

## ENERGY ASSISTANCE POLICY PAPER \*

### I. Introduction

This paper sets forth AID energy assistance policy and describes, in very general terms, energy activities appropriate for AID financing. It should be read in the context of AID's overall "Strategy for a More Effective Bilateral Development Assistance Program."

Three objectives have been identified for U.S. Third World energy programs:

- to assure adequate energy supplies at reasonable prices to support continued world economic growth;
- to encourage developing countries to expand their own energy resources, both non-renewable and renewable, without increasing the risk of nuclear proliferation;
- to assist developing countries in overcoming energy-related constraints to their development.

The U.S. Government has consistently supported the expansion of energy programs for developing countries. Heads of State at the last three Economic Summits have supported and then reaffirmed a U.S.-sponsored initiative to increase assistance for such an expansion. Top Executive Branch officials have frequently stressed the importance of energy cooperation with developing countries, and the United States has strongly supported the expansion of the World Bank's energy program. The President has directed AID and ACTION/Peace Corps to give high priority to "developing integrated projects for reforestation, more efficient fuelwood use, and alternative energy sources." IDCA has identified energy as one of its sectoral priorities. And the Congress has added a number of provisions to the Foreign Assistance Act stressing the importance of energy activities for developing countries.

### II. The Third World Energy Problem

Third World energy problems stem from depletion of traditional

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fuels, on the one hand, and a lack of developed conventional sources and inability to pay for imported fuels, on the other. Too frequently energy in Third World countries is equated with commercial (often imported) energy: oil for transport fuel and heating; kerosene for cooking and lighting; and oil, gas, coal, and hydropower for electricity generation. Yet energy also includes traditional fuels: fuelwood, charcoal, dung, and crop residues. Traditional fuels, particularly in rural areas, supply the major share of total energy in most AID-recipient countries and 80-90 percent of the energy used in some of the poorest countries.

While traditional and commercial energy problems are separately identifiable, there is also considerable interdependence between them. The demand for fuelwood in the cities is a major cause of pressure on many traditional fuel supplies in rural areas. Kerosene and natural gas for cooking, if widely available at affordable cost, could ease the demand for traditional fuels, yet their cost rises with the price of oil. Diesel oil for transport fuel is an essential cog in the transportation systems that support rural development. The energy implications of alternative development strategies and policies, affecting prices, production, conservation, and technology related to both traditional and commercial energy, carry important consequences for the incomes and well-being of the poor.

#### A. Traditional Renewable Fuels

As they have been for centuries, wood and charcoal fuels are today the main source of energy for household uses (cooking and heating) in developing countries. The World Bank estimates that in rural areas of Latin America, the Middle East, Asia, and Africa, only 12 percent of the population relies on commercial energy for cooking. Kerosene and natural gas are widely used in countries with a sizable middle class, where these fuels are subsidized or where charcoal and fuelwood are inadequate. Even in urban areas, the majority of the poor depend on traditional fuels for cooking and heating.

Deforestation is occurring rapidly in many countries, because of the increasing population's search for new agricultural land and domestic energy sources. Developing countries face a projected loss of 40 percent of their forest resources between 1978 and 2000. Whereas 10-15 kilometers is the most anyone can regularly walk to collect fuelwood, there is today virtually no wood within 70 kilometers of Niamey, Niger or Ouagadougou, Upper Volta. At the current deforestation rate, physically accessible forests would disappear altogether by 2020.

Even assuming both significant savings from more efficient stoves and considerable substitution of new sources of energy for fuelwood, recent World Bank analysis indicates that forestation activities must be increased worldwide by a factor of five -- and in Africa by a factor of fifteen -- in order to

meet projected demand. The sooner the problem is attacked, the lower the cost of effective action through balanced production and use rather than wholesale reforestation.

Rapidly escalating fossil fuel prices make a widespread solution through substitution by kerosene or natural gas highly improbable. Rather, the scarcity of fuelwood forces the poor to switch to the available alternatives of dung and crop residues. This switch deprives the land of top-soil and nutrients, thereby encouraging soil erosion and resulting in a decline in crop yield per unit of land. The World Bank estimates that by the year 2000 Nepal, for example, will lose an estimated one million tons of grain production directly attributable to this loss of natural fertilizer caused by the shortage of fuelwood. Thus, adequate fuelwood supply is critical for food production, as well as for energy.

#### B. Fossil Fuels and Hydroelectricity

Oil is the main source of commercial energy and largest single import in most developing countries. Forty-eight of the seventy-four oil-importing developing countries surveyed by the World Bank now depend on oil for 90 percent of their commercial energy requirements -- a dependency attributable to oil's flexibility as an energy source and its low cost until 1973. Transportation, industry, and modern agriculture are all dependent on oil.

Coal and natural gas have not been significant resources for most Third World countries, although many are now making efforts to exploit these resources. In some countries, hydropower is an important energy source. Few AID-assisted countries have large enough electrical grids to make nuclear power an economic proposition.

The post-1973 revolution in energy prices has created major alterations in the economic situation of the developing countries. The key effect is on the terms of trade: they must now give up more of their resources to buy a unit of imported energy than before. This poses three major issues, among others: (1) How will developing economies -- and national development plans -- adjust to higher energy prices? (2) Can enough external capital be obtained to cover balance of payments requirements? and (3) Will countries have continued access to energy supplies?

Economic adjustments to higher energy costs take time; moreover, they are politically and economically difficult and potentially disruptive to the development process. Following both the 1973 and 1979 oil price increases, developing countries borrowed heavily to finance continued levels of imports, causing a rapid increase in

their balance of payments deficits. The current account deficits of the oil-importing developing countries -- gradually reduced in 1976 and 1977 from the peak of 1975 -- again rose in 1978 to \$24 billion. Deficits are now estimated to have been \$43 billion in 1979 and are projected to reach \$61 billion in 1980.

This borrowing by developing countries, much of it from private sources on commercial terms, has caused a dramatic rise in debt servicing requirements. Between 1973 and 1978 oil-importing developing countries' external debt rose from \$68 billion to \$187 billion, while their annual debt service requirements rose from \$8 billion to \$28 billion. Some developing countries will find it difficult to continue borrowing on the private market. Adjustments in their economies in the coming decade will be required.

The internal adjustments required by higher energy costs raise difficult policy choices. Commercial energy -- unless subsidized -- is often beyond the means of the poor. Subsidies, however, create distortions in resource allocation and generate large budget, and usually also foreign exchange, costs to the government. Developing countries are rethinking kerosene subsidies and possible alternatives. India, for example, is encouraging the production of fuelwood to substitute for kerosene, saving petroleum expenditures for higher value uses.

Access to supplies is also a concern. The 1973 embargo and the disruptions in 1979 and 1980 due to the Iran Revolution and the war between Iran and Iraq illustrated the tenuous nature of the international supply system. In 1979, for example, several countries suffered shortages; the lack of diesel fuel grounded half of Thailand's fishing fleet, halted irrigation pumping in India, and threatened Kenya's truck transport system.

On the positive side, there may be great potential for alleviating both sets of problems during the next 10 years. For example, fossil fuel exploration in the oil-importing developing countries remain low in comparison with other regions despite large sedimentary basin areas about which little is known. There is tremendous scope for increased use of hydroelectricity, since less than 10 percent of the potential has been developed. New and renewable energy technologies are also promising. Many of these are most appropriate in rural areas to meet basic needs, while others such as alcohol fuels will have a direct impact on demand for imported energy. The loss of tropical forests can be much alleviated by improved resource management and by more efficient use of fuelwood. On the energy demand side, significant gains can be made in energy

conservation and inter-fuel substitution. The World Bank estimates that up to 15 percent reductions in total LDC demand could be achieved by 1990, without sacrificing economic growth.

### III. AID Energy Policy and Programs

AID has two basic policy goals in the energy area: (1) to ease the immediate energy constraints to development in developing countries, and (2) to help those countries make the difficult transition to a mix of energy sources that will sustain their economies in the future.

In achieving these goals, several things should be kept in mind. The first concerns the relationship of energy assistance activities to the Agency's bilateral development assistance strategy. The severity of the energy crisis and its impact on economic performance can be so great as to threaten the very capacity of many countries to succeed in the implementation of a development strategy of any kind. Thus, AID programs must be sensitive to the range of energy activities -- involving commercial energy as well as traditional fuels -- that affect development prospects.

More rapid development of the energy potential of these countries is impeded by a variety of technical and financial problems. These include:

- Lack of basic resource knowledge
- Lack of adequately trained personnel
- Lack of appropriate technology
- Lack of comprehensive energy planning and management
- Lack of sufficient financial resources

Overcoming these obstacles will require the combined efforts of donor governments, the private sector, and the governments of developing countries themselves. Not every aspect of the energy problem requires U.S. Government involvement or official financial assistance. AID development assistance for energy should complement rather than substitute for the resources available from other sources.

An additional consideration that should be kept in mind is that AID's program in energy, as in other fields, should be implemented in recognition of both resource and staffing constraints. Program concentration should be in those areas where AID's flexibility and capacity give the Agency a comparative advantage vis-a-vis multilateral development banks and other donor programs. In most development assistance programs, AID does not expect to provide capital assistance except for fuelwood and small hydropower and to a limited extent for other renewable energy activities.

With these considerations in mind, AID's energy program should:

- Support a wide range of activities, primarily technical assistance, tailored to the specific needs of countries in coping with the impact of petroleum price increases and the depletion of traditional renewable fuels, and beginning the long-term adjustment to an era of expansive energy and fossil fuel scarcity. AID expects that its programs will be giving major attention to renewable energy sources, especially fuelwood.
- Promote least-cost energy alternatives selected on the basis of life-cycle cost calculations (total cost of the technology over its useful life).
- Stress coordination with other U.S. agencies, bilateral donors, the World Bank and other multilateral assistance organizations, and the private sector.
- Reflect the importance of energy as an integral element in AID's various sector activities -- rural and urban -- in support of equitable growth.
- Emphasize those areas in which AID has special competence and experience: analysis and planning assistance, including project preparation and feasibility studies; training and institution-building; and site testing, demonstration, and evaluation of technologies.

This guidance should be implemented flexibly. In different countries or regions, local problems, AID program objectives, and contributions by others will dictate different mixes. A broader program that includes capital investments outside the areas of primary emphasis may be justified in certain cases, e.g., in major Economic Support Fund programs or in countries with a strong and demonstrable commitment to equitable development. Ultimately, AID's energy activities must depend on the particular country's situation, on AID's overall program goals in that country, and on the degree of creativity that AID staff can bring to bear.

#### A. AID Energy Programs

Consistent with these broad policy considerations, AID will carry out energy programs in the following areas:

##### 1. Energy Analysis and Planning

A country's energy plans must be based on its own particular mix of resources and pattern of development. Yet most Third World countries have not yet examined their energy needs, uses, resources, and policies in a comprehensive and systematic manner.

Basic information on energy resources is essential for the expansion of indigenous energy production through informed decisions on energy supplies, needs, and technologies, as well as energy conservation. Existing data bases for effective planning often are poor, especially with respect to energy use in rural areas. Even in countries that have carried out extensive economic planning, the sharp increases in the price of energy since 1973 may necessitate a reevaluation of the energy systems that support their development plans, as well as possible adjustments in the plans themselves.

Technical assistance can play an important role in developing country energy resource analysis and planning, by supporting or contributing to comprehensive energy studies, geological and geophysical surveys for conventional fuel sources, renewable resource assessments, energy demand analyses, the formulation of national energy strategies and policies, and studies of particular energy subsectors. Technical assistance can also increase public and private sector capabilities to analyze the benefits and costs of the variety of energy activities, as well as presenting options for development strategies and investment priorities in different time frames. AID should be prepared to provide technical assistance in those areas where the United States has substantial expertise that is applicable to, or could be organized to address, Third World energy analysis and planning problems.

## 2. Energy Training and Institutional Development

The establishment of indigenous technical and institutional capability to address energy problems is a high priority for all Third World countries. Experience in agriculture, population, and other assistance programs has shown the value of significant efforts in training and institutional development.

Designing and pursuing viable energy strategies requires a wide range of skills at various levels, in such areas as energy planning, project management, geology, engineering, environmental analysis, economic and social science disciplines, and energy equipment operation and maintenance. The social, economic, and cultural aspects of energy programs are as important as the technical aspects. AID training programs, both centrally and regionally funded, should be capable of responding to the need for training people in renewable and conventional energy and include both academic and in-service arrangements. Particular attention should be paid to programs implemented in the Third World, as well as in the United States, and might cover arrangements between U.S. institutes, laboratories, or universities on the one

hand, and individual developing country or regional institutions on the other.

Institutions to establish, finance, manage, and operate energy programs in developing countries. Assistance is needed at the national level to assure that the institutions and trained people are in place to develop a national energy plan and coordinate its implementation. Developing countries must also have regional and local capability to give life to national plans or to implement region-specific activities. AID's programs should recognize and reinforce the role of the developing country private sector (manufacturing, credit, rural cooperatives) in supporting dissemination of proven new technologies.

### 3. Site Testing, Demonstration, and Evaluation of New Energy Technologies

Prospective "new" technologies from both renewable and non-renewable sources stretch across the entire spectrum of energy needs. Among others, they include solar hot water heaters, photovoltaic pumps, wind pumps and generators, bio-gas digestors, ethanol and methanol production, small scale hydropower, and utilization of coal-oil mixtures. These technologies are in different stages of development and application. Technology assessments are needed to match energy needs in developing countries with prospective technologies and to establish priorities for U.S. Government research, development, demonstration, and investment for developing country applications.

The United States is spending several billion dollars a year to develop and demonstrate energy technologies aimed at meeting our own domestic energy requirements. Most of these technologies have attractive applications in developing countries, either in their present form or with some modifications. A systematic review and analysis of U.S. research and development is required to identify and adapt these systems for potential developing country use.

Renewable technologies are cost-effective today vis-a-vis petroleum-dependent technologies for some applications in developing countries. Further, if present research and development reduces their cost while oil prices continue to rise, renewable technologies will be more cost-effective. Widespread adoption of new technologies will not occur, however, irrespective of cost comparisons, unless the technologies have been proven effective from technical and social as well as economic perspectives in actual developing country settings.

AID should support the site testing and demonstration of potentially attractive technologies that are ready for application and careful evaluation. With the strengthening of developing country capability in energy technology and a well-structured analysis of applications, developing country specialists and institutions can learn which technologies are appropriate for each individual setting and can formulate programs for their widespread utilization. AID should coordinate site testing and evaluation programs with other assistance agencies and developing countries to expand the information base on new technologies.

#### 4. Increasing Energy Supplies

Developing countries must increase the amount and the efficiency of energy use in both commercial and traditional fuels to support their development efforts. AID has identified six forms of energy in which important progress can be made where AID can make a contribution: (1) fuelwood; (2) hydropower; (3) new renewable energy technologies, such as direct solar, wind, and biomass conversion; (4) oil and gas; (5) coal; and (6) energy efficiency improvements (which are functionally equivalent to a new source of supply). In addition, in selected countries AID may provide technical assistance in the development of geothermal or oil-shale resources.

AID will devote major attention to fuelwood production, both directly and by supporting multiple-use forest management activities that preserve and enhance forest resources. Used primarily for domestic cooking and heating, fuelwood has received considerable attention because of the high potential pay-off of fuelwood and forestry programs. Returns include (a) substitution for expensive imported kerosene (India estimates rural use at 3 liters/household/month or about 9 gallons/year), (b) reduced deforestation, with subsequent control of erosion, siltation, and flooding, and (c) continued use of organic fertilizers (dung, crop residues) to increase food production rather than as cooking and heating fuel. Considerable time and money must be devoted to designing fuelwood and forestry activities, because the economic, social, and political issues, along with the technical aspects, are critical, yet are still not very well defined, much less understood. Production possibilities include fuelwood plantations serving primarily urban areas and social forestry projects (e.g. supplying fuelwood, small timber, and minor forest products to the rural population) such as those now being implemented in India, Nepal, and Sri Lanka.

AID's emphasis here will be on experimental projects, village or family woodlots, social forestry projects, and

multiple-use forest management, where these activities are appropriate. AID will look initially to the multilateral development banks for most of the financing of large-scale fuelwood plantations, but stands prepared to provide technical assistance for these activities. In light of the importance of fuelwood and forestry to rural development and the well-being of the poor, however, AID will consider capital assistance for fuelwood and forestry activities when other sources of financing are not available.

In the field of hydropower, AID expects the multilateral development banks to finance the large capital costs of conventional schemes. In particular countries or regions AID can play an important role by conducting basic surveys and helping countries formulate comprehensive plans to develop large hydropower projects. The banks are not generally involved in the development of medium- and small-scale hydropower (up to 10 megawatts), which could provide decentralized electricity and feed into national or regional grids. With some systems already less expensive than fossil fuels in rural locations, and with escalating fuel prices making small hydropower even more competitive, AID will consider assistance for these smaller hydro projects.

AID will also rely heavily on the multilateral development banks, other assistance agencies, and the private sector to finance energy production from new renewable sources (e.g., biomass conversion, direct solar, wind) when the technologies and their applications have been proven. As already suggested, however, there will be many opportunities for AID to provide technical assistance for testing and demonstration of new technologies, training, institution-building, and planning.

In the near to medium term, fossil fuels will continue to be a critical commercial energy source for both industrialized and developing countries. In fact, if they are successful in promoting economic growth, most developing countries will need to increase their relative reliance on these fuels while they begin to search for long-term replacements. Large tracts of unexplored, or poorly explored, sedimentary basins exist throughout the Third World, and a recent World Bank study estimates that production from these countries could increase from 2.6 million barrels per day now to 5.9 million barrels or more per day by 1990.

The private sector will be a primary source of capital and expertise to exploit fossil fuels. In some developing countries, private investment has been impeded by corporate fears of expropriation or high taxation,

lack of potential for exportable surplus, and misunderstanding and mistrust between the host government and the corporation. The World Bank's "Program to Accelerate Petroleum Production in the Developing Countries" is intended to help overcome these problems, as well as to supplement private resources. AID's role in the fossil fuel area -- oil, gas, coal -- will take the form of technical assistance for training and institutional development, policy advice, and financing of some geological and geophysical studies in coordination with other assistance agencies.

Increasing energy efficiency in developing countries is an important but neglected "source" of new energy. Because present energy practices evolved in an era of cheap energy, and because little attention has been paid to the design of efficient energy systems, large returns can now be expected from effective conservation practices. AID will support programs to develop and promote improved cooking stoves, more efficient kerosene stoves and lamps, and more efficient charcoal manufacturing techniques. AID will also provide resources for programs to analyze and promote modern sector energy savings in industry, transportation, building, and electric power generation and distribution, in addition to household use.

#### 5. Rural Electrification

In the past, AID has provided considerable assistance for rural electrification. The multilateral development banks also have been financing rural electrification projects. Future plans for assistance for rural electrification should take into account (1) the implications of national rural electrification plans for energy supply (particularly as they relate to oil imports); (2) evidence of the benefits from previous rural electrification projects (degree of encouragement of industry, increased irrigation, lessening of urban migration, improved income distribution, etc.); (3) the cost of electricity from a central grid when compared with decentralized systems, both conventional and non-conventional, over the life of the investment, assuming realistic estimates of future fossil-fuel prices; and (4) the relative benefits of rural electrification compared to foregone planning assistance, site testing, fuelwood activities, and other rural development programs.