NEW DIRECTIONS FOR A.I.D.'S RENEWABLE ENERGY ACTIVITIES

FINAL REPORT

OFFICE OF ENERGY,
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EXECUTIVE SUMMARY

OVERVIEW

This report responds to the Agency for International Development (A.I.D.) Administrator's call for a critical reassessment of the Agency's experience with renewable energy. It describes today's climate for renewable energy technology in light of lower and unstable world oil prices, declining fuelwood resources, and the present commercial status of various renewable technologies. General lessons learned in developing and applying renewable technology are also described, as well as priority applications and the appropriate role of the private sector. The report then sets out the proposed New Directions for A.I.D. renewable energy activities.

A.I.D.'s focus is on self-sustained economic development. Rural and agricultural development are essential prerequisites to achieving overall economic growth, and special attention is needed to address the energy requirements this development implies.

This report shows that while new renewable energy technologies have not had the far-reaching impact many had hoped in contributing to rural development, specific renewable technologies have demonstrated that they have a valuable role to play. A number of renewable energy technologies are now becoming economically and financially attractive in developing countries. Commercialization of these technologies offers considerable economic benefit to developing countries.

A major finding of this reassessment is that, to mount successful renewable projects, A.I.D. should rely on market forces to select which technology is best for which development application. This represents a significant shift away from past experience, which was too often technology driven and where Government played a large role in renewable energy technology selection and development. A.I.D.'s new direction for renewable energy emphasizes private sector development and assistance programs to stimulate market-driven applications of these energy sources.

WHY HAS RENEWABLE ENERGY BEEN GIVEN A HIGH PRIORITY?

Renewable energy technologies utilize direct solar energy, wind, flowing water, biomass, and/or geothermal energy as alternatives to petroleum or other non-renewable sources of

energy. Use of renewable energy sources has been promoted in developing countries for several reasons. These include the following:

- Renewable energy sources are indigenous and available in large quantities in the developing countries.
- Renewable equipment can be small in unit size and fit the need for rural small-scale development applications.
- Renewables utilization has the potential to create rural employment and increase productivity.
- Renewable energy technology often has less severe environmental impacts than conventional alternatives such as fossil fuels.

In most developing countries, rural economies have subsisted by relying on renewable energy sources including traditional biomass and other indigenous sources. Fuelwood scarcity, however, poses a serious problem, requiring that more attention be given to improving the efficiency of utilization and to alternative energy sources. In 1980, it was estimated that of the 2 billion people who depend on biomass fuels, over half could not meet their minimum energy requirements from available sources without reducing the growing stock. It was further estimated that from 2 to 3 billion people may be living in areas of acute fuelwood scarcity by the year 2000.

Renewable energy technologies are sufficiently different from conventional energy systems, in terms of their higher first costs, greater perceived risks, and small scale of individual applications, to require alternative financing approaches (among other incentives and policies) in order to attract investors or buyers.

A number of constraints and problems, however, have been encountered in the effort to deploy new renewable technology. These have included the erratic course of international prices for oil products with which renewables compete, weak institutions for perfecting and promoting renewables, and the inherent difficulty of introducing new technology into an often subsistence-level rural economy. Distortions in energy prices, as well as other policies, have created an environment which stifles private sector initiative and seriously retards the introduction of new alternatives such as renewable technologies.

Given the experience to date and the above constraints and problems, what lessons have been learned and what New Directions are appropriate for A.I.D. in its strategy to exploit renewable energy sources and technology?

LESSONS LEARNED

The main lessons learned in this reassessment are as follows:

- Large-scale introduction of new renewable energy sources through A.I.D. or other's efforts has not been achieved. This is due primarily to two factors. First, most renewable energy projects were R & D projects and intended were to develop technologies (and institutions), not to directly disseminate commercially mature technologies; and second, institutional weaknesses and unfavorable policy conditions constrained renewable energy implementation.

- While many R & D efforts have not succeeded, a significant number of technical approaches have been demonstrated to be reliable. Several renewable energy technologies such as small hydro, some biomass applications, remote solar applications, and others, have now matured sufficiently for commercial applications to proceed.

- Projects should avoid technology options that are commercially unproven, unless projects are explicitly designed to support technology development as part of an overall commercialization plan.

- Only renewables able to compete in the marketplace with conventional technology in terms of cost, convenience, quality, service delivered, and reliability, will succeed.

- Local user or "market" acceptance determines whether a new renewable technology succeeds or fails. User involvement or market testing in project design, implementation, and evaluation should be a project requirement.

- Renewables' market penetration is seriously impeded when other fuels are subsidized or other unfavorable policy conditions exist. Policy conditions require up-front attention in A.I.D. efforts to support renewables introduction.

- Project ideas and designs cannot simply be transplanted from place to place. Applications must be tailored to local market, physical, material, institutional, and economic conditions.

- Lack of attention to "after-sales" service, including maintenance, spare parts, and local skills development, has often proved fatal to both demonstrations and attempts to commercialize a technology.

- Local private sector marketing of technology for commercial purposes is the best way, where possible, to ensure successful dissemination.

- Learning from past experience is severely handicapped by lack of adequate documentation of successes and failures. Improved interchange of results and methods of application could make a major difference in the rate of future success.

ELEMENTS OF A.I.D. RENEWABLE ENERGY STRATEGY

Based on the lessons learned above, it is appropriate for A.I.D. to establish New Directions for its renewable energy strategy. These directions should recognize today's economic and technical realities, and integrate renewable options, where appropriate, as components of rural, agricultural, and other development programs. Long term energy price expectations should be used as a basis for decision making, and a diversified fuel mix that includes renewables should be encouraged. This strategy must be applied within the resource, social, environmental, and institutional situation of particular countries and even sites. Thus, no predetermined technology choice is possible; rather, a better informed judgement and case by case comparative evaluation is called for.

What are the overall objectives of A.I.D.'s New Directions?

- First, to ensure the supply of appropriate "least-cost" sources of energy to strengthen rural development efforts, enhance agricultural productivity, and create rural employment opportunities.

- Second, to support local and U.S. private sector initiatives to supply necessary energy services, technology, and capital in order to achieve self-sustaining solutions to energy problems.

- Third, to place special focus on household energy problems through expanded biomass supply and improved utilization.

- Fourth, to create the policy and institutional conditions required for sound energy sector development.

A.I.D.'s renewable energy program will be directed to support the following New Directions:

- **Private Sector Collaboration**

  Expanded cooperation between A.I.D., and U.S. and developing country renewable energy firms and developers to merge A.I.D. knowledge of country constraints and conditions and A.I.D. technical and financial support with private sector skills in design, manufacturing, and marketing.

- **Rural Development and Private Enterprise Support**

  Technical assistance to mission private enterprise and rural development programs will be increased to ensure provision of adequate renewable and other sources of energy for projects requiring new energy sources, to identify energy business opportunities and to provide information and training for A.I.D. staff on energy options for health, agriculture, and other rural development activities.

- **Training in Support of Renewables Commercialization**

  Renewable energy training sponsored by A.I.D. and related initiatives, will be expanded to support the Less Developed Country (LDC) private sector and stimulate the commercial use of renewables in water pumping, health, rural commercial-industrial applications, and decentralized electric power supply, among other rural development applications.

- **Emphasis on Implementation**

  Development of innovative financing schemes to assist in the commercial penetration of renewables into rural and dispersed private markets.

  Expansion of risk-sharing via feasibility study and other explicit support, such as targeted use of the A.I.D. commodity import program to facilitate U.S. and LDC private sector ventures to transfer, adapt, and market cost-effective rural energy systems.

  Further development and adaptation of energy production and utilization technology for selected high priority rural development applications, including adaptation of United States renewable energy equipment.

- Coordinated Action

  Reliance on greater donor coordination will be pursued to more effectively utilize and leverage A.I.D. resources and help develop the policy conditions necessary for the introduction of new energy sources.

IMPLEMENTATION ACTIVITIES

Implementation Vehicles

The major implementing vehicles for the New Directions proposed above include the Renewable Energy Applications and Training Project (REAT), the Bioenergy Systems and Technology Project (BST), and centrally funded activities in the areas of household fuels, and energy and irrigation. All are ongoing projects or activities.

The Bioenergy Systems and Technology (BST) Project is intended to design, develop, and implement field projects using bioenergy systems. The Renewable Energy Applications and Training Project (REAT) has been responsible for the assessment of A.I.D.'s past experience with renewables and proposals for new initiatives to support rural and agricultural development.

Household fuel activities are another area of emphasis. Current work includes investigation of markets for briquette fuel substitutes made from coal and/or biomass residues, especially in countries experiencing increasing wood scarcities. Household fuel strategy development work, and a review of charcoal stove programs in East Africa are also being pursued.

The energy and irrigation activity is designed to promote the economic utilization of water for irrigation in A.I.D.-assisted countries.

Missions' Lead Role in Implementation. The above projects and activities are the centrally-funded and managed programs available for implementation of the proposed new directions in renewable energy. A.I.D. in-country missions, however, retain the lead implementation role in A.I.D. renewable activities, by virtue of missions' responsibility in the areas of project proposal, design, and implementation. The new directions are, in large part, being proposed to stimulate and assist the missions to incorporate energy considerations (including renewable energy where appropriate) more fully into project design and planning. Missions are urged to contact the Office of Energy (S&T/EY) if there are any questions concerning renewable energy technologies, either in general or concerning specific applications, countries, or regions.