DOE's Born-Again Solar Energy Plan

In its search for clean, low-cost sources of power, the Department of Energy finally sees the light; R&D programs restructured

AFTER SUFFERING STEEP funding declines during the Reagan Administration, renewable energy research programs are basking once again in a bit of federal sunshine. For the first time in a decade, the Department of Energy (DOE) is proposing significant increases in the budgets for solar and biomass energy research, and a new assistant secretary with solid credentials in managing public and private solar projects—J. Michael Davis—has been put in charge of reenergizing the long-neglected "soft technology" side of DOE.

Energy Secretary James Watkins actively supports this change of policy, having taken a fresh look at ways to increase the nation's energy supply with minimal environmental damage. Thanks to Watkins' inside lobbying, the Bush Administration is asking Congress to hike spending for solar and biomass programs by 25%, from $89.7 to $115.9 million.

Among the philosophical underpinnings of this funding hike is a desire on the part of Administration officials to pump more resources into the most promising technologies. At the same time, they want to cut support for research programs that are mature, or not likely to yield significant returns in the foreseeable future.

Consequently, under the proposed fiscal 1991 budget, biofuels, photovoltaic, and solar thermal energy research programs capture major increases in funding. But R&D for wind, ocean thermal, geothermal, and solar heating for buildings is reduced or eliminated (see chart). "We have reviewed the various technology path options and focused on those areas that we think can achieve the highest payoff," says Robert L. San Martin, deputy assistant secretary for renewable energy.

The program that is slated to get the largest single funding increase is biofuels—a 73% hike that will bring its budget to $28 million. Most of the added dollars would go to boost research on gasifier and fermentation technologies to woody biomass feedstocks to ethanol and methanol. Don Stevens, biofuels program manager at the Solar Energy Research Institute (SERI), which runs this research effort for DOE, says the aim is to get more alcohol from each fermentation batch by discovering ways to extract more sugar from the feedstock material.

This mission complements the Bush Administration's efforts to attack urban air pollution by gradually shifting the nation's automobile fleet to alternative fuels such as methanol and ethanol (*Science*, 13 October 1989, p. 199). But it isn't a new one for DOE, which has made significant strides in the past 10 years in identifying fast-growing, nonfood plants that can lower the cost of producing methanol and ethanol from biomass.

Jack Ranney, director of the biomass production program at Oak Ridge National Laboratory, says the number of high sugar–bearing species has been narrowed from 120 to 5. Ranney expects that genetic engineering will instill greater pest and herbicide resistance in cultivated fuel crops that will further improve the economics. Biomass-produced ethanol and methanol, DOE officials predict, will be competitive with petroleum by 2010—or when oil prices reach $25 a barrel. Although Watkins does not think biomass fuels can meet all of the nation's future needs, he told *Science* in a recent interview that they "will go a long way toward laying the groundwork for a transition away from oil over time as our primary transportation fuel."

After biomass R&D, photovoltaics shows the next largest growth in the new budget, climbing by almost a third ($9 million) above last year's level. Most of the new funding will go for cost-shared research with industry to develop manufacturing processes for high-efficiency cells that can produce electricity at 10 to 15 cents per kilowatt-hour.

The new money comes at a crucial time, says Scott Sklar, director of the Solar Energy Industries Association. While the United States remains a leader in technology and in sales, Japanese and European outlays for research have outpaced U.S. R&D expenditures. This year, for example, DOE budgeted $34.7 million, a figure dwarfed by West Germany's $68 million and Japan's $47 million.

But Watkins and the Office of Management and Budget are aware of the competitive threat, says Sklar, and are prepared to respond more vigorously in the future. Indeed, Watkins has thrown his support behind a SERI request to replace aging leased space in Golden, Colorado, with a new $19.6-million research facility.

"The whole environment has changed," Sklar opines. "It is no longer a question of whether the solar industry should have a place at the table."

Not only are solar cells getting more support within DOE's upper ranks, there is renewed interest in solar thermal collectors capable of producing process heat, driving turbine generators, and detoxifying hazardous wastes. The entire 30% funding jump in this $15-million program would be focused on getting more heat out of devices that will be used to purify contaminated water or to generate electric power.

Even though the renewable energy program is faring better than it has in years, funding is hardly about to return to the peak ($628 million) it reached in 1981 when Republicans took charge of the White House. Consequently, the DOE's very enthusiasm for some programs will increase the pressure for it to make tough choices on the future of others, says DOE program chief San Martin.

Take the 15-year-old ocean thermal energy program, which has a budget of $4

PROPOSED CHANGES IN RENEWABLE ENERGY R&D
(millions of dollars)

Program	FY 1990 budget	Proposed FY 1991 budget	Increase/ reduction
BIOFUELS ENERGY TECHNOLOGY	$16.3	$28	+$11.7
SOLAR BUILDINGS TECHNOLOGY	1.26	1	-$0.26
PHOTOVOLTAIC ENERGY SYSTEMS	34.6	43.6	+$8.9
SOLAR THERMAL ENERGY SYSTEMS	15.9	19.5	+$4.5
WIND ENERGY SYSTEMS	9.1	8.6	-$0.53
OCEAN ENERGY SYSTEMS	4.1	00.0	-$4.1
SOLAR ENERGY RESEARCH INST.	0.65	5.2	+$4.5
OTHER SOLAR ACTIVITIES	8.6	9.97	+$1.39
GEOTHERMAL	18.08	18	-$0.08
Total Renewables Program	$107.8	$133.9	+$26.1

million this year. If Congress agrees, the entire program would be killed in 1991. Any move in that direction is sure to be contested by legislators from Hawaii, where DOE's research effort has been centered. San Martin, however, defends the Administration's decision to ax the program, saying that it was not that the technologies lack merit, but because the department had to choose where to use its limited resources.

Although ocean thermal is the only major program targeted for elimination, cutbacks have been proposed across much of the DOE's renewable energy program. And that won't be the end of the programmatic trauma: more economies are expected next year when the new assistant secretary for conservation and renewable energy, J. Michael Davis, unveils the 1992 budget. He is the first high-level program manager to come to the job with an extensive background in renewable and solar energy—he served as a program leader at DOE in the late 1970s, a manager at SERI, and head of a solar equipment company in Denver.

Based on this expertise, Davis is already planning a major restructuring of his entire conservation and renewable energy division to focus R&D programs on industrial, transportation, utility, and building applications. Davis seems to be making a favorable impression on industry and DOE researchers by asking Congress for permission to use $6.5 million in leftover 1989 funds to expand research this year instead of returning the funds to the federal treasury. The money would go for photovoltaics, solar thermal concentrator technology, and the construction of the SERI research facility.

"The good news is that we have somebody who knows the research," says Sklar. "The question is can he take a program that has been in disrepair for the last 8 years and make something intelligent out of it."

■ MARK CRAWFORD

Who Should Study Radiation Effects?

Credibility is the gold standard of public life: when you have it, you can do no wrong, and when you lack it, you can do nothing right. This explains why the Department of Energy has been trying desperately in recent months to regain public confidence in its methods of evaluating health risks at weapons plants and the other nuclear sites it operates. So far it has not had great success, and it may now be about to give up. It is considering turning over most of its $29 million in long-term radiation exposure research to another department.

DOE has been battered by unfavorable news reports since the mid-1980s, when investigators began to unveil its once secret past and discovered one mistake after another in the handling of radioactive materials. It has also been attacked for suppressing data on workers' exposure to radiation.

Last year, searching for a way back into the public's good graces, DOE Secretary James Watkins appointed a special committee to advise him on how to improve the agency's conduct of epidemiological studies—in particular, how to make them credible. The problem, as the advisory panel recognized, is that regardless of whether DOE stifles good epidemiology, it has a stake in the results and may not be the best research sponsor.

DOE "manages its epidemiologic activities in an uncoordinated and inconsistent manner"

This quandary came to the fore in 1977 in the celebrated case of epidemiologist Thomas Mancuso of the University of Pittsburgh. The health researcher got into a quarrel with DOE's predecessor, the Atomic Energy Commission, over rights to data he had collected while working under an AEC contract. When Mancuso claimed to have found excess cancers among workers at the Hanford nuclear site, he was denied access to the records. Even as recently as this year, a researcher complained that DOE officials made it clear that they did not want contract research to come up with "unfavorable" results. Greg Wilkinson, an epidemiologist formerly at the Los Alamos National Laboratory and now at the University of Texas, testified that he had been chided by superiors for producing a study that found excess cancers among DOE workers. A Los Alamos spokesperson responded afterward that the study had not been suppressed, pointing out that it appeared in a scientific journal. Although this report was published, Wilkinson said he felt uncomfortable about the pressure and eventually left Los Alamos.

Watkins's new advisory group, chaired by Kristine Gebbie, secretary of health for the state of Washington, quickly got to the heart of this business and produced a draft report early this year. In a manner untypical of most Washington committees, it has already voted to turn the results over to Watkins next week and close down 2 months ahead of schedule.

The panel's legacy, according to executive director Steven F. Boedigheimer, will be unanimous agreement on a major point: that much of DOE's health effects research should be conducted not by DOE but by some other federal agency, probably the Department of Health and Human Services. This is the primary change sought by many critics who contacted the panel. However, they generally wanted a more sweeping overhaul.

For example, Jack Geiger of Physicians for Social Responsibility argued that *all* health-related duties should be entrusted to an independent agency, because "it is. . .intolerable that the fox could have the exclusive right [or even the primary responsibility] for reporting on morbidity and mortality in the chicken coop."

Boedigheimer says that "we did not take the broad-brush approach" of these DOE critics, but identified "two distinct functions" in epidemiology and assigned one to DOE and the other to HHS. The one that should go to HHS, the panel believes, is "long-term analytical" research, involving mainly retrospective studies of large populations. Meanwhile, the job that should remain at DOE, according to the committee, is the day-to-day monitoring of workers' health and radiation exposure. Panel members believe this makes sense not only for practical reasons, but also because they think employers have a responsibility to step into the workplace and actively protect the health of employees.

The draft report of 3 March makes other pointed comments:

■ DOE "manages its epidemiologic activities in an uncoordinated and inconsistent manner," its agenda is not planned, and data collection is not standardized.

■ DOE should create a new assistant secretary for occupational and environmental health who, among other duties, should "investigate urgent and immediate problems surfaced by the surveillance system or by managers, workers, or community concerns."

■ DOE and HHS should set up a joint committee to raise the quality of epidemiologic research.

■ ELIOT MARSHALL