AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
**BIBLIOGRAPHIC INPUT SHEET**

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Batch 77

1. SUBJECT CLASSIFICATION
A. PRIMARY: Science and technology — TA00-0000-0000
B. SECONDARY: General

2. TITLE AND SUBTITLE
Energy organization options; section 119, 1977 International Development and Food Assistance Act

3. AUTHOR(S)
(101) National Acad.of Public Administration,Washington,D.C.

4. DOCUMENT DATE: 1977
5. NUMBER OF PAGES: 78p. 74p.
6. ARC NUMBER: ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
NAPA

8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publishers, Availability)

9. ABSTRACT

10. CONTROL NUMBER
PN-AAF-233

11. PRICE OF DOCUMENT

12. DESCRIPTORS
Assessments
Developing countries
Energy
Foreign aid
Management
Public administration
Technical assistancee

13. PROJECT NUMBER

14. CONTRACT NUMBER
AID/ta-C-1482 GTS

15. TYPE OF DOCUMENT

AID 590-1 (4-74)

# ENERGY ORGANIZATION OPTIONS

(Section 119, 1977 International Development and Food Assistance Act)

Report by a Panel of the
National Academy of Public Administration

December 30, 1977

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## FOREWORD

The following report deals with what would seem, in terms of dollars involved and existing organizational commitments, a question of relatively slight significance. The task assigned the Academy was to evaluate options for organizing the Federal Government to channel energy assistance to less developed countries.

While presently authorized sums are small in relation to the budgets of either AID or DOE, the future is likely to bring a substantial increase in allocation of funds to assist developing countries in assessing their various energy resources potentials and in optimizing those potentials. The decisions made in the near future concerning organizational options will thus have far-reaching implications for an area of growing significance in the overall relationship of the United States with the nations of the Third World.

As this report makes clear, the basic interest of the United States in promoting development in the LDCs is inextricably intertwined with the national interest in overseas development of energy supply and conservation programs that will reduce pressures on world export availabilities of oil and will minimize the risks inherent in nuclear proliferation. The interdependence of these policy issues has a direct bearing on questions of organization and administration. The conclusions and recommendations of the panel reflect a full awareness of this interdependence and of the importance, in any development assistance program, of the complex and yet to be fully understood processes of technology diffusion and interchange.

The Academy has been exceptionally fortunate in being able to bring together on very short notice, both as Panel members and observers, men of distinction and experience. Each of the Panel members gave generously of his time, attending several Panel meetings, reviewing extensive background materials and providing drafts of major sections of the report for Panel consideration.

The Panel members, whose names are listed below, brought to the study assignment a wide range of backgrounds and specialized knowledge relevant to the task. According to the customary procedure governing Academy Panels, members who are employed by federal agencies contributed their time, serving in their individual capacities and not as official representatives of their agencies

The Panel was chaired by William E. Warne, who also serves as Chairman of the Academy Standing Committee on Environment and Resource Management. Erasmus H. Kloman, of the Academy staff, served as Project Director and Secretary to the Panel, assisted by Brig. General DeWitt C. Armstrong, III, USA Ret., consultant to the Panel.

Panel on Energy Organization Options
(Section 119, 1977 International Development and Food Assistance Act)

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## EXECUTIVE SUMMARY

In November 1977, the Agency for International Development (AID) asked the National Academy of Public Administration to have a Panel review the alternative ways for the US Government to organize for carrying out Section 119 of the 1977 Foreign Assistance Act. That Section calls for "cooperative programs with developing countries in energy production and conservation, with particular emphasis on programs in research, development and use of small-scale, decentralized, renewable energy sources for rural areas..." The Section also requires an AID review of options for implementation, with one option to be a nonprofit Government corporation called the International Energy Institute (IEI). In this Panel contribution to AID's review, the Panel identifies ten such organizational options, examining in detail the IEI and three others. The most suitable, in the Panel's judgment, is to have AID responsible and in a lead role, supported by an International Energy Development Service (IEDS), within the Department of Energy (DOE)

A major influence on the Panel's choice is the critical importance for Section 119's purposes of the process for diffusion and interchange of technology. Several decades of experience in assisting less-developed countries (LDCs) have made clear that to root a technology successfully in an LDC requires a common problem-solving approach, engaging both provider and receiver. One-way transfer seldom is sustained, for it seldom matches the technology to local incentives or induces LDC institutions to maintain and extend the process.

But the US organization must also find or develop the energy technology that will best suit an LDC's needs. For small-scale, renewable sources, the US has little technology on the shelf, but it does have a growing R&D capacity and the ability to assess systematically both needs and potential resources. For these, DOE has experience and organization, just as AID does for technology diffusion. DOE also has just begun what is called the "LDC Energy Program", aimed to help the more advanced LDCs with overall energy needs, primarily to foster awareness of fruitful non-nuclear options.

Systematic assessment is important because energy is a key feature in overall development, and its production and use have many cause-and-effect linkages with other aspects of development. Especially is that true for small-scale, renewable source energy applications. For Section 119 purposes, then, it will be necessary to assess an LDC's development situation overall, then the role of energy within it, and finally the role of small-scale, renewable source energy within that.

Taking into account these and other considerations, the Panel eliminates six possible organizational options and compares the remaining four: an IEI, parallel programs by DOE and AID, DOE as lead agency, and AID as lead agency. The comparison uses explicit criteria: effectiveness in helping

LDCs to produce and conserve energy, effectiveness in contributing to overall development, efficiency within US Government organization, and economy in using available resources.

Summarized Panel judgments about each option:

--The IEI option would create an independent agency to do the Section 119 program. This would have the advantage of focusing the organization's attention on a single purpose, but much time would be consumed passing legislation, organizing the agency, and starting up the program. Controlling neither AID's deployed elements nor DOE's energy laboratories, the IEI would be dependent upon support from AID and DOE, yet each has its own priorities. The Panel would expect the IEI to do technology diffusion less well than AID, and to manage energy R&D less well than DOE. The IEI's inherent duplicativeness would add complexity and new staff to government.

--The parallel option would have two Section 119 programs: one by AID for poor LDCs, one by DOE for the more advanced. DOE's portion could blend well with its "LDC Energy Program". Practical results could start early but would be uneven since, among other things, AID might be unable to provide all the support DOE would need for technology diffusion. Some manpower duplication and complicating of inter-agency coordination would be inescapable. Corrosive rivalry is a possibility too.

--The option with DOE as lead agency would offer best access to US energy technology, plus in-house R&D. But an LDC-cooperation program, well offset from the Department's main thrust, might not compete well with other DOE programs for top management's attention, high quality people, and budget. Being inexperienced at technology diffusion and cross-cultural activity, and lacking easy access to LDC institutions, DOE would need extensive AID support. In the early years, a result-oriented engineering approach would be more natural than the joint problem-solving approach so essential to sustained transfer of technology.

--The option with AID as lead agency would be hampered somewhat by AID's internal problems and Congressional restrictions on AID. While AID alone would have less access than DOE to energy technology and R&D, the proposed creation of an International Energy Development Service within DOE but funded by AID would compensate. Two outstanding merits of the option are AID' unique experience with technology diffusion and its existing capability to work closely with LDC institutions. Through these, AID could stimulate LDC capacity both to assess and to develop energy applications suited to local incentives. Durable results could thus appear early.

Appreciating that no option is ideal, the Panel judges the AID option preferable.

The Panel therefore recommends that the US Government organize as follows for implementing the purposes of Section 119 of the 1977 Foreign Assistance Act:

A. US bilateral programs for cooperation with developing countries in the assessment of their energy needs and resources and in energy production and conservation should be the responsibility of AID as the lead agency, with DOE as the principal supporting agency providing technical services.

B. AID should organize a small core of high quality professional staff in the energy field to manage the use of outside resources from the DOE, other agencies, the private sector and international organizations, and to relate the programs to other aspects of development cooperation.

C. An International Energy Development Service (IEDS) should be established within DOE, financed by AID, to provide technical advice and to assist in program implementation, including field operations.

The Panel further suggests consideration of merging DOE's "LDC Energy Program", if it is to become substantial, with the Section 119 program, and proposes several ways Congress and AID could act to help progress toward the purposes of Section 119

# I. INTRODUCTION AND PREMISES

## Introduction

The International Food and Assistance Act of 1977 (Public Law 95-88) provides in Section 119 that funds up to $18,000,000 are authorized to furnish assistance "for cooperative programs with developing countries in energy production and conservation, with particular emphasis on programs in research development and use of small-scale, decentralized renewable energy sources for rural areas...." The panel interpreted this language in the broad sense implicit in the first part of this statement, while also paying special attention to the emphasis given to small-scale technologies. As the following enumeration of panel premises makes clear, the question of small-scale technologies for rural areas cannot be treated in isolation from other aspects of LDC energy needs and resources.

The Agency for International Development is called upon to conduct a review of the options for implementing the purposes of Sectio 119, one of which shall be a proposal for a non-profit Government corporation (which would be designated as the International Energy Institute) outside the Agency for International Development. The Act calls upon the President to submit a comprehensive report on such review to the Congress by January 31, 1978.

The National Academy of Public Administration was commissioned by AID to undertake a study of the several organizational options for fulfilling the purposes of Section 119. The contract authorizing this study was signed on November 4, 1977, too late to allow for the thorough and detailed examination that such a complex organizational issue deserves.

Nevertheless, through the mechanism of a Panel composed of individuals with a range of experience and expertise relevant to the task at hand, aided materially by contributing expert observers, it has been possible to concentrate a considerable effort in a short time span. The product of this effort is this Panel report submitted to AID for transmittal to the interagency Development Coordination Committee which will review the report and, in turn, pass it to the Executive Office of the President for consideration in preparation of the January 31 report to Congress.

To assure the most objective and systematic analysis of the relative merits of the several options for implementing Section 119, the Panel adopted an approach in which options were evaluated against certain stated criteria. This approach had been used by an earlier Academy Panel with considerable effectiveness in a study to determine the organizational location best suited for operating the nation's space shuttle program.[1] Although the differences in the nature and scope of the two assignments are obvious, the rationale for using such a system for weighing the values of alternative organizational approaches is equally applicable in each case

No one argues that such a task as that assigned to this Panel can be performed through exclusive reliance on a formal methodology The Panel took full cognizance of the political climate, however changing and uncertain, in which the program under its review will operate. Full consideration was also given to the dynamics of change within and between the executive branch agencies involved and in the relationships between the executive branch and the Congress.

## Premises

The Panel conducted its deliberations on the basis of the following premises applicable to energy production and conservation in LDCs.

a. The availability of sufficient energy and its efficient use are integral parts of any rational program for economic and social development. Cooperation with a developing country in energy production and conservation must therefore be placed within the framework of that country's developmental efforts as a whole. Such efforts encompass various kinds of needs, for urban as well as rural areas, and various kinds of energy technologies.

b. The use of small-scale, decentralized, renewable energy sources for rural areas is likely to play an increasingly important part in many developing countries, especially the poorer ones with limited transportation networks, inadequate fossil fuel resources, and general capital stringency. The attractiveness of such sources arises from the increasing cost of most conventional centralized alternatives, and also from the ravages of deforestation in many regions. In some areas, firewood has been the traditional small-scale, decentralized source of energy for cooking and heating, but the over-exploitation of forests threatens their renewability and causes more general environmental damage. Other kinds of decentralized renewable sources (direct solar, wind, biomass--including more systematic forestry, biogas, and small hydro) warrant more intensive investigation. For certain areas, decentralized energy technologies depending on hydrocarbons may be most

appropriate for years to come. The desirable role and mix c energy sources in any particular country or region, however including the scale and pace of their development, can be determined only as part of a general assessment of energy needs, modes of use, and alternative resources in the particular circumstances of that country or region.

c. Energy supplies for rural areas, especially decentralized renewable supplies, cannot be separated from other aspects of rural development in the same areas. Hydropower from small streams must be related to other measures for water control and use; biomass requires land or water for cultivating the vegetable fuel; and biogas is related to the availability of livestock and crop wastes and to community settlement and organization patterns. Any program for rural energy development must therefore be intimately associated with agricultural and other rural development policies and programs.

d. With only few exceptions, the United States does not possess appropriate technology "on the shelf" and ready to be "transferred" for decentralized rural energy production in developing countries. However, under the impact of high energy prices, the private sector is actively developing technologies that may be applicable to developing countries. In some fields, such as solar space and water heating, other industrial countries ave more extensive experience than we. Technologies developed in dvanced countries will usually have to be modified for adaptation n less developed and more isolated rural environments, e.g. o facilitate repair and maintenance or to withstand tropical limate, or perhaps to employ locally available materials. The

task therefore consists more of development and application of technologies in the developing countries themselves than it does simple transfer. The American contribution is likely to be as great in methodologies for assessing and comparing energy supply and conservation options and in methods for developing supply and maintenance systems as in production hardware.

e. The broad policy objectives of a United States program for cooperation with developing countries in energy production and conservation are fourfold: (a) to promote the successful development of the cooperating countries, especially in raising the living standards and improving the quality of life of the poorer sectors of their populations; (b) to moderate the global demand for oil imports so as to reduce LDC dependence on costly external energy sources, to reduce upward pressures on world oil prices, to delay the onset of a general shortage, and to facilitate a smooth transition to a "post-petroleum" era; (c) to develop knowledge about energy applications for LDCs that may be useful in U.S. energy programs; and (d) to reduce the risks of nuclear weapons proliferation by avoiding atomic energy development in places where superior alternatives can be made available. The first two of these converge with the stated aims of most developing country governments. The third is enhanced by U.S.-LDC collaboration in energy R&D activity as described in the section on this topic below. The fourth is more likely to be achieved if the superiority of non-nuclear alternatives appears as a by-product of an objective analysis of energy needs and supply options, and not as an <u>a priori</u>

assumption. It follows that programs to find non-nuclear alternatives will only be credible to LDCs if they are integrated with broader efforts at cooperation with developing countries for energy production and conservation and overall development.

## II. THE EXISTING ORGANIZATIONAL SETTING

### AID Again in Transition

AID, an agency that has gone through some sixteen reorganizations in the course of its nearly 30-year history is now caught up in another internal reorganization. This reorganization partially reflects the findings of the AID Organizational Task Force established in June, 1977, which issued its report while this Panel's study was in progress. AID has also been the subject of study by the Development Coordination Committee and by the Brookings Institution.[3] The future organization of AID has an obvious bearing on th question of how a United States energy assistance program shoul be located within the U.S. government.

Although its reputation has declined progressively in the eyes of certain segments of the public and especially the Congress, AID is still the U.S. agency with primary responsibility for delivery of developmental assistance to the LDCs. In recent years, Congress has dictated "new directions" for AID's main efforts, directing the agency away from capital-intensive high-technology projects to meeting the needs of the rural poor. The intended focus is on what development assista does to enhance the lives of individual human beings, and there is a renewed emphasis on the goal of promoting greater self-reliance on the part of recipient countr

While this redirection in the purposes of AID programs has been in process, another redirection in tactics has been under way. A major effort on the part of Administrator John Gilligan has been to decentralize decision making. His Task Force on organization has endorsed a model calling for strong field missions, transferring more resources and power to the missions while limiting the authority centralized in Washington. The rationale behind this approach reflects the philosophy that decisions taken on the basis of consensus between the host country and the AID mission are more likely to lead to sustained development and decreasing dependency than edicts from Washington.

The change in relative position and power as between headquarters and field is to be accompanied by some internal restructuring of headquarters staff. The Technical Assistance Bureau, under whose auspices this study was commissioned, is to be consolidated in a Development Support Bureau along with the Offices of Population, International Training, and Engineering and Development Information. The Development Support Bureau will concentrate more on technical support for country programs rather than centralized R&D and other project

AID has been criticized on occasion for its slowness in developing a corps of energy experts. A question sometimes raised is how AID can take on responsibility in the energy area when it has such limited technical competence. Without seeking to answer that question fully at this point, attention should be given to the fact that many on-going AID programs such as rural electrification and agricultural development have a substantial energy-related component. Moreover,

irtually all AID project implementation and much of its echnical planning is carried out through contractor rather han direct hire personnel. Increasing numbers of energy pecialists are being signed on as contractors

:onstraints on AID's Effectiveness

Implicit in Congressional interest in a separate :nternational Energy Institute (as in Congress' concurrence in AID's proposal to create a separate Appropriate Technology Inter- ıational Corporation) is a concern that AID will not do an effec- :ive job. LDC energy is considered important -- too important to ıeglected -- hence the question whether a new entity should be created. For purposes of weighing the options considered by the Panel, the constraints on AID's effectiveness were identified as follows:

First, is a series of problems imposed on AID by its own administrative decisions. It is over-centralized in Washington both in manpower and authority with consequent excessive paper work and delays. As noted above, the Administrator of AID recognizes this problem and is reported to be moving vigor- ously to correct it.

Second, AID has historically not been free within the executive branch to make decisions on aid from the point of view of maximizing development. The White House and State Department have made decisions seen to be essential from a national security or diplomatic point of view not necessarily compatible with a development point of view. Long after the diplomatic value of the activity had been forgotten AID has had to live with constraints on development which have not

enhanced its image of effectiveness.

Third, Congress has given AID a confused legislative mandate in which so many purposes are identified as priorities that all sense of a central purpose is lost. Among the many priorities in the legislation are the following:

- Use AID to encourage LDCs to allocate income fairly between rich and poor
- Use women in development
- Adopt appropriate technology
- Protect human rights, and
- Protect LDCs' environment

In addition to the confusion of central purpose, the legislation imposes a number of other time-consuming requirements:

Prevent LDCs from

- Seizing U.S. fishing vessels
- Expropriating U.S. citizens' property
- Defaulting on debts to U.S. citizens
- Failing to pay their dues to U.N. agencies
- Purchasing sophisticated military equipment
- And use AID to promote U.S. exports including, for example, purchasing only vehicles or pharmaceuticals made in the U.S, and shipping in U.S. ships

The list of such statutory requirements numbers over 100 and grows longer each year. Each of these goals has - or onc had - an understandable rationale. The cumulative effect however, is probably counter to the real wishes of Congress that AID be an effective instrument of development abroad. A number of legislators have taken a keen interest in using AID to promote goals or activities they consider important.

Each expects his interest to be given top priority. Among the purposes of AID, Congress has also stated the goal of helping LDCs achieve their development goals. With all of the other priority demands placed on U.S. AID, it is difficult to keep the development goal in focus.

Fourth, the Congress requires AID to submit any new AID projects for prior Congressional review. Congressional staff have exercised this review vigorously, requiring changes, ejecting projects and demanding extra justification. The net ffect is (1) to place AID in a dilemma: on the one hand it s awkward to discuss projects seriously with the host overnment prior to submission to Congress lest the project e denied or distorted with a loss of host government confider n AID, and on the other hand, it is risky to submit a project to Congress without host government approval lest it not be approved by the host government and the Congress accus AID of not knowing what it is doing. (2) Any innovations are necessarily delayed -- often to the next program cycle a year after the idea is developed. (3) The Congressional staff involved generally do not have the time needed for sound assessment of many programs and they are not held responsibl for the results of their actions on program impact. There has been a confusion of legislative and executive functions that impairs good program administration.

Fifth, the milieu that AID operates in is most inhospit to innovation. Any organization of course must strike a bal between staff whose function is to get things done and those

whose job is to avoid errors. In most agencies the former predominate -- only a few "policemen" are needed. But AID operates in such a hostile environment that in self defense most AID employees must spend a disproportionate share of thei time ensuring that no errors occur and documenting the reasons for their decisions against the possibility of being accused of an unwise judgment.

Since foreign aid and technical innovations inherently involve many uncontrollable factors and unknowns and therefore high risk of failure of individual projects (i.e., that requir much risk taking to achieve their central purpose of inducing important positive changes), an attitude that does not expect and tolerate failures is particularly damaging to program achievement. There are active audits and inspections by Congressional Committees, and by the Comptroller General. Because of the embarrassment to the Agency when one of these audit systems finds either an error or simply something that has not worked as expected, AID has a very large, very active internal audit staff to catch the errors first. The net effect: decisions are agonized over at length, and avoided if possible Daring or innovation are necessarily regarded with great suspicion. The new Administrator is reported to be trying to instill a new and more innovative spirit into the organization.

AID Authority to Operate in Middle Income Countries

As part of this process of internal review and reorganization, AID is currently engaged in an investigation of possible expansion of its activity in middle-income countries. According to AID officials, the fact that AID is now doing relatively

little in such countries is attributable to a shortage of personnel and other resources, not to a lack of authority

In a letter to the Panel Secretary from Nicolaas Luykx, (see Appendix A) it was noted that

> "Currently AID has authority to work in middle income countries when the program or project is multi-country in nature. These activities deal with topics of importance to an entire defined region in which poor countries figure. However, because the topics are regional in scope, other countries in the region are also dealt with. This occurs also at the inter-regional level when a topic is of world-wide significance. Energy seems well-adapted, as a topic, to implementation on a regional or inter-regional basis."

The implications of the changes currently underway in AID for this Panel are not easily discernible. One important proposition that emerges, however, is that in gearing up for a higher level of performance, AID is seeking to restore confidence in its institutional capability. How much will be actually accomplished through these efforts and when positive change can be anticipated are matters for conjecture.

Department of Energy: Embarking on Its Mission

The Department of Energy was established on October 1 and is still establishing many basic organizational patterns and administrative procedures. It is far too early to assess how effective the department will be in carrying out its mission. That mission is primarily domestic, though nearly all energy matters have global aspects and there are obviously many important functions and responsibilities assigned to DOE's Office of International Affairs. The DOE professional complement is heavily weighted with scientific and technical people. Some, though not a great many, DOE staff have experience and training relevant to the specialized field of

overseas development assistance. Moreover, there is within DOE, a limited body of knowledge and experience in the kinds of non-conventional, renewable, and decentralized technologies cited for special emphasis in Section 119.

Under terms of its present legislative mandate, DOE is and will remain involved in a number of LDCs, advising them on energy matters significant to U.S. interest. Some LDC having oil, natural gas, or coal for export are receiving technical assistance from DOE on how to exploit these resources most effectively. Similar assistance will be provided to countries where a potential for export exists.

During the first half of 1976, plans were laid in ERDA for what was called the "United States Program for International Energy Development with Less Developed Countries" (IEDP).[4] The report of this study outlines a program of cooperative energy technology and resource development for LDCs with three specified objectives:

1. "to contribute to economic and social development and to improve in the quality of life of the poor majority in the less developed countries.
2. "to assist near and medium term development goals of LDCs by aiding in the reduction of dependence on petroleum..
3. "to contribute to nuclear nonproliferation goals..

The report has eleven annexes containing submissions by all of the relevant divisions of ERDA indicating contemplated roles and activities in the IEDP. Lacking in perspective on the technology transfer process as seen from the LDC

ewpoint, the report illustrates the problems arising when cientific or technical experts grapple with issues dependent n institutional and socio-economic concerns. Now this report as no official status, although it does provide a compendium f the ERDA/DOE capabilities and strategies.

DC Energy Program

Before the formation of the Department of Energy, President arter approved, on September 20, 1977, a program to assist eveloping countries in meeting their energy needs through the se of non-nuclear energy alternatives. The Congress has unded this program in the DOE budget at $3.5 million for FY 1978. his activity, subsequently called the LDC Energy Program, was leveloped at Presidential request by a joint agency task force hat included, among others, the Department of State, AID and he Department of Energy.[5] The first stage of this program will support comparative analysis of all available energy ptions, conventional and unconventional, and energy needs f selected countries. The program will be reviewed at the end of a year to determine if it will be continued and, if so, at what level of funding.

The LDC Energy Program's objective is to assist developin countries in identifying options to meet their valid energy needs in a manner that avoids premature and economically questionable commitments to major nuclear energy programs, and that avoids increasing world dependence on dwindling supplies of petroleum. The Department of State will provide overall policy and program guidance while the Department of Energy is responsible for operational program management and technica

support. Other agencies will also contribute in their areas of expertise, notably AID for development assistance and the Department of Interior for resource assessment. This program is coordinated through an Interagency Group chaired by the State Department.

The Department of State describes the present rationale for placing the LDC Energy Program in the Department of Energy's budget in the following terms:

> The Department of State is not an implementing agency as such. DOE and its predecessor ERDA have proven responsive to the policy guidance so crucial to the initial success of an endeavor with significant foreign policy implications. AID, as an organization with a foreign assistance role, could be uncomfortable if it appeared to act as a direct agent for US foreign policy. The AID mandate, working with specific countries or with the "poorest of the poor" within these countries, could limit unnecessarily the LDC Energy Program. The present AID legislation would not easily allow for examination of all energy options, including conventional, central-station power alternatives, nor for dealing with middle income countries, the "AID graduates". Finally, the Department of Energy does have immediate access to the National Laboratories that will be performing much of the work, either directly or through subcontractors.[6]

The LDC Energy Program, in its present pilot form, is obviously too modest to make significant impact on decisions by LDCs concerning their future course for energy development. If the program is to grow by the great magnitudes necessary to give it some impact, it will necessarily become an instrument not only of energy technology advice and assistance but also of development assistance. Concerns for development even as conceived under the "new directions" emphasis on the poor majority, are by no means separable from decisions on what kinds of energy policy and programs should be adopted by LDCs. The objectives of the U.S. government for the two

programs may be different. But at the other end of the process, where success or failure is finally measured, there must be a convergence that fits each LDC's development goals.

In order for an LDC Energy Program to be effective, it must be perceived as something other than a United States effort to induce LDCs to choose a non-nuclear energy course. Moreover, as the LDC Energy Program states, "This effort also takes into account that a thorough and objective analysis of national energy positions and options could justify using nuclear power in certain cases."[7]

As the following section discusses, the matter of technology transfer, whether it be high or low technology, involves an enormously complex set of issues and institutions. Though the past record of technology transfer from developed to developing countries may be considered disappointing, progress is being made at least in recognizing the nature of the problems. The place in the U.S. government where the efforts have been made and where the competence exists to work in collaboration with developing countries is AID.

Future programs to assist developing countries in the energy field will obviously require cooperation and coordination between AID and DOE. These have not been the main features of relations between these two agencies to date.

Working Relationship Between AID and DOE

The working relationship between AID and the energy agencies over the past two years has left much to be desired. Each agency has complaints about the unresponsiveness of the other.

DOE and its predecessor, ERDA, have found that AID has failed to provide the energy agency with clear guidance on what was expected or desired in the way of its help or participation. Letters and proposals for projects to AID have gone unanswered There has not been sufficient consultation on the part of AID with DOE's technical experts, and AID arrangements for the use of one of the national laboratories were made without informin those offices of DOE having an obvious interest.

On the other hand, AID has found DOE/ERDA the most diffic of the many agencies from which it has sought access to techni expertise. Complaints made by DOE against AID are mirrored on the other side. In each instance there are problems of coordination within an agency, though one must deal with the liabilities of aging bureaucracy while the other is still sorting out internal reporting systems, procedures and structural relationships. Under such circumstances, it is not surprising that a number of conflicts should arise.

Efforts to strengthen and improve these interagency relationships have included the signing of a Memorandum of Understanding in November 1976 and a General Agreement between the two agencies in September 1977. Just within the past month, a new Interagency Steering Group has been formed expressl for the purpose of fostering communication and cooperation between the two agencies. Although the record of such committees is mixed the formation of the group seems a step in the right direction

## III. SOME KEY CONSIDERATIONS

The following two sub-sections deal with issues that are essential to the successful achievement of the purposes of Section 119. They relate to the overall question of technology diffusion and interchange and to the ways of relating U.S. and international development systems. An understanding of these processes is essential in evaluating organizational options.

### Diffusion and Interchange of Technology

The central concern of Section 119 is technology transfer in the energy field. How can U.S. knowledge and capabilities best be mobilized to help meet LDC needs for rapidly increasing amounts of energy? This energy must be generated and applied by means that make the most efficient use of the specific and varying LDC resource endowments and that fit well the natural and socio-economic environments of each area. Thus, more is required than a capability to transfer energy technology in the forms used in the United States.

Technologies for energy generation and application, like other technologies, are transferred by multiple routes. Much is transferred to developing countries through activities of commercial firms. These activities include direct operations overseas, training of LDC personnel, equipment sales, and sal or licensing of processes or other knowledge. Other transfer occur via the training or experience of LDC engineers and oth energy professionals in the United States (i.e., outside of commercial companies in the energy business), via provision of technical advisory services in LDCs, or via technical publications and other non-proprietary means for transm

of technical information. A technology transfer route of particular interest here is R&D collaboration on new options for producing and applying energy. This is particularly relevant here because, as Section 119 recognizes, the LDCs need options more suited to their needs than most of those now available which were largely designed for developed country conditions and some of which are increasingly inadequate even for those conditions.

Publicly supported technical and financial assistance can be used to foster any of these means of technology transfer. All of them merit some support, although the commercial transfer processes largely take care of themselves.

The Panel's recommendations for U.S. government organization to foster the transfer of energy technology to LDCs reflect the following set of interrelated conclusions about the transfer process.

First, in the current circumstances of U.S.-LDC relationships, of need for a wide range of new energy technology options in LDCs, and of significant parallel needs for some new energy technology options in the United States, the transfer of technology and related information and experience is likely to be particularly fruitful when it occurs as an integral part of joint problem-solving (R&D) processes. This approach contrasts with the largely unilateral process of the U.S. transferring technology that it has developed to LDCs, either "off-the-shelf" technology or technology newly developed for LDC use. Combining experience and skills on both sides in devising new technology and application systems is

likely to assure the best combination of technical efficienc and local fit. The mutuality of effort has important political/psychological advantages, encouraging greater LDC acceptance, support and subsequent appreciation for U.S. efforts. This approach also tends to encourage participation by the best talent on both sides, and greater continuity of effort. LDC capabilities for devising their own solutions are increased in the best way--learning as an automatic by-product of doing together with professional colleagues rather than in a teacher-pupil or "show-and-tell" mode. Widespread collaborative participation by LDC experts and the similarity of some of our needs for new non-petroleum based solutions increase the prospects of technical feedback that is useful to the United States.

Second, an indispensable condition for adequate development of energy technologies up of their own organizational capabilities to assess, develop, adap and use such technologies. The extent and effectiveness of R&D to fit technologies to local circumstances is likely to be meager without extensive participation by local R&D institutions. They are also essential to permit much use of outside scientific and technological talent, findings, and experience in developing solutions for local use. Local R&D institutions are among the most effective "gate-keepers" through which these external technological resources can flow t local users <u>and</u> through which local experience can flow out to other LDCs and to the U.S. and other developed countries. To perform these tasks effectively, the local R&D organizations

must of course maintain good relationships for communication and collaboration not only with external sources of relevant technology components and other knowledge but above all with local users of energy technology. Contact with users involves primarily working with the various elements of the technology delivery system (energy producers and distributors, suppliers of equipment, engineering, credit and other services for energy production and use, training institutions, and so forth. The local R&D organizations must cultivate similar relationships with governmental sources of the relevant development policies & goals, resource availability estimates, and the like.

Third, experience has accumulated in recent years, primarily in agriculture but also in other fields, with systems for R&D collaboration among organizations all over the world that are doing research and related knowledge dissemination in a particular problem area ("international R&D networks"). This experience suggests that such mechanisms can be productive in furthering the purposes described above (technology transfer via joint problem-solving, and building LDC R&D capabilities), where circumstances are favorable.

These R&D networks concentrate on problem-solving in a discrete and widely pervasive problem area. They are characterized by voluntary, self-selecting participation, by organizations that are private or public, national or international (but not by governments as such), in whatever collaborative activities they find useful (e.g., joint research projects, pooling and exchanges of R&D materials and results, program coordination, reciprocal provision of research sites, advisory

or training services, exchange visits of professional staff, or use of common information services). Essentially, they form a common pool of R&D results to which all participants contribute, based on the types of work that they want to do and are able to do for their own purposes, and from which all may draw whatever they can use for local adaptation, as needed to fit their own situations. The stimulus for the network's operations is provided by one or several of the more advanced participating organizations performing functions essential for this purpose, such as leadership in organizing collaborative programs or projects, logistical support, and information or materials management services. Although the research collaboration in such networks follows the traditional pattern of voluntary cooperation among scientists or organizations sharing common interests, the collaboration in the newly-emerging agricultural research networks tends to be more extensive, systematic and sustained than the rather casual and intermittent international research collaboration that has long existed.

Such associations potentially have the advantages described earlier for joint problem-solving. They also foster increased research specialization and divisions of labor that could increase the rate of progress of R&D on global energy problems. Appropriate divisions of labor permit economies of scale by concentrating much of the more expensive and difficult types of research at facilities that can serve international needs, particularly the needs of developing countries. The networks can provide LDCs with access to worldwide scientific and technological capabilities far beyond anything that they

could provide or organize for themselve on a country-by-country basis, even if they receive large-scale aid. They can have great flexibility in fostering contributions from and contributions to organizations and countries with diverse capabilities, needs and wants.

The key conditions for effective R&D networking to address LDC problems seem to be present to an adequate extent in the energy field. Foremost is a strong and rapidly rising demand for the technology product, a market widely spread among LDCs. Second is a significant amount of use potential in the U.S. and other developed countries of new alternatives for energy generation and application that are suitable for LDCs, or of new knowledge components needed for the design of new energy alternatives for LDCs. - (Appendix B presents one summary version of technologies for Section 119) Third is a substanti amount of trained manpower and service institutions in LDCs that are engaged or useable in technology development and delivery systems in the energy field. Where this third condition is inadequate for effective collaboration, helpin to create the necessary local capabilities could be a priority focus for development assistance programs.[8]

The Panel judged the above considerations to be highly important to success for the Section 119 program, and hence the Panel's evaluation of alternatives.

Relating U.S. and International Development Systems

U.S. development assistance functions in the energy fi should be located and structured for optimum results in strengthening three components of an international system f development and transfer of energy technology, and possibly

The U.S. Government functions involving catalysis or technology development and transfer activities that benefit LDCs, with particular attention to small technologies for rural use. This includes fostering a stronger role for the U.S. private sector, as feasible, and also useful technical feedback to the U.S.

Energy R&D institutions in the LDCs, which are well related to their own commercial and governmental functi

International networks of collaborative R&D and technology diffusion activities, as already described.

Possibly an international institution to do or foster research, R&D training and technology transfer in the energy field. (This would be an organization with international legal status located in some LDC rather than the "International Energy Institute" mentioned in Section 119 which is intended to be a U.S. institution, i.e., the latter is one alternative for organizing the U.S. Government functions mentioned abo

None of these four elements is a substitute for any of the others. U.S. organizational provisions and subsequent activity need to foster the strengthening of the overall technology development and transfer system, i.e., by helping to build productive components at several echelons and the working relationships between them.

## IV. ANALYSIS OF ORGANIZATIONAL OPTIONS

### General Organizational Principles

The panel approached its assignment with a full awareness that good organization is not a guarantee of good performance. There is no single "right" way to structure an undertaking such as that contemplated in Section 119. In the inexact field of public administration, it is well to recognize that the prospects for any organizational effort on the U.S. side depend on people, both within and outside the organization, formal relationships with other organizations, and the political environment surrounding the endeavor. In the field, where the technology transfer process occurs, there is a similar need for consideration of the institutional environment of the host country.

In his letter of November 16, 1977, (attached, at Appendix C) Senator Humphrey presents the logic behind the choice of the nonprofit institute under the Government Corporation Control Act. He states that neither AID nor DOE conducts adequate programs in the area of renewable energy technology which "is no the explicit obligation of either agency". Actually, as preceding discussion has demonstrated, each agency claims mandates to carry out program activity in this field. There is no doubt, however, that the programs conducted to date fall far short o what is needed. For a discussion of the Department of State' interest, see the letter from Under Secretary Benson to Willi Warne at Appendix D.

A basic question posed in the present situation is whethe it is better to try to make existing institutions work or to

reate something new. The answer to this basic question is closely inked to two subsidiary sets of questions.

1) Assuming that a new organization were considered necessary or desirable:
   a) what form should it take?
   b) where should it be located?
   c) what effects will it have on existing institutions?
2) If on the contrary it is concluded that existing agencies should be adapted to meet the new need:
   a) what is the most promising means of adaptation?
   b) how should existing agency resources be optimized?
   c) what structure is best suited to provide a leadership role for an interagency effort?

## Panel Analysis

### 1. Methodology

The Panel was charged with examining the available organizational options, including an International Energy Institute, and recommending the one which appears best suited. The steps taken in fulfilling the Panel assignment were the following:

a. To note the purposes the US seeks to achieve.
b. To set out the functions a proposed organization would perform.
c. To list and review all available organizational options, setting aside those which clearly are not best suited.

d. To set out the principal criteria by which the remaining options will be judged.

e. To compare the options, highlighting in this report only those points which seem of special significance to a choice, and select the one best suited.

f. To express Panel conclusions and recommendations.

2. Purposes (Section 119 and Related Policies)

The purposes enacted in Section 119 can be summarized as to help developing countries produce and conserve energy, especially through small-scale, renewable means.

Other national purposes, as noted in the statement of premises, can be inferred from current executive and legislative policies.

3. Functions

To pursue those purposes, a US Government organization must perform the following functions:

1. Assess realistically and comprehensively (within the context of overall development needs and plans) the individual LDC's overall energy needs and programs and its opportunities and needs for small-scale, renewable energy applications. To the utmost extent the assessments should involve LDC institutions and people themselves.

2. Gain access to the energy technology best fitted to the discovered needs, whether this technology be accessible within the US Government or from the private sector or through foreign sources. The technology may

exist and only require being found and mobilized, or R&D may be needed in the US or abroad, short-term or long-term

3. Participate in the diffusion and interchange of technology. By far the hardest and most important of the functions, this requires not merely a US delivery system, but also collaboration with the network of other national and international institutions and with LDC institutions. To be effective, the process must be culturally sensitive and attuned to indigenous perceptions and incentives.

4. Perform assessments of the actual and potential social, economic, environmental and political impacts of the energy activities in the countries and regions where it conducts programs.

5. Assure that policies and actions are compatible with US foreign policy, with other US programs and policies, and with development activites of private and multilateral organizations.

6. Manage soundly and economically the diverse training, procurement, personnel, service, and other activities involved, so as to win both the confidence of LDCs and the Congressional support essential to success.

4. <u>Options</u>

The options for implementing Section 119 can be categorized in a variety of ways. The Panel began its revie by cataloging the full range of possibilities and narrowing that range to the four which had some practical prospect of adoption and inherent merit. At the outset, the list of possible

options was as follows:

1. International Energy Institute - as proposed i: Section 119

2. Parallel programs by AID and DOE; both develop capacities and receive budget; cooperate from autonomous base:

3. DOE is lead agency; receives total budget; draws on AID via PASA

4. AID is lead agency; receives total budget; draws on DOE collaboration via RSSA/PASA (terms of present General Agreement).

5. AID sole responsible organization; receives total budget; develops technical capacity

6. DOE sole responsible agency; receives total budget; develops overseas capacity

7. A joint program office similar to the structures established between the Atomic Energy Commission and the Department of the Navy and NASA

8. International Energy Institute as a new multilater agency

9. Locating function in an existing multilateral body

10. Locating function in the Appropriate Technology International Corporation

The process of narrowing the field proceeded as follows.

Numbers 5 and 6 were eliminated on grounds that no justifi cation exists for developing a capacity in one agency that duplicates an existing capacity in another.

Number 8 was eliminated on grounds that, although there is much to be gained in pursuing the multilateral approach includ

a multilateral IEI, it is recognized that there are many difficulties standing in the way of setting up such an institution and, in any event, it will not be a complete substitute for United States program activity.

Number 7 was eliminated on grounds that the advantages of this device are most applicable to discrete projects, success is heavily dependent on individual leadership qualities, and certain bureaucratic dysfunctions are likely to result.

Number 9 was eliminated on grounds that no existing international entity provides an appropriate vehicle for administering U.S. program concerns. Moreover, few existing international agencies are effective for this type of purpose.

Number 10 was eliminated on grounds that ATIC is having too many problems in getting itself off the ground, that it runs counter to some of the general organizational principles cited above and is not a promising vehicle for a program calling for urgent action and high priority. It was agreed, however, that ATIC should be used as a resource to the extent that it develops a capability.

The four options remaining were:

International Energy Institute (1)

Parallel Programs by DOE and AID (2)

DOE in lead role (3)

AID in lead role (4)

5. Criteria

Having identified the four organizational options which could best carry out the functions necessary to pursue the national purposes of the program, the Panel then compared them

In its comparative analysis, the Panel used four broad criteria:

a. Effectiveness in helping LDCs to produce and conserve energy.

b. Effectiveness in contributing to overall development.

c. Efficiency within US Government organization.

d. Economy in using available resources.

For each of these criteria, the sub-sections below list the main factors which bore upon Panel judgment of how well an option met that criterion. For each factor, explanatory

Effectiveness in helping LDCs to produce and conserve energy.

| | |
|---|---|
| Access to suitable technology. | Existing and future, through R&D. Suitability in terms of LDCs' real needs, and what they will sustain. |
| Ability to transrer technology. | Most important by far, and most difficult. Motivations and customs within relatively static cultural setting outweigh engineering aspects. Requires accurate assessment of people's needs, and close cooperation with LDC institutions. |
| Emphasis on small-scale, renewable, rural applications. | Required by the Act. Differs from most applications in domestic US programs, in AID energy programs to date, or in programs which could substitute for nuclear power generation. |
| Pace | Act calls for "earliest practicable development and use", and economic imperatives both of development and of trade balances call for speedy results. Involves early recognition of technological opportunity, institutional promptness, responsiveness in R&D and in-country activities, and access to LDC decision processes. |
| Political acceptability | LDCs may be suspicious of motives, sensitive about second-class technology, apprehensive about modes of operating or organizations involved. |

b. Effectiveness in contributing to overall development.

| | |
|---|---|
| Reinforcement of other US activity in LDC development | Policy consistency, program consistency, procedural compatibility, economy in demand upon local resources. |
| Integration with LDC's own development plans | Access to LDC officials and institutions, cross-cultural comprehension, sensitivity t LDC resource limitations, ar suitable coordination with other outside organizations operating within the LDC. Private sector involvement should be consistent with the LDC's own preferences. |
| Compatibility of development with the US agency's main thrust | Since major budgeting and program decisions tend to be strongly influenced by the principal objectives and themes at the level where budgets are decided, this compatibility has profound implications. |
| Stimulation of development activity beyond US Government efforts | US and foreign private sectors, governments of other developed countries, international organizations. |

c. Efficiency within US Government organization.

| | |
|---|---|
| Flexibility, dynamism, and management skill | Energetic adaptation to new opportunity or changed circumstances. Ability to promptly engage other US Government or private sector resources. Degree of restraint imposed by internal administration or by Congress. Use of RSSAs and PASAs. Leverage with other US agencies. Quality of program management. |
| Duplication of existing functions | Making government more complex, blurring responsibilities, adding manpower and delays, causing jurisdictional disputes and consuming management effort unproductively. |
| Amenability to policy control | Smooth, solid relationships with NSC, State, AID, Energy, Commerce, and others. Absence of motives for undue agency assertiveness and independence. |
| Location of budget responsibility | Logical consistency, ability to compete effectively with other activities for funds, impact on Congressional committee arrangements. |
| In-country coordination | Clarity of US Ambassador's in-country control. Likely cooperation with existing US development activities. |

d. <u>Economy in using available resources</u>

| | |
|---|---|
| Economical management of US resources | Experienced, sound program management and financial management. Solid coordination with other US activities in both energy and development. Readiness and ability to engage the private sector. Promptness in recognizing dry holes and shutting them off. |
| Conservation of time | Speed in accurately assessing develop ment situation, actual energy needs of people, and technological opportunities. Speed in perceiving R&D needs, in US and in LDCs, and meeting them. |
| Conservation of the environment | Act stresses suitable protection of the environment. |
| Conservation of LDC resources | Skilled manpower and money especiall Involves cross-cultural comprehension of situation and institutions o LDC, plus easy access to LDC offici and coordination with development activities of others. |
| Ability to deal with future interest group pressures | At present funding level, program attracts little attention. Potenti funding levels, 10 or 20 times greater, would probably lead to attempts at capture. |

Comparison of Organizational Options

In its analytical comparison, the Panel applied the above criteria to each of the four options. For space and time reasons, not all of the analytical detail thus developed appears below. What does appear, separately for each option, is the Panel's summary of the main judgments contributing to its recommendations

International Energy Institute (IEI)

This option would free the program from the institutional encrustations of AID. Having solely an international development mandate, it might acquire the cross-cultural sensitivity which is characteristic of AID and so indispensable to technology transfer. The act of forming an IEI should be well received by the LDCs and should assure prompt access and cooperation. IEI might also enjoy considerably less constraint upon its freedom of action than Congress is willing to offer AID. But this positive weighting seems to be more than offset by negative values. The Panel finds little to argue for and much to argue against establishing a new organization. A basic problem of public administration today stems from the proliferation of government organizations. William Carey has observed that "there is something ludicrous in creating another splinter organization ten minutes after we have raked together the organizational fragments and packed them all into a Department of Energy. We see-saw between concentration and fragmentation in our organizational paranoia".[9]

The specific form of organization proposed for the International Energy Institute, a nonprofit Government Corporation subject to Title I of the Government Corporation

Control Act, presents a number of serious problems. The risks inherent in the increasing reliance on this organizational device are enumerated in the work of Harold Seidman, a leading authority in Federal organization. His study, Politics, Position and Power cites the risks in loss of accountability and the many misconceptions about government corporations contributing to the widespread adoption of this mechanism.[10] Seidman notes that government corporations are exempted from most of the regulatory and prohibitory statues applicable to the expendi of public funds, except those specifically applicable to government corporations. He observes that the "independence" of this type of organization has often been the equivalent of "isolation" from those with authority for making national polic At the same time, "independence" can serve to insulate the agency from the general public. With respect to the specific form envisaged by the Senate in approving the June 15 IEI proposal, it should be noted that the provision for Congressional appointment of board members has subsequently been declared unconstitutional by the Supreme Court in the case of the Federal Elections Commission.[11]

Furthermore, there would necessarily be a long delay before any productive work began. Not only is new legislation needed, which could hardly emerge before at least mid-1978, but also the start-up process for this entirely new organization would consume many more months.

The IEI would lack direct control over the government's applicable resources in both the energy and the development fields. Even after negotiating various support arrangements it would still find its authority well short of its responsibility. Thus, in the crucial area of technology diffusion and interchange, it would depend heavily upon AID, which would have its own imperatives and priorities. Relating as a separate entity to OMB and the Congress, the IEI would be a rather weak contender in the budgetary process and would have little leverage with respect to other government agencies. And as an independent agency, it might not be responsive to overall policy control.

Moreover, the IEI would be inherently duplicative, having functions that are already within the purview of AID or the Department of Energy. It would also add more employees to government. To create it would thus run counter to the Administration theme of reducing government's complexity and size, and counter to those organizational principles which the Congress customarily applies in legislation. Problems about Congressional committee jurisdiction would arise, as well. Legislative and executive branch support for creating a new independent agency in public corporation form ordinarily requires a reasonably strong showing that the task cannot be done adequately within the existing government structure.

On balance, then, the IEI option measures poorly against the criteria of efficiency in government and effectiveness in overall development, yet it does not demonstrate unusual merit elsewhere to compensate.

Parallel Programs by DOE and AID

This option, which assumes two autonomous bases for AID and DOE, would offer several attractive features. For one, practical results might be visible sooner, since each agency could continue working along lines of existing programs, AID focusing primarily, but not exclusively, on the poorer LDCs and DOE concentrating more in middle-income countries. On the surface it would appear that less restructuring and fewer new resources would be needed under the retention of parallel programs than if either one took on the whole task. In meeting its own needs, DOE would also meet some AID needs for locating and developing technology, possibly doing so faster and better than if DOE were simply servicing an AID program under the usual RSSA or PASA arrangements. But since AID is very lightly staffed and not active in the advanced LDCs, AID would not be able to compensate easily for DOE's weakness at technology diffusion.

A benefit of parallel programs could be that DOE and AID might each learn from the other some ways to increase effectiveness and minimize costs. But, given the possibility of continuin rivalry, the relationship might well deteriorate with each agency running down the other and trying to extend its jurisdiction at the other's expense. The actual outcome would depend more upon the personalities of leadership than on the structure of government organization, and it might well shift with little warning as time passed.

In any case, the parallel programs concept would be somewhat duplicative. Even if the two LDC groups (middle-income

and poorer) were clearly and permanently distinct, as they are not, some functions would be done in DOE which would als be done in AID, by other people and probably in a somewhat different way. Even with attempts to minimize overlap in technical areas, redundancy of administration would divert resources and manpower. Other organizations in the public and private sector would have to deal with two agencies providing energy assistance to LDCs instead of just one. Since the policies and procedures of DOE and AID would not be identical, the outside organizations would have to accommodate to two systems. The confusing prospect of two different sets of scheduling systems, reports, and administrative regulations might well inhibit some private sector and third sector participation--certainly their enthusiasm.

The two programs would surely be uneven. DOE would stress technical not cultural aspects, and would suffer from inexperience with the diffusing of technology. AID would lack skill at managing energy R&D, would have less than first-class access to DOE technical services, and would scarcely attend to DOE's in-country needs as keenly as to its own. Seeking coordination would create new difficulties for both the executive and legislative branches--and thus new administrative and manpower requirements.

No matter what real virtue might exist in conducting parallel programs, the press and public would not find the rationale convincing. A separation would be interpreted as violating the Administration's commitment to reduce the complexity and size of government. And Congress's distaste for apparent or real duplication has often been observed.

In sum, the parallel programs option fails to meet the criterion of effectiveness in energy assistance to LDCs, chiefly because it would tend to preclude the technology diffusion support which DOE would crucially require in the advanced LDCs. This option scores poorly on the efficiency in-government criterion, and might fail it if rivalry occur red. The shorter start-up and possible benefits of competition are distinctly outweighted by duplication, more complex coordination, and the potential for corrosive rivalry.

--DOE in Lead Role

The Department of Energy option would assure favored access to energy technology, both existing and potential. Controlling its own laboratories, managing a large and increasingly comprehensive RD&D effort, and already serving as program manager of the LDC Energy Program, DOE would be in a position to apply some of its resources to the purposes of Section 119.

As a new Department, DOE should be results-oriented, dynamic, and freer than AID from detailed congressional intervention. But DOE is still organizing itself, merging elements which have their own institutional histories and vested interests. Moreover, the major priorities of DOE are not the same as the goals of Section 119, which would therefore be handicapped in competing for the attention of top management, for personnel, and for budget. In fact, the Section 119 program would risk becoming the innocent victim of buffeting in the wake of decisions about DOE's major programs

Being new and also little experienced with coordination in LDC development, DOE could not be expected to operate effectively in that international arena of technology diffusion and interchange. Lack of familiarity with the multilateral institutions concerned with development could lead to miss- opportunities.

While DOE may have shown a positive attitude about coordinating its activities within a U.S. foreign policy context, an inexperienced DOE will not have the required background and sophistication for a leadership role in the development sphere. Because of the make-up of DOE staffs, there might well be an institutional tendency for DOE to adopt an engineering or hardware approach with too little sensitivity to the significance of cultural differences. DOE personnel operating inside LDCs will come to realize, for example, the radical difference between actual incentives and those implicitly assumed in analyses and plans. But it would take years to implant such understanding in those parts of DOE which assign people, specify procedures, manage research facilities, and so forth. DOE operating in a lead role could be prone to some of the same mistakes made by AID. Consequently, DOE management would sometimes be impeding the diffusion which it wants to help.

The chief defect of the DOE option would be relative ineffectiveness inside the LDCs. Dealing only with certain energy applications and not with overall development, DOE would have correspondingly limited appeal for LDC institutions and governments. Lacking any intimate acquaintance within a given LDC, DOE would be heavily reliant upon help from an AID with its

own mandates and assigned priorities. DOE is thus unlikely to achieve satisfactory access to LDC people and organizations whose participation in the common problem-solving mode is indispensable to the diffusion and interchange of energy applications.

To sum up, the DOE option would not measure up well against any of the four criteria.

--AID in Lead Role

The AID option offers the obvious advantage that AID, as the development assistance organ of the US, has the greatest experience in and potential capacity for the diffusion and interchange of technology. AID habitually cooperates with LDCs on the basis of common problem-solving, which, although hard to bring about, is nevertheless essential to success for the Section 119 mission. This mutuality derives not only from past and present programs and from the very nature of AID's function, but also from continuing links with LDC institutions and from the cross-cultural sensitivity acquired among its development-experienced people. By taking part in the various initial energy assessments, these LDC institutions would progress toward the capacity, indispensable to fully rooting the energy applications, to perform assessments on their own. Because of AID's prime mission, the AID option would optimize the matching of energy applications to realistic local incentives, the meshing of these with the LDC's overall develop ment scheme, and the development of local institutional capabilitie As noted earlier, AID also has the fullest experience and contacts for fostering international collaborative systems to work on LDC

problems.

On the other hand, the AID option has real weaknesses. One is the complex set of current legislative restrictions. The agency's administrative and personnel problems would adversel affect program execution. These weaknesses could be partially compensated through AID's experience in drawing widely upon the specialized resources of others, through PASAs and RSSAs with government agencies and through contracts in the private sector or the not-for-profit sector.

The most apparent weakness of AID is its inexperience and limited technical resources in energy technology. Granted that DOE is also short on experience with small-scale, renewable source technologies, it has more of the specialist connections to those institutions where know-how can be developed. Yet AID could become much more attentive than DOE to identifying useful non-US technologies, particularly in the LDCs, and to doing R&D inside the LDCs.

As to suitably coordinating Section 119 activity with overall US foreign policy, the AID option would seem less than ideal but nonetheless superior to all other available options. The other alternatives would fail to capitalize on AID's several decades of experience with State, both in the field and in Washington. If AID is not sufficiently responsive, that weakness should be corrected. What underlies much of the criticism appears actually to be AID reluctance to being used as a political tool--a resistance compatible with its mission. Yet, on the other hand, AID is a key part of the total U.S. effort to achieve long range global objectives and normally

works closely with State personnel in the field. Even so, AID would not compete particularly well for funds in the federal budget, given the history of its relations with Congress and its lack of a domestic constituency.

On the whole, the AID option may be said to measure less impressively against the criterion of efficiency in government, than on the first two criteria, effectiveness in helping LDCs with energy, and effectiveness in overall development. AID's considerable experience with technology diffusion more than offsets its limited command of energy matters. Moreover, it can hire energy expertise or make use of DOE technical services

## V. THE PREFERRED OPTION AND RECOMMENDATIONS

### The Preferred Option

The foregoing analysis makes two things clear. First, no one of the options is ideally suited to the Section 119 task, for they all have defects. Second, the option with the fewest grave defects is the one having AID in the lead role. The question then becomes what should be done to correct or ameliorate the defects in the AID option, so as to give it the best prospects for success. In order to lay a foundation for the Recommendations section which follows, the remainder of this section will deal with that question.

Earlier discussion developed five main constraints on AID's effectiveness. These were AID's difficulty with internal administration, interventions from outside for short-term non-development reasons, over 100 Congressional mandates, the requirement for prior Congressional review at the project level, and an over-emphasis within AID on error-avoidance, which under-emphasizes getting things done.

To ease these constraints, the Panel believes Congress could move, along lines similar to those recommended in other studies such as the Brookings interim report, in the following directions:

1. Make clear to the executive branch that funds appropriated for LDC energy are solely to help LDCs meet their energy needs, and that the executive branch should not use them toward short-term diplomatic purposes; meanwhile,

the Congress should match the principle by exempting this program from the country limitations and other statutory constraints that hamper sound program management for development purposes.

2. Eliminate the requirement for prior project approval of new projects including those under Section 119.

3. Reassure AID that Congress recognizes that it is more important to innovate and to achieve than to avoid projects involving any risk of failure, providing that AID self-evaluations weed out unpromising projects. Congress should direct the several auditing systems to judge AID by this standard in its use of LDC energy funds.

In addition, we believe that AID should take certain actions to encourage innovation in LDC energy use especially in rural areas. First, top management should stress the significance of the program through messages from the Administrator and Assistant Administrators, through the program review process and the informal flow of communications in Washington and to the field. The need for creativity and innovation should be emphasized. Second, the funding should be so managed that those field missions with good energy projects can get money for that purpose without losing money from their regular programs. Third, AID should staff for this special job. As the lead agency for the Section 119 program, AID would need to draw technical advice and implementation services from outside the agency, as for other activities. But it would also need to maintain a small core of very high quality professiona

staff of its own in the energy field to manage well this use of outside resources and to provide essential internal participation in AID's programming and program evaluation work. Besides a much strengthened central staff that is knowledgeable about small-scale renewable energy, each geographic region should have an energy expert, with special competence in the small-scale technologies.

AID would need to make heavy but not exclusive use of the primary energy agency of the Government, the new Department of Energy, much as it has drawn on USDA resources in the past. It would need to be free to draw outside technical services from the best available outside source for each need (e.g., much of the current US technology development for independent small energy systems is in the private sector). Thus there should be standby contracts with appropriate universities and other institutions as well as National Energy Laboratories to furnish expertise as needed. Field offices should be reassured that they will be given the help they need to monitor energy projects and to advise host governments. AID is already showing promising interest in this topic, and these additional steps should make substantial difference.

With AID playing the lead role, the DOE should have an important two-part supporting role. One is to be an agent for implementation of assistance projects and the key source of technical advice for AID. The other less visible role is to foster the building of international collaborative dimensions within the mainstream of US domestic energy R&D programs wherever this is an efficient

means of advancing the domestic program purposes. This should include collaboration between US R&D and related work in LDCs, without need by DOE for significant subsidy of the costs of LDC participation in the collaborative activities. DOE might find it worthwhile to pick up some minor costs of collaborativ activities beyond its proportional share, such as conferencing or travel costs, or AID might wish to help LDCs finance some costs of participation in such international collaboration.

One especially promising means by which DOE and AID can work together to get the job done despite AID's present lack of much energy expertise is through the creation of an International Energy Development Service (IEDS). This group would serve essentially in a broker's role, seeing to it that the appropriate DOE resources are mobilized for each AID activity needing DOE support. Modeled after a similar agricultural service through which USDA made a major contrib tion, the IEDS could be manned by regular DOE staff with enough rotation of people to ensure timely diffusion into DOE's activities as well as into the Section 119 program. IEDS would be part of AID's budget, and AID would provide program direction. Using temporary teams tailored to purpo and location, the IEDS could materially reinforce the more stable AID region and mission structure. For the Section 1 program, an AID country director could well find his most valuable subordinate to be his IEDS local director.

The "LDC Energy Program" now being started by DOE shou for the sake of its own underlying purposes as well as those

program conducted by AID. If it were conducted separately and by DOE, it would have much less credibility to LDCs and would look like a simple effort to reserve nuclear power for the developed world.

But the coordinating and policy machinery for the "LDC Energy Program" set up under State Department leadership can usefully view energy activity in a non-proliferation context. The Panel believes this machinery should continue in approximately its present form, with its responsibilities being policy and program strategy, not operations. Section 119 activities should also be carried out in close coordination with the Department of State which has lead responsibility for all matters concerning U.S. foreign policy.

Looking to the future, the Panel conceives the interests of the US and the LDCs alike being best served by increasing involvement of multilateral institutions and of multilateral collaboration in this field. Initially, the U.S. Government needs to focus on joint problem-solving by LDC and US institutions. However, there should be early opportunities to foster international networks of collaborative R&D and technology diffusion activities and possibly, in due course, a new international institution to play a leading role in such a network. A proposed approach to an international network for energy R&D appears at Appendix E.

Recommendations

I. The Panel recommends that the U.S. Government organize as follows for implementing the purposes of Section 119 for the International Food and Assistance Act of 1977:

A. U.S. bilateral programs for cooperation with developing countries in the assessment of their energy needs and resources and in energy production and conservation shoul be the responsibility of AID as the lead agency, with DOE as the principal supporting agency providing technical services.

B. AID should organize a small core of high qualit professional staff in the energy field to manage the use of outside resources from the DOE, other agencies, the private sector and international organizations, and to relate the programs to other aspects of development cooperation.

C. An International Energy Development Service (IE should be established within DOE, financed by AID, to provide technical advice and to assist in program implementation, including direct participation in field operations, when called for by AID.

II. If the present exploratory "LDC Energy Program" in DOE appears likely to become a substantial and sustained effort, consideration should be given to its merger with programs under Section 119, in recognition of the operational advantages of a single organization for energy cooperation with developing countries. In that event, the inter-agency committee should be maintained under State Department chairmanship to deal with policy and strategy concerning non-proliferat aspects of energy activity abroad.

III. The purposes of the legislation in Section 119 and the above recommendations for organizational structuring would both be facilitated if:

A. AID is able, for Section 119 activity, to cooperate with any developing countries (in the case of the richest LDCs on a reimbursable basis).

B. Congress reviews and reduces the cumulative weight of the 100-plus legislative restrictions which hamper effective management of development programs, including those in the energy field. The principal criterion in this review should be whether the restrictions contribute importantly to development purposes.

C. Congress ceases to exercise the requirements for prior program approval at the detailed project level.

D. AID promptly completes its organization and personnel revisions and concentrates its attention upon innovation and positive results in energy assistance to LDCs.

E. AID seeks out ways to encourage and support systematic collaboration in energy technology development and diffusion among government and private organizations all over the world engaged in such activities, with particular attention to strengthening LDC capabilities. This should include consideration of a possible future role for a new multilateral R&D and technology diffusion institution in this field.

## FOOTNOTES

[1]"U.S. Space Transportation in the 1980's: Organizational Alternatives", Report by a Panel of the National Academy of Public Administration, June 1977, prepared for the National Aeronautics and Space Administration

[2]"Organization and Structure of A.I.D", Task Force Report for the Administrator, Agency for International Development, October 1977

[3]"Interim Report: An Assessment of Development Assistance Strategies", The Brookings Institution, October 1977

[4]"United States Program for International Energy Development with Less Developed Countries, June 13, 1977

[5]Joint U.S. Agency Task Group Report, "LDC Energy Program May 12, 1977

[6]Department of State memorandum provided to Panel Secretary, December 13, 1977

[7]ibid, p.2

[8]A useful discussion of some of the issues of technology appear in "The International Energy Institute: an option for energy assistance to LDC's", Eli B. Roth, September 26, 1977. A detailed report of great relevance to future work in this area is "Energy for the Villages of Africa", James Howe and staff of the Overseas Development Council, February 25, 1977.

[9]Letter from William D. Carey to Erasmus H. Kloman, November 11, 1977

[10]Seidman, Harold, Politics, Position & Power; The Dynamics of Federal Organization, Second Edition, Oxford University Press, 1975

[11]Buckley v. Valeo 424 US1 1976

PPENDIX 1

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

December 12, 1977

Dr. Erasmus Kloman
National Academy of Public Administration
Suite 300
1225 Connecticut Avenue, N.W.
Washington, D.C. 20036

Dear Ras:

This is written to follow up on your inquiry about AID's potential for operating in middle-income countries, which came up in our telephone conversation today. I have checked informally within the Agency.

Under present and prospective conditions AID won't be doing much in middle-income countries. This is more because of the shortage of personnel, and other resource constraints, than it is for lack of author

Currently AID has authority to work in middle income countries when the program or project is multi-country in nature. These activities deal with topics of importance to an entire defined region in which poor countries figure. However, because the topics are regional in scope, other countries in the region are also dealt with. This occurs also at the inter-regional level when a topic is of world-wide significance. Energy seems well adapted, as a topic, to implementation on a regional or inter-regional basis.

If the "LDC Energy Program" were to take on a scope beyond its present pilot nature, and become a significant foreign assistance effort, it would be subjected to the same constraints whether implemented by AID or DOE. Any changes in authorizations for middle income country involvement would have to be specifically made by Congress; and could be applied as easily to AID as to any other federal unit.

Therefore, it seems consistent to hold the LDC Energy Program and Section 119 activities together as a pair of program components having separable objectives. Congress would have to take up the questions of the scale of involvement, and authority to work in all developing countries. Whatever it wanted to decide for the program, it could decide for AID as well as for any other agency.

Sincerely yours,

Nicolaas Luykx

Nicolaas Luykx
Director
Office of Development Administration
Development Support Bureau

APPENDIX B

B. Knowland
DRAFT 7/1/77

Technologies for Sec. 119

Section 119 calls on the U.S. government to "furnish assistance. . . for cooperative programs with developing countries in energy production and conservation, with particular emphasis on programs in research, development, and use of small-scale, decentralized, renewable energy sources for rural areas. . . directed toward the earliest practicable development and use of energy technologies which are environmentally acceptable, require minimum capital investment, are most acceptable to and affordable by the people using them, are simple and inexpensive to use and maintain, and are transferable from one region of the world to another."

Since technologies that might conform to these guidelines differ markedly in type, potential use, sophistication, stage of development or availability, and known or anticipated costs, we wish to offer here a very brief summary of some of the technologies likely to receive immediate promotion under the legislation. We presume however that there are few, if any, energy production or use technologies, including conventional, centralized, and even large-scale technologies that might not prove to be appropriate in some instances.

The potential applications of the most promising renewable energy technologies are indicated in Figure 1. Each of the technologies listed can be used at a scale down to that of a small village or individual house hold. Solar cells, concentrating collectors, solar engines (Sterling or Rankine), wind-powered and hydroelectric generators, solar cooling, and some pyrolysis devices are likely to require at least some parts not readily availabe in rural areas of most developing countries. All of the others can be fashioned from locally available materials or (for greater sophistication or efficiency) with manufactured parts. With the possible exception of photovoltaic cells, each of the devices is potentially amenable to manufacture within most developing countries. All of these

devices are presently "on the shelf" or have been extensively lab-tested; virtually all of them would benefit by additional research, particularly in adopting them to specific local needs. There is evidence that each of these technologies is comparable in cost to conventional rural commercial energy sources in at least some instances.

(FN: Proceedings of the NAS workshop on Solar Energy in Tanzania, August 1977, forthcoming) Their economic competitiveness and acceptability to villages for widespread application will be uncertain until a body of comparative cost-benefit data is available -- i.e., until a number of on-site demonstrations have been made of each.

A growing number of examples suggest some of the potential of these and related technologies: in China some 60,000 small and mini-hydroelectric generators averaging 40 kilowatts in capacity supply most of the electricity used by three quarters of the rural communes and there are nearly 5 million family and multi-family biodigestors providing biogas for cooking, heating, and powering tractors and yielding residue that is a rich fertilizer. Tens of thousands of small farmers in India are now using gobar (cow dung) gas digestors for similar purposes and at least one large dairy cooperative is using solar energy to substitute for a significant proportion of the fuel necessary to dehydrate milk. In Niger solar water heaters designed and manufactured by local scientists provide hot water for several hundred residences and some hotels. In the Omo River Valley in southeastern Ethiopia, wind pumpers of an ancient Cretan design now enable irrigated production of several crops a year where a few years ago barely one crop a year could be grown. Relatively much more sophisticated (and much more expensive) solar-powered irrigation pumps marketed by the French are operating successfully in nearly a dozen developing countries, with the Mexican government recently purchasing the rights to produce several

thousand for rural villages throughout Mexico. Also under a French program, photovoltaic cells have been successfully powering 22 educational televisions in remote schools in rural Niger since 1967.

The potential for renewable energy devices and technologies ranging from improved cooking stoves to burn scarce firewood more efficiently to solar "power towers" to generate electricity for large industries or tow and cities is just beginning to be realized and added to the already-established list of "conventional" energy technology options available t developing-and developed-countries.

Figure 1

SOLAR ENERGY APPLICABILITY MATRIX

(from a forthcoming *Science* article)

| SOLAR TECHNOLOGY / ENERGY USE | Water Pumping | Lighting | Refrigeration | Communications | Water (desalting, Purification) | Spinning (Textiles) | Sewing | Cooking | Space Heating | Domestic Water Heating | Grinding | Drying | Transport | Fertilizer |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Solar Cells | xxx | XXX | xxx | XXX | – | xxx | xxx | – | – | xxx | XXX | – | – | – |
| Flat Plate Collectors | XXX | – | XXX | – | – | – | – | XXX | XXX | XXX | – | XXX | – | – |
| Concentrating Collectors | XXX | XXX | XXX | xxx | xxx | xxx | xxx | XXX | xxx | – | xxx | xxx | – | – |
| Solar-Stirling | XXX | XXX | xxx | – | – | xxx | xxx | – | – | – | xxx | – | – | – |
| Solar-Rankine | XXX | XXX | xxx | – | – | xxx | xxx | – | – | – | xxx | | – | – |
| Solar Stills | – | – | – | – | XXX | – | – | – | – | – | – | – | – | – |
| Wind (Mechanical) | XXX | – | – | – | – | xxx | xxx | – | – | – | XXX | – | – | – |
| Wind Generator | XXX | XXX | xxx | XXX | – | xxx | xxx | – | – | – | XXX | – | – | – |
| Water (Mechanical) | XXX | – | – | – | – | XXX | XXX | – | – | – | XXX | – | – | – |
| Hydroelectric | XXX | XXX | XXX | XXX | – | XXX | XXX | – | – | – | XXX | – | – | – |
| Bioconversion – Wood/ Pyrolysis | – | xxx | – | – | xxx | – | – | XXX | XXX | XXX | – | XXX | – | xxx |
| Biogas | XXX | XXX | xxx | xxx | xxx | xxx | xxx | XXX | – | xxx | xxx | xxx | xxx | XXX |
| Solar Cooling Equipment | – | – | XXX | – | – | – | – | – | – | – | – | – | – | – |
| Draft Animals | XXX | – | – | – | – | – | – | xxx | – | xxx | XXX | – | XXX | XXX |

XXX = most applicable

xxx = somewhat applicable

– = not applicable

Source: Adapted from a table designed at the Tanzanian workshop by J. Richard Williams.

* We have included animals as a solar technology (based on photosynthesis). For many villages use of animals would represent a modernizing step. It includes the use of dung for burning or fertilizing.

APPENDIX C

HUBERT H. HUMPHREY
MINNESOTA

United States Senate
WASHINGTON, D.C. 20510

November 16, 1977

Mr. Erasmus H. Kloman
Panel Secretary
National Academy of Public
Administration
1225 Connecticut Avenue, N.W.
Washington, D. C. 20036

Dear Mr. Kloman:

In anticipation of your first panel meeting on November 21st regarding the International Energy Institute, I want to share with you some thoughts I have on the IEI.

I have two major objectives in mind for the IEI.

First, to serve as a focal point, a coordinating entity for public and private sector efforts by this nation to promote and to accelerate the use of renewable energy sources in Less Developed Countries. As you know, the Department of Energy and AID have line responsibilities in that sort of program. However, because the transfer of renewable energy technology is not the explicit obligation of either agency, neither agency conducts adequate programs in that area. The IEI, by drawing on the programs of each agency, would fill the gap left now by those same agencies.

Let me stress that the IEI would involve the public sector and the private sector. There is little reason to hope that a purely public effort in the transfer of renewable energy technologies would be successful. The success of that program could only be measured by the follow-up activities of private entrepreneurs seeking to expand their markets and consequently, the use of renewable energy technologies in Less Developed Countries. In a real sense, then, the IEI can serve as a catalyst, a vehicle for the development of renewable energy technology suitable for Less Developed Countries, and then for the transfer of that suitable technology on a wide scale to those countries.

Regarding the organization or structure of the IEI, the senate accepted my suggestions on that point made June 15th. The organization of the IEI approved by the Senate bears resemblance to the structure of the Inter-American Foundation. In addition, it resembles the Appropriate Technology Institute, more recently established as an adjunct to AID's activities. So, substantial precedent exists for an entity along the lines of the IEI approved by the Senate some 5 months ago.

To sum up, the looming oil shortage has created a serious challenge for our nation. We have no choice but to rapidly and very aggressively develop alternative energy technologies, particularly, for oil. This requires the active use of resources within our Federal Government and within our private sector. And, the IEI as I envisioned it, would be the proper and perhaps the only institutional arrangement capable of rapidly and effectively developing and transferring renewable energy technologies to the LDC's. We face a unique challenge and a unique entity is necessary to my mind to meet that challenge.

If I can be of assistance in your organization's efforts regarding section 119 of the International Development and Food Assistance Act of 1977, please contact me or Mr. George Tyler of my staff at (202) 224-5171.

Best wishes.

Sincerely,

Hubert H. Humphrey

Hubert H. Humphrey

APPENDIX D

UNDER SECRETARY OF STATE
FOR SECURITY ASSISTANCE
WASHINGTON

December 1, 1977

Mr. William E. Warne
Chairman, National Academy
of Public Administration
1225 Connecticut Avenue, N.W.
Suite 300
Washington, D.C. 20036

Dear Mr. Warne:

The National Academy of I
been directed to examine energy organization options for Section 119 of the International Development and Food Assistance Act. We understand you are Chairman of the panel charged with this mission.

Although the Department of State was represented at your November 21 meeting, we feel the importance of energy in foreign policy warrants our reemphasizing our interests in the panel's deliberations. Energy, both as the most exchanged commodity in international trade and, literally, as the driving force behind economic and social development, plays a key role in the relations between nations. Within the Department, energy is examined from two perspectives: First, we deal with pricing and availability of supply as they affect global energy security concerns; second, we are responsible for energy technology cooperation and, in the case of nuclear energy, national security concerns. Section 119 could, of course, have a direct impact on both aspects of U.S. policy.

While the State Department recognizes the Agency for International Development's lead role in questions of development, the Department's responsibility for U.S. foreign policy imposes certain additional requirements that we hope you will consider. If the AID mandate is limited either by the choice of countries or by the economic groupings within a country, Section 119 could contribute less from the State Department's perspective.

More important, however, is the issue you raise, "How well would its activity be coordinated with national policy on foreign affairs...?" Although the mission of AID and its effectiveness could be undermined if its programs were too closely linked to changing political currents, careful coordination of the Section 119 effort with the Department of State is imperative, given the bearing this program can have on our overall political and economic relations with the developing world. We hope your panel will have suggestions to specify the coordination process among AID, DOE and the Department of State in such a way that energy activities related to Section 119 will reinforce U.S. foreign policy while contributing to LDC development goals.

Sincerely,

Lucy Wilson Benson

Lucy Wilson Benson
Under Secretary for Security
Assistance, Science and
Technology

Appendix E

J. Bernstein
December, 1977

## An International Network for Energy Research and Development

Given the widespread interest among developed countries, LDC's, and development assistance organizations in the development and application of new energy technologies, it seems timely to explore new initiatives to foster an R&D network in this field or perhaps more than one network for different types of energy R&D. A continuing working committee or board could be established to foster continuing coordination and cooperation among organizations financing assistance in this field. (Alternative models are the Consultative Group on Food Production and Investment or the International Board for Plant Genetic Resources.) This continuing body could include LDC as well as donor representatives. It might be jointly sponsored by the World Bank, IEA, and UNDP which could provide secretariat services and meeting and analysis costs. Functions could include coordination of assessment work on existing activities, the state of the art and new R&D needs; coordination of program support for R&D activities in the LDC's; development of joint programs, possibly using some funds provided to a common budget for selected "pump-priming" or gap-filling initiatives; promotion of working linkages among energy R&D organizations or programs around the world where these are focused on problems that have high priority in LDC s; and so forth.

One advantage to this approach is that it permits involvement of the U.N. agencies and could reinforce and strengthen their activities, without entangling the technical and program coordination activities of the energy network in the decision-making politics of the U.N. agencies or in their internal procedures or implementation control. This permits relatively rapid and flexible action, free of international and intra-organizational politics that encumber the U.N. agencies.

Eventually, such a body might decide to sponsor an international R&D institution that could play a leadership role in an international research network and that could also help to build LDC research capabilities through training and advisory services. The model of the international agricultural research institutes seems appropriate here, i.e., an autonomous private organization with international legal status, an international staff, and an international and self-perpetuating board of governors who serve as individuals. The institute would be located in a suitable LDC. The Board might be required to gain approval of its budget from the sponsoring donor/LDC committee. The institute's functions could include high-priority research on prototype technologies that are widely transferable with suitable local adaptation; coordination of joint research projects involving many locations; logistical support for technical conferences; assessments of energy resources needs and trends and the state of the art; operation of R&D information services and research materials services; training

R&D manpower; technical assistance for building of national R&D and extension capabilities; etc. The three conditions mentioned on page 25 of the text as favoring establishment of an international R&D network in the energy field also favor this type of institute initiative.

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