$f \simeq 2.6 \times 10^{-5}$ dynes, which is somewhat larger than the force estimated earlier for extraction of a glycophorin molecule. However, since the forces are estimated to be the same order of magnitude, we conclude that some integral membrane proteins, especially those with folded cytoplasmic tails, may preferentially come out of the membrane together with associated lipids rather than in naked form.

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NEWS AND COMMENT

A Bright Solar Prospect Seen by CEQ and OTA

The Sun Day observance of 3 May was intended as more than a good-humored celebration of the sun and the promise of solar technology. It was also expected to afford the opportunity for some strong criticism of what many solar advocates see as the government's failure to push the development and commercialization of this technology more vigorously.

Indeed, such criticism has been brewing for some time. Several national environmental groups recently accused the Carter Administration of backing away from a commitment to energy conservation and development of decentralized, renewable energy systems in favor of nuclear power and massive subsidies for synthetic fuels.

As it happens, new reports by the Administration's own Council on Environmental Quality (CEQ)—which under President Carter has been allowed to play somewhat the role of a gadfly—and the congressional Office of Technology Assessment (OTA) lend credence to the view that federal support for solar development has not been nearly in keeping with this technology's promise. Both reports say that the technology is on the verge of a flourishing new phase but that, without aggressive federal support, its contribution to national energy supplies will fall far short of what now seems technically and economically achievable.

The CEQ report, based on an extensive literature review and discussions with solar scientists, says that it should be possible for solar technology to supply a quarter of all U.S. energy by the year 2000 and "significantly more than half" by 2020. "For the period 2020 and beyond, it is now possible to speak hopefully, and unblushingly, of the United States becoming a solar society," the CEQ adds. No federal agency has ever previously held out even the possibility of so rapid a growth of solar energy, and

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The Attorney General and the Snail Darter

The snail darter has been the object of much scoffing ever since a federal appeals court ruled early last year that the Tennessee Valley Authority's $120-million Tellico Dam project could not be completed because the last known habitat of this little 3-inch fish would be destroyed. Recently, the snail darter, already one of the best known creatures on the endangered species list, was back in the news as the subject of a Supreme Court hearing. Moreover, it turns out that a few months ago the darter and the dam project gave rise to a curious and surprisingly intense interplay among high Carter Administration officials, including the President himself.

From an environmentalist's point of view, the heavy in this until now untold story is Attorney General Griffin B. Bell. During the Supreme Court hearing on 18 April, Bell urged that the appeals court ruling be reversed so that the all-but-completed dam could be closed and the reservoir filled. But the origins of this convoluted tale go all the way back to 1973, when Congress passed the Endangered Species Act, which says that federal agencies must not jeopardize the continued existence of endangered or threatened species or destroy habitat deemed "critical" to their survival. Two years later, the Department of the Interior listed the snail darter as endangered and a part of the free-flowing Little Tennessee River that was to be impounded by the Tellico Dam project (then already far along) as critical habitat.

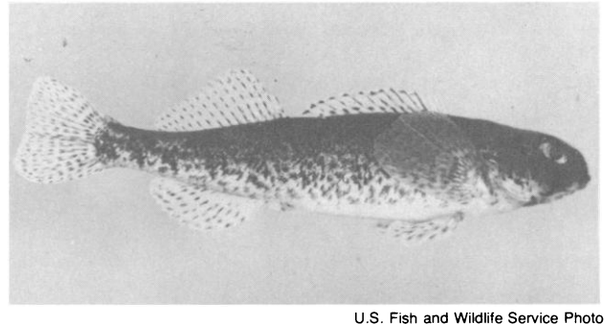
Since then, the snail darter and the Endangered Species Act have quite obviously been seized upon by litigants who have wanted to stop construction of the Tellico Dam largely for other reasons. But this merely means that the battle over the Tellico project is part of the larger national controversy over water policy reform. Advocates of such reform regard the Tellico project as a prime example of why new rules are needed for project justification.

In a report to Congress late last year, the General Accounting Office (GAO) itself concluded that many of the benefits which TVA has claimed for the project are questionable. For example, the GAO said that in claiming substantial recreation benefits TVA failed to take account of the fact that many visitors to the new reservoir would be people diverted from other TVA reservoirs, of which there are about a score within 60 miles of Tellico.

There has been a question all along whether the Carter Administration should lend its support to the Tellico project by having the Department of Justice represent the TVA (which can represent itself) in its appeal to the Supreme Court. White House staffers have recognized that for Justice to do this might appear at odds with the President's support of the Endangered Species Act and his promotion of water policy reform. It might also seem a bad precedent for the Administration to embrace the TVA argument that Congress has in effect exempted the Tellico project from the Endangered Species Act by continuing to appropriate funds for it even after the appeals court ruling. Such congressional behavior is known, in Washington parlance, as "legislation by appropriation."

Nonetheless, last year the Justice Department asked the Supreme Court to hear the snail darter case without fully realizing how strongly Secretary of the Interior Cecil D. Andrus and the President's advisers at the Office of Management and Budget (OMB) and the White House would object to this course of action. But, once this had been done, Justice could not withdraw from the case without seeming to repudiate its own client—something which Attorney General Bell apparently decided early he was simply not going to do.

Accordingly, the Attorney General is said to have become disturbed, and even angry, upon learning a few months ago that President Carter had been persuaded that Justice should not represent TVA. This initial decision by the President was made on the strength of a recommendation by Secretary Andrus, OMB, the Council on Environmental Quality, and two of the key figures on the White House staff, Robert J. Lipshutz, the President's counsel, and Stuart E. Eizenstat, his domestic affairs adviser. But Bell had enough influence with Carter to turn things around.



U.S. Fish and Wildlife Service Photo

After the Attorney General talked with him, the President passed the word that Bell, Andrus, and Lipshutz should arrange a compromise. What followed was an agreement that Justice would represent TVA but that, in an appendix to its Supreme Court brief, the Department of the Interior would present its argument against the Tellico Dam and for the snail darter. Some have viewed this as no compromise at all, believing that the Supreme Court would surely be led to think that Justice and not Interior is really expressing the Administration position.

Another irony about the snail darter affair lies in the very fact that it was Bell rather than the Solicitor General, Wade Hampton McCree, Jr., who argued the case before the Supreme Court. McCree had to disqualify himself because he happens to have been one of the appeals court judges who ruled against the TVA last year. In light of this, the Tellico project seems almost without convinced champions in the Administration. Yet, even so, it now carries what the Supreme Court may well choose to regard as the Administration's imprimatur.—LUTHER J. CARTER

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last year's Ford Foundation–sponsored report on nuclear power said the solar alternative could not make a significant contribution to U.S. energy supplies until "rather far into the 21st Century."

(In commenting on an early draft of the CEQ report, Richard Caputo of the Department of Energy's Solar Energy Research Institute at Golden, Colorado, observed that "solar energy is indeed a long-term, 21st century option." He added that it took 30 years for nuclear power to take even 2½ percent of the national energy market, and that "to expect solar energy to do better is unrealistic.")

CEQ's surprisingly optimistic projections depend on a strong national commitment to conservation as well as to solar development. The development contemplated includes systems that would tap solar energy in both its direct and indirect forms—from photovoltaic cells for the production of electricity and solar thermal collectors for heating and cooling to windmills, hydropower dams (with a new emphasis on small "lowhead" hydro generation), and systems for the production and conversion of "biomass," or plant material.

The OTA report, *Application of Solar Technology to Today's Energy Needs*,* offers no estimate as to how far solar technology will go toward meeting future energy demand, but does suggest that this technology could begin coming on strong within 10 years. Addressing itself only to such decentralized, "on-site" technologies as photovoltaic cells and solar heating and cooling, the report suggests that the government could support solar research, development, and demonstration more adequately (about 10 percent of the energy R & D budget now goes to solar technology); provide financial incentives such as tax credits and low-interest loans for purchasers of solar equipment; and remove regulatory barriers, such as any that would prevent or inhibit the sale to a utility of surplus electricity generated by a homeowner or commercial business on site. With such federal assistance, the report says, "on-site solar devices could be made competitive in markets representing over 40 percent of U.S. energy demand by the mid-1980's," although it would probably take longer for them actually to capture more than a small part of the market.

The report adds these words of caution: "Existing federal programs controlling fuel prices and subsidizing non-solar energy sources have created a situation where, without compensating subsidies, solar energy is uniquely disadvantaged. Federal support of solar energy has concentrated disproportionate attention to central electric generating systems instead of exploiting the special opportunities provided by onsite equipment."

But the report says that even the remedying of the above-mentioned problems would not necessarily ensure a growing share of the market for onsite solar systems. For substantial market penetration, potential customers must be persuaded to make their purchases on the basis of total "life-cycle" costs and not merely the initial purchase price.

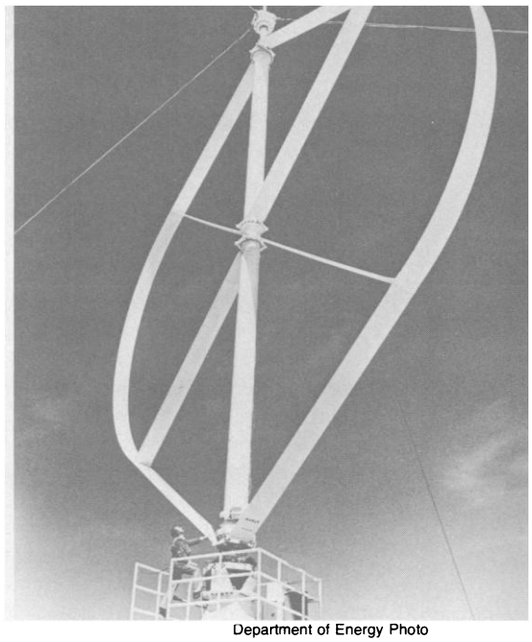
Also, the extent of market penetration will depend partly on the rate at which an infrastructure for the manufacture, sale, installation, and maintenance of these systems can be developed. In 1977, solar heating and cooling supplied only a minuscule part of total U.S. energy needs, the report observes. Starting from this small base, it says, solar sales would have to increase by over 50 percent a year for 20 years for the output of onsite solar systems to meet 10 percent of U.S. energy needs. Moreover, an investment of more than $500 billion would be required.

According to the CEQ report, many of the economic comparisons drawn between solar energy and other energy technologies unfairly leave out of account the large subsidies enjoyed by solar's competitors. It says that well over $100 billion have been spent over the last several decades to stimulate development and production of these competing forms of energy.

Mired in Controversy

The Carter Administration's proposals in the direction of replacement-cost pricing for oil and (to a much more limited extent) for natural gas became mired in controversy shortly after they were submitted to Congress more than a year ago. The most the House and Senate have done so far to put solar technology on a more equitable footing with its competitors is to approve the President's proposals to provide tax and loan incentives for solar purchasers; to call for an end to utility rate structures that discriminate against solar energy; and to authorize some $198 million in purchases of photovoltaic and solar heating and cooling equipment for federal buildings.

As part of the President's official family, the CEQ has not directly criticized Administration policies. But not much reading between the lines of its report is necessary to get the message that those policies are deemed pathetically inadequate in relation to the need for rapid development of solar energy as an alternative to coal and nuclear power. Given the environmental and weapons proliferation problems associated with these latter two energy sources, the council seems to view them as questionable long-term supply options.



Department of Energy Photo

Experimental vertical-axis windmill seven stories high at Sandia Laboratories, Albuquerque, New Mexico. This eggbeater-shaped machine produces 30 kilowatts of power in a 22-mph wind and up to 60 kilowatts in a 28-mph wind.

Although no new recommendations for federal action are put forward by the CEQ, the council sets forth a variety of proposals heard in recent months from solar advocates. The most striking of these is a proposal for the United States to undertake a vast effort, on the scale of the Marshall Plan for postwar recovery in Europe, to aid less developed countries in developing solar energy.

The OTA report suggests that closer cooperation between U.S. and foreign solar programs could contribute to the growth of investment and employment in the domestic solar industry. "Many types of onsite solar energy are likely to be economically attractive abroad before they enter commercial markets in the U.S.," the report says, adding that worldwide use of solar energy could reduce the tensions caused by international competition for diminishing supplies of fossil fuels.

The CEQ scenario for the year 2000 envisions a solar mix in which no one technology would be dominant. Of the 23 quadrillion btu's to come from solar sources, windmills, solar heating and cooling systems, and "intermediate temperature systems" (solar collectors to produce industrial process heat) would each contribute 4; photovoltaic and bio-

*To be available from the U.S. Government Printing Office in June.

Carter Versus Advisory Panels

"Before I became President I realized and was warned that dealing with the federal bureaucracy would be one of the worst problems I would have to face," President Carter recently told a news conference. After more than a year of jousting, Carter added, "It has been even worse than I had anticipated."

Apparently, the observation is especially warranted with regard to his efforts to cut the size and cost of federal advisory committees, the centerpiece of Carter's government reforms thus far (*Science*, 2 December 1977). According to the President's annual report on the advisory committees, released several weeks ago, the cost of the committees over the last year increased substantially even though the number of people serving on them declined. In the Department of Defense, for example, the committees managed to run up a bill for 1977 that is 18 percent higher than the bill for 1976, despite a drop in committee membership of 15 percent. Overall, the membership dropped 10 percent, but the costs rose by nearly the same percentage.

Government experts are at something of a loss to explain the phenomenon, except to suggest that some of the 299 committees that were abolished did not shut down early enough last year to have a budgetary impact, and that the 15 new committees established during the year spent more than their predecessors. Some success was achieved: the magnitude of the cost increase was less than the rate in 1976 of 15 percent, but this achievement is only a temporary advance. The advisory panel budgets for 1978 call for a whopping 17 percent increase.

Thus, the primary result of the reforms has been only a drop in the number of advisory panels or—to reach a bit—avoidance of even greater cost increases. This has been the case at the National Science Foundation (NSF), where the number of committees dropped considerably after several consolidations, but the overall membership was actually permitted to rise under the new committee charters.

Carter Orders NSF Plan Blocked

Recently, the NSF changes were given informal Administration approval, despite a flap over the membership totals that personally involved President Carter. The flap occurred when Carter read an account of the NSF consolidations in his periodical news summary and wrote a note in the margin directed to Hamilton Jordan, the President's top adviser, and to the Office of Management and Budget (OMB). The note is said to have read, "Prevent this, Jimmy." According to one Administration official, Carter was upset because the overall increase in NSF advisory panel membership appeared to be an evasion of his order that "the number of advisory committees will be sharply reduced, and that appropriate changes in membership will be made whenever necessary."

William Bonsteel, then the OMB official in charge of the advisory panel reforms, was asked to get an explanation from NSF. In the response, NSF director Richard Atkinson said that in some cases, committee memberships had been increased "to provide for stronger oversight and evaluation of the conduct of our programs." He noted, however, that the "number of advisors actually used to review research proposals and for all other purposes will nearly always be less than the charter limits and will vary considerably at different points in time."

Atkinson's response never made it back to the President, but sources at OMB and NSF said that the letter was forwarded up the line to James McIntyre, the director of OMB, and the NSF plans were informally approved. The net result is that the NSF has not had to carry out the instructions that Carter wrote on the margin of the news summary.

Asked to comment, an NSF spokesman, Tom Ubois, said that when the initial directive on advisory committees was sent by the President, "NSF noted the President's request and examined the words very closely at the time we made the consolidations." As for the directive in the news summary margin, "NSF never heard anything about it," Ubois said. "There was never any attempt to circumvent the President."—R. JEFFREY SMITH

mass systems, 3 each; and hydropower (including the output of existing large-scale hydro facilities), 5.

As the CEQ report points out, the recently issued two-volume interim report on *Distributed Energy Systems in California's Future* concludes that, from a purely technical standpoint, by the year 2025 it would be possible to meet nearly all of California's energy requirements from sustainable, renewable sources indigenous to the state. Again, these sources would include solar energy in all its forms, plus some geothermal energy.

This study, prepared under a Department of Energy contract by researchers from the University of California's Davis and Berkeley campuses and from the DOE's Livermore and Berkeley laboratories, assumed that California's population would nearly double by the year 2025, its gross state product would triple, and its energy prices would quadruple. A further assumption was that energy consumption would be restrained by the higher prices and improvements in energy efficiency, but that there would be no major change in life-style owing solely to conservation. The one significant shortfall in energy supply is a deficiency of about 0.6 quads in the liquid fuels needed for transportation—one that occurs despite use of electric vehicles for urban transportation and maximum production of liquid fuels from municipal and agricultural wastes and the biomass from plantations covering nearly 17 percent of all land in California.

Land Use Conflicts

The most severe problem identified in the California report has to do with potential land use conflicts. Such conflicts would arise in establishing the extensive biomass plantations (though none would be on irrigated farmland), finding sites for up to 35,000 large windmills, and attempting to locate solar collector fields for industrial electric and process heating systems (which, if located adjacent to the industries that they would serve, could take up 25 percent of all of the state's urban land).

The California study, which is continuing, was undertaken in response to the debate provoked by Amory Lovins of Friends of the Earth with his much publicized thesis that energy development should follow the "soft" path of decentralized, renewable sources, as opposed to the "hard" path represented by development of large-scale, centralized nuclear and coal-fired facilities. The new solar reports by CEQ and OTA will now no doubt lend further intensity to this still ongoing debate.—LUTHER J. CARTER

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