the energy subcommittee of the House Science and Technology Committee on 22 October. The Academy report—prepared by a committee headed by physicist Richard L. Garwin of the IBM Corporation—recommended a single central institute with small field stations, employing some 630 professionals in all, and operating on an annual budget of some $48 million, to be provided by the energy agency in the form of block funding rather than project grants. The Academy went into considerable detail in recommending how the staff, management, and board of directors should be organized.

The Mitre report, a quickie survey of some 16 organizations that are members of the fledgling "solar energy industry," came up with a variety of opinions about the new institute and what it should do. "The outstanding characteristic of the responses of the industry was their diversity," Mitre reported.

Interestingly enough, several industry respondents were "strongly opposed" to university participation in the new facility's management, whereas the Academy recommended that the facility be run by a board of directors elected by "a parent body whose members in turn are a number of universities and similar institutions." The Academy also suggested a role for itself in nominating directors.

Questions by congressmen at the hearing revealed concern that the management structure suggested by the Academy might be unwieldly and might insulate the institute from proper accountability. There was also concern that the site criteria proposed might unreasonably rule out localities that were more than an hour's drive from a jetport or that lacked some ill-defined "cultural amenities."

As to fears that the White House might dictate the site selection for political reasons, officials of the energy agency, the Academy, and Mitre all insisted they had not been contacted by the White House. "We want to assure that no citizen or organization is allowed to have a preferred position, or even appear to have knowledge which would give an unfair advantage over any other organization or person," pledged John M. Teem, the agency's assistant administrator for solar, geothermal, and advanced energy systems.—P.M.B.

sible technology for coal liquefaction if the technology cannot then be used—because coal mines cannot supply the coal, transportation facilities are inadequate, capital is unavailable, or water is insufficient."

The second category of defect involved an overemphasis on increasing the supply of energy as opposed to programs aimed at reducing demand for energy. Unfortunately, although Congress, by law, has required that energy conservation be "a primary consideration" in developing ERDA's program, only 2 percent of the cent of the ERDA budget appears to be allocated to conservation programs.

These criticisms are similar to some of those made earlier this year in a report to the Joint Economic Committee by Robert Gilpin, professor of public and international affairs at Princeton University. Gilpin challenged the government's efforts to find a "quick fix" to the energy problem through a "highly questionable approach to technological innovation." Instead of relying on a technology-oriented "crash program" such as was used to develop the atomic bomb or send men to the moon, he said, the government should concentrate on reducing the numerous financial, market, and technical constraints which inhibit the private sector from finding solutions to energy problems. Instead of developing technologies and then trying to "push" them on the economy, he suggested, the government should try to unleash the demand forces that would "pull" needed technologies into use.

The OTA panelists, for their part, came up with a host of more specific criticisms, including the following:

- The ERDA plan pays little attention to solutions that might have an impact over the next 10 years; only about 5 percent of the agency's budget for fiscal year 1976 is devoted to solving near-term problems.
- The plan overemphasizes electrification, which has many advantages but is vulnerable to equipment malfunction and sabotage and has adverse environmental impacts. It emphasizes breeder reactors, solar electric systems, and fusion reactors as "inexhaustible" energy sources for the long term, all of which are capital-intensive producers of electricity. Meanwhile, it tends to neglect production of synthetic fuels by solar or nuclear energy; hydrogen and biomass fuels; and direct use of solar, geothermal, and other direct heat sources—solutions which may not have the ultimate potential of the "inexhaustibles" but could be "vital ingredients in the future energy mix."
- Conservation plans are "timid and underfunded, despite strong Congressional encouragement."

• ERDA's efforts to integrate environmental control research into its technology development programs seems "at present illusory." This is dangerous because "There is a significant risk inherent in the totality of ERDA's mission. The impact on climatic balance of massive increases in heat rejection to the atmosphere by man is unknown but potentially catastrophic."

• The level of funding for energy R & D may be too low, since it is an outgrowth of decisions made prior to the Arab oil embargo.

• Insufficient emphasis is placed on international cooperation, and on coordination with state and local governments.

• Only limited attention is given to research and analysis on social, economic, environmental, and behavioral aspects of the energy problem.

• ERDA's basic research program has been inherited from the agencies it incorporated, with the result that virtually all funds are devoted to nuclear power and high energy science, while materials, combustion, fuel chemistry, and other disciplines crucial to ERDA are neglected.

• The methodology used in developing the ERDA plan relies on scenarios based on questionable assumptions. The possibility of a major reduction in energy growth because of higher costs is not taken into account. Moreover, the calculated capital costs for energy systems include only supply side costs and exclude consumer costs. Thus, ERDA's programs are biased in the direction of research to decrease supply costs while minimizing research to reduce capital costs of such end-use items as refrigerators, heat pumps, and solar home-heating systems.

• ERDA has shown "timidity" and a reluctance to assume its mandated role as the "lead agency" for energy R & D. The consequences could be costly because three separate federal agencies are now exploring technologies for coal cleanup and there is a danger that agencies "might work at cross purposes."

ERDA has not yet made an official response to the OTA criticisms, but many ERDA officials are said to agree with the major thrust of the OTA critique. Thus J. Frederick Weinhold, director of ERDA's office of technical program assessments, told *Science* there is "a lot of pulling and tugging" within the agency over whether ERDA should take a broader approach to energy problems. He expects that the next version of the plan will give greater emphasis to commercialization and environmental issues, though not necessarily to all the nontechnological issues stressed by OTA, some of which, he feels, may more appropriately fall within the purview of other federal agencies. Similarly, Weinhold anticipates some efforts to increase the attention paid to end-use technologies. "We inherited programs with a lot of bucks and people on the supply side," he says, "but only minuscule things on the end-use consumption side."

Whatever ERDA does about the broader, nonhardware issues, the OTA panelists warn, "there can be no question of their importance. . . . Most are not, at present, receiving priority attention anywhere."

—PHILIP M. BOFFEY

Amniocentesis: HEW Backs Test for Prenatal Diagnosis of Disease

The federal government, taking a bold position on a controversial medical issue, has put its stamp of approval on amniocentesis, the procedure by which genetic disorders can be detected in a fetus before birth. The government's endorsement rests on the results of a 4-year study of more than 2000 women that indicates that amniocentesis is safe. The endorsement is likely to inflame "right-to-life" groups that see amniocentesis as the first step down the road to abortion (see box on p. 538).

The study, which was conducted by researchers at nine major medical centers,* was coordinated and supported by the National Institute of Child Health and Human Development (NICHD). The study was designed to answer two basic questions about the use of amniocentesis during the middle 3 months of pregnancy. Is it safe? Is it accurate? On both counts, the investigators say, the answer is Yes. Their findings were reported in detail recently at the American Academy of Pediatrics meeting in Washington, D.C.

Theodore Cooper, assistant secretary for health in the Department of Health, Education, and Welfare (HEW), spoke about policy implications of the study. Reading from a text drafted by Duane Alexander, a pediatrician who, with Charles U. Lowe, was an NICHD staff officer on the study, Cooper noted that "Few advances compare with amniocentesis in their capability for prevention of disability." He went on to declare, ". . . It is most appropriate for the Public Health Service, as a matter of policy, to foster use of amniocentesis by those women for whom it is indicated by educating both physicians and the public as to the availability and applicability of the technique and, based on the results of this study, its safety." Cooper also stated unequivocally that no one should coerce a woman into having the procedure.

The number of women for whom amniocentesis might be appropriate is enormous—perhaps as many as 400,000 a year. But the number who have it is small. Last year, mid-trimester amniocentesis was performed on only 3000 women in the United States. Dr. Aubrey Milunsky, director of the birth defects and genetics clinic at the Eunice Kennedy Shriver Center in Boston, estimates that 20,000 babies with birth defects are born every year. In 1974, he says, only 100 or so were detected in utero. Not all, but many others, could have been.

There are two groups of people who look on midtrimester amniocentesis with distrust—antiabortionists and practicing physicians, primarily obstetricians. Antiabortionists oppose amniocentesis because they reason that, except in very rare cases, the only thing one can offer a woman who is carrying a defective child is an abortion. Indeed, when Cooper referred to amniocentesis as a valuable tool for preventive medicine, what he meant, but did not spell out, is that genetic disorders can be prevented only by aborting fetuses that have them. Researchers who have devoted tremendous effort during the past 7 years to the development of prenatal diagnosis of birth defects are the first to admit that, for now, there isn't much they can offer by way of therapy. Just the same, therapy is their real, ultimate goal, and they are moving slowly in that direction.

Where abortion is not an issue, practicing obstetricians have had another reason for shying away from amniocentesis—

*The participating institutions were: Children's Memorial Hospital, Chicago; Eunice Kennedy Shriver Center, Boston; Johns Hopkins University School of Medicine, Baltimore; Mount Sinai School of Medicine, New York; University of California at Los Angeles–Harbor General Hospital, Torrence; University of California School of Medicine, San Diego; University of Michigan School of Medicine, Ann Arbor; University of Pennsylvania School of Medicine, Philadelphia; Yale University School of Medicine, New Haven.