Chapter III
MANAGEMENT AND INSTITUTIONAL ISSUES

Chapter III
MANAGEMENT AND INSTITUTIONAL ISSUES

This chapter discusses issues that are important for the successful operation of all programs within the Office of the Assistant Secretary for Conservation and Solar Energy (C&SE). They overlap in some cases with problems in other portions of the Department of Energy (DOE).

These issues are not specific to certain programs or technical areas, as are the issues discussed in chapter IV. Rather, they examine questions of program administration (such as evaluation, procurement, and staffing) and institutional questions, such as whether or not an appropriate role has been defined for utilities, for States, and for other parts of the Federal Government regarding energy problems. By and large, these issues must be dealt with by the Assistant Secretary and the Deputy Assistant Secretaries, with the involvement of program managers. A number of the points discussed in this chapter have been chronic problems within DOE, and attention to these questions may a prerequisite to moving the entire C&SE effort forward more vigorously and with greater long-term impact.

Issue 4

Program Staffing and Management

Development of conservation and solar energy research, development, and demonstration (RD&D) and commercialization programs has been hampered by imbalance between staff and a rapidly expanding program level, lack of organizational stability, and management turnover.

Summary

The C&SE programs show a significant growth in budget authority during a period when organizational structure and management have changed several times. Congressional initiatives, often requiring rapid development of plans and regulations, have grown much faster than C&SE staff. Delay in appointing an Assistant Secretary and repeated internal reorganizations have added to the strain on the staff. As a consequence, the ability of DOE to provide guidance for the development of solar and conservation programs has not seemed to equal the capability or interest of industry and citizens to move the technologies forward. This lack of management guidance and adequate staff has caused a lack of momentum, and has contributed to the difficulty of developing coherent long-term goals and strategies.

Questions

1. Are the job levels and pay classifications for C&SE managers equal to that of their peers in DOE?
2. Are the authorized positions within C&SE adequate to handle the workload? How many authorized positions are filled at this time?
3. Why have so many authorized positions within C&SE not been filled?
4. What techniques are used to evaluate staff performance?
5. Why have more personnel not been assigned to high payoff new initiatives such as the Building Energy Performance Standards (BEPS), which require entirely new analytical tools and management strategies?
6. How many personnel positions designated for program management have been con-

verted to staff positions to support supervisory work?
7. Have the conflict-of-interest regulations inhibited recruiting and retention of quality personnel ?
8. How does the ratio of personnel to number of contracts in C&SE programs compare with other technology programs?
9. Does the intrinsic diversity of conservation and solar technologies require more staff and management resources per dollar of hardware procurement or submarket analyses than other technologies (i. e., fossil and nuclear)?

Background

During the 30 months since DOE was established in **1977,** C&SE was without an Assistant Secretary for about half that time, and without an approved organizational structure for 26 months. This resulted in an inability to fully staff the office, which continued to have a high proportion of vacancies. At the same time, pressures associated with quickly implementing major legislation, — Energy Policy and Conservation Act (EPCA), Energy Conservation and Production Act, and National Energy Conservation Policy Act (NECPA)— combined with the need to brief a new and changing management structure, contributed to a deterioration of morale and made it difficult to attract talented people to work in such an environment.

Under these circumstances it has been virtually impossible to develop an integrated conservation and solar strategy, with measurable goals and evaluation programs, above the subprogram level. Without such a strategy, and a management structure that alines program responsibility with planning and implementation authority, conservation and solar technologies cannot be effectively developed and commercialized.

Continuity in management could provide an opportunity to develop both strategies and needed program integration approaches (see Issue 12). With a full complement of Deputy Assistant Secretaries, program managers can give full-time attention to program direction. Congress can rightfully expect that the Assistant Secretary and his Deputies establish program milestones and be held accountable for meeting them. The Assistant Secretary must be responsible for program integration and direction, for improving the balance of staff (technical and nontechnical) in each division, and for removing the remaining vestiges of the old "Federal Energy Administration/Energy Research and Development Administration" split. Each Deputy Assistant Secretary must be responsible for actually managing their program areas as well as helping to set goals.

Staffing levels have clearly been inadequate. Congress must keep in mind that authorizing new programs while staffing levels remain constant will mean delays, inadequate analysis and regulation development, increased use of contractors for policy development, and inability to fully respond to the needs of States, localities, and industry. The apparent absence of a formal evaluation **personnel process** for DOE staff means that normal procedures for reviewing staff performance are not part of the standard management responsibility, thus eliminating an obvious opportunity for feedback and direction.

Issue 5

Program Evaluation

DOE has no consistent method for evaluating program performance. Such evaluation is needed to allow adequate congressional oversight, to measure meaningful progress toward goals and milestones, and to assist DOE in determining levels of effort for new initiatives or reduction in program support.

Summary

Despite large expenditures, many diverse projects, and continuing requests for information on program effectiveness and impact, DOE has not mandated or strongly encouraged careful evaluation efforts, Lack of such efforts adds to the impression that little is being ac-

complished, particularly in areas such as conservation where measurement is inherently difficult, (Taking credit for energy NOT used is a complex business.) In the absence of careful evaluation, program managers must rely on instinct in selecting new initiatives. Although evaluation is difficult and time consuming, it is worth both the money and the time.

Questions

1. How many efforts within C&SE have been formally evaluated? How many by trained evaluators? How many by DOE staff?
2. To what extent has program experience been specifically analyzed and applied to succeeding or related programs?
3. How can DOE personnel obtain thoughtful and objective insights into the actual impact of the programs they administer?
4. What methods of evaluation are most applicable to conservation programs? Are new methods of evaluation needed to measure "energy saved?"
5. How does the DOE Office of Policy and Evaluation assist the program offices in project evaluation and review?

Background

Evaluation is the tool needed to answer the variety of questions raised about programs, The questions can be grouped into two major categories:

- **process (formative) evaluation** seeks to provide prompt feedback to program managers and staff to help them modify the program to improve performance, For example, formative evaluation of the schools and hospitals program might lead to a reduction in the number of forms that each institution must complete
- **Outcomes (summative) evaluation** seeks to quantify the effects of the program on client groups. These responses are of interest both to program personnel and to policymakers. For example, a summative evaluat ion of the Residential Conservation Service (RCS) Program would show the effects of the RCS Program on annual energy consumption for program participants in comparison with changes in annual energy consumption for nonparticipants.

Both types of evaluation are important, although for somewhat different reasons.

Unfortunately, DOE is unable to answer such questions concerning most conservation and solar programs. To make matters worse, very little work is now underway to provide such information in the future.

Although evaluation is a time-consuming, uncertain, and expensive task, it is much too important to ignore. A reasonable budget for data collection and program evaluation activities is probably about 5 to 10 percent of total program funds.

Why has so little attention been devoted to evaluation? Failure of the Department and of Congress to expect such evaluation and consequent lack of funds, changing organization, and program goals that make evaluation criteria uncertain, and intense day-to-day pressures on program staff all contribute.

Within the Office of Buildings and Community Systems, several behavioral research programs — Project Payback, Low Cost/No Cost Conservation Program in New England, use of energy feedback devices in homes — have included careful evaluation efforts. Some States–particularly Michigan, Minnesota, and Tennessee— have carefully evaluated some of their conservation programs. Thus, it can be done.

As an example of what a careful evaluation might include, consider RCS. The first step in any program evaluation is to define the goals of the program in a measurable fashion. The RCS goals might include provision of information to residential customers on the conduct of energy audits and other services, and ultimate reductions in household consumption for program participants. The second step is to design the evaluation to collect data that can be used to answer the evaluation questions of program staff and management. This might include telephone surveys with program participants and also with nonparticipants to collect demographic information, structural characteristics

of their homes, their sources of energy conservation information, their reactions to RCS (if they participated), and their estimates of what conservation actions they recently took and why. An additional effort might include collection of fuel bills from utilities to measure changes in energy consumption before and after RCS for program participants and nonparticipants. A key issue here is the need to carefully separate the effects of RCS on energy savings from the effects of other determinants. Because any measurement technique is subject to errors, it is useful to measure program effectiveness in several ways; here telephone interviews are used with personnel involved in delivering RCS services to households (e.g., utility staff, State energy office, contractors, suppliers, banks),

The above example illustrates the difficulties and time required to do a careful evaluation. It is not enough to ask program participants what they did; this does not allow adjustment for what they might have done without the program. Collecting postprogram data from both participants and nonparticipants is also not enough; self-selection will surely influence the prior energy use behaviors of the two groups.

The difficulty of measuring the impact of conservation efforts suggests that a number of evaluation techniques be tested. Staff and contractor evaluations will both be important. New techniques may be needed to understand efforts to conserve energy.

Issue 6

Relationship of Regulatory, Incentive, and Budget Outlay Options

Without redefinition of conservation and solar program goals, regulatory and incentive programs will continue to be poorly integrated with RD&D and information programs into a coherent commercialization strategy throughout the Government.

Summary

In the past the Office of the Assistant Secretary for C&SE has had insufficient leverage in either planning or implementing "off-budget" Federal policies such as gas guzzler taxes, tax credits, auto fuel economy standards, and utility rate regulation. As a result, program progress tends to be measured by budget levels, and off-budget policies are not fully understood as critical tools for achieving a more broadly defined objective. Defining **total** program goals, and expanding the scope of program planning to include off-budget policies and programs, may correct the current imbalance. Program plans would then be explicitly based on comparisons of the full range of policy instruments and their relative effectiveness in meeting program goals. Developing off-budget mechanisms requires a serious commitment of resources. This type of planning may also assist DOE in urging other agencies (such as the Treasury Department) to move more vigorously in implementing "off-budget" policies.

Questions

1. Which solar or conservation technologies could be developed and implemented by private industry with no Government role other than incentives or regulations? What fraction of the R&D budget supports these technologies?
2. What amount of budget outlays could be avoided by policies such as guzzler taxes, technology-forcing standards, and financial incentives that would create a market for products? Would such policies obviate the need for DOE to finance demonstration projects by making it worthwhile for competing vendors to underwrite such projects? Are such policy alternatives compared with budget outlay options on any systematic basis? Can the cost of incentives be compared with the cost of outlay programs?

Background

The effectiveness of off-budget conservation and solar policies, such as tax incentives and regulations, has been frequently underestimated by DOE and its predecessor agencies, Energy performance standards for new autos

and buildings resulted from congressional initiatives. Legislation establishing these programs, and for appliance efficiency standards, typically calls for the most stringent standards that are technically feasible and economically practical. This places an extraordinary burden on the Government to build and maintain — in the public domain — a body of expertise nearly as sophisticated as that developed by the industry. In the areas of building performance and appliance efficiency combined, however, DOE has less than 20 full-time professionals charged with regulating tens of thousands of producers and dealing with conservation technologies for which little information exists (e. g., passive solar) or is proprietary (e.g., appliance efficiency). Moreover the nature of the regulations required by statute (minimum standards instead of "fleet average") requires that they be set at a "least common denominator" level to avoid anticompetitive impacts in industries characterized by many small producers. For them to be technology-forcing would require introduction of a "fleet average" feature or a complementary program of subsidies for exceeding the minimum standards by a significant amount.

Inadequate staffing of and attention to regulatory programs leads to delays (statutory deadlines missed for BEPS, appliance labeling, appliance standards) and to poor regulatory analysis. Without extremely sophisticated and credible regulatory analyses, DOE will either be afraid to propose stringent standards, or will be vulnerable in the face of industry pressure, Regulatory analysis and enforcement are not inexpensive, Their full costs, however, should be weighed against alternate approaches.

In cases where regulations must be implemented by States (e. g., RCS, BEPS) DOE technical assistance has been inadequate to ensure program effectiveness.

With more imaginative and aggressive use of taxes, incentives, and regulations, many of the functions now performed by DOE budget outlay programs could be performed by manufacturers of energy-efficient equipment. Accompanying an aggressive off-budget conservation strategy would be a complementary set of RD&D and information programs. In cases where the industrial RD&D capacity does not exist, direct Federal involvement is needed. Work that produces information whose benefits may not be fully captured by patents, or programs that are too risky or long term for the private sector perspective may also require Federal outlays.

The problem is complicated by the fact that DOE does not have authority over such options as tax incentive implementation. The Department has supported tax credits for solar and conservation systems that would go well beyond those released by the Treasury.

In short, DOE and Congress must give more emphasis to changing the institutional environment to give private enterprise more incentives to increase RD&D and commercialization efforts. A restructured DOE program would complement such efforts, and be focused on developing new technologies that are appropriate to the changed institutional environment.

Issue 7

Procurement and Contracting

The substantial delays and bureaucratic complications that characterize the current DOE procurement process threaten the viability of even the best conceived and most competently planned initiatives.

Summary

Successful programs depend as much on timely and efficient procurement as on technical competence. DOE should emphasize speed and responsiveness to program objectives as well as fiscal soundness. Accountability is not merely an auditing function. Lengthy and difficult procurements result in a variety of uniformly unfortunate impacts on conservation and solar activities.

Questions

1. How long does a "normal" DOE procurement take?
2. Are contracts for C&SE processed as quickly as contracts for other offices?
3. How are priorities for processing determined within the procurement office?
4. Does the procurement process damage either small or large firms in particular?
5. Do DOE procurement processes more properly apply to the weapons and defense activities of the Department than to other areas?
6. Is an entirely new or separate procurement system needed?

Background

In an organization such as DOE, technical excellence and careful planning of the scientific, engineering, and commercialization activities depend on procurement actions that bring the best available talent to bear on the problem at hand. Delays in executing procurement actions seriously hamper program progress. Delays running into years, with an average procurement cycle of 14 months, destroy the best-laid technical plans and convert potentially successful ventures into failures.

One effect of very long procurement is that the system sometimes favors large firms with established operations, high overhead rates, and the ability to sustain themselves against major delays. Many smaller firms cannot retain high-quality personnel while waiting and may be forced to release employees or shift to other work. This is unfortunate because many innovative ideas originate with small firms and individuals outside the mainstream of private sector funding, and because the diverse nature of both conservation and solar opportunities — there are literally dozens of solutions for many problems— means that a wide diversity of responses is important in exploring options. (The delay in processing actual payments, even when a contract is in place, also weighs heavily on small firms and individuals.)

On the other hand, large firms that offer major opportunities for cost reduction and market penetration are sometimes excluded or restricted in contract bidding because of small business setaside policies. Such setaside policies (throughout the Government) must consider the return on Federal investment, product performance, and innovation.

The present lengthy process encourages program managers to establish large, open-ended management contracts with firms that can then be called on for quick-response work, including program planning support. Many of these firms become alter-egos of the program offices, and people not directly employed by the Federal Government actually shape policy. (Individual employees often go from firm to firm in order to perpetuate their relationship with program offices.)

A simple but critical effect of delay is that opportunities are simply missed. By the time the money comes, the window is closed.

It is possible that an essential element of the problem is that DOE procurement procedures were designed to fit the needs of the weapons components of the Department. Thus, DOE offices whose purpose is to catalyze private and public sector activity and generate unusual types of research may be unduly burdened. A similar concern is that procedures needed for very large contracts are imposed on small contracts. (Methods developed at the direction of Congress for the Small Grants Program have shown that change is possible.) Care is needed to ensure that procurement procedures are adequately flexible and carefully applied.

The protective nature of the procurement regulations and related bureaucratic layers has resulted in a long list of required signoffs and clearances, almost certainly more than should be necessary for some types of purchases.

There is a role for sole-source procurement by DOE, because of the many firms and individuals with unique expertise and information, and the number of unsolicited proposals. Speeding up procurement would remove the present incentive for program managers to request sole-source approval for the sake of speed alone.

One result of the clifficulties of procurement has been the use of field offices and national laboratories to manage procurement. This may expedite the process (or not), but it results in a real transfer of responsibility. The extent of such delegation and its effects should be reviewed as part of an effort to improve the procurement process.

It is unclear whether existing problems can be resolved through review and clarification, or whether an entirely new approach, preceded by congressional debate, is necessary. Perhaps each major division within DOE should have a separate procurement staff, implementing procedures appropriate to the needs of the programs. Absent such an overall revision, the DOE leadership could perhaps most effectively prove its commitment to conservation and solar by resolving the delays in the procurement process.

Issue 8

Data Collection and Analysis

DOE data acquisition, analysis, and information dissemination are inadequate to understand current energy problems, take advantage of what can be learned from current programs, and analyze future responses to policy options.

Summary

There is a serious absence of usable data regarding energy use in all sectors of the economy. This situation is even more severe regarding distributional data such as disaggregations of national statistics by income groups, regions, etc. Although data is now being generated through a number of federally funded programs, much of the data appears destined to collect dust rather than contribute to understanding energy needs and uses.

Questions

1. What systematic plan have the Energy *In*formation Administration (E IA) and C&SE prepared to meet the numerous gaps in the information on current and future energy use and the buildings, vehicles, and equipment that use it?
2 What arrangements exist between the Department and States or other institutions to improve the data base on regional and local energy use? For sharing E 1A data?
3. What plans are there for ensuring that data generated under current programs funded by the Federal Government are validated, documented, and made available within the Department and elsewhere?
4. In planning data collection, how are the preferences of the policy office, the program managers, and E 1A balanced? Must the program office be tied to use of E 1A data?

Background

Energy data acquisition and forecasting are central to the evaluation of energy development and commercialization programs, and to the development of policy. DOE's existing data gathering, forecasting, and analysis efforts are virtually unusable for determining the impact of its programs or of the programs of States and local governments. One reason for this is the extraordinarily high level of aggregation used in national energy planning, wherein it is simply not possible to determine what the impact is (on coal, oil, gas, nuclear use, or consumer prices) of insulating the uninsulated homes in, for example, the State of California. (One year ago, DOE's model showed energy use in California 20 percent higher than the intensely detailed "end-use" models developed by the State.)

EIA has recently begun to collect detailed primary data from energy users in the residential and commercial sectors. The attempt to improve knowledge of the housing stock is thorough, careful, and well-balanced between survey work and validation. If E 1A continues

these efforts into the future, information will then be available concerning changes over time. At the present time, there is little understanding of the determinants of energy use, in particular how Government conservation programs interact with market forces to improve efficiency of energy use.

As improved data collection increases, end-use modeling of energy use (present and future) will improve policy makers' ability to rate the effectiveness of particular energy programs, to target important R&D areas for oil savings (choose one option), and even to rate the agency's ability to deploy its own programs. DOE must work closely and cooperatively with each State to collect, analyze, and model end uses of energy if priorities are to be correctly set, programs are to be evaluated, the cost effectiveness of incentives, regulations, and other policies are to be judged, and States are to be effectively integrated in energy planning.

For example, the Schools and Hospitals Grant Program has funded audits generating professional engineering analyses of proposed capital modifications for hundreds of buildings. A careful synthesis of this raw data could produce information vital to determining the targets for future loan and grant programs, estimating the impact of legislative proposals on energy consumption, and identifying research needs. At present, there are no plans to perform such a synthesis.

DOE should provide technical assistance to State energy offices on the best methods of collection of energy use data. Existing and planned Federal conservation programs require States to collect large amounts of data related to energy use and program effectiveness. However, the data are likely to be varied in quality and organized differently in each State. This will make it difficult to develop national data bases and to use these data to help understand patterns of energy use and their determinants.

Improved data collection and analysis will require more funding. Such an increase is necessary to underpin program efforts.

Issue 9

Basic Research

DOE has paid insufficient attention to basic research directed at energy conservation and solar energy.

Summary

One of the principal weaknesses of the DOE conservation program has been the lack of basic and applied research designed to broaden the conservation technology base. A strong effort in the physics and chemistry of industrial processes is needed to assist the transition away from fossil fuels to solar energy and electricity. Similarly, research on materials and heat transfer needs more attention if advances in insulation, heat recovery, and energy storage are to continue. Building energy conservation could benefit by work on airflow and the physical conditions affecting comfort. An effort to begin a basic research program is now being made with the establishment of an Office of Conservation Research within C&SE. This Office should not only fund critical research efforts but bring together relevant research results from programs funded by other Federal agencies and encourage the development of university graduate research programs in process chemistry and physics.

Questions

1. What are DOE's long-term goals for basic research in energy conservation?
2. How will the Office of Conservation Research interact with the other conservation off ices charged with near- and mid-term responsibilities? Will there be some systematic way of trading information and ideas?
3. Does the Office of Conservation Research plan to catalog other federally funded research that may be relevant to basic research in energy conservation?

[1]John H. Gibbons, "Long-Term Research Opportunities," *Energy Conservation and Public Policy* (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1979), p. 210.

Background

The basic research activities of DOE have focused primarily on supply questions such as combustion research, fusion, and fission. Little work has been undertaken concerning the use of energy, particularly in industrial processes. The Nation is facing a transition in the coming decades away from direct fossil fuels combustion as the primary energy source for industry to direct solar and electricity. As these shifts are made it will be very important that new ways to use these sources are developed to maximize economic efficiency; the direct substitution of solar and electricity as heat sources into current thermal chemical processes may be very wasteful and costly. Therefore, increased attention should be given to electrochemical and photochemical processes. Examples include using electromagnetic radiation through lasers and microwaves or photochemistry with appropriate catalysts to drive chemical reactions, These processes could be useful for chemical processes, heat treating of metals, and transformation of raw ore to finished metals, al l of which are now predominately driven by heat from direct combustion of fossil fuels, Similarly, electricity may be more efficiently used as a heat source by using induction heating or isolating particular portions of the spectrum (infrared or ultraviolet).

More work could be done to understand the basic properties of materials for their use as insulation, heat transfer equipment, and energy storage devices, While programs are underway to develop and demonstrate technologies in most of these areas, they are principally oriented to applying existing technologies to the problem, and devote only a small effort to basic research. Examples are the ceramics program in advanced engine research and the battery program, both of which are attempting to develop finished products. They do not have the resources or the charter to explore more fundamental materials' properties questions related to their mission.

Other basic research opportunities in conservation include exam i nation of building airflows with the goal of al lowing smaller operating temperature ranges for heat pumps and air-conditioners (and therefore higher efficiencies), examination of the effect of temperature, humidity, and air velocity on comfort, and lighting levels and techniques, particularly those using solar.

Many of the items mentioned above are receiving some attention in the research community. The efforts are not coordinated toward energy use goals, however, and it is possible that valuable results will be lost or not attained unless a directed conservation basic research program exists. The new Office of Conservation Research within C&SE may be able to provide this coordination and leadership in addition to funding new work. Efforts should be made by the Office to make use of relevant work sponsored by other Federal agencies and perhaps to expand those projects where possible. The Office should also look into ways to encourage the reestablishment of university graduate programs in process chemistry and physics. This could be of great assistance in supporting industry research on more efficient and productive industrial processes.

Issue 10

Commercialization

Confusion exists regarding appropriate and effective methods to commercialize conservation and solar technologies, both within the Department and Congress. More careful analysis of commercialization techniques and better delineation of authority within DOE are needed.

Summary

Legislative guidance to DOE includes the responsibility for research, development, and commercialization of solar energy and conservation devices. The OTA *Analysis of the ERDA Plan and Program,* completed in 1975, states the issue, "The development of effective commercialization policies and procedures is not adequately addressed in the ERDA plan, " The

new administration goals for the use of renewable energy by 2000 add to the urgency of this problem. Commercialization connotes many methods and approaches to both Congress and DOE management, thus adding to the confusion. A recently established Office of Commercialization within C&SE has been charged with the responsibility of better defining the effort. Experience from early demonstration programs can be applied to commercialization.

Questions

1. Who is responsible for determining commercialization strategies for C&SE? For selecting products or technologies to commercialize? What does commercialization mean within C&SE?
2. How does DOE decide on the relative merit of channeling commercialization subsidies directly to industry (via budget outlay programs) v. indirectly through tax credits, utility rates, or regulatory programs?
3. Has DOE carefully studied the successes and failures of other Federal agencies in commercialization (e. g., the U.S. Department of Agriculture)?
4. Are DOE commercialization efforts consistent with general principles that emerged in the administration's Domestic Policy Review?

Background

The R&D process leading to a commercial product is seldom a staged, linear process. In fact, the stages in the process are separated by formidable gaps, often difficult to bridge even in a monolithic organization, and not always easy to describe as a set of sequential events. Engineering development, for example, often depends on many lines of research carried out earlier which are recombined into new patterns to develop a useful device or product. Similarly, successful commercialization depends on economic and marketing factors, and perhaps regulatory considerations, that go far beyond the bare existence of a useful, reliable product. For these reasons, one should not expect Government-sponsored R&D to lead directly to successful commercialization. Those instances where Government R&D has led to a successful outcome have almost always been with large systems for the military or space where cost considerations have not been paramount or with nuclear energy for an already organized market. The success of these systems cannot be translated easily into commercializing the diverse and numerous products and design approaches required for the penetration of solar and conservation technologies.

This lack of applicable experience combined with a belief that the Government does have the resources to achieve market impact (based on successful defense and space work) causes confusion. On the one hand, Congress has sometimes simply expected that DOE could somehow force new technologies to be used. On the other hand, attempts by DOE to deal directly with the market through supporting particular products, to support one technology at the expense of the other, or to undertake private sector type traditional market research and advertising, have been met with strong resistance by both private industry and some members of Congress. For example, one resource important to private sector commercialization is the availability of money to use flexibly, so that unexpected market opportunities can be seized. Is existing DOE reprograming authority sufficient to meet this need? Would Congress allow greater flexibility?

Similarly, there is no concensus as to how far along toward commercialization Government efforts should continue. It is clearly inappropriate and inefficient for a unit of the U.S. Government to assume the role of entrepreneur. Even before this point, Government involvement can be counterproductive, since Government-sponsored developments are generally made equally available to all industrial comers. If Government activity prevents any one company from acquiring a sufficient market share, successful commercialization may be impossible. Government-sponsored R&D in fields such as conservation, where the associated industry is too fragmented to carry out these tasks for itself, may be productive. Government demonstration of technical viability, particularly for technologies to be used by util-

ities and industry, is clearly justified. A concurrent responsibility is to make the results of such activity available to industry.

The principal questions regarding commercialization then revolve around the degree of DOE involvement in accelerating industry activity when national goals require it. This is the situation in the energy arena today. Steps available beyond information dissemination include technical and financial assistance and market guarantees as well as a host of less direct measures, such as removal of institutional barriers.

Effective strategies must be based on an accurate understanding of current market conditions. For example, the nature and extent of capital investment in solar heating systems would be a useful piece of information to people responsible for accelerating the use of solar systems. Such research is not being done within the Department at this time.

There is no one answer as to what approach would be most effective or appropriate. Each technology and each industry has its own characteristics and may play a different role in the national energy system. Hence the commercialization efforts must be designed for the particular situations.

An Office of Commercialization has **recently** been created within C&SE, with responsibility to try and identify the best commercialization strategies and methods for various technologies, for both short- and long-term needs. It is too early to assess the effectiveness of the Office, but its existence may indicate a stronger commitment by C&SE to come to grips with the commercialization issue and try to develop coherent approaches.

Experience gained through the Federal solar heating and cooling system demonstration program and other demonstration efforts suggest some lessons that the Department can apply in trying to bring technologies into the market successfully. Federal demonstration programs have had very mixed results in demonstrating the practicality of solar heating and cooling systems. The programs have resulted in technical innovations, increased public awareness of solar technology, and important information on system performance. However, the programs have been criticized on many grounds, including unreliable operation of solar systems due to poor installation and the use of unproven technologies, and unacceptable economic performance due to the use of costly systems. Many critics believe the demonstration programs, which were mandated by Congress, have been so problem-plagued that they have been of questionable or negative value in demonstrating the attractiveness of solar energy to the general public.

Much of this confusion can be clarified by making a clear distinction between engineering field tests and public market demonstrations. Engineering field tests involve constructing systems that are considered well along in the technical development process, allowing them to operate with minimum interference and adjustment in a field environment, and monitoring their performance over time. Industry never treats engineering field tests as a public demonstration. Rather, such tests are done carefully, and when the technology is judged ready, it is given a "public demonstration" in the marketplace. The same principle should apply in Government programs.

Public exhibitions should feature only proven, reliable, cost-effective technologies. They should assure that equipment is certified and installation is done correctly. Strict selection criteria should be established to assure that a large number of builders can participate, that locations are chosen for high public exposure, and that a few large projects do not dominate the budget.

Demonstration programs should only be undertaken after a careful evaluation of alternative approaches. For example, information, education, and advertising programs, the development of codes and standards to assure consumer satisfaction, cooperative Federal-State programs to identify and publicize private sector "model projects, " and other approaches may be more cost-effective than public demonstration programs for promoting consumer awareness and acceptance of solar technologies. Historically, funding for construction

programs has been easiest to obtain from both the Office of Management and Budget (OMB) and Congress, while funding for information, education, and related programs has been a prime target for budget cutting. The questionable results of past Federal solar demonstration programs suggest that historical patterns need to be reassessed.

Issue 11

Non hardware Research

DOE has given social science research an insignificant level of funding despite important and relevant discoveries in this field, and opportunities to enhance public acceptance of conservation and solar energy investment.

Summary

The success of many conservation and solar programs depends on hundreds of millions of decisions made by millions of individuals. However, DOE has shown little interest in examining the consumer's "energy environmerit, " or in learning how attitudes and motivations affect the level of energy use, and how to best encourage people to take energy-saving actions. Yet this research field is well-defined and can be targeted at finding crucial aspects of attitudes and action that most affect energy use. DOE should expand this research to reflect its potential contribution to changing energy use.

Questions

1. Why has the applied social science R&D budget remained at the same level for the past 3 years?
2. Why is DOE putting more effort into public information than into determining what information is most effective in altering energy use patterns?
3. What plans does DOE have to coordinate its social science research with conservation and solar "hardware" research?

Background

The amount of control that individuals exercise over their own energy use has gone largely unrecognized by DOE, despite the significant contributions that an energy-conscious society of consumers could make toward reducing energy consumption. The bulk of research conducted on energy conservation has been within the sphere of physical sciences. The conservation social science budget has remained constant for the past 3 years, failing to keep pace with the rapid expansion of the overall conservation budget and gal loping inflation.

There is ample evidence that social science research can produce meaningful and effective results, not simply in understanding people's actions, but also in helping them make more informed decisions. For example, in DOE's "No-Cost, Low-Cost" experiment carried out in New England last fall, over a million residents took actions in their homes to cut down on their energy bills. Basing the program on prior marketing and behavioral research, DOE prepared a brief guide outlining 12 simple steps which if adopted could cut the resident's energy bill by 25 percent for an investment of less than $100. About 30 percent of the residents receiving the packet (which was a brochure and a waterflow controller) took actions because of the information. DOE estimates that for every $1 it spent on the program, New England residents will save about $26 in energy costs, making this an unusually cost-effective program. Knowledge gained in previous DOE marketing experiments and advertising efforts was used to determine the preparation of all materials and promotion for "Low-Cost, No-Cost, "

In research at Twin Rivers, in Princeton, N. J., researchers found that some families use twice as much energy in their homes as others, even though they live in identical homes, with many similar traits such as family size, education level, and income. I n another project, DOE discovered that if people realize at what rate they use energy, they will cut down on its use. Appropriate feedback to motivated people has cut home electrical energy use by 10 percent.

Research has also shown that many attitudes that might be thought to affect home energy use (such as belief in the reality of the energy crisis or optimism about a technical solution) are not related. Information of this kind is valuable because it provides the basis **for** design of effective conservation campaigns.

Another valuable finding involves utility companies' equal monthly payment plans. Since these plans soften the impact of large bills, there was concern that people selecting this form of payment might increase energy use; a concern that was heightened because of rapid growth of participation in equal-monthly payment plans. Subsequent research indicated that this type of payment plan did not foster excessive consumption.

Well-defined and carefully conducted social science research plays an important role in selecting strategies for changing energy use. More attention to this work, and use of the results by program offices, could substantially improve DOE effectiveness

Issue 12

Conservation and Solar Integration

The division of authority into "conservation" and "solar energy" causes competition where cooperation should exist, and may reduce the effectiveness of both programs. *

Summary

It is essential that conservation and **renewable energy be understood as a unified approach, consisting of demand reduction** plus a shift to sustainable energy. **The DOE organizational structure accentuates the differences between conservation and solar, rather than finding opportunities for cooperation.** This can result in **pitting conservation against** solar in the competition for limited resources, and can generate solutions that are not optimal. A particularly clear example of the need to begin to integrate these approaches lies in the buildings area, although the need for a more integrated approach is also evident in the areas of industrial and transportation programs.

Questions

1. **Is new** legislation necessary to directly integrate the programs now separately defined as conservation and solar?
2. What is the rationale for conducting two separate programs, both designed at reducing fossil-fuel use in buildings, without a unified approach to solving the problem?
3. To what extent are buildings likely to change in response to conservation measures? Will the more efficient buildings "fit" the types of solar systems now under consideration by the Department?
4. How frequently and in what ways, formal and infer-mal, do the staffs of both offices assigned to buildings compare research and applications experience?

Background

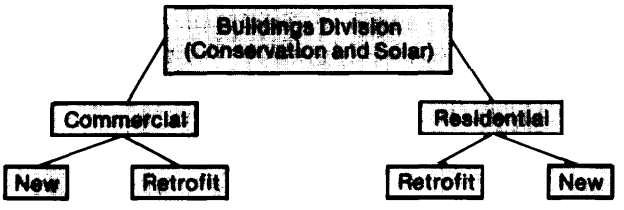
The Buildings Program, within the Office of the Deputy Assistant Secretary for Conservation, is now organized into three areas: Architectural and Engineering Systems, Regulatory Programs, and Applications and Incentives. Within the Office of the Deputy Assistant Secretary for Solar Energy, the areas of Solar Active, Solar Passive, and Photovoltaic all fund work relating to building energy use. Because of these organizational distinctions, there is little integration of conservation techniques that can radically alter the configuration of a structure, and thus alter the type and cost of a solar system. While some research will be necessary for various technologies and should be conducted separately, application of research can best be done by end-use category.

An approach is needed which seeks to provide the most efficient solution to the problem, instead of focusing on conservation and solar as mutually exclusive technologies. Integration of conservation and solar would help

*This issue does not recommend an immediate reorganization of all programs. The issue points out one way in which a desired redefinition could eventually be reached

architects, engineers, designers, and builders to produce the most energy-efficient solutions by providing them with integrated energy-conscious designs. An integrated approach to building design would focus attention on critical and relatively neglected questions like the following: To what extent can conservation measures improve the economics of solar systems by reducing the collector area needed for meeting building heating requirements? What combinations of solar systems and conservation measures are more cost effective than the conservation measures alone? What changes in solar design philosophy should occur as buildings are made tighter? How does greater thermal integrity affect the comparative costs of backup systems and thermal storage systems? Could "superinsulation" techniques virtually eliminate the need for conventional heating sytems in new buildings? What passive additions are economically justified in building retrofits? Should existing homes with fireplaces generally convert to wood burning "fireplace furnaces" in areas where wood is readily available? Is solar heating preferable to oil and gas for minimizing air quality problems in heavily insulated buildings? In what circumstances will solar district heating systems be superior to solar retrofits on individual buildings?

The existing division of responsibility tends to produce "separate but equal" solutions, discouraging designs that combine both approaches. An organization that would emphasize the most efficient problem solving could replace the existing organization with divisions by building type (see below). Within each program, staff would seek the most effective combination of conservation and solar techniques.



The different stages of work within each of the four programs above could be:

1. collection of baseline data and goal setting;
2. R&D in the thermodynamics by building type;
3. collection of climate data on a region-by-region basis;
4. R&D in energy-efficient systems, materials, and components that integrate solar with conservation;
5. analysis and load quantification;
6. R&D in institutional barriers;
7. evaluation of the results of the preceding programs; and
8. information and education to the public on techniques and products.

A full reorganization of the solar and conservation buildings programs along the lines suggested here may not be desirable in the immediate future. (In fact, the OTA panels were unanimous in the view that a respite from major reorganizations is needed.) Nevertheless, it is desirable that DOE move over time toward an integrated "buildings program, " and many cooperative steps toward that goal are feasible in the near future. For example, solar and conservation programs could cooperate closely to define and promote a "least cost retrofit strategy" (see Issue 31), and the passive program could emphasize the development of designs and prototype buildings that integrate passive features with conservation measures and active solar systems (see Issues 32 and 33).

Issue 13

Federal Energy Coordination

There is no indication that Federal agencies are coordinating their energy activities in accordance with the President's Executive order and the June 1979 solar message to Congress.

Summary

Many Federal agencies, quasi-public corporations, and departments within agencies can be employed in the implementation of energy policy. Effective coordination and use of these resources is essential in obtaining the desired solar goals. The Energy Coordinating Committee (ECC) was formed for this purpose, but has yet to show visible progress.

Questions

1. How will the effectiveness of ECC and the Solar Subcommittee be assured?
2. Why has the Energy Productivity Subcommittee apparently been abandoned?
3. Will ECC provide Congress with a first-year progress report detailing each agency's actions in accordance with the President's June 1979 directives reported in the Message to Congress?
4. How can coordination be promoted without adding red tape and reducing DOE's managerial effectiveness?

Background

In his June 1979 message on solar energy, the President announced the formation of a Standing Subcommittee on Solar Energy within ECC, which had been established by Executive order the previous year. The subcommittee was created to coordinate the solar-related activities of over a dozen Federal agencies. The subcommittee has no authority but reports to ECC which in turn reports to the President. As a cabinet-level committee, ECC has authority to resolve problems. It is not clear that ECC is fulfilling its mandate (or even meeting), Since ECC can play a vital role in efficiently implementing national policy, Congress might request progress reports and encourage ECC to aggressively pursue its mission.

Issue 14

Assistance to States

The Office of State and Local Programs (S&LP) needs increased technical capability and discretionary monies to properly assist the States and encourage flexible and responsive efforts meeting both State and National needs.

Summary

States are expected to be the prime movers in implementing many national programs mandated by Congress. The wide variation in the level of funding, staffing, and resources of State Energy Off ices, combined with the diversity of energy use patterns, fuel sources, living patterns, and climate of the States, suggests that effective implementation by States of national goals must be based on a flexible approach. Congress and DOE should understand this need for flexibility and for support to the States. S&LP needs additional capability to provide technical assistance to States.

Background

Many of the programs that the States are called on to implement are technical in nature. A comparison of resources between the C&SE offices shows that S&LP has a much smaller staff than the research offices; and that the S&LP staff has fewer employees with training in technical fields such as engineering and economics. In the absence of technical guidance provided directly by the central office, or regional offices, assistance could be given to the States by contractors. However, the very

large C&SE budget is dedicated almost entirely to the State grants themselves, with very little discretionary money for contractor support and technical assistance. R&D offices, on the other hand, have great discretion in how their funds are allocated.

State programs are largely composed of common elements, most required by Congress. These elements include energy conservation telephone hotlines, home energy audit programs, audit training, energy management seminars, energy use data collection and management systems, consumer publications, and so on.

DOE does not generally provide "models" for these programs, which the States could adopt, modify, or reject. This leads to great duplication of effort. While there is an understandable and legitimate desire on the part of the States to have materials that are uniquely theirs, basic guidance, particularly in highly technical areas, would be helpful. An example is the Schools and Hospitals Program, which contained Federal requirements concerning training and certification of audits. A Federal guidebook to this process would have been helpful. Contractors must be well-chosen, and have experience with field operations or State and local environments. Assistance provided by the evaluation of the Energy Extension Service in the 10 pilot States was apparently helpful to those States. The Office of Buildings and Community Systems preparation for implementing RCS includes development of a model audit and model audit training program. If this effort is delivered soon and of good quality, it will help the States and improve the effectiveness of the RCS program.

In providing technical assistance to States, close cooperation is required. State energy offices are best able to say what type of technical assistance they require, and to help design the projects. Good ideas are often too late in arriving (see Issue 7).

It might be helpful in general if DOE Washington personnel responsible for working with States could actually spend more time in State energy offices, to learn first-hand the day to day reality of a State energy office, and their real capabilities and needs,

Issue 15

Consolidation of State Programs

SL&P now manages three separate but similar programs that impose too much paperwork on State energy offices, and unnecessarily duplicate services. The programs should be consolidated and streamlined, as both DOE and Congress have proposed.

Summary

The State Energy Conservation Program, the Supplemental State Energy Conservation Program, and the Energy Extension Service should be combined into a single program to facilitate their management by the State energy offices as well as by DOE. Goals need redefining so that States have a single set of objectives that elements of all programs combine to achieve. The most effective methods of providing technical assistance to States should be identified by the States and retained, with less appropriate approaches dropped. Precautions are needed to ensure that consolidation does not burden States under the guise of helping them.

Questions

1. Has DOE carried out an evaluation of its existing State and local programs to provide guidance for their consolidation?
2. What plans does DOE have to eliminate the duplication that now exists among these three programs?
3. What steps is DOE planning to ensure that consolidation will make it easier, not more difficult, for States to achieve energy conservation goals?
4. Has DOE considered conducting a pilot project to test the proposed consolidation in several States before expanding it nationwide?

Background

DOE now manages three State energy conservation programs, the State Energy Conservation Program, the Supplemental State Energy Conservation Program, and the Energy Extension Service. To be eligible for grants under the State Energy Conservation Program and the Supplemental State Energy Conservation Program, a State must develop plans to promote energy efficiency in buildings (both structure and components), and transportation, with techniques to be used including coordination among Government bodies, reform of procurement regulations to promote energy efficiency, and public education. Under the Energy Extension Service, States are to develop energy-saving programs such as self-help workshops for the public, energy audits for homeowners and small businesses, and energy management services for local governments.

Because many of the services provided are similar (e.g., technical assistance, information dissemination, building audits), there is considerable overlap. The programs are managed by different staff at DOE, and operate on different budget cycles and different grant application deadlines. Consolidation would eliminate much duplication and inefficiency.

Also, the grant application process needs to be simplified. The experience of some State and local agencies with these programs suggests that getting hold of Federal funds is a discouraging, laborious process. This can impede creative development and efficient pursuit of programs on the State and local levels. For example, if reporting forms are too time consuming or redundant, groups may be sloppy in submitting them. In one case under the Schools and Hospitals Program, for example, an institution applying for a $300 grant must fill out separate forms for DOE, EIA, and OMB. These grants, for walk-through energy audits, may well not be worth the cost of preparing and processing them.

To the extent that State and local groups get bogged down in applications for and administration of Federal monies and in coping with Federal requirements, their ability to tackle their own programs is eroded.

As DOE consolidates these State programs, precautions are needed to avoid encumbering the States with still more regulations and requirements, without providing them with more resources. The Energy Management Partnership Act (EM PA) proposal could result in adding more requirements for States without providing additional funds to help the States meet those requirements. This would make EMPA counterproductive rather than increasing flexibility in State programing.

Testing of EMPA through a pilot program in a few States would provide an opportunity for Congress to evaluate and modify EMPA before expanding it nationally. Such a test could be similar to the pilot testing of the Energy Extension Service.

Issue 16

Role of Utilities

Private and public utilities can play a major role in promoting the use of conservation and solar energy but are inhibited by Federal disincentives.

Summary

Although utilities are potentially effective promoters of conservation and solar energy, they are currently prevented from undertaking this role by Federal law. NE CPA prohibits utilities from supplying, financing, and installing conservation and solar energy services because of concerns over anticompetitive effects. If the restriction is removed by Congress, DOE can encourage utility experimentation with various approaches, and can provide technical and economic information to assist utilities.

Questions

1, Should the Federal Government allow utilities to directly assist customer-owned conservation and solar investments by removing current financing and supply restrictions?

2. What information is DOE providing to utilities regarding the experience of those companies now actively involved with conservation and renewable?
3. What steps is DOE taking to coordinate the numerous departmental activities affecting utilities?
4. What types of demonstrations in conservation and renewable might DOE fund through utilities?

Background

Utilities are expected to deliver energy efficiently, reliably, and at the lowest possible cost. Their promotion of conservation measures and renewable energy sources is consistent with these goals. Utilities offer a unique delivery system that reaches nearly every commercial, residential, and industrial building in the country; technical capabilities, consumer services, and consumer contact; and service area familiarity and access to money markets that can positively affect the penetration of solar technologies and conservation measures.

NE CPA requires utilities to offer energy audits, to disseminate information, and to arrange for the installation and financing for various conservation and solar energy measures, through RCS. But NE CPA also prohibits new programs to supply, install, or finance conservation and solar energy technologies in residences. Only under certain conditions may DOE, in consultation with the Federal Trade Commission, issue a waiver of this prohibition.

The major concern leading to this prohibition was over the fear of allowing a monopoly power to influence a competitive marketplace. Methods are needed to ensure that utility energy marketing programs do not lead to anticompetitive effects. To the extent that these new technologies can be developed by many openly competitive firms, utilities should not be allowed to act in a manner that would unreasonably favor one or a few firms over others, or limit consumer choice in any manner. The potential for competitive prices and varied technical design must be maintained. However, a blanket prohibition on utility activities in this area obstructs the stated national goal of the accelerated use of conservation and renewable energy sources in cost-effective applications and limits innovation. DOE could sponsor and evaluate a variety of utility programs designed to promoted conservation and solar energy development in a competitive environment, while avoiding the concerns that led to these restrictive regulations/prohibitions.

In many cases, the requisite program analysis can be accomplished at the State level. All State regulatory commissions are required by law to consider the potential anticompetitive impacts of utility programs. Some States have supplemented this requirement with additional regulatory restrictions (see, for instance, California Public Utilities Code). States are in a better position to tailor utility initiatives to their own circumstances than DOE because they have more authority and clearly have responsibility for decisions with ratepayer impacts. DOE should further scrutinize utility programs only where the States have failed to fulfill this responsibility.

A few utilities that had active or planned programs to promote the use of conservation and renewable resources by customers have recorded striking success. The Tennessee Valley Authority (TVA) has launched an aggressive program to place wood stoves and solar water heaters in its service region. The TVA program of home energy audits and interest-free financing on loans for insulation has generated a strong consumer response. Both of these programs, and other TVA efforts, save money for all customers through lowering demand for electrical generation and delaying or eliminating the need for new thermal generating plants. Pacific Power and Light, in Portland, Oreg., has saved both capital and operating costs through an active program of home energy audits and utility-financed retrofits.

The existence of these programs indicates two things. First of all, it will be very much in the economic interest of many utilities and their customers to encourage and finance conservation and renewable energy devices. Secondly, many utilities have not acted to establish such programs, and may not do so even if current legal restrictions are removed. Thus,

the Department can play an important role in helping utilities understand the potential of these technologies.

Another major incentive provided by utilities for deployment of solar energy and cogeneration is the potential for utility purchase of excess power. A key to such buyback is the development of technologies that can be successfully connected to the existing utility grid. Technical compatibility issues can best be addressed by direct contact between utility engineers and local entrepreneurs.

Price issues are partially resolved by the recently issued regulations implementing the Public Utilities Regulatory Policy Act. These regulations establish mechanisms to guide States in determining the rates at which utilities will purchase power from local generators and the rates at which the utility will sell standby power. States have 1 year to implement their own methods. Continuing Federal oversight in this process, along with information sharing, can help launch this new effort constructively.

Issue 17

International Markets

The requested level of funding for the solar international program is inconsistent with the potential importance of the international solar market and the needs of developing countries for solar and conservation options.

Summary

Solar exports, especially of relatively high-technology products such as solar cells, wind generators, electrical controls, and heat engines, could greatly benefit both U.S. industry and developing countries where conventional energy costs are high. Commercialization in the United States for some products such as photovoltaics, which evidently are susceptible to large cost reductions with mass production, could be accelerated by this expanded market. A large international market also exists for relatively low-technology products such as low-temperature collectors for water heating and agricultural applications. Stimulating indigenous production capacity may be more beneficial for developing countries and could reduce pressure on the world oil and financial markets. DOE activity in the international solar area appears to be increasing, as there is now an Office of International Programs reporting directly to the Assistant Secretary for C&SE as well as a specific line item budget. However, the projects being managed by this new Office do not result from a coherent U.S. export policy and are not responsive to the urgent needs of developing countries.

Questions

1. Is an international plan being developed? What should be the objectives of such a plan? What balance is appropriate between an emphasis on maximizing opportunities for U.S. exports and providing technical assistance for the creation of an indigenous solar industry in developing countries with a limited capacity to finance imports?
2. To what extent should simpler, low-temperature technologies be targeted for export along with more high-technology options?
3. Should conservation technologies be integrated into the solar international program?
4. To what extent should the solar international program be restructured on the basis of foreign policy considerations such as the balance of payments and the economic stability of poor countries? To what extent are such factors being considered in planning the DOE program?
5. Did DOE take the DPR on **innovation into account** in developing its international program?

Background

No systematic surveys have been undertaken to estimate the total size of the solar export market, but many observers are convinced that a potential market of many hundreds of millions of dollars in annual sales could be developed in the 1980's. Developing

these markets would be highly beneficial to the domestic solar equipment market, **since the additional overseas demand would result in larger production runs and accelerated research.** This would reduce domestic prices and accelerate improvements made **in devices** sold in the domestic market, yielding the United States a long-term advantage, even if many developing countries began to manufacture their own systems with U.S. technical assistance.

Developing nations may have both the greatest need and the best conditions for many solar technologies. As OTA's study of the *Application of Solar Technology to Today's Energy Needs* emphasizes, poor nations are likely to be most vulnerable to energy shortages and steep increases in energy prices. They typically have not yet invested in an extensive network of transmission and distribution facilities, so that onsite solar technologies could provide power to dispersed sites without the expense and delay associated with building such facilities. Onsite solar equipment can be installed in small increments, as needed, reducing the lengthy periods of construction required for conventional energy facilities.

Some applications of solar energy may well become economically attractive in developing nations before they do so in the United States. The cost of competing energy–when it is available at al 1— is often high. Labor costs — which represent a substantial fraction of the total costs of some solar installations — are usually quite low. And most developing countries are located in areas where sunlight is more plentiful than in North America.

Solar energy may also prove especially attractive to many developing countries on broader grounds of social utility. The relatively high labor intensity of some solar technologies can help alleviate the endemic high unemployment and underemployment that plague most developing countries. Solar facilities can often be constructed using materials that are locally available. And using solar energy does not commit developing countries to forms of energy production that they may not be able to sustain because of fuel shortages or the lack of secure funds for fuel costs and other operating expenses.

The attractiveness of solar technologies for many developing countries, the expense of transporting bulky solar equipment, and the limited capacity of many poor countries to finance extensive imports suggest that many developing countries will find solar energy an ideal import substitution industry. The U.S. international program should find an appropriate balance between maximizing opportunities for exports and providing technical assistance for the creation of an indigenous solar industry in developing countries. Since conservation measures can often be combined effectively with solar technologies (see Issues 12 and 33), it may be cost effective to integrate conservation technologies into the international solar program.

A new Office of International Programs is described in the solar energy goldbook, though it has not yet been officially organized. The initial projects for the Office, apparently inherited from other programs, are not large enough to have significant impact either abroad or on the domestic solar industry. The total budget request is only $15 million ($11 million in solar technology, $4 million in solar applications). Of the $11 million, $9.2 million is allocated to projects in Saudi Arabia and Italy. The largest is a 350-kW (peak) photovoltaic system in Saudi Arabia, to begin operation in **1981.**

These projects represent neither a coherent U.S. export policy nor a coherent policy for providing technical assistance to developing countries. It might be hoped that future agreements will involve some of the more constrained developing countries; that a more appropriate balance be found between export-oriented programs and technical assistance programs; and that conservation technologies be integrated into solar- technical assistance programs.

Fruitful relations with other countries will depend on careful planning and implementation of agreements, and coordination with

other Government agencies. An overall plan for what the Office is trying to accomplish and how it will go about it would be extremely useful, both in directing activities and avoiding the many pitfalls that exist in dealing with other countries.

Issue 18

Energy Use in Federal Buildings

DOE should consolidate existing programs to equip Federal buildings with energy conservation and solar energy systems, and move more aggressively to implement these programs.

Summary

Federal buildings offer an important opportunity to test integrated conservation and solar technologies, reduce fossil energy use, assist market penetration and cost-reduction of products through large-scale procurement, and prove the commitment of the Federal Government to reducing fossil energy use. Currently there are three separate congressionally authorized programs in this area. DOE should couple the consolidation of these programs with aggressive implementation, and solicit more active interagency participation to meet the legislative goals for Federal buildings.

Questions

1. How much did the Federal Government spend on building energy use last year?
2. What progress has been made toward reducing the total energy use in Federal buildings?
3. What methods have been established to ensure uniform building audits? How much is known regarding energy use by various building type and climate zones?
4. Why has the Department failed to move vigorously to cut fossil energy use? What are the staffing plans to coordinate this effort this year?
5. How will the Department ensure that solutions are optimized for each building, that the results are shared within the Government, and explained to the public?
6. How does the Federal Government ensure that components and appliances purchased for buildings are energy efficient?
7. How will the present "solar" and "conservation" Federal Buildings Program be coordinated? Why are they not directed by the same office?

Background

The Federal Government has an obvious opportunity to display publicly its commitment to renewable technologies, conservation, and more efficient fossil fuel use through energy-conscious management of its own buildings. In addition to demonstrating its credibility, Federal properties serve as a useful instrument for testing some new technologies and demonstrating new but proven technologies (see Issue 10). The large, coordinated procurements represented by the Federal market offer the prospect for creating a market-induced, cost-lowering mechanism for such devices as solar collectors and high-efficiency furnaces.

The Federal Government accounts for about 2.6 percent of total U.S. direct energy use, through its 490,000 buildings and related operations. While promises about reducing this consumption are strong, there is little evidence that change is occurring. Congress has given DOE goals for the conservation-based efforts that include reducing energy in existing Federal buildings by 20 percent in **1985,** and by **45** percent in new buildings (below the **1975-76** levels). These goals are easily achievable technically and would clearly be cost effective, yet little progress has been made toward achieving them. Congress has also asked DOE to submit a 1 O-year plan for energy conservation in all Federal buildings.

Separately, the Solar Federal Buildings Program is aimed at demonstrating Federal leadership through the use of solar heating and cooling in new buildings. With limited resources,

centralized program integration is essential. In addition, one of the principal lessons of research and experience with building energy use over the past few years is that solutions must be carefully tailored to each building, with consideration given to existing energy use and cost, building function, site orientation, and so on. The arbitrary determination that "solar" or "conservation" is the choice for a building retrofit reinforces the undesirable distinction that already exists between these two complementary options. The Assistant Secretary should act to develop methods to integrate these programs, including consultation with appropriate congressional staff.

At present no coherent data base exists regarding energy use in Federal buildings. No program effort can be carefully crafted until such a base is created. Many buildings will immediately emerge as candidates for simple retrofits which will quickly lower energy use. Information gained from examining the patterns of energy use will indicate what types of effort should go to training building managers, to major retrofits, and to minor retrofits.

Strategies developed for an integrated Federal buildings approach might include widespread demonstration of low-cost, no-cost techniques that could also be used in homes, including explanations of the devices; testing of advanced energy systems in a few carefully selected sites; timely implementation of strong energy standards for Federal structures; and Government-wide monitoring of energy use by building type. Discount rates used in determining investment for Federal buildings should be scrutinized to determine if they correctly assess market impacts and marginal costs.

While DOE must be the catalyst for Federal action, all agencies must be held responsible for their own properties, and a supportive position by OMB is critical to the success of a Government-wide effort.

DOE has not acted aggressively in the past in implementing the Federal Energy Management Program, in spite of clear instruction from Congress. [1] Vigorous leadership by DOE, as coordinator of Federal energy conservation and solar energy programs for all Federal agencies and facilities, is necessary to demonstrate to the public that integration of solar and conservation techniques produces the most energy-efficient results.

[1] See House Government Operations Committee report, *Energy Conservation Within the Federal Government,* The Department of Energy's *Role,* November 1979.

Issue 19

Organizational Conflicts—SERI, RSECs, ROs

Confusion and competition between the several "arms" of C&SE add to the difficulty of meeting goals.

Summary

There is considerable uncertainty and conflict regarding the appropriate roles to be played, in both research and commercialization, by the non-Washington components of C&SE –the Solar Energy Research Institute (SERI), the DOE Regional Offices (ROs), the Regional Solar Energy Centers (RSECs), and the national laboratories. Lack of clearly defined roles for these units, and lack of a clear understanding of their relationship to each other and to DOE headquarters, add a needless obstacle to effective program operation and constrain limited resources.

Questions

1. What is the exact responsibility of each of the agencies identified above regarding research and commercialization of solar technologies and energy conservation? What is their relationship to each other?
2. **Is** the organizational decision that places a separate administrator (Deputy Assistant Secretary for Field Operations and International Programs) over these agencies likely to improve coordination and reduce competition?
3. **Is** the organizational decision to place a separate Deputy Assistant Secretary over these agencies likely to further separate these agencies from headquarters program direction?

4. Is there a long-term strategy to combine these agencies?
5. How do these agencies ensure that they assist the State energy offices rather than complicate their work?

Background

Solar and conservation activities require much more local outreach, education, and grassroots activity than most Federal programs. It is also clear that solar and conservation choices must be responsive to local climate and other variable characteristics, and that many types of research and many avenues to implementation will be needed. In response to this conclusion and in response to the seemingly universal desire of States and localities to locate Federal facilities in their areas, specialized agencies have come into being.

Since the agencies have often been limited (or understand themselves to be limited) to either "conservation" or "solar," their existence has contributed to the competition between these two divisions (see Issue 12). Since the agencies wish to conduct their own projects, repetition of effort could occur, Perhaps most critically, opportunities for cooperation and complementarily are lost.

The 10 DOE ROs seem to operate primarily as administrative vehicles for transmitting various forms and applications from States to headquarters. Consequently, most staff effort goes into such activity. The staffs typically are not well informed on the programs run from Washington, thus making it difficult for them to deal effectively with States and citizen groups, No meaningful technical expertise has been made available through the ROs. Those headquarters programs that have attempted to decentralize management, such as the Small Grants Program, have found that staff assigned to their program in the RO report to the RO Director, and their time can be redirected to whatever tasks or programs are highest current priority for the Regional Director. This further reduces the incentive for programs to be decentralized, as Washington management cannot ensure the availability of staff assigned to their program. If there is no demonstrated need for the ROs, perhaps they should be eliminated or replaced by an office that only dispenses information produced by DOE.

SERI and RSECs reflect a strong response to the Department's solar constituency, as well as an attempt to distribute Federal funding for solar across the country. While SERI is beginning to consider its mandate to include the promotion of solar and related conservation technologies, RSECs have tended to concentrate entirely on solar. RSECs have difficulty providing comparable levels of service to all States, due to their geographic location, and the role of SERI has clearly changed from the initial concept of the principal solar research arm of the Department to a much broader entity, with an expenditure level expected to reach $122 million in fiscal year 1980 and over 700 employees. The level of funding for the four RSECs was $13.5 million in fiscal year 1979, and should be about $21.7 million in fiscal year 1980. Authorized personnel level for RSECs is 235.

The Energy Extension Service, now underway in all States following a pilot program in 10 States, is primarily concerned with conservation techniques, although the legislative mandate specifies both conservation and renewables. The Energy Extension Service programs can be expected to vary widely and be responsive to specific State needs.

As program budgets grow and strategies become more clearly defined toward the goals of the DPR, it will be increasingly important to find complementary roles for these groups. A thorough review and analysis of the actual activities conducted by each at this time, including staffing patterns and the outreach activities, plus a rigorous evaluation of effectiveness, would be helpful as a first step.