science and technology, government, industry, and the universities are linked by labyrinthine relations whose complexity stymies planners.

At the hearings, these complications were fully acknowledged. Testimony tended to swing from general problems of planning to specifics of how to do it. Industry witnesses sought to describe how corporate planning practices can be relevant to national planning activities. Discussion of issues such as whether planning should be "top down or bottom up" tended to be a bit abstract, but there was a clear consensus, for example, on the general principle that, in any sphere, planners and managers must be in continual, close touch or plans will not be converted into action.

Planning experience in other countries seemed, in the case of Canada, mostly cautionary. Canada began taking a serious interest in science policy in the mid 1960's, but apparently this interest became such a preoccupation that action to support science and technology was delayed. The early 1970's seem to have been a period of trial and error with both institutions and programs with very mixed results. Now things may be looking up; requirement of 5-year plans for science and technology from government departments, for example, seems promising.

In the case of Japan, science and technology policy has never been separate from economic policy. In the post World War II era, science and technology was mobilized to serve the national strategy of restructuring industry, first, to build up basic industry and heavy manufacturing and then, from about 1970 onward, to move to nonpolluting, investment-intensive, high-technology industry. Planning in Japan is not carried out by government fiat, but by a goal-setting consensus process. Science and technology have performed a different function in Japan than they have in the West; Japanese industry, for example, has depended heavily on the import of Western technology and great emphasis has been placed on engineering. Concern is increasing in the United States about the contribution of science and technology to productivity and industrial competitiveness, areas in which Japan has been notably successful. Although Japan is an example, because of social and economic differences, it can hardly be a model.

To succeed in the United States, planners will have to devise strategies that take into account both the strengths and the recalcitrance of the system. The immediate concern here, as evidenced in the Fuqua bill, is to give science funding continuity and stability at a time when constraints on federal funding make the sector particularly vulnerable. Multiyear funding is seen, in part, as a means to that end.

In a comment printed in the report on the bill Frank Press is quoted on the point:

> In my view, you are not being parochial in singling out research and development for implementing multi-year authorization. By its nature, most research and development has to be planned and implemented over a lengthy time frame. There consequently appears to be little purpose served in much of the annual effort that leads to routine extensions of authorizations. Annual authorization reviews across the spectrum of research and development cannot but be superficial much of the time. Moreover, there may be little to evaluate on an annual basis if the work has not yet progressed to its next logical stage for a substantive review. I believe that in both the Executive and the Legislative Branches we need to schedule the reviews so that selected program areas receive intensive attention at critical stages of the research and development process.

Press makes a case for multiyear authorizations for R & D which is also an argument for much broader planning authority. The difficulty is that anyone who considers the case for planning and the obstacles to it could easily conclude that real science planning in the United States is both necessary and impossible.—JOHN WALSH

Energy Standards for Buildings Face Delay

Conservation performance standards draw fire from builders and electric utilities; they may be made purely voluntary

Nothing else rivals energy conservation as an environmentally benign and relatively low-cost, quick-payback way to reduce the need for foreign oil. But it lacks the macho appeal of big-buck energy supply programs and seems not to get the same support from politicians. The troubled status of the Buildings Energy Performance Standards (BEPS) program represents an excellent case in point.

BEPS is a particularly promising conservation program that is capable of reducing national energy needs by the equivalent of at least 440,000 barrels of oil per day by the year 2000. Yet it now faces high risk of delay and possibly weakening changes from a Congress that has just approved a synthetic fuels program that will cost billions, have substantial environmental impacts, and, according to many energy specialists, fall far short of its production goal of 2 million barrels per day by 1992. The BEPS program, as presently proposed, is under strong attack from influential industry lobbies for the home builders and the electric utilities. Moreover, there are no signs anywhere on Capitol Hill of a countervailing fervor that could push forward a strong program of energy conservation for buildings.

Established under the Energy Conservation and Production Act of 1976, the BEPS program was supposed to have been well along by now. The standards were to have been promulgated this August and—it was hoped—to have been adopted as part of state and local building codes by August 1981.

Development of the standards (which apply only to new buildings) has proved far more complicated than anyone expected, and some delay in getting them out was perhaps inevitable. But Congress, urged on by the home builders and utilities, seems likely to prescribe a 1-year program of prototype testing. This could delay, by $1\frac{1}{2}$ years or longer, even a start by state and local officials in having the standards incorporated in their building codes. The testing, to be carried out in at least two different climatic regions, would be intended to show the impact of the standards on building designs and costs, on builders and home buyers, and on energy savings.

Representative Thomas L. Ashley (D–Ohio), chairman of the subcommittee on housing and community development,

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and Representative Clarence Brown (R-Ohio) will seek to have this year's housing authorization bill amended to call for the prototype testing. Their amendment is expected to win approval on the House floor. Substantial support for this proposal exists in the Senate, too, although all that the Senate has done thus far is pass a bill to give DOE the additional time needed to improve the standards and present them in terms readily understandable to builders.

Grant Thompson, an energy specialist with the Conservation Foundation, regards the Ashley-Brown amendment as purely a delaying measure because, in his view, a year is not long enough to build new dwellings according to new energy performance standards and then test the standards against actual results. And Thompson, together with officials at DOE, is disturbed by the fact that the amendment would extract the few teeth that the BEPS program has. This it would do by striking from the National Energy Act of 1978 language which, as interpreted by DOE, calls for the new standards to be automatically made a part of the Department of Housing and Urban Development's "minimum property standards" that govern eligibility for most federal home loan guarantees.

If the link between the HUD property standards and the new building energy standards is lost, the latter are likely to be purely voluntary. Under the 1976 law, DOE is at liberty to recommend to Congress that federal subsidies for housing be withheld in any state or local jurisdiction that refuses to adopt the standards. But no such Draconian sanction would be acceptable to Congress. Maxine Savits, the deputy assistant secretary in charge of the BEPS program, knows the weather on Capitol Hill very well and is, at the moment, "leaning" toward a decision not to propose any sanctions at all.

The BEPS program has both supporters and detractors, but there is no question but that it is the latter who have the most influence and clout in Congress. Supporting the program are the environmental and consumer groups and the American Institute of Architects (the architects, through $9 million in federal contracts placed with the AIA research corporation, have had a substantial part in preparing the standards). These groups want the program implemented soon and feel that the standards are much weaker than they could be. The Consumers Energy Council of America, in a study done for DOE, urged that the initial standards be made 30 percent more stringent and that they be further tightened at 5-year intervals thereafter.

The National Association of Home Builders (NAHB), which has affiliates that it can rally in every congressional district, is probably the BEPS program's most potent critic. The home builders see two problems with the program. One has to do with the effect that the standards, which were put forward for review last November, would have on housing prices.

DOE says the effect would be slight—from 75 cents to $1 per square foot, or some $1500 or less for a new home of average size. But the builders contend otherwise. They say that the cost of a new home could be increased by several thousand dollars, doing further harm to a housing market that has still not fully recovered from the slump brought on by inflation and high mortgage rates. DOE replies, however, that even if the cost of meeting the standards should turn out to be as great as the builders say, home buyers would get a rapid payback on the investment.

The home builders' other major complaint relates to the complexity of the standards. Unlike the more prescriptive approach followed by the energy-efficient standards issued in 1975 by the American Society of Heating, Refrigeration, and Air Conditioning Engineers, the DOE standards are strictly performance-oriented. An energy budget is to be arrived at for every new building, and the architects and builders will be free to conform to this budget by whatever means they can devise.

Although the freedom allowed by the performance concept is attractive in principle, many builders, especially small ones, would much rather follow a building code and energy-efficiency standards that take a cookbook approach. They do not want to worry about designs whose acceptability must be verified by sophisticated computer analysis. All along, DOE itself has recognized a need for the performance standards to be translated into cookbook-type manuals and codes; but pressed for time and short of personnel, Deputy Assistant Secretary Savits and her staff had the BEPS proposal published last year before the cookbook was ready. This is now admitted to have been a bad tactical mistake, one that will not be repeated when revised standards are published next February.

According to Savits, the revised standards will be more stringent than those first proposed if further analysis, based on current energy prices, building construction costs, and other factors, show this to be justified. But, she says, DOE will not, for now, impose standards that would require builders to use other than commonly accepted construction practices and materials. For instance, energy budgets will not be tightened to the point that builders would have to use two-by-sixes as wall studs—in place of the usual two-by-fours—and thus make room for more insulation.

The utilities say the whole weighting scheme is crazy, that it discriminates against use of . . . coal.

The electric utilities' complaint against the proposed standards is that buildings with electric-resistance heating will be expected to be about three times more energy-conserving than those that use natural gas. In most parts of the country, the cost of electricity (Btu for Btu) is three times that of gas and is even somewhat greater than the cost of heating oil. The DOE argument for applying "weighting" factors based on relative energy prices and requiring more insulation or other energy-conserving features for homes with electric-resistance heating is quite simple: owners of such homes are said to need, and to be able to afford, better means to keep their heating bills in check. (Less of a weighting factor would be applied to homes with electric heat pumps, which are relatively energy-efficient.)

The utilities say that the whole weighting scheme is crazy, that it discriminates against use of electricity generated by coal, an abundant domestic energy resource, and encourages use of oil and natural gas, both of which are relatively scarce. But, as conservationists point out, the utilities' argument is flawed by the fact that numerous power plants still have oil- or gas-fired boilers. Savits has promised to consider modifying the weighting factor to reflect regional variations in energy prices and the like. She has not, however, indicated that the weighting factors (which applies to oil as well as electric heat) will be given up altogether.

Conservation in homes and commer-

cial buildings can, it seems clear, yield truly large energy savings over the next several decades if relatively simple changes in building design and construction practices are brought about through tightened building codes. Although few people are as yet aware of it, some energy specialists now entertain the possibility that it will be feasible, even in colder parts of the country, to build "superinsulated" houses* that are so tight against the weather as not to require a furnace; one or two portable electric heaters could be enough to keep them comfortable on even the coldest days. A number of such houses have already been built in the United States and Canada at a cost said to be roughly comparable to that of conventional construction.

A well-studied example is the $60,000 home built in 1977 in Regina, Saskatchewan, and operated and monitored by the engineering department at the University of Saskatchewan. Besides its supertight construction, this house has two other special features: (i) an air-to-air heat exchanger to keep the air fresh inside the dwelling and prevent excessive humidity and (ii) passive and active solar heating. Experience to date indicates that the house would be quite comfortable even without the active solar system.

Energy consumed in homes and commerial buildings represents about 37 percent of all the energy used in this country. Savings of the magnitude suggested by the superinsulated houses would, of course, be enormous. But experience with such dwellings has been limited, and one must assume that, for one reason or another, such savings might not be achievable. Yet savings of even half that magnitude would eventually become large as the existing housing stock, which turns over at the rate of 2 percent a year or less, is replaced.

Although some builders have been adopting energy-conserving designs voluntarily, the industry's record in this regard is, as DOE can testify, quite spotty. To a degree, market forces promote adoption of such designs, but they alone are believed to be insufficient because even the most sophisticated home buyer may find it impossible to compare the energy efficiency of different dwellings unless they are built to common standards. This is why conservationists are eager for an early start to be made at having such standards adopted nationwide.

—LUTHER J. CARTER

*See *Superinsulated Houses and Double-Envelop Houses*, an illustrated monograph by William A. Shurcliff, which examines these new construction methods. Available for $10 from Shurcliff at 19 Appleton Street, Cambridge, Mass.

Ma Bell Losing Grip on Old Markets

Her control over the transmission of long-distance phone calls has gone on hold

The first coast-to-coast telephone line was put into operation between New York and San Francisco in 1915, and from that day forward, American Telephone and Telegraph (AT&T) enjoyed a transcontinental monopoly in the transmission of long-distance phone calls.

Until recently.

In the past 5 years new competitors have snatched an increasingly large share of Ma Bell's long-distance profits. With the aid of microwave towers and geostationary satellites, these entrepreneurs last year rang up $400 million in revenues—a little less than 2 percent of AT&T's long-distance total. But revenues are rapidly rising because these competitors can undercut Bell's prices by as much as half. All this, however, does not necessarily add up to unmitigated consumer bliss. There have been scattered problems with the new long-distance services, such as signals fading in and out. In addition, the competition could trigger more serious problems. As Bell loses long-distance revenues, it is likely that a nationwide increase in the monthly rates charged for local telephone service will soon follow. This is because Ma Bell subsidizes local service charges with the easy profits made in long-distance services—or did, until the new entrepreneurs started chipping away at her long-distance empire.

Bell, of course, has been fighting this invasion of her domain for some time, and on occasion the grand old lady of telecommunications has tried to snuff out the upstarts.

Consider the case of MCI Communications Corp., one of Bell's new rivals. According to federal regulations, MCI can hook its long-distance service into Bell's local exchanges, so that Bell phones can send and receive calls transmitted on MCI's microwave towers. In a recent suit, however, MCI charged that AT&T had undercut this federally sanctioned arrangement by filing unfair state tariffs, by cutting prices in violation of federal antitrust law, and by disconnecting MCI lines that were already hooked up. The jury agreed, and awarded MCI $1.8 billion in damages—an amount that Harold Levy, the general solicitor of AT&T, calls "obscene."

This outcome is expected to encourage new entrants to join the competitive long-distance fray, and to help current AT&T rivals expand their services. MCI, which for 5 years served only the business community, recently launched a major campaign to win residential customers. "Reach out and touch someone," reads one of their ads. "But do it for half of what Bell charges." MCI says it is currently adding customers at the rate of 30,000 each month.

The new entrepreneurs can underprice Ma Bell because of AT&T's practice of nationwide price averaging. During the 1950's and 1960's, technological advances reduced the cost of providing long-distance phone service, while the cost of providing local service rose. To prevent sharp rises in the local rates, Bell began subsidizing local service with profits made in the increasingly lucrative long-distance market. As a result, Bell's long-distance rates are priced far above the actual cost of providing long-distance service.

The big question is how much longer. The discount companies are making inroads into the residential market, and

This is the second of a two-part series on the changing definition of what it means to be AT&T—the world's largest company. The first looked at Bell's expansion into new markets, in particular computers and data processing.

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