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International Conservation and Solar Energy Activities

In view of its large current energy consumption, the U.S. must develop domestic policies that will stimulate the changes and investments that will reduce both the national dependency on imported petroleum and the pressure on the world oil market that is exerted by that demand. However, it is imperative that these policies be complemented by large and diverse international efforts, an important part of which will be conservation and solar energy-related activities.

The rationales for action at that level are compelling. International economic interdependence is a reality that makes it impossible for any nation, including the U.S., to solve its energy-related problems through domestic policies alone. It is questionable whether the world financial system, strained by the aggregate impact of individual nations' past efforts to deal with high oil prices, can withstand similar demands in the future. Currently, world inflation penetrates all borders, and it is estimated that 25 to 50 percent of total world inflation is the result of oil price increases.^{1/} It therefore becomes increasingly difficult for any nation to insulate itself from the strains on the international economy.

Secondly, energy considerations have taken a prominent place in the arena of foreign relations. Among the developed countries there is an understandable, but ultimately destabilizing tendency to seek and use the most expedient bi-lateral arrangements by which to secure petroleum for their countries. In less-developed countries (LDC's) the pressures of dealing with high

energy prices are undermining already weak governments' strength, and are building resentment against countries such as the U.S. whose energy demands put upward pressure on oil prices and thus constrain the trade and financing opportunities of the LDCs. The OPEC nations, though much wealthier, are also a most vulnerable and volatile group with sophisticated and complex political motivations. The U.S. government must support its foreign policies with respect to all of these groups with appropriate energy-related technological and economic initiatives.

Finally, international cooperation is desirable because it is likely to result in faster technological advances and commercialization, and can avoid unnecessary duplication of efforts and extravagant use of resources.

Conservation and solar energy have thus far played a very small role in international energy efforts. A change in this pattern to programs that stress indigenous energy resources or non-conventional sources is advisable for technical, economic, and political reasons. Energy aid, estimated to have represented approximately 25% of total capital aid transfers in the past, has focused on centrally generated electric power.^{2/} However, other forms of electricity generation which could substitute for oil fired power plants however, are extremely capital intensive; compared to oil-fired plants, hydroelectric and nuclear plants require 50 to 100 percent more capital investment and coal-fired plants require 30 to 40 percent more

capital investment.—^{3/} On the other hand, many renewable energy systems require technological skills that are closer to those already found in LDC's and can use local materials and fabrication facilities, thus minimizing imports. Furthermore, their small scale and decentralized nature makes them the best, if not the only alternative for providing energy to certain rural and remote areas.

Multilateral efforts on the part of developed countries to use renewable energy and cut demand in general hold the possibility for reducing inflation and slowing the rise of oil prices. In addition, such efforts would serve as proof of commitment to the path being proposed to LDCs. They would also reduce the rate of depletion of the world's scarce oil reserves, a policy which is in line with the declared intentions of many OPEC nations.

CURRENT OUTLOOK

Since 1973, non-oil producing countries have made a series of adjustments to maintain desired levels of both human standards of living and economic activity in the face of the approximately 400 percent increase in oil prices at that time, and also to reduce dependence on that highly uncertain source of energy. New financial arrangements, searches for alternate supplies, utilization of alternative supplies, and demand reduction programs were all employed during the 1970's with a certain measure of success; this is evidenced by the fact that a major collapse of the international financial system, military conflict over oil supplies, and other disastrous possibilities foreseen did not, indeed, take place in the 1970's.

However, as these efforts have been mounted, so has the challenge to them grown. At the outset of this new decade, the oil-importing nations face a threefold challenge; they must deal with new price increases, increased uncertainty of availability, and also with the consequences of their previous actions.

More than 50 percent of the energy consumption of the nations of the Organization for Economic Cooperation and Development (OECD) is currently met by oil. U.S. oil production is expected to, at best, remain stable over the next five years, and other non-OPEC countries production levels are expected to do likewise. Therefore, OECD oil production is expected to be approximately 14.4 to 16.9 MM b/d in 1985. With respect to other fuels, the OECD countries are expected to increase their production of natural gas (in gaseous and liquid forms), coal, nuclear power, and renewable energy by 27 percent. ^{4/}

If OECD energy total demand in 1985 rises to 89.8 MM b/d and oil demand to 44.0 MM b/d, the net amount of oil imported is expected to be between 27.1 and 29.6 MM b/d in 1985. Of this volume of imports, 20.0 to 23.2 MM b/d would have to be imported from the Persian Gulf. ^{5/}

In summary, OECD dependence on the Persian Gulf has not diminished significantly and is not expected to decline by 1985. The estimated percentage of oil imports coming from the Persian Gulf in 1979 and 1985 are as follows:

	U.S.	Japan	W. Europe	Total	
1979	31	73	63	55	
1985	34	73	62	56	^{6/}

For the developing countries the situation is more critical.

In 1976 the developing countries accounted for about 12 percent of world primary energy consumption, 15 percent of world petroleum consumption, and 19 percent of world gross imports of petroleum.^{7/} Of 74 developing countries that import oil, 48 depend on it for at least 90 percent of their "commercial" needs (those needs which consumers normally meet by purchasing energy in modern markets) and only four depend on it for less than 50 percent of those needs.^{8/} It is important to note that 50 to 90 percent of total energy consumption in most developing countries is met by traditional fuels such as firewood, crop residues, and animal dung.^{9/}

Lacking indigenous commercial resources and being too small to affect world oil prices through demand restraint, these nations have had to increase their debt in order to pay for imports; the only alternative would have been to reduce their economic growth to an even greater extent than has in fact occurred. Thus far, they have accumulated a debt of approximately \$300 billion.^{10/} Commercial banks, recirculating the large financial surpluses of OPEC nations, provided much of the financing that went to the developing countries during the 1970's. Having received approximately \$130 billion from them in recent years, many oil-importing LDC's have reached or surpassed the credit limits that commercial banks (and/or their home countries) are willing to accept.^{11/}

At the same time, the world economic slump is adversely affecting the export opportunities of the LDCs. The total current account deficit for all oil importing developing countries increased from \$36 billion in 1978 to \$45 billion in 1979 and is expected to reach \$55 billion in 1980.^{12/}

The uncertain outlook for their trading prospects and the likelihood of higher oil-import bills increase the need for LDCs to rely on official foreign aid. However, in the 1970's increases in aid from developed countries have been overtaken by increases in the costs of oil imports.

	(\$Billions)		
	1973	1979	1980 estimated
Foreign Aid	13	29	32
Oil Costs	8	35	55 <u>13/</u>

There is a real danger that the disparity between oil costs and foreign aid will become even more pronounced in the 1980's as developed countries respond to their own mounting economic problems by cutting back on aid to LDC's.

Unfortunately, the rate of growth of energy demand is expected to be higher in the developing countries than in the developed countries. Even the limited economic growth that is expected to occur and changing economic structures in developing countries are expected to carry many of them into national income levels that are associated with significantly higher energy use. Trends such as urbanization, which will take place to a greater or lesser extent depending on the rate of economic growth will also result in demand for commercial energy in the place of traditional energy sources.

2. OBJECTIVES OF CURRENT INTERNATIONAL ENERGY PROGRAMS

The U.S. is pursuing two sets of objectives through its international activities, one relating to industrialized countries and another relating to less developed countries. The possibilities for common political, economic, and technical benefits are great in both arenas.

Concerted efforts with developed countries are aimed at relieving the demand pressure on oil prices and at furthering the state of the art and penetration of existing technologies. The industrialized countries, being the largest consumers of oil can have the biggest impact on oil prices. They also have the ability to devote resources to research and development of improved energy supply and end use technologies. For the U.S. there may be useful lessons to be learned from the experience of countries that have lived with relatively high energy costs for many years.

Activities relating to developing countries are carried out by many different organizations and are focused on one or more of the following objectives:

- Development Assistance;
- Export promotion;
- Non-proliferation of nuclear capability;
- Improved foreign relations.

These objectives must be pursued with sensitivity to the needs and outlooks of other countries which, naturally, can come to resent a patronizing or overbearing attitude on the part of the U.S.

3. CURRENT ACTIVITIES

Within the Federal government three agencies, the Department of Energy, the Department of State/Agency for International Development (AID), and the Department of Commerce have major international renewable energy programs. Other U.S. entities directly or indirectly involved in international solar energy activities include the National Aeronautics and Space Administration (NASA), the Peace Corps, the National Science Foundation, the Department of Agriculture, the Department of Interior, the Export-Import Bank, the Overseas Private Investment Corporation (OPIC), and the Inter-American Foundation. The U.S. also participates in the energy activities of several international organizations such as the World Bank, the International Energy Agency and the United Nations.

These official activities are complemented by numerous strong programs designed and executed by private foundations.

Federal Programs

Department of Energy

The Department of Energy is responsible for managing international solar energy research, development and demonstration activities in which the U.S. engages. The policy guidance for these activities and international agreements that govern them are developed in cooperation with the U.S. Department of State.

Within the DOE, the Division of International Affairs coordinates all international agreements. These agreements are developed in conjunction with other DOE offices as appropriate. They are developed in response to requests from abroad, as a component of a federal foreign policy initiative, or as a reflection of a need perceived by offices within DOE. In the case of agreements that cover solar energy, the Division of Conservation and Solar Energy is the DOE entity that is responsible for developing and implementing technical projects.

The Solar Energy Research Institute (SERI), one of the field organizations under the Assistant Secretary for Conservation and Solar Energy, is chartered to serve as the focal point of America's international solar activities. SERI has been requested to be the lead institute in implementing bilateral solar energy agreements that involve technical projects and/or information exchange. Furthermore, SERI is responsible for directing its research and development activities to support multilateral and bilateral international agreements and U.S. efforts to meet international needs.

DOE participates in three kinds of activities that have direct impacts on international solar energy utilization: multilateral cooperation, bilateral agreements and activities, and international solar application development. Through the International Energy Agency alone, DOE is a party to thirty-five separate agreements for multilateral cooperation. Among these

are solar energy projects in the following areas: Solar heating and cooling R&D, wind energy R&D, large-scale wind turbines, small solar thermal power systems R&D, forestry energy R&D, biomass information, and wave power system development and testing. Multilateral programs and events are discussed in detail below.

The DOE has solar-related bilateral agreements in effect or in negotiation with over 14 countries with approximately the same number of developed and developing countries involved.

The countries are:

Australia	Italy	Mexico
Brazil	Ivory Coast	Pacific Islands
China (PRC)	Japan	Saudi Arabia
France	Korea	Spain
Israel	Mali	U.S.S.R.

A distinct bilateral program is the International Energy Development (pilot) Program (IEDP). The IEDP, implemented in cooperation with the U.S. State Department, is the only program specifically aimed at developing countries. Under the IEDP, countries with non-nuclear energy alternatives are selected and, upon receipt of approval from the host government, full individual energy assessments are performed. The main purpose of the assessment is to increase use of indigenous energy resources in developing countries. Two additional activities called for are program strategy development and world energy resource and technology information collection. So far, energy assessments of Egypt and Peru have been completed and Korea, Argentina, and Portugal assessments are in varying stages of preparation.

The question of whether AID, rather than DOE, should manage this program in cooperation with the State Department has been the cause of considerable debate. Generally, it is considered

a rightful activity for DOE because development is not the primary, but a secondary benefit of the program.

Finally, there are domestic programs that are aimed at effecting increased solar energy technology utilization internationally.

SERI is responsible for setting priorities for technological, institutional and funding areas for the U.S. solar activities with developing countries. In fulfillment of this mission, SERI funds policy studies and will establish a test and demonstration site for systems that are suitable for developing countries' needs.

Another area of internationally-focused domestic activity has to do with export-promotion. The International Solar Commercialization Working Group, led by the DOE, was formed in 1978. It includes representatives of the DOE, the State Department, U.S.AID and the Department of Commerce and works to promote the export of U.S. solar technologies to the rest of the world. A major product of the Working Group is the International Photovoltaic Plan which was authorized by Congress on

Agency for International Development

The major U.S. assistance organization has been the U.S. Agency for International Development (AID). In 1973, Congress mandated a definite shift of emphasis to meeting the needs of the rural poor. One of the bases of the hardships faced by these people throughout the developing world is the scarcity/cost

of fuel. Between 1960 and 1973 \$815 million were spent on energy assistance and none went to fund renewable energy projects. ^{14/} In 1975, the Foreign Assistance Act was amended to encourage activities both to produce and to conserve energy in developing countries. Further amendment in 1977 authorized expenditure for small-scale decentralized, renewable energy sources.

Conventional and renewable energy projects are initiated in AID by either the headquarters Office of Energy or by regional bureaus themselves. The Office of Energy is meant to be both an administrative center and a source of technical support for the regional bureaus.

There is no overall AID agency energy policy. ^{15/} Some broad policy guidance encouraging AID missions to incorporate energy considerations in their plans and programs has been provided. Currently, the bureaus (Africa, Asia, Latin American/Caribbean, and Near East) are developing individual regional energy strategies of varying dimensions and are engaging in activities ranging from hardware projects through training programs.

The increase in AID energy programs and in other federal international energy activities opened the way for duplication of effort and conflicting policies. This led to the establishment of a steering group to coordinate AID and Energy Research and Development Administration (ERDA) efforts. ^{16/} As a result of the International Development Cooperation Agency Act (IDCA) of 1979, the aim of which is to consolidate overseas assistance organizations, a new organization -- the Institute for Scientific and

Technological Cooperation -- was formed.^{17/} This organization has been authorized (although no funds have been appropriated for it yet) and is planned to engage in cooperative energy projects and studies with other countries. The danger of future duplication of effort is evident.

It should be noted that aside from AID activities, the State Department also directs the International Energy Development Program (IEDP) executed in conjunction with the Department of Energy.

Department of Commerce

The Department of Commerce (DOC) has included conservation and solar equipment in its usual export promotion activities; these include trade fairs, exhibitions of American products in foreign countries, and other events.

In addition, the Department of Commerce has initiated a new program of Specialized Assistance Campaigns (SAC) under which export development programs will be developed for particular industries. A plan will be developed that specifies the activities that the industry and the International Trade Administration of the Department of Commerce will undertake to the end of increasing U.S. exports. The Solar Energy Industries Association plans to participate in this program. It is expected that exports will be promoted by this form of established, long-term commitment on the part of businesses trade associations and DOC. DOE Headquarters and SERI will also have a role in the program; their contribution will be largely in the form of information

provided to the industry regarding legislative and technical developments, new international agreements, and foreign opportunities. In addition, DOE will be responsive to data needs and will provide opportunities for increasing the international visibility of solar technologies.

Coordination of Federal Efforts

The number of offices involved in international energy activities within the federal government has become a source of some concern. Cooperation among these offices has been demonstrably limited as has their awareness of each other's activities. Several efforts have been made to increase coordination. The AID/DOE/State Department steering committee formed in 1977 was mentioned above. This committee is reported to have improved coordination among those three organizations to some degree. In 1973 the Interagency Development Coordination Committee was formed to advise the President on precisely the challenge of coordinating development related programs. That committee considered the energy program issue in 1978-79 but was able to produce no acceptable solution to the problem. Another attempt is being made now by a group formed under the direction of the National Security Council: the Interagency Task Force on Accelerated Energy Production in Oil Importing Developing Countries. This Task Force is currently working on developing a unified energy policy that also defines the role of individual federal agencies and organizations. The report is expected in approximately one month.

International Organizations

(Discussion of International Energy Agency to be added)

United Nations

The United Nations does not have a central, coordinated approach to energy issues. Many of its organizations have interest and "jurisdiction" over energy subject areas, and in many cases the responsibility for projects is shared, with one organization providing financing and another handling implementation.

The United Nations Development Program (UNDP) finances a majority of the U.N. energy projects. However, between the years 1970 and 1978 less than 1 percent of the funds provided by UNDP went to nonconventional energy projects. ^{18/} Most of the renewable energy efforts are initiated by two other offices in the U.N. The United Nations Center for Natural Resources, Energy, and Transport has demonstrated a particular interest in renewables. Aside from funding and administration of studies and projects the Center is currently leading the preparations for the 1981 U.N. Conference on New and Renewable Sources of Energy.

The origins of this upcoming U.N. conference underscore the difficulties of foregoing a cohesive multilateral stance on energy issues. Beginning in 1975, the U.N. considered various proposals for the establishment of an International Energy Insitute (IEI) either within or separate from the U.N.

The creation of such an institute was strongly supported by the U.S. and European countries but met with even stronger opposition from existing U.N. organizations and, more importantly, from both oil-producing and oil-importing developing countries. The developing nations perceived the proposal for a world energy policy organization as part of the developed countries' nuclear non-proliferation efforts. As a result, in 1977 the U.N. Economic and Social Council (ECOSOC) refused to consider the proposed IEI and recommended instead that a feasibility study be done of a world conference on new and renewable energy. It was this study, completed in May 1978, that recommended the conference that is now being planned for 1981. 19/

World Bank

The World Bank has, historically, devoted a substantial share of its funds to power generation and distribution projects. Its most significant new program, initiated in 1979, is one which lends for oil and gas exploration in developing countries. It is estimated that under this program loans may total \$500 million annually beginning FY81.

Renewable energy is the primary focus of only one project implemented by the World Bank and which is being funded by UNDP. It is a test of small, solar-powered irrigation pumps in the Philippines, Mali, India, and the Sudan. Aside from that project, some consideration is given to renewable energy in the course of conducting other projects and there are efforts

at reforestation to replace trees used for fuel wood. The following reasons are cited for the Bank's continued unwillingness to engage more heavily in renewable energy projects: First, it is hesitant to invest in technologies that are in an early stage of development; the Bank's lending criteria preclude high risk investments and malfunctions as projects operate over time are feared. Secondly, renewable energy systems, particularly in developing countries, are generally small in scale thus, appraising and financing many of these projects would strain World Bank's available staff resources.^{20/} In view of the World Bank acknowledgement that "Several non-conventional energy technologies are practical and competitive in developing countries at present prices" and that "the opportunities for further development and improvement of non-conventional energy sources and uses are substantial" lack of direct action in this area is difficult to rationalize.^{21/}

Other Organizations

Other International Financial Institutions such as the Inter-American Development Bank, The African Development Bank, the Asian Development Bank, and the Caribbean Development Bank have devoted varying quantities of resources to renewable resource projects. But, it is too early to evaluate the impact of these activities.

4. PROBLEMS FACING INTERNATIONAL ACTIVITIES

Increasing the total amount of U.S. resources currently devoted to international energy assistance/cooperation and

raising the portion devoted to conservation and solar energy will not automatically ensure alleviation of the energy-related problems discussed above.

The existing programs face several obstacles to success. First, cooperation between the U.S. and other developed countries because of market differences in the interests of developed countries with respect to energy, they have found it difficult to reach concordance on energy policy. Individual nations' interests vary as a result of real or perceived differences in:

- Dependence on Foreign Energy Resources: The U.S. is in a unique position among western developed nations with respect to current domestic energy resource availability. Although it is no longer a major exporter of petroleum it depends on imported oil for only about 20 percent of its needs. In stark contrast, Japan imports about 73 percent of its total energy needs. With respect to indigenous resources, most other developed nations fall in between these two extremes but more closely resemble the Japanese, rather than the U.S. case.^{22/}
- Supply sources: Their high dependency on imported energy has led other developed countries to protect their economies and national security by diversifying their energy suppliers, by securing bilateral supply contracts wherever possible, and by adopting policies that predispose their contemporary or potential energy

suppliers favorably toward them. With respect to cooperation in energy policy, this pattern of behavior reflects an "every country for itself" attitude that is directly contrary to a coordinated approach.

- Ability to influence oil companies: In the years following the 1973 oil embargo there was considerable concern among the developed countries that the predominance of U.S.-based oil companies in the Middle East translated into an unequal advantage in favor of the U.S. in the case of a supply disruption. The ability of the U.S. to influence the actions of multinational corporations including the oil companies has been called into serious question by numerous private and public investigations. In addition, the ability to influence the oil companies has become of less apparent importance as the oil producing nations have curtailed oil company power -- by increasing the proportion of total production that is being sold either in the spot market or through direct bilateral arguments between governments rather than through the oil companies. Nevertheless, there remains some concern that a future scenario might find the return of U.S. oil companies to a position of some power and that that, in turn, would benefit the U.S. disproportionately.

Secondly, there are several obstacles to successful programs between the U.S. and developing countries. These include:

- Credibility. Less developed nations are extremely sensitive, even hostile to receiving lectures from developed countries and having technology that is not considered seriously in those same countries recommended for use in LDCs. In addition, the continued high levels of oil consumption and dependence on conventional fuels (including nuclear) in industrialized countries undermine the rhetoric and efforts to promote alternative energy use and conservation in developing countries.
- Underdeveloped Infrastructure. Renewable resources are best exploited as part of an integrated energy planning and development effort. Unfortunately, the lack of trained manpower, data, and institutional linkages among institutions in many developing countries (and to a certain extent in developed countries) make this process an extremely ambitious undertaking. Individual projects are also hindered by this lack of infrastructure.
- Lack of Financing. Cost-shared energy projects planned by some organizations have had to be abandoned for lack of financing in LDC's. This is a significant problem even though renewable energy projects often have lower capital requirements than conventional energy systems.

Finally, there are the following institutional obstacles that hinder the potential for increased international conservation and solar energy use and technology exchange:

- Lack of Program Coordination. It cannot be said that existing resource commitment levels are coordinated for maximum effectiveness. In the U.S. itself, the efficiency of existing programs in both the public and private sectors suffers as a result of poor coordination of efforts. There are two aspects to this problem: 1) the organizations sponsoring energy related international activities are often not aware of what other organizations are funding that may be related; 2) energy-related projects are not planned to be complementary -- their objectives are clearly different and institutionally there exist no effective mechanisms for encouraging complementarity of efforts.

A related and fundamental problem is the absence of a clear national policy with respect to energy technology transfer. This adds to the credibility obstacle described above since countries approached for cooperation may attribute one organization's objectives to another.

As was discussed above, there have been several attempts to provide coordination among existing programs. However, no comprehensive policy or system has been established to date.

- U.S. Patent Practices. It is DOE practice to make all developments from jointly funded project public property. Not only does this discourage some private sector firms from participating in joint projects but it is also a policy that discourages participations by foreign countries that would prefer to be able to capture the rights to the products of joint undertakings.

5. MECHANISMS

The system under which world energy resources are currently traded may well be unsustainable. The oil price increases of 1973-74 contributed as much as 25% to 50% to the world inflation rate and the round of increases in 1979 not only added a further twist to the inflationary spiral, but came at a point in the economic cycle when the western economies were already in danger of moving into recession. Furthermore, the projected demands on the world financial system arising from the need to meet increased energy import bills will add to an already serious debt servicing problem for developing countries. At worst, the inability of LDCs to meet these payments could trigger a major international financial crisis. In addition, domestic and international political instability has already been exacerbated worldwide by diminished economic growth and the prospect exists of increasing rivalry for access to petroleum supplies. These developments continue to undermine the strength of the Western alliance and to increase the vulnerability of the free world to external threats.

The magnitude and, moreover, the acuteness of the overall problem suggests the need to consider programs far beyond those already in existence. Essential elements will include: International Multi-Lateral activities; International bilateral agreements; and unilateral measures on the parts of developed and developing countries.

Multi-Lateral

International multi-lateral activities have considerable potential for identifying and implementing programs that can reduce the negative impacts of the current energy situation. Admittedly, by their nature, these sorts of efforts also face severe obstacles to success. Reconciliation of the varied objectives and opinions of many countries, protection of national sovereignty, and the maintenance of multi-lateral commitment to agreements reached are among the problems that have diminished the success of previous international efforts in other areas.

On the other hand, the relatively recent increase in the importance of blocks of countries (e.g., OPEC, AOPEC, EEC) as actors in the international arena along with individual nations, makes it more appropriate that serious, action-oriented forums be multi-lateral. Specifically, effective solutions to the energy-related problems of developing countries in particular can be expected to encounter difficulties if OPEC nations are not involved in, at least, the discussion of them. Furthermore, particularly when endeavoring to secure a set of commitments to investment in conservation and solar energy, the participation of all these blocks provides them with some indication that their efforts will be matched or reciprocated in some manner; by thus making the benefits of their actions more certain, multi-lateral efforts are more likely to persuade individual countries to participate.

Secondly, international institutions provide appropriate fora for each interested and affected nation to express its needs. In the case of an energy initiative development effort, this feature is particularly important; any program that results from such an effort must reflect the fact that each country and region has unique energy characteristics and needs. Not all conservation and renewable energy technologies are "appropriate technology". Waste of both resources and international goodwill could result from well-intentioned but unilaterally-developed energy assistance and cooperation efforts which ignore these considerations.

Thirdly, the probability of success of any initiative which involves more than one nation is enhanced greatly if the affected countries all have some stake in the outcome. The developed nations must avoid instigating programs that appear to dictate needs to developing countries and provide assistance for those needs as identified. Developing countries will be much more likely to make good use of energy assistance projects that are well suited to their individual needs and to which they have made a tangible commitment. Such a commitment could take the form of cost-sharing, trained manpower contributions, incorporation of the particular project into central national plans, and other actions.

Bilateral Agreements

Continued and expanded bilateral energy cooperation and assistance activities between the U.S. and foreign countries will continue to be important means for dealing with national and international energy problems.

Clearly, one of the functions of international energy activities, the support of U.S. foreign policy positions, can often be served best through bilateral programs. In addition, the U.S. can make use of existing international institutional links (e.g., between academic institutions, etc.) and can focus programs at specific technological goals by entering into agreements with foreign countries on a selective basis.

The burden of action may indeed, fall very heavily on bilateral actions if efforts at stimulating major conservation and solar energy cooperation and assistance programs at the multi-lateral international level fail. However, even if programs are launched through such an effort, those programs will represent the product of compromises allowed by all participants in the process. Consequently, there may well be U.S. priorities that will require implementation of programs outside of those conducted pursuant to a multi-lateral accord.

Unilateral Activities

There are certain national preconditions and ancillary unilateral activities that can enhance the probability of success of international multi-lateral or bilateral energy assistance and cooperation agreements between developed and developing countries.

The developed nations and in particular, the U.S. have a very important role to play separate from that of providers of aid and technology. They should be prepared to provide leadership in the transition to efficient energy use and greater reliance on renewable energy resources. But such leadership will not be effected through verbal persuasion or commercialization efforts alone.

An innovator must demonstrate genuine confidence in the innovation in order to persuade others to accept it. Similarly, the developed countries must demonstrate a commitment to conservation and renewable energy sources through their domestic public sector policies and programs in order to overcome developing country skepticism with respect to the true value of those technologies.

The U.S. in particular suffers from an energy wasteful image worldwide. Part of this is a lingering resentment based on assessments of the U.S. energy consumption patterns prior to the 1973 oil price increases. Another part is a very strong current assessment that the U.S. is not doing enough conservation considering the impact that U.S. energy demand has on the international petroleum market.

On their part, the developing countries must examine the relationships between their energy needs and their economic plans, and they must also be as aware as possible of actual energy consumption trends -- for example the balance of commercial and traditional energy used. Here they may be able to call on the developed countries, either individually or jointly, to provide technical assistance in the analysis. The interrelationships between energy policy and trade policy must be borne in mind so that the optimal adjustments can be made for the most productive uses of scarce foreign exchange.

activity in other countries. It is the only way to reduce the "credibility" barrier described above.

- The U.S. should develop a national policy on international conservation and renewable energy activities.

The United Nation's Conference on New and Renewable Sources of Energy will take place in 1981. In view of the previously hostile response of many U.N. members to the proposals that predated the conference, it can be expected that the conference itself will be a forum for considerable controversy. As a major U.N. event it will also have high visibility worldwide. The chances for any real cooperative agreement to emerge as a result of the conference are not great, but do exist. Nevertheless, as important to note is the possibility of a failure to reach any agreement and the possible ramifications thereof. We discussed above the importance of multilateral activities as well as the obstacles to successful multilateral efforts. Unfortunately, once an attempt at reaching such as international accord is made and fails, it becomes many times more difficult to attempt again. Clearly, it is in its own best interest for the U.S. to develop a national policy that reconciles the varied objectives being pursued through the many existing U.S. international energy programs -- and to develop such a policy in advance of participating in the U.S. conference.

The existence of such a national policy would be a foundation for U.S. participation in the conference -- not as a set of inflexible maxims but as a strong point of departure and possibly as a source of ideas for cooperative policies developed at the conference.

- The U.S. should lead the developed world in according increased attention to the energy related problems of the developing countries. The current energy outlook for the developing countries is particularly bleak. As was discussed above, it is in the best interest of the developed nations to help the LDCs cope with both the symptoms and causes of these problems. The U.S. should formulate a strong policy with respect to the developing countries -- one that reflects the willingness of the U.S. to be a world leader in acknowledging the importance of assisting the LDCs and also, in the process of transition away from fossil fuels.
- Using either policies suggested by the National Security Council or others, the coordination of existing programs should be improved. It is not yet known to what extent the current National Security Council's analysis of existing programs will establish the respective roles of the various federal organizations engaging in international conservation and solar energy activities, and/or mechanisms by which to coordinate those activities. The NSC recommendations should be

examined and, if found to be satisfactory, should be implemented immediately. The funds being devoted to these international programs are too limited to risk duplication of efforts. If the NSC report does not adequately address the need for information exchange and coordination among entities involved in international programs, then a policy effort to deal with these issues should be mobilized. One option is to have the International Development Cooperation Agency (IDCA) take the lead in coordination of U.S. activities.

- The U.S. should use its influence in international organizations of which it is a member to urge them to actively promote and support the transfer of conservation and renewable technologies to developing countries. The U.S. contributes funds and/or has input into the program planning of a number of international organizations. Wherever possible it should emphasize the value of information and technology transfer in conservation and solar technologies as well as the need for action to alleviate the energy-related problems faced by developing countries.

Programmatic Actions

- Continue the International Energy Development Program (IEDP) of country energy assessments as a regular program.

The IEDP is not only the only DOE-managed program which is aimed at developing countries; it is also a program which has received wide acclaim in the countries with which it has already dealt. IEDP should lose its pilot-program status and be funded at a level sufficient to allow the execution of three country energy assessments per year. This would effect continued gains of goodwill abroad as well as provide invaluable information on energy demand and supply trends in the program countries.

- The U.S. should support solar industry efforts to reach markets abroad. Many private renewable energy companies in the U.S. are interested in overseas markets. These companies' free market efforts are to be encouraged.

The activities of the U.S. government and those of the private sector should complement each other in this area. On one hand, the Department of Energy has technical and market information that would be of use to the U.S. private sector solar industries that are interested in overseas markets. On the other hand, federal programs should be directed in part at filling the informational and technical gaps that are made apparent by the private sector's activities.

- The Department of Energy should expand its domestic efforts in support of international applications of renewable energy. The DOE can engage in a variety of

"supporting activities" that are not or cannot take place in the private sector. Renewable energy systems for use in developing countries often require special development. In addition, reliable data on markets, technology, and existing programs is needed by all participants involved in public and private technology transfer. DOE headquarters and SERI should evaluate their present activities, and identify areas that merit expanded efforts.

- The U.S. should expand efforts at cooperative renewable energy technology development. Bilateral agreements for information transfer and technological cooperation accelerate the development of a wide range of technologies suited to needs of a variety of markets. The DOE should continue to expand the cooperative activities in which it engages.

Notes

1. "The Petro-crash of the '80s" Business Week, November 19, 1979 p. 176.
2. "Bypassing Oil and the Atom" Thomas Hoffmann and Brian Johnson. Energy Policy June 1979 p.91.
3. Energy Options and Policy Issues in Developing Countries, World Bank Staff Working Paper, No. 350, 1979, p. 3.
4. Estimates calculated by Division of International Affairs, Department of Energy, as presented in testimony by Dr. John Sawhill before the Senate Foreign Relations Committee on February 20, 1980.
5. Ibid.
6. Ibid.
7. "Energy Options", World Bank, p. 9.
8. Ibid.
9. Ibid, p. 11.
10. "Petro-crash", Business Week, p. 182.
11. Ibid, p. 186, 179.
12. Ibid, p. 182. The World Bank estimates of oil-importing developing countries' current account deficit are \$32 billion, \$43 billion, and \$50 billion for the years 1978, 1979 and 1980, respectively.
13. OECD data as presented in "'Me Decade' Looms for Oil Users", Washington Post, March 23, 1980.
14. U.S. Energy Assistance to Developing Countries. Clarification and Coordination Needed. General Accounting Office. March 1980.
15. Ibid.
16. The State Department is also a member since 1978.
17. The Overseas Private Investment Corp. (OPIC) is now a component of IDCA as well.
18. U.S. Energy Assistance. General Acctg. Office, March 1980.

19. "Bypassing Oil and the Atom" Thomas Hoffman and Brian Johnson, Energy Policy, June 1979, p. 93.
20. Ibid, p. 97.
21. World Development Report, 1979, World Bank, August 1979, pp. 42-43.
22. Estimates calculated using data from Office of International Affairs.

REGIONAL SOLAR ENERGY CENTERS

In 1974, Public Law 93-473 (the Solar Energy Research, Development, and Demonstration Act of 1974) was passed; it called for the creation of a Solar Energy Research Institute (SERI) to conduct research, development, and related work to achieve commercial viability of various applications of solar energy technology. The Energy Research and Development Administration, a predecessor agency to the U.S. Department of Energy (DOE), announced on 24 March 1977 that it had selected the Midwest Research Institute to manage and operate SERI, to be located in Golden, Colorado.

At the same time, recognizing the regionally diverse nature of solar energy applications, ERDA announced its intent to establish four regional solar energy centers (RSEC). Subsequently, organizations representing the northeastern, north central, western, and southern regions of the U.S. were awarded planning grants to promote the widespread use of solar energy.

Mission

While SERI is responsible for research, development and demonstration, the regional centers concentrate on commercialization of solar application. Commercialization includes those activities that will bridge the gap between successful solar technology demonstrations and widespread use of these technologies by both the public and private sectors. These activities are designed to provide a secure and permanent market for the solar industry, to reduce buyer uncertainty, and to accelerate the use of solar technologies.

Activities

The market development activities of the regional centers are aimed at identifying and removing institutional and other barriers to solar energy use through the establishment of appropriate standards, codes, regulations, and incentives by state and local governments, education and technician training programs, technical and marketing assistance efforts for businesses, and consumer awareness campaigns. Programs are designed and funded to permit the federal government to work together with the key constituencies who can make solar energy happen for the nation: manufacturers, designers and architects, builders, installers, financial officers, state and local government officials, public utility commissioners, and consumers. Programs are now structured to emphasize those solar technologies that have reached or are near market-readiness: passive solar design, solar water heating, industrial process heat, small wind, and wood combustion.

(the shifting of established funding from one program to another). Such a process is inefficient and burdensome both to the RSEC and headquarters individuals who must reconcile incompatible budget requests and available resources, and to the headquarters offices that must effect the final programming and adjust to revised budget levels.

In summary, the coordination of RSEC and headquarter objectives, activities, and management and the communication between the two organizations has been deficient in the start-up period of the RSECs.

Evaluative discussions in Congress and elsewhere have also raised questions about the adequacy of the interaction between RSECs and the regional and state entities in their areas of jurisdiction. As is discussed more fully in the background paper on Multi-sectoral efforts, regional, state, and local organizations often have uniquely valuable insights into the needs, systems, and activities in their areas. This sort of information is invaluable to commercialization efforts since such efforts are most successful when they are tailored as closely as possible to the characteristics of the targeted area.

It should be noted that in the case of organizations such as the RSECs, whose major responsibility is outreach, the public perception that "local" input is not being used or sought is almost as damaging as the reality.

Current Management and Organization

As of October 1, 1979, the regional centers and SERI report to the Assistant Secretary for Conservation and Solar Energy as a result of a DOE reorganization. In September of 1979 a DOE policy review of the RSECs took place and resulted in a series of decisions that address the problems discussed above and establish specific contract provisions to govern certain aspects of their operations.

Each fiscal year, DOE will issue a program guide that outlines regional center program direction and emphasis; the RSECs are to be solely dedicated to the mission defined by DOE. Following this guidance, the regional centers will submit Annual Operating Plans which will specify the activities and projects they have selected to undertake in adherence to DOE's planning and funding guidance; these plans are to be developed with public input and with input from states. This process for program definition was initiated for the second half of FY79. The development of these plans in accordance with DOE

guidance and on the schedule determined by DOE will bring the RSECs integrally in line with the overall budget activities of DOE headquarters.

In addition, a single point of contact has been established in DOE in the Office of the Deputy Assistant Secretary for International SERI and RSECs who will coordinate all RSEC-related actions.

The 1979 Regional Center policy review concluded that no directives should be given by DOE to the RSECs regarding management style. They will be allowed to continue to manage their operations as they see fit with DOE setting only staff levels in accordance with each Regional Center's Annual Operating Plan.

The centers are located in Cambridge, Massachusetts (Northeast Solar Energy Center); Atlanta, Georgia (Southern Solar Energy Center); Minneapolis, Minnesota (Mid-American Solar Energy Center); and Portland, Oregon (Western Solar Utilization Network). The following figure shows the regional jurisdiction of each center.

Regional Solar Energy Centers: Geographic Areas

The four regional centers are under 5-year (1979 to 1984) operating contracts with DOE. Funding and staff levels and activities are established for each fiscal year. Funding and staff levels for regional centers are summarized in Table

Table. Funding Levels for Each Regional Center

CENTER	FY 79 (\$ IN THOUSANDS)	FY 80 (PLANNED) (\$ IN THOUSANDS)	AUTHORIZED PERSONNEL
Northeast	4,400	5,700	90
Mid-American	3,800	5,300	60
Western	2,600	5,100	30
Southern	2,700	5,600	55
TOTAL	13,500	21,700	235

Each regional center is governed by a Board of Directors with an appointment to the Board by each of the state governors in the respective regions. In addition, the centers have advisory groups that assist the regional center staff in planning and program development. State solar offices work directly with state and local governments to promote solar energy use. The regional centers are able to identify and implement activities that are tailored to the specific needs of each region, as well as to DOE's national solar energy program.