and officials. Calls to medical libraries in the Washington, D.C., area showed that they had not yet received copies.

As the institute tries for an out-front style, a titantic legal battle for control of the Hughes estate is heating up. It was only recently that Thorn resigned his post as HHMI's director of medical research to join Chester C. Davis and Frank William Gay as members of the institute's executive committee. The three are pitted against William R. Lummis, a Texas-born cousin of Hughes who has taken over the chairmanship of Summa Corporation since Hughes' death in 1976. Summa has authority over most of Hughes' holdings—except for Hughes Aircraft, the most profitable of all.

From 1970 on, while Hughes was in self-imposed exile, Gay and Davis managed both Summa and the medical institute. During that time, Summa is reported to have lost almost $132 million. Last year, however, Lummis fired Davis as the company's director and chief council and this March "accepted the resignation" of Gay as Summa's president. In a Delaware court, Gay *et al.* have now charged that it was Hughes' intention to ultimately transfer the balance of his estate to the institute. They now want "reasonable time" to prove a lost will and probate it. Lummis has countered with a court action to oust Thorn, Gay, and Davis from the controls of the medical institute and to have himself or "some other appropriate person" named as trustee. He claims they usurped power over the institute in a manner that Hughes, the sole trustee, never intended. The Attorney General of Delaware, Richard R. Weir, Jr., has teamed with and supports Lummis as a coplaintiff. They have petitioned the court to order the institute to account "for its activities since the death of Hughes."

The corporate duel over the institute heats up, but its scientists still go about the business of biomedical research with a philosophic calm. Said one: "There is a minimum of red tape and a maximum of freedom, a maximum willingness to let you go where the idea leads, even if it takes you to another lab for collaboration." But critics contend that too few people appreciate what goes on in the institute's labs. It even gets to people on the inside. Said Murial Fox, a spokesperson for Hughes Aircraft who suddenly found herself besieged by calls concerning Thorn's article: "I wish they'd open up. I think they have a great story."—WILLIAM J. BROAD

Policy Review Boosts Solar as a Near-Term Energy Option

Solar energy, not long ago officially regarded as an exotic energy source that could not contribute much toward meeting total U.S. energy demand before the year 2000, is now on this year's national agenda as a major option for the near term as well as for the next century. In the recent report of the interagency Solar Energy Policy Committee, the Department of Energy (DOE) has joined the Council on Environmental Quality (CEQ) and other agencies in concluding that by the year 2000 solar energy could, given continuing increases in the price of oil, provide up to 20 percent of the nation's energy needs.

Now under consideration by the White House staff, this report (which has still not been officially released) sums up the findings and policy options arrived at in the domestic policy review (DPR) of solar energy that was commissioned by President Carter late last spring and announced on Sun Day, 3 May. Although coming too late to have had much effect on the President's fiscal 1980 budget, the DPR could lead later this year to a special presidential message on solar energy and possibly to a supplemental request for a budget increase for solar.

In a report issued last April, the CEQ found that solar energy could, with proper encouragement by the federal government, meet 25 percent of all U.S. energy needs by the year 2000 (as opposed to 6 percent today) and "significantly more than half" by 2020. But this was the CEQ talking, not the DOE. It was clear from the National Energy Plan (NEP), which emphasized coal and nuclear power, that neither the DOE nor the White House had been looking to solar to meet anything approaching a fourth or a fifth of national energy needs, even counting hydro and firewood as indirect solar energy.

The President did lend credence to the CEQ estimates by referring to them in the Sun Day speech he gave at the Solar Energy Research Institute in Colorado, then observing: "Progress toward these goals is a cornerstone of this nation's energy policy." But the President apparently had not accepted the CEQ estimates unreservedly, because one of the things expected from the DPR was an analysis of the potential contribution that solar energy could make.

The DPR has, in the view of most solar enthusiasts, now given solar energy another strong boost, both by concluding that solar could in fact become a major part of the national energy supply over the next 2 decades and by setting forth a large mix of possible policies and programs to bring this about. Inasmuch as it was conducted by a presidentially ordained committee chaired by the Secretary of Energy and made up of representatives of more than 30 agencies, the DPR moved solar energy onto the center stage of national energy policymaking.

This is not to say that the entire federal energy establishment has become bullish on the prospects for solar. In late October, when the DPR was already far advanced, Deputy Secretary of Energy John F. O'Leary, in a speech at an American Public Power Association seminar, declared: "The future of solar is in the next century. It doesn't apply significantly during this century." (It has not been explained how, on the basis of the DPR, O'Leary could have arrived at a conclusion so different from the one reached by others in his department, including Secretary James R. Schlesinger.)

Also, in the Congress, Representative Mike McCormack (D-Wash.), chairman of the House Science and Technology Subcommittee on Advanced Energy, was recently quoted by the *Solar Energy Intelligence Report* as saying that "Solar cultists are talking about getting 20 percent of our energy [from solar] by the year 2000, but we'll be lucky to get 4 percent." "These solar cultists want the U.S. to commit [energy] suicide," the congressman added.

The DPR report itself acknowledges that forecasting total energy demand, or the use of specific energy sources, could not be done beyond the near term with any certainty. Such forecasts could, the report indicated, easily be upset by unforeseen changes in such "unpredictable factors" as the course of energy prices and the availability of competing fuels.

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The report simply sets forth three scenarios to suggest the solar potential under different assumptions and circumstances. In the "base case" scenario, with present policies and programs continuing, by the year 2000 solar energy could, the report says, supply 10 to 12 quadrillion Btu's out of a total national energy supply of 95 to 114 "quads." But this scenario rests on the assumption that energy prices will rise to the equivalent of $25 to $32 per barrel of oil in 1977 dollars, compared to the $14.50 a barrel now paid for imported oil.

In the second scenario, with a "maximum practical effort" by federal, state, and local governments on behalf of solar energy, some 18 quads of energy from other sources (or up to 20 percent of the total energy supply) could be displaced. In the third scenario, called the "technical limits" case, the market penetration of solar technology would be limited to a maximum of 25 to 30 quads primarily by an inability to expand solar manufacturing capabilities or replace building stocks any faster.

The report presents three optional policy packages, and option 2 is put forward at least implicitly as the one to be preferred, although the possibility of a composite choice, with programs and policies to be drawn from all three options, is not excluded. Compared to option 1, which calls for modest improvements in existing programs without any major new initiatives, option 2 is highly ambitious; but the some $2.5 billion in additional funds that would be needed for it during the first 5 years would be nothing compared to the $40 billion required for the third option.

Both options 2 and 3 stress tax credits and subsidized loans for the purchase of solar systems as being essential to overcome buyer resistance to the relatively high "first cost" of solar technology (as opposed to the full life cycle cost) and to offset the heavy existing subsidization of competing fuels and energy systems. Option 2 contemplates, for instance, giving a tax credit to the builders of energy-efficient houses and commercial dwellings that include such passive solar design features as large double-glazed, south-facing windows to let in the winter sun and massive masonry walls to retain the heat. Under the National Energy Act (NEA) of 1978 as it now stands, builders, unlike homeowners, cannot qualify for the solar tax credit. And when passive solar design features are an integral part of the structure, as they usually are, no one is entitled to a tax credit for them.

Option 2 also would bring about a redirection and expansion of the federal solar R & D effort. "Near term technologies for the direct production of heat and fuels, community-scale applications, low-cost technologies and basic research would receive increased support," the report says, "while technologies for electric generation at centralized facilities would be developed at a more moderate pace."

Other changes in policy would include requiring federal power-generation and marketing agencies to maximize hydroelectric output at existing federal dam sites and allowing them to use a wide range of solar technologies. In addition, all new federal facilities would be required to use passive and active solar systems when such systems are cost-effective, and post offices and other federal buildings heavily used by the public would be retrofitted with solar systems.

Option 3 would differ from option 2 in that the tax credits and other subsidies would be much larger and more extensively applied. Also, this option calls for making use of passive and active solar technology mandatory if the financial incentives fail to bring about widespread acceptance of these technologies. For example, the "Building Energy Performance Standards" (BEPS) now in preparation by the DOE under the Energy Conservation and Production Act of 1976 would, by 1987, be tightened so much that to meet them would require use of passive solar design.

Yet the DPR participants appear to have been quite aware that mandatory measures are politically hazardous and that groups such as the National Association of Home Builders—which strongly oppose regulations that increase red tape and housing costs—have plenty of clout on Capitol Hill. Apparently for this reason, implementing regulations that could generate a powerful political backlash generally would be deferred long enough to give tax credits and other subsidies a chance to work.

But subsidization is an alternative with problems of its own. Any substantial new subsidies, and especially the massive subsidies envisioned under option 3, promise to be controversial in a period of chronic budget deficits and inflation. Moreover, the Department of the Treasury is opposed, as a matter of principle, to solar tax credits or other "off-budget" financing approaches that bypass the congressional appropriations process.

The large subsidies that would be available under option 3, and to a lesser extent under option 2, are not universally favored even among solar enthusiasts. Theodore B. Taylor, a former nuclear weapons designer and now a well-known solar consultant, is convinced that massive subsidies would discourage rapid innovation and progress toward lower cost solar applications.

Taylor is well aware that solar is at a disadvantage in the marketplace because of the many subsidies, such as depletion allowances for oil and massive federal research support for nuclear power, which promote the use of competing fuels and energy technologies. He also knows that these subsidy programs are often deeply entrenched politically and are hard to remove. "But to try to correct this by adding massive solar subsidies is simply inflationary," he says. "If you make it possible to go with high-cost solar technology, it will stay high cost," he adds. Although as optimistic as anyone about the prospects for solar, Taylor, on this fundamental issue of subsidization, is miles apart from most other leaders of the solar movement.

Together with his colleagues at the Solar Lobby, Herb Epstein put forward the proposals that went into option 3. He sees heavy subsidization as the only alternative to an early emphasis on politically risky regulatory approaches. Furthermore, he believes that the subsidy programs can be designed so as not to freeze the state of the art. Also, Epstein believes that the building energy performance standards should and can be written to require that passive solar designs be gradually adopted over the next decade for all new residential and commercial construction. The combination of progressively tighter performance standards and carefully designed subsidies would, in his opinion, advance passive solar technology, not retard it.

In any case, if important new federal initiatives are to be taken to promote solar technology, President Carter and the Congress may have to look to some combination of subsidies and regulation because the DPR does not seem to have generated much in the way of proposals of any other kind. An alternative would be for the government to cheer the solar industry on, provide more money for long-term basic research, and, otherwise, leave solar development pretty much alone. But except for a few individuals such as Taylor—who among solar enthusiasts seems almost alone in his faith in the ability of the solar industry to make rapid progress with little help from the government—this course of action would not enjoy much popularity in the solar community. With the DPR, solar seems to have gained a high place on the energy policy agenda, and the faithful are waiting to hear what the President plans to do.—LUTHER J. CARTER