UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

INTERNATIONAL DIVISION

B-208537

AUGUST 13, 1982

The Honorable M. Peter McPherson
Administrator, Agency for
International Development

Dear Mr. McPherson:

Subject: AID's renewable energy projects (GAO/ID-82-57)

We have reviewed U.S. efforts to promote renewable energy and fuelwood projects in developing countries. Because AID's renewable energy and fuelwood projects are in early implementation stages, we believe it premature to evaluate the field projects. Two issues surfaced during our initial work, however, which should be brought to your attention: slow project implementation and questionable field-testing of energy devices.

If AID is to meet its goals of easing energy constraints to development and assisting developing countries in making the transition to using various energy sources, including renewable energy sources capable of sustaining developing-country economies in the future, project implementation and energy device field-testing should be reviewed.

We have discussed these matters with program officials and have incorporated their views into our report where appropriate. We look forward to hearing about your actions regarding the issues we outline in this report and will be happy to discuss these matters with you. The cooperation our staff received during this review is most appreciated.

We are sending copies of this letter to the Chairmen of the Subcommittee on Energy, Nuclear Proliferation and Government Processes, Senate Committee on Government Affairs; the House and Senate Committees on Appropriations; the Senate Committee on Foreign Relations; the House Committee on Foreign Affairs; the Subcommittee on Energy Research and Development, House Committee on Energy and

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Natural Resources; the Subcommittee on Energy, Environment and Safety Issues, House Committee on Small Business; and the Subcommittee on Energy, Conservation and Power, House Committee on Energy and Commerce. Copies are also being sent to the Director, Office of Management and Budget; the Secretary of Energy; and the President, Appropriate Technology International.

Sincerely yours,

Frank C Conahan

Frank C. Conahan
Director

Enclosure

AID'S RENEWABLE ENERGY PROJECTS

BACKGROUND

Because high oil prices during the 1970s caused severe balance-of-payment problems, interest in alternative energy sources has been stimulated in many developing countries. The growing demand for energy to assist economic growth has also emphasized the need to develop domestic energy. An interest in renewable energy has occurred because of forest depletion in many developing countries. In contrast to rising oil prices, the fuelwood crisis is a less visible problem. Currently, fuelwood requirements range from about 50 to 75 percent of the total energy consumption in the developing world.

The Foreign Assistance Act of 1961 lists renewable energy as an example of projects which AID should undertake. This legislation calls on AID to give particular attention to the promotion of "small scale, decentralized, renewable energy sources for rural areas carried out as integral parts of rural development efforts."

AID has set two basic goals to respond to its energy mandate: (1) to ease the immediate constraints to developing countries and (2) to help those countries make the difficult transition to various energy sources that will sustain their economies in the future. AID is attempting to meet these goals primarily through institution-building and technical assistance projects which are directed at (1) assisting in the discovery and exploitation of fossil fuels, (2) conserving resources, and (3) developing renewable energy and fuelwood resources.

During fiscal years 1978-82, AID obligated $782.1 million for 141 energy projects. About half of these projects (68 valued at $127 million) deal with various forms of renewable energy; 23 (valued at $34.7 million) are concerned with increasing supplies of fuelwood.

AID has increased its emphasis on renewable energy and fuelwood while maintaining a fairly constant overall energy program. AID plans to obligate $48.3 million for renewable energy projects in fiscal year 1982--three times fiscal year 1978 obligations. Most projects involve technical assistance, participant training, feasibility studies, and field-testing of renewable energy devices, i.e., solar collectors, photovoltaic cells, windmills, biomass, etc. The projects are designed to establish self-sustaining energy programs in the host countries.

In our review, which was done entirely in Washington, we focused on how AID was assisting developing countries in promoting and using renewable energy-producing techniques. We also examined AID's policy statement and pertinent project documents, and interviewed responsible officials of AID and the Departments of Energy, State, the Treasury, Appropriate Technology International, the World Bank, and the Inter-American Development Bank.

ENCLOSURE I

Of AID's 91 renewable energy and fuelwood projects, we reviewed 35. These projects represent 28 mission projects (18 renewable energy and 10 fuelwood) and 7 headquarters projects (6 renewable energy and 1 fuelwood). The projects were selected because of their high dollar value, geographic diversity, and varied renewable energy forms. These 35 projects represent $111.6 million ($71.1 million for renewable and $40.5 million for fuelwood) or 69 percent of the total funds ($161.7 million) obligated for AID's renewable energy and fuelwood projects through fiscal year 1982; $17.5 million was obligated in fiscal year 1982. This review was conducted in accordance with the General Accounting Office "Standards for Audit of Governmental Organizations, Program Activities, and Functions."

RENEWABLE ENERGY PROJECT RESULTS

Our review of the 28 mission projects showed evidence of slow implementation, as shown by the projects' rate of expenditure. The 28 projects were scheduled to have spent $54.6 million by the end of fiscal year 1982. The actual spending, however, was only $18.7 million as of June 30, 1982. Thus, with only 3 months left in the fiscal year, the projects were underspent by 65.8 percent. We also noted potential opportunities in some mission projects for testing more economical and socially acceptable energy devices. The headquarters energy office projects, however, are being implemented in a timely manner.

Inadequate planning has caused slow implementation of projects

The Agency Directorate for Energy and Natural Resources has ten active projects ($20.9 millon) which are all or partially renewable-energy related. We reviewed seven ($15.2 million) of the ten projects and found that all projects were being implemented in a timely manner. However, 24 of the missions' 28 projects are behind their initial implementation schedules. Overly optimistic estimates by AID staffs during project planning phases account for some of the delay in implementation schedules. Implementation problems are also caused by such factors as the lack of (1) host-country institutional capacity for the project, (2) AID staffs trained in energy issues, and (3) enough host-country personnel skilled in energy and management areas. For example, the implementation schedule in the August 1, 1978, Mali project paper provided that by November 1980 (1) four photovoltaic-powered water pumps would be installed, (2) meteorological and socioeconomic studies in 25 villages would be completed, (3) an energy lab would be constructed, and (4) test devices would be installed in the field. Our examination showed that implementation problems began immediately. It was not until July 1979 that AID was able to enter into an agreement with the Department of Energy Solar Energy Research Institute (SERI) to act as the project implementing agent. It then took SERI until

January 1980 (17 months from the date of project agreement) to hire a qualified French-speaking engineer as the on-site project director. Implementation problems persisted and, according to a September 1980 mission project status report, the project was 1 and 1/2 years behind schedule and seriously late by any reasonable standard.

An April 1982 AID report cited several reasons for slow project implementation in Mali, including

--no energy ministry or national plan;

--no organization to coordinate the 15 different organizations working on the energy problems; and

--inadequate personnel trained in management organizations, finance, engineering and coordination skills.

We noted that similar problems were present in the Philippine renewable energy project. According to the project paper, all equipment was to have been installed and operations begun by September 30, 1981. According to a private consultant's evaluation report, dated December 1981:

> "The five year project agreement for the Philippines Nonconventional Energy Development Project * * * is now slightly over 3 years old. By any conventional set of standards, the AID/GOP Nonconventional Energy Development Project is severely behind schedule. Only three of the nine individual subprojects are now underway, and these are between six months to one year behind schedule."
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> "The project expectations and recommended schedule in the Project Paper were based on and justified by the existance of an established entity in the Philippines to carry out the project. This entity did not, in fact, exist and much of the time between project initiation and now has been spent in institution and staff capability building."

AID regional bureau officials stated that except for a few missions, such as Egypt, Morocco, and Indonesia, AID lacks technically qualified mission staffs to develop and implement workable energy projects. They added that regional bureaus and energy office technicians, who should be concerned with developing energy policy and regional programs, spend an inordinate amount of time writing project identification documents and papers and resolving implementation problems. In addition, as with most AID projects, contractors are

frequently required in every phase of energy planning, implementation, and evaluation. For technical assistance, AID also relies extensively on other agencies, such as the USDA Forestry Service, the NASA Lewis Research Center, and the DOE Solar Energy Research Institute.

In December 1981, African Bureau officials held a workshop on energy, forestry, and environment to learn from their field staff about the primary energy issues for their jurisdiction and how they should go about their work. The workshop report recommended that adequate training be given to mission officers to strengthen AID's ability to carry out effective energy activities. AID officials stated that training classes are planned for the fall for bureau and mission staffs. We support AID's decision to initiate these training classes, especially if the Administrator ensures that effective energy training programs are developed and held on a recurring basis.

AID regional bureau officials advised us that host governments also lack the personnel technically qualified to implement multi-million-dollar energy projects. In addition, few countries have internal organizations devoted to developing energy resources. According to the African Energy Workshop report,

> "In virtually every country of Africa, there is a recognized energy dilemma. Ministries, agencies or departments of energy have been newly created with all the incumbent problems of infancy."
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> "Most African governments are just beginning to consider their energy needs, uses, resources and policies. Experienced staff, data availability, policy precedents, and planning models are, at best, scarce and, at worst, nonexistent."

This limited absorptive capacity of developing governments further compounds the difficulties of implementation when these countries receive assistance from numerous sources, including the United States, international organizations, and other bilateral donors, such as Canada, France, Germany, and the United Kingdom. We noted this problem existed in Rwanda, the Philippines, and Botswana.

AID officials stated that good project coordination existed at the mission level with both bilateral and multilateral donors. They believe the problem lies with the weaknesses within the host governments to effectively expend their external funds. World Bank and Inter-American Development Bank officials advised us that coordination exists with AID where possible; however, each organization finances projects to meet its particular goals.

In this connection, our recent study of forestry activities determined that donor coordination is the exception, not the rule. It concluded that donors are not always willing to coordinate their work, often opting to retain independent operation. In addition, the study found that developing countries are not sufficiently organized, do not have enough trained staff, or are not sufficiently funded to undertake the level of forestry activities (including fuelwood production) which AID projects outline. As a result, satisfying the covenants and conditions of AID projects has become difficult, if not impossible. The study concluded that to avoid delays and serious implementation problems, AID project planning must be more realistic in assessing the capabilities and limitations of developing countries.

Present approach to field-test energy devices may be questionable

AID has installed and is continuing to field-test energy production techniques which have questionable potential for being economically duplicated in the foreseeable future. In 1979, for example, AID installed a photovoltaic-powered grain grinder and water pump in the village of Tangaye, Upper Volta. The project has been fairly successful because the villagers have been able to grind more grain, and the unit is relatively maintenance free. No saving in fuel use has resulted, however, because the villagers were manually performing these functions before the unit was installed. More importantly, the replacement cost of the unit ($200,000) raises the important question of whether the developing countries can afford such an expensive energy-producing system.

AID has also installed photovoltaic water pumps in Mali. Projects in Tunisia, Morocco, Botswana, Rwanda, and Ecuador include photovoltaic-powered water pumps, a power station, and a health center. According to an April 1981 consultant's report to the AID Office of Program and Policy Coordination, past estimates of photovoltaic costs were overly optimistic so, photovoltaics will not be an economically feasible energy source until sometime into the 1990s.

AID's renewable energy projects are also testing other technologies--solar, biomass, hydropower and windpower. Most technologies have proven to be technically sound; however, they are being field-tested to demonstrate that they can be economically purchased and maintained and will be socially and culturally accepted in villages and urban centers. It is generally accepted that under favorable conditions hydropower and windpower devices can be economically viable energy sources. However, the effectiveness of such devices as solar, biomass, and several other energy devices is still being evaluated.

According to the April 1982 African Energy Workshop report,

> "While AID has been testing and demonstrating a wide range of technologies in many countries, very few of them appear to be capable of widespread replication due to technical problems, excessive costs in relation to benefits, social acceptability, or to maintenance and repair problems which appear to be beyond the capacity of African institutions and entrepreneurs."

AID officials told us that they believe energy devices should be tested locally to determine their acceptability and adaptability to their settings. However, we believe AID should only test those devices which have the greatest potential for commercial marketing and contribute the most to national energy supplies.

Need to examine possible duplication of AID-supported energy laboratory

In Mali, AID is funding the construction of a new national energy lab at an estimated cost of $750,000. This lab is to replace and update an existing National Solar Energy Lab built in 1964. Because of numerous implementation problems, however, as of May 1982, the building contract had not yet been awarded. AID has also been asked to contribute $5 million to construct a regional energy lab only a few miles away from the Mali National Lab.

According to an AID official in the Sahel Regional Office, the regional lab is to be quite large ($45 million) compared to the Mali National Lab (less than $1 million) and, therefore, it is theoretically possible that the labs may perform some duplicative activities. He stated that he had not studied the proposed activities of both labs; therefore, he could not be more precise in his response. The same official stated that the United States had been unsuccessful in its earlier attempts to discourage the donor countries, sponsoring the lab, from building it. He added that the United States has no funds obligated to construct the regional lab and intends to contribute only several hundred thousand dollars in technical assistance to the regional lab to satisfy the Arab and African participants who want some U.S. representation in the project.

According to a March 1982 AID consultant's report, the regional lab

> " * * * * is expected to assimilate and help develop renewable energy technologies such as photovoltaic, solar heating and cooling, biomass, mini-hydro, wind, water

supply and combined uses of renewable energy. The main objective is to lessen the region's risky, undiversified dependence upon imported oil and scarce forest reserves."

According to another AID consultant's report, dated July 14, 1982, a purpose of the AID-supported Mali project is to help Mali develop the capacity to develop renewable energy--solar, wind, firewood, and biogas--by strengthening Mali's solar energy laboratory. The consultant informed us that, although the report recommended that a new national lab be built, he qualified his recommendation based on an opinion given him by mission personnel that the United States is obligated to finance the new national lab because of commitments made when the project originated. He stated that he is concerned that the Mali Government will not have the resources to operate the lab once it is built, and that before construction begins, there should be some assurance that the Mali Government, a private voluntary organization, or some other international organization, can generate operating funds. He stated that he had not compared the national lab operations with those of the regional lab.

Because there are questions about the feasibility of financing the construction of a national lab in Mali, we believe that before a final decision is made, assurances should be made that the proposed activities of the Mali lab do not duplicate those of the regional lab and that the Mali Government can effectively support both national and regional labs.

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Project problems similar to those described above are not new to AID and have been previously identified by GAO and AID's Inspector General. In testimony before the House Government Operations Committee last fall, GAO noted that project implementation has slowed down while the pipeline of obligated, but undisbursed, funds has increased greatly. In June 1982,1/ we reported that AID is neither systematically or comprehensively identifying and recording lessons learned during the life of a project. Although Agency staff does apply lessons learned in developing new projects, the application of this information is restricted primarily to the personal initiative and experience of individuals involved in a particular project.

We believe the weaknesses outlined in this letter and previous GAO reports result in ineffective use of development assistance funds. An effective tool to combat such problems is timely and effective project monitoring and evaluation. Early exposure of project difficulties allows for more immediate corrective action.

1/"Experience--A Potential Tool for Improving U.S. Assistance Abroad," (GAO/ID-82-36, June 15, 1982.)

Most of the renewable energy projects we reviewed provided for interim and final evaluations as a regular part of the implementation schedule. These evaluations represent an effective mechanism for applying lessons learned to future projects and also provide a basis for future budget decisions.

We were informed that AID plans to perform a major evaluation of renewable energy projects in Africa and that the review will be used to develop lessons learned which can be applied to future project design and implementation. We support and approve this evaluation and believe that similar evaluations in the other geographic regions could also provide valuable lessons-learned data.