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SOLAR ENERGY

DOMESTIC POLICY REVIEW

INTERNATIONAL PANEL

REVIEW OF EXISTING FEDERAL PROGRAMS

September 20, 1978

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1. SUMMARY REVIEW OF EXISTING FEDERAL PROGRAMS

The Federal Government has a growing number of international activities relating to solar energy. These "programs," which are assuming increased importance within the overall context of U.S. foreign policy in energy, derive from different legislative authorities (see Section 2) and serve a variety of U.S. interest. Overlapping jurisdictions appear to exist with regard to programs with developing countries.

The scope of existing activities is broad, including cooperative arrangements and agreements with both industrial and developing countries in research and development on solar technologies, energy and resource assessments, training in energy management, institutional development and demonstration of solar technologies. Expenditures for these activities in FY78, including staff time, are estimated to be in the range of $25-30 million, of which about two-thirds is for programs of the Agency for International Development. DOE's expenditures in FY78 are approximately $6 million, of which $5 million is for overall energy assessments with Egypt and Peru under the pilot program of cooperation with developing countries and $1 million is for R&D cooperation, primarily with other industrial countries through the IEA. The International Communications Agency and the Peace Corps are incorporating an emphasis on solar energy into their regular programs and bilateral agreements.

U.S. support for energy assistance to developing countries, particularly in the area of solar energy, was recently reflected in the Text of Declaration at the Bonn Economic Summit. The seven countries at the Bonn Summit agreed that: "To help developing

countries, we will intensify our national development assistance programs in the energy field and we will develop a coordinated effort to bring into use renewable energy technologies and to elaborate the details within one year."

An area of increasing interest is the international commercialization of solar technologies. DOE is just beginning to consider overseas market potential and the possible domestic implications. The Department of Commerce is also increasing its information gathering activities on international solar markets and is beginning to sponsor solar trade fairs and overseas exhibits of U.S. solar technologies.

A brief assessment of major activities is provided in Section 4. Since most of the activities are of relatively recent origin, assessing their current or potential effectiveness is difficult. It is, however, the panel's judgment that the various efforts could benefit, especially during the formative stages from increased coordination and rationalization. The panel urges the speedy development of an overall international solar strategy as one component of a U.S. international energy policy.

2. MAJOR LEGISLATIVE AUTHORITIES FOR INTERNATIONAL SOLAR ACTIVITIES

2.1 Foreign Assistance Act of 1961, as Amended (1977).

Section 103 (Food and Nutrition) of the Foreign Assistance Act of 1961 authorizes energy activities related to rural development programs, including rural electrification. Section 106 (Technical Assistance, Energy, Research, Reconstruction and Selected Development Programs) authorizes assistance for "programs to help developing countries alleviate their energy problems by increasing their production and conservation of energy through such means as research

and development of suitable energy sources and conservation methods, collection and analysis of information concerning countries' potential supplies of and needs for energy and pilot projects to test new methods of production or conservation of energy." Section 107 (Intermediate Technology) authorizes assistance in appropriate or intermediate energy technologies. In addition, while not a source of funding, Section 119 (Renewable and Non-Conventional Energy Technologies) calls for "assistance for cooperative programs with developing countries in energy production and conservation, with particular emphasis in programs in research, development and use of small-scale decentralized, renewable energy sources for rural area..."

2.2 Energy Reorganization Act of 1974

The Department of Energy Organization Act, established as a responsibility of the Administrator of ERDA the following: "encouraging and participating in international cooperation in energy and related environmental research and development."

2.3 Solar Energy Research, Development, and Demonstration Act of 1974

The Solar Energy Research, Development and Demonstration Act of 1974 authorizes, in Section 11, U.S. participation in (1) "inter-institutional, bilateral, or multilateral research projects in the field of solar energy" and (2) "agreements and programs which will facilitate the exchange of information and data relating to solar energy resource assessment and solar energy technologies." In Section 2, the law explicitly recognizes that "the early development and export of viable equipment utilizing solar energy, consistent with the

established preeminence of the United States in the field of high technology products, can make a valuable contribution to our balance of trade."

2.4 Department of Energy Authorization Act of 1978

In the section on Program Management and Support of the Department of Energy Authorization Act of 1978 Civilian Applications, there is a one-line item, "International Cooperation in Non-Nuclear Technologies," which authorizes funding for cooperation with developing countries in support of the President's policy on nuclear non-proliferation.

2.5 Nuclear Non-Proliferation Act of 1978

Title V of PL 45-2 42 authorizes a U.S. program of cooperation with developing countries for the purpose of: "(1) meeting the energy needs required for the development of such countries; (2) reducing the dependence of such countries on petroleum fuels, with emphasis given to utilizing solar and other renewable energy resources; and (3) expanding the energy alternatives available to such countries.... The program shall include both general and country-specific energy assessments and cooperative projects in resource exploration and production, training, research and development."

2.6 Bretton Woods Agreements Act, as Amended

PL 95-118 encourages the development and utilization of light capital technologies, including renewable energy resource applications, in the activities of the international financial institutions.

2.7 Organic Act of February 14, 1903

The Organic Act of February 14, 1903, Title 15, Commerce and Trade, established the Department of Commerce powers and duties to foster, promote, and develop the foreign and domestic commerce, the

mining, manufacturing, shipping, fishery industries and transportation facilities of the United States.

3. EXISTING POLICIES AND PROGRAMS

3.1 Overall Policy Objectives

U.S. promotion of solar technologies internationally is closely tied to its broad foreign policy objectives with respect to energy. These are:

- To encourage the transition from reliance on depletable petroleum supplies to alternative and essentially renewable sources of energy,
- To seek to make energy an area of cooperation, rather than divisiveness, within the Western Alliance,
- To contribute to the continued economic and social advancement of the developing countries by assisting them in overcoming energy-related obstacles to these objectives,
- To advance the state of U.S. domestic technical programs,
- To encourage the international commercialization of solar technologies by U.S. industry,
- To avoid premature or excessive commitments to the use of nuclear energy and to assure that where nuclear power is utilized, appropriate safeguard measures are applied,
- To promote appropriate bilateral and multilateral scientific and technical cooperation, and
- Where appropriate, to facilitate bilateral relations with particular countries.

The Department of State has primary responsibility for providing general guidance to ensure that activities are consistent with overall U.S. foreign policy goals.

3.2 AID Programs in Solar Energy

AID activities in solar energy focus primarily on assistance for cooperative programs with developing countries in decentralized

renewable energy resources to support rural development efforts. The AID solar energy program should be viewed as a part of an overall effort which aims at integrated development of the countries rather than as a goal in itself and attempts to assist those countries in using renewable energy resources to overcome the constraints generated by rising oil prices. Many AID projects include an energy component as part of larger, on-going development programs. Thus, AID programs of reforestation in Gambia, or appropriate village technology in Peru, Yemen and Haiti incorporate a significant energy component.

At the same time, AID has a diverse program dealing directly in energy which includes special studies of energy needs of developing countries, establishment of a management training course, and support for solar technology development and demonstration. Primary among these have been an $8.7 million loan-grant to the Philippines for non-conventional energy development, an extensive study of the energy needs and resources in developing countries, and a study of the energy needs in the food system. Also, there is a program to install a solar powered pump for irrigation in Senegal which is coordinated with France. AID on-going activities include a solar cell demonstration in Upper Volta, a program for methane generation in Nepal, utilization of a solar cooker for Haiti and a study of the Bakel Solar Pump. Solar programs are also planned for Senegal and Peru. AID's decentralized energy program is expected to be funded at a level of $20 million in FY 78 with a larger effort planned for FY 79.

In March, 1978, AID established a central energy office in Washington, D.C. to provide technical service to the regional bureaus and country missions in the development of energy projects as well as

manage a centrally-funded program involving energy assessments, training in energy management, institutional development, and the testing and demonstration of renewable energy technologies. The regional bureaus are also expanding their capabilities and energy assistance efforts similar to the Philippines program are being planned for, among other, Thailand, Indonesia, Morocco, Jordan, Yemen, Jamaica, Mali, Tanzania, Senegal, and Niger. DOE will provide technical support for these efforts on a cost-reimbursable basis.

3.3 DOE Technical Cooperation Agreements in Solar Energy

The U.S., through the Department of Energy, engages in international solar R&D activities, principally with other industrial countries, our assessment indicates they are of technical benefit to the U.S. domestic solar program. A description of each of these activities is contained in Appendix C. The principal focus of these activities is the International Energy Agency (IEA). Under the IEA's Committee on Energy Research and Development, the U.S. is a party to seven agreements in the following solar areas: solar heating and cooling, small solar power systems, wind energy conversion systems, large-scale wind energy conversion systems, forestry energy, wave power, and biomass technical information service. While these activities have been limited in the past to technical information exchanges, plans are to proceed to joint hardware projects. For example, the U.S. is presently contributing to the design studies for two 500 kW solar power systems to be built in Spain under IEA auspices. The U.S. also serves as the lead country for the Solar Energy Pilot Study of the NATO Committee on the Challenges of Modern Society (CCMS), which seeks to promote cost-effective applications of

solar heating and cooling technology. Cooperative programs are planned with Saudi Arabia, under a $100 million ($50 million U.S. contribution) 5-year agreement, with Spain, under the U.S.-Spanish Treaty of Friendship and Cooperation, with Brazil, in support of an initiative by President Carter during his first April trip, and with Japan. The U.S. is also developing cooperation in solar technology with Italy. U.S. expenditures, including staff time, in support of these R&D activities, are approximately $1 million in FY 78.

3.4 International Energy Development Program

In September 1977, President Carter approved an interagency pilot program of cooperation with developing countries in non-nuclear energy alternatives. The program plan submitted to the President proposed cooperative activities with selected developing countries in the areas of energy and resource assessment, training, research and development, technical assistance, and exploration and development. The approved one-year pilot program, which is managed by the Department of Energy, stems from Presidential Decision Number 8 on Nuclear Non-Proliferation. Activities in FY 78 focus on cooperation with Egypt and Peru in a comprehensive analysis of their energy resources and options, including solar energy. The immediate objective is to demonstrate a methodology that can be used as a tool by Egyptian and Peruvian planning officials in energy development decision making.

Egyptian and Peruvian decision makers are concerned with the interrelationship of energy requirements to expansion plans in a variety of sectors. The use of a systematic assessment method can help to relate data on the availability of various energy resources and technical requirements for delivering these resources to meet the

future demands in these sectors. The near-term results of the assessments are expected to be:

- o Familiarization, through direct participation, of Egyptian and Peruvian energy and planning experts, with this type of state-of-the-art methodology. (See outline of approach provided in Appendix D.)

- o A collaborative, objective evaluation of available data regarding existing and potential resources including oil and gas, geothermal, coal, nuclear raw materials, water resources and hydropower generation prospects, new energy prospects and energy-related materials;

- o The identification and examination of specific energy supply alternatives based on identified and potential resources, available technologies and those being developed. Implementation functions such as required lead times, costs, availability of financing (capital and foreign exchange), manpower requirements and key projects will be identifed;

- o A collaborative integrated analysis of the energy demand and supply options available to Egypt and Peru which are consistent with their national plans and objectives for national economic growth and social development;

- o Identification of areas where further data or more in-depth evaluation is required;

- o Establishment of arrangements between U.S. and Egyptian institutions to continue work on the assessment methodology.

A draft of the Egypt country energy assessment is now under review by the U.S. and Egyptian governments. A number of possible cooperative projects in solar energy have been identified, which may be funded by the U.S. in the future. The President will review the results of the first year's activities and decide on the continuation of the program in the fall. The pilot program is funded at a level of $3.5 million in FY 78, with an additional $1.5 million in Special Foreign Currency.

3.5 Title V of the Nuclear Non-Proliferation Act

No funds have been authorized as yet for Title V activities. The future implementation of this title will depend heavily on the evaluations of the pilot program described above.

3.6 ACTION/Peace Corps Activities

Peace Corps Volunteers have been involved for many years in adapting a variety of solar technologies to the social, economic, and technical conditions in rural villages of the Third World. A majority of these projects have included either solar heating, wind energy or biomass conversion technologies. These efforts have been undertaken in response to local requests and have not reflected, to date, a Peace Corps-wide strategy. Reforestration is the one program area in which the Peace Crops has substantial experience. Volunteers have been working on reforestation projects in many countries, including Nepal, the Philippines, the Sahel, Central America, Ecuador, and Chile. In FY 79, the Peace Corps is planning to implement a worldwide rural energy audit. Volunteers who have lived for a minimum of 1 year in a community will be asked to perform an audit on current sources and uses of energy and on the potential for expanding the use of renewable energy sources. This audit will lay the foundation for a major thrust in the field of energy and energy-related programs.

3.7 International Communications Agency

The ICA has incorporated solar energy as a topic in many of its information exchange and visitor programs. Under the international visitor grant program, ICA has sponsored several developing-country nationals, who work in the fields of energy or science and technology, on visits to the United States where they have met with public and private sector representatives engaged in various aspects of solar energy technologies and visited various DOE solar project sites. ICA has also sponsored seminars on solar energy and prepared a video-tape

recording on this topic for use in individual countries. DOE solar program officials have also visited developing countries on ICA programs.

3.8 World Bank and Activities in Solar Energy

The World Bank currently funds a modest field program to demonstrate the feasibility of using solar energy in developing countries. Present World Bank solar projects include a $165,000 4-year effort in Bolivia to help a local institution develop and adapt low-cost energy devices for heating, cooling, pumping, food-drying and greenhouse agriculture; a $1.7 million program of applied research in non-convective solar ponds; the installation of solar water heaters in the houses of teaching staff in Liberian rural schools. A further description of World Bank projects in solar energy is provided in Appendix B.

3.9 United Nations Activities in Solar Energy

The U.N. Secretariat activities in solar energy are presently focused in the Centre for Natural Resource, Energy and Transport and the Office for Science and Technology. The CNRET has sponsored a $76,000, three-year solar training program in Turkey which emphasizes flat collectors, solar concentrators and space heating utilization. The emphasis is on training indigenous professions in solar technology rather than on providing direct demonstration assistance. The CNRET also has a solar water heating program with Cyprus, and is working on a preliminary mission with El Salvador to advise its government on solar energy applications. Similarly, the U.N. plans to assist Jamaica, Kenya and Pakistan to examine their solar potential as part

of an overall energy analysis. The CNRET is concurrently collecting data and analysis on solar and renewable energy feasibility for the developing countries. A modest program in solar and renewable energies is also being undertaken by the U.N. University of Tokyo.

The role of renewable energy technologies, mainly solar, will be addressed at the UN Conference on Science and Technology for Development (UNCSTD) scheduled for August 1979. Also, the UN Secretariat has recommended that a Conference on New and Renewable Energy Resources be convened in 1981. This recommendation will be considered at the July 1978 meeting of ECOSOC. The U.S. is participating in the preparations for UNCSTD and will support the Secretariat's recommendation for a UN conference on renewable energy resources. Among the UN specialized agencies, the UN Environment Program (UNEP) and the United Nations Industrial Development Organization (UNIDO) have programs involving solar technologies. UNEP is preceding to establish two rural energy centers in Sri Lanka and Senegal to illustrate the use of solar energy. UNIDO's technical assistance program is evaluating the use of solar pumps and their possible manufacture in Senegal, the creation of a solar laboratory in Mali, the prototype production of windmills to provide low-cost water development in Kenya, existing technologies for production of biogas, and two solar sea water distillation plants in Somalia.

3.10 DOC Activities in Promotion of International Marketing of Energy Products

For many years DOC has assisted U.S. industry in the international marketing of energy generation and distribution machinery and

auxiliary equipment through its 42 field offices throughout the U.S., its business assistance program managed in Washington, its overseas personnel and in association with the United States Foreign Service at Embassies and Consulates around the world.

For eighteen years DOC has provided direct overseas trade promotion assistance through the organization of its own trade fairs, exhibitions in international trade fairs, exhibitions and services at its twelve U.S. Trade Centers, Trade Missions, seminars, conferences and symposia, and Video/Catelog Display Events. Annually, on average, twenty such events have featured energy generation machinery and auxiliary equipment, primarily nuclear, hydro, and fossil fuel systems. In 1978 an exhibition in Iran was exclusively Solar Energy Equipment. Two additional events planned for Italy and France will feature solar and other alternative energy source machinery and equipment. A greater portion of these resources can be devoted to solar energy promotion as conditions justify or direction permits.

Each promotion by DOE must be supported and justified by a contracted market research study or a market survey conducted by on-site DOC or U.S. Foreign Service personnel. In addition DOC is working with DOE to contract for special market studies in eight European countries to determine the availability of energy efficient products and new such technology.

DOC has initiated meeting with DOE to develop a cooperative DOC/DOE effort in international promotion of U.S. alternative energy technology and manufactured machinery and equipment. The objective is to mount a joint effort. DOE will provide guidance on the priorities, and proper structure and balance of energy products to be featured.

DOE will provide the market economic and commercial knowledge, market research information, experienced promotion personnel, and exhibition expertise. The determination of country markets offering the best opportunities will be mutually determined.

4. ASSESSMENT OF MAJOR PROGRAMS

4.1 AID Programs

AID's programs in energy and technology transfer have pointed out the importance of the following four considerations:

- Solar energy is and will continue to be the primary source of energy for the poorer people in developing countries.
- The use of high-priced commercial energy is justified on the basis of the lack of proven alternatives;
- There is a great potential for more efficient use of solar energy and for the use of solar energy to replace commercial energy in the Lesser Developed Countries (LDCs);
- The basic problems facing the wider use of solar energy are institutional as well as technical--problems of financing, lack of an entrepreneurial base, issues of social organization and governmental policies.

The current AID solar energy program is designed to attack some of these problems. The progress of these efforts to expand the use of solar energy will ultimately depend on the LDCs themselves. The process of adapting to change and economic development normally occurs over extended periods of time, usually far more slowly than the U.S. and other developed countries institute technologic change. The primary barriers to AID in achieving its goals will be (1) creation of LDC institutions which can provide applied research and implement solar energy technology, (2) expansion of LDC resources to support introduction and maintenance of solar energy and (3) availability of solar energy technologies which are relevant to LDC applications. AID

will continue to need resources and personnel allocations to meet expanding program objectives in energy.

4.2 DOE Technical Corporation Agreements

DOE international solar R&D programs have in large measure met the goals of U.S. legislation and have resulted in a number of benefits to the U.S. These activities have given, or can be expected to provide the U.S. in the future, the opportunity to:

- Gain confirmatory information on preferred approaches and strategies for U.S. program plans,
- Spot inadequacies in U.S. solar programs,
- Gain new information on technologies which are relatively further advanced in other countries,
- Undertake cost-effective development and testing projects through cooperation and cost-sharing with other countries,
- Test technologies in advance of U.S. program plans on foreign sites through using devices and facilities not currently available in the U.S.,
- Develop international systems performance reporting formats which provide a common basis for the exchange of experimental results, and
- Foster a climate of cooperation among participating nations and private institutions.

The question of whether other nations have benefited to a greater extent than the U.S. from these activities is, however, unclear at this time. Some concern exists both within and without DOE that the U.S. may have given away too much in the name of cooperation. Since most international solar agreements are still in the information exchange and research stage, this proposition is difficult to evaluate.

U.S. objectives have up to now emphasized technical advances; yet the ultimate goal of expanding the global utilization of solar

technologies has not been sufficiently addressed in these activities. Consideration of commercial opportunities, as the recently established International Solar Commercialization Working Group is beginning to do, must be incorporated into the strategy-planning process to ensure more effective translation of U.S. goals into the scope of future cooperative activities. Within DOE, international cooperative solar R&D activities are not now centrally funded or managed; rather each project is managed by its related domestic solar program office with overall policy coordination by the office of International Affairs. This situation has limited DOE's ability to implement overall cooperative strategies. Issues concerning appropriate agency roles and coordination will have to be addressed as a prelude to new or expanded U.S. international solar initiatives.

4.3 International Energy Development Program

U.S. activities with developing countries should aim at helping them increase their capabilities to identify and pursue viable energy options. The IEDP pilot program seeks in the cases of Egypt and Peru to promote the formulation by these countries of a comprehensive framework for energy policy and strategy analysis. A draft country energy assessment has been completed for Egypt and is under review. In Peru, the first phase--data collection--has been completed. It is hoped that once these assesments are made available, they will provide a useful source of information for public and private sector decision-making on the focus and level of energy assistance and investment. The assessments examine the role of solar energy within the context of total national energy resources and options. Such a framework is essential to establishing both the opportunities and limitations of

solar energy in meeting a country's overall energy needs. The cooperative enterprise has clearly pointed out the difficulties involved in identifying energy needs and the requirements for closer integration of overall economic planning with energy sector planning. Close coordination between State, DOE, AID, and USGS in the planning and implementation of the assessment activity is essential.

4.4 DOC International Promotion Activities

DOC International marketing information gathering and direct trade promotion activities are effective but are now directed at markets and feature all types of energy generation systems machinery and equipment based on measureable potential for marketing existing technology and U.S. manufactured products.

DOC needs to be given the authority and additional resources and directed to commit a specific amount of resources to promotion of U.S. solar energy technology and manufactured products.

APPENDIX A

RELEVANT LEGISLATION

Note.—Foreign Assistance and Related Programs Appropriations Act, 1978, Loan Allocation, Security Supporting Assistance: Of the new obligational authority appropriated under this Act for Security Supporting Assistance, not to exceed $856,800,000 shall be available for grants: *Provided*, That of the amounts available for loans, not to exceed $865,400,000 shall be available for loans with maturities in excess of thirty years, but not to exceed forty years, following the date on which funds were originally made available under such loans.

Sec. 103. Food and Nutrition.—(a) In order to alleviate starvation, hunger, and malnutrition, and to provide basic services to poor people, enhancing their capacity for self-help, the President is authorized to furnish assistance, on such terms and conditions as he may determine, for agriculture, rural development, and nutrition. There are authorized to be appropriated to the President for the purposes of this section, in addition to funds otherwise available for such purposes, $745,000,000 for the fiscal year 1977, *and $580,000,000 for the fiscal year 1978,* which amounts are authorized to remain available until expended.

(b) The Congress finds that, due to rising world food, fertilizer, and petroleum costs, human suffering and deprivation are growing in the poorest and most slowly developing countries. The greatest potential for significantly expanding world food production at relatively low cost lies in increasing the productivity of small farmers who constitute a majority of the nearly one billion people living in those countries. Increasing the emphasis on rural development and expanded food production in the poorest nations of the developing world is a matter of social justice as well as an important factor in slowing the rate of inflation in the industrialized countries. In the allocation of funds under this section, special attention should be given to increasing agricultural production in the countries with per capita incomes under $300 a year and which are the most severely affected by sharp increases in worldwide commodity prices.

(c) Assistance provided under this section shall be used primarily for activities which are specifically designed to increase the productivity and income of the rural poor, through such means as creation and strengthening of local institutions linked to the regional and national levels; organization of a system of financial institutions which provide both savings and credit services to the poor; stimulation of small, labor-intensive enterprises in rural towns; improvement of marketing facilities and systems; expansion of local or small-scale rural infrastructure and utilities such as farm-to-market roads, land improvement, energy, and storage facilities; establishment of more equitable and more secure land tenure arrangements; and creation and strengthening of systems to provide other services and supplies needed by farmers, such as extension, research, training, fertilizer, water, and improved seed, in ways which assure access to them by small farmers.

(d) Foreign currency proceeds from sales of commodities provided under the Agricultural Trade Development and Assistance Act of 1954 which are owned by foreign governments shall be used whenever practicable to carry out the provisions of this section.

(e) In order to carry out the purposes of this section, the President is authorized to participate in and provide, on such terms and conditions as he may determine, up to $200,000,000 to the International Fund for Agricultural Development. There is authorized to be appropriated to the President without fiscal year limitation $200,000,000 for such contribution.

(f) No funds may be obligated to carry out subsection (e) unless—

(1) satisfactory agreement is reached on the Articles of Agreement for the International Fund for Agricultural Development;

(2) such Articles of Agreement are reviewed and approved by the Senate Committee on Foreign Relations and the House Committee on International Relations;

(3) all donor commitments to the International Fund for Agricultural Development total at least $1,000,000,000 equivalent in convertible currencies, except that the United States contribution shall be proportionately reduced if this combined goal is not met; and

(4) there is equitable burden sharing among the different categories of contributors.

(g) The President shall submit to the Congress full and complete data concerning United States participation in and operation of, the International Fund for Agricultural Development in the annual presentation materials on proposed economic assistance programs.

(h) Of the funds authorized to be appropriated by this section for the fiscal year 1978, the President is requested to commit up to $60,000,000 for the purposes of assisting India with foreign exchange costs incurred in connection with the construction of grain storage facilities or other purposes specified in this section.

Sec. 103A. Agricultural Research.—Agricultural research carried out under this Act shall (1) take account of the special needs of small farmers in the determination of research priorities, (2) include research on the interrelationships among technology, institutions, and economic, social, and cultural factors affecting small-farm agriculture, and (3) make extensive use of field testing to adapt basic research to local conditions. Special emphasis shall be placed on disseminating research results to the farms on which they can be put to use, and especially on institutional and other arrangements needed to assure that small farmers have effective access to both new and existing improved technology.

Sec. 104. Population Planning and Health.—

(a)[1] In order to increase the opportunities and motivation for family planning and to reduce the rate of population growth, the President is authorized to furnish assistance, on such terms and conditions as he may determine, for population planning. There are authorized to be appropriated to the President for the purposes of this subsection, in addition to funds otherwise available for such purposes, $167,000,000 for the fiscal year 1978, which amount is authorized to remain available until expended.

(b)[1] In order to prevent and combat disease and to help provide health services for the great majority, the President is authorized to furnish assistance, on such terms

[1]Subsections (a) and (b) shall take effect on October 1, 1977.

shall be available for the fiscal year 1978, to support the southern African student program and the southern African training program, for the purpose of providing educational assistance to Southern Africans.

Sec. 106. Technical Assistance, Energy, Research, Reconstruction, and Selected Development Problems.—(a) The President is authorized to furnish assistance, on such terms and conditions as he may determine, for the following activities, to the extent that such activities are not authorized by sections 103, 104, and 105 of this Act:

(1) programs of technical cooperation and development, particularly the development efforts of United States private and voluntary agencies and regional and international development organizations;

(2) programs to help developing countries alleviate their energy problems by increasing their production and conservation of energy, through such means as research and development of suitable energy sources and conservation methods, collection and analysis of information concerning countries' potential supplies of and needs for energy, and pilot projects to test new methods of production or conservation of energy;

(3) programs of research into, and evaluation of, the process of economic development in less developed countries and areas, into the factors affecting the relative success and costs of development activities, and into the means, techniques, and such other aspects of development assistance as the President may determine in order to render such assistance of increasing value and benefit;

(4) programs of reconstruction following natural or manmade disasters;

(5) programs designed to help solve special development problems in the poorest countries and to make possible proper utilization of infrastructure and related projects funded with earlier United States assistance; and

(6) programs of urban development, with particular emphasis on small, labor intensive enterprises, marketing systems for small producers, and financial and other institutions which enable the urban poor to participate in the economic and social development of their country.

(b) There is authorized to be appropriated to the President for the purposes of this section, in addition to funds otherwise available for such purposes, $104,500,000 for the fiscal year 1977, *and $105,000,000 for the fiscal year 1978* which amounts are authorized to remain available until expended. Of the amounts made available under this section, not less than $30,000,000 shall be available during the period beginning July 1, 1975, and ending September 30, 1977, only for reimbursement to private voluntary agencies of the United States for costs incurred with respect to the shipment of food and nonfood commodities provided through private donations.

Sec. 107. Intermediate Technology.—Of the funds made available to carry out this chapter for the fiscal years 1976, 1977, and 1978, a total of $20,000,000 may be used for activities in the field of intermediate technology, through grants in support of an expanded and coordinated private effort to promote the development and dissemination of technologies appropriate for developing countries. The Agency for International Development shall prepare a detailed proposal to carry out this section

and shall keep the Senate Foreign Relations Committee and the House International Relations Committee fully and currently informed concerning the development of the proposal. The proposal shall be transmitted to these committees no later than March 31, 1976, and shall not be implemented until thirty days after its transmittal or until passage by each committee of a resolution in effect approving its implementation.

Sec. 108. Application of Existing Provision.—Assistance under this chapter shall be furnished in accordance with the provisions of titles I, II, or X of chapter 2 of this part, and nothing in this chapter shall be construed to make inapplicable the restrictions, criteria, authorities, or other provisions of this or any other Act in accordance with which assistance furnished under this chapter would otherwise have been provided.

Sec. 109. Transfer of Funds.—Notwithstanding section 108 of this Act, whenever the President determines it to be necessary for the purposes of this chapter, not to exceed 15 per centum of the funds made available for any provision of this chapter may be transferred to, and consolidated with, the funds made available for any other provision of this chapter, and may be used for any of the purposes for which such funds may be used, except that the total in the provision for the benefit of which the transfer is made shall not be increased by more than 25 per centum of the amount of funds made available for such provision. The authority of sections 610(a) and 614(a) of this Act may not be used to transfer funds made available under this chapter for use for purposes of any other provision of this Act, *except that the authority of such sections may be used to transfer for the purposes of section 667 not to exceed five per centum of the amount of funds made available for section 667(a)(1).*

Sec. 110. Cost-Sharing and Funding Limits.—(a) No assistance shall be furnished by the United States Government to a country under sections 103 through *106* of this Act until the country provides assurances to the President, and the President is satisfied, that such country provide at least 25 per centum of the costs of the entire program, project, or activity with respect to which such assistance is to be furnished, except that such costs borne by such country may be provided on an "in-kind" basis and except that the President may waive this cost-sharing requirement in the case of a project or activity in a country which the agency primarily responsible for administering part I of this Act determines is relatively least developed based on the United Nations Conference on Trade and Development list of "relatively least developed countries".

(b) *Except for grants to countries determined to be relatively least developed based on the United Nations Conference on Trade and Development list of "relatively least developed countries", no* grant assistance shall be disbursed by the United States Government under sections 103 through *106* of this Act for a project, for a period exceeding thirty-six consecutive months, without further justification satisfactory to the Congress and efforts being made to obtain sources of financing within that country and from other foreign countries and multilateral organizations.

(2) the steps the Administrator has taken to alter United States programs under this part in any country because of human rights considerations.

(e) Of the funds made available under this chapter for the fiscal year 1978, not less than $750,000 may be used only for studies to identify, and for openly carrying out, programs and activities which will encourage or promote increased adherence to civil and political rights, as set forth in the Universal Declaration of Human Rights, in countries eligible for assistance under this chapter. None of these funds may be used, directly or indirectly, to influence the outcome of any election in any country.

Sec. 117. Infant Nutrition.—*The President is encouraged (1) to devise and carry out in partnership with developing nations a strategy for programs of nutrition and health improvement for mothers and children, including breast-feeding, and (2) to provide technical, financial, and material support to individuals or groups at the local level for such programs.*

Sec. 118. Environment and Natural Resources.—*The President is authorized to furnish assistance under this part for developing and strengthening the capacity of less developed countries to protect and manage their environment and natural resources. Special efforts shall be made to maintain and where possible restore the land, vegetation, water, wildlife, and other resources upon which depend economic growth and human well-being, especially that of the poor.*

Sec. 119. Renewable and Unconventional Energy Technologies.—*(a)(1) The President is authorized to furnish assistance under this chapter 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 carried out as integral parts of rural development efforts in accordance with section 103 of this Act. Programs under this subsection shall be undertaken, whenever appropriate, in cooperation with the Energy Research and Development Administration or its successor and shall be carried out, to the greatest extent possible, through and in conjunction with activities under section 107 of this Act. These programs shall be 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.*

(2) Of the funds made available to carry out this chapter for the fiscal year 1978, up to $18,000,000 are to be used for carrying out this subsection.

(b)(1) In furtherance of the purposes of this section, the President is authorized to carry out studies to identify the energy needs, uses, and resources which exist in developing countries. The results of the studies conducted under this subsection shall be reported to the Congress by March 1, 1978.

(2) The Agency for International Development, in cooperation with the Energy Research and Development Administration or its successor, shall conduct a review of the options for implementing the purposes of this section, one of which shall be a proposal for a nonprofit Government corporation (which would be designated as the

International Energy Institute) outside the Agency for International Development, The President shall submit a comprehensive report on such review to the Speaker of the House of Representatives and the Committee on Foreign Relations of the Senate by January 31, 1978, together with his recommendations as to which option should be implemented.

Sec. 120. Sahel Development Program — Planning.—The Congress reaffirms its support of the initiative of the United States Government in undertaking consultations and planning with the countries concerned, with other nations providing assistance, with the United Nations, and with other concerned international and regional organizations, toward the development and support of a comprehensive long-term African Sahel development program.

(b) The President is authorized to develop a long-term comprehensive development program for the Sahel and other drought-stricken nations in Africa.

(c) In developing this long-term program, the President shall—

(1) consider international coordination for the planning and implementation of such program;

(2) seek greater participation and support by African countries and organizations in determining development priorities; and

(3) begin such planning immediately.

(d) There is authorized to be appropriated to the President, to carry out the purposes of this section, in addition to funds otherwise available for such purposes, $5,000,000 for the fiscal year 1976, which amount is authorized to remain available until expended. The President shall submit to the Foreign Relations and Appropriations Committees of the Senate and the International Relations and Appropriations Committees of the House of Representatives not later than April 30, 1976, a comprehensive proposal for carrying out the provisions of this section which shall include budget materials relating to programs for the fiscal year 1977.

Sec. 121. Sahel Development Program—Implementation.—*(a) The President is authorized to furnish assistance, on such terms and conditions as he may determine, for the long-term development of the Sahelian region. Assistance furnished under this section shall be in accordance with a long-term, multidonor development plan which calls for equitable burdensharing with other donors and shall be furnished whenever appropriate, in cooperation with an international coordinating mechanism.*

(b) The President shall prepare an annual report on the Sahel Development Program concerning the allocation of the United States contribution to the Program, the extent of the contributions from other donor countries, the effectiveness of the integrated effort through the Club des Amis du Sahel, and the progress made in achieving the objectives of the Program.

(c) There are authorized to be appropriated to the President for purposes of this section beginning in the fiscal year 1978, in addition to funds otherwise available for such purposes, $200,000,000, except that not to exceed $50,000,000 may be appropriated under this section for the fiscal year 1978. Amounts appropriated under this section are authorized to remain available until expended.

29

Public Law 93-473
93rd Congress, S. 3234
October 26, 1974

An Act

To authorize a vigorous Federal program of research, development, and demonstration to assure the utilization of solar energy as a viable source for our national energy needs, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Solar Energy Research, Development, and Demonstration Act of 1974". Solar Energy Research, Development, and Demonstration Act of 1974. 42 USC 5551 note.

DECLARATION OF FINDINGS AND POLICY

SEC. 2. (a) The Congress hereby finds that— 42 USC 5551.

(1) the needs of a viable society depend on an ample supply of energy;

(2) the current imbalance between domestic supply and demand for fuels and energy is likely to persist for some time;

(3) dependence on nonrenewable energy resources cannot be continued indefinitely, particularly at current rates of consumption;

(4) it is in the Nation's interest to expedite the long-term development of renewable and nonpolluting energy resources, such as solar energy;

(5) the various solar energy technologies are today at widely differing stages of development, with some already near the stage of commercial application and others still requiring basic research;

(6) the early development and export of viable equipment utilizing solar energy, consistent with the established preeminence of the United States in the field of high technology products, can make a valuable contribution to our balance of trade;

(7) the mass production and use of equipment utilizing solar energy will help to eliminate the dependence of the United States upon foreign energy sources and promote the national defense;

(8) to date, the national effort in research, development, and demonstration activities relating to the utilization of solar energy has been extremely limited; therefore

(9) the urgency of the Nation's critical energy shortages and the need to make clean and renewable energy alternatives commercially viable require that the Nation undertake an intensive research, development, and demonstration program with an estimated Federal investment which may reach or exceed $1,000,000,000.

(b) The Congress declares that it is the policy of the Federal Government to—

(1) pursue a vigorous and viable program of research and resource assessment of solar energy as a major source of energy for our national needs; and

(2) provide for the development and demonstration of practicable means to employ solar energy on a commercial scale.

DEFINITIONS

SEC. 3. For the purposes of this Act— 42 USC 5552.

(1) the term "solar energy" means energy which has recently originated in the Sun, including direct and indirect solar radiation and intermediate solar energy forms such as wind, sea thermal gradients, products of photosynthetic processes, organic wastes, and others;

at any new or existing Federal laboratory (including a non-Federal laboratory performing functions under a contract entered into with the Project or with any of the agencies represented in the Project as well as a laboratory whose personnel are Federal employees).

INTERNATIONAL COOPERATION

SEC. 11. (a) The Chairman, in furtherance of the objectives of this Act, is authorized to cooperate and participate jointly with other nations, especially those with agreements for scientific cooperation with the United States, in the following activities: 42 USC 5560.

(1) interinstitutional, bilateral, or multilateral research projects in the field of solar energy; and

(2) agreements and programs which will facilitate the exchange of information and data relating to solar energy resource assessment and solar energy technologies.

(b) The National Science Foundation is authorized to encourage, to the maximum extent practicable and consistent with the other objectives of this Act, international participation and cooperation in the development and maintenance of programs of education to carry out the policy set forth in section 9.

REGULATIONS

SEC. 12. The Chairman, in consultation with the heads of the Federal agencies having functions under this Act and with other appropriate officers and agencies, shall prescribe such regulations as may be necessary or appropriate to carry out this Act promptly and efficiently. Each such officer or agency, in consultation with the Chairman, may prescribe such regulations as may be necessary or appropriate to carry out his or its particular functions under this Act promptly and efficiently. 42 USC 5561.

ANNUAL REPORTS

SEC. 13. The Chairman shall report, on an annual basis, to the President and the Congress all actions taken under the provisions of this Act, all action planned for the ensuing year, and, to the extent practical, a projection of activities and funding requirements, for the ensuing five years. The Chairman also shall recommend, as he deems appropriate, any legislation or reorganization which might further the purposes of this Act. Report to President and Congress. 42 USC 5562.

INFORMATION TO CONGRESS

SEC. 14. Notwithstanding any other provision of law, the Chairman (or the head of any agency which assumes the functions of the Project pursuant to section 16) shall keep the appropriate committees of the House of Representatives and the Senate fully and currently informed with respect to all activities under this Act. 42 USC 5563.

COMPREHENSIVE PROGRAM DEFINITION

SEC. 15. (a) The Chairman is authorized and directed to prepare a comprehensive program definition of an integrated effort and commitment for effectively developing solar energy resources. The Chairman, in preparing such program definition, shall utilize and consult with the appropriate Federal agencies, State and local government agencies, and private organizations. 42 USC 5564.

(b) The Chairman shall transmit such comprehensive program definition to the President and to each House of the Congress. An Transmittal to President and Congress.

Public Law 95-242
95th Congress

An Act

Mar. 10, 1978
[H.R. 8638]

To provide for more efficient and effective control over the proliferation of nuclear explosive capability.

Nuclear Non-Proliferation Act of 1978.
22 USC 3201 note.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Nuclear Non-Proliferation Act of 1978".

STATEMENT OF POLICY

22 USC 3201.

SEC. 2. The Congress finds and declares that the proliferation of nuclear explosive devices or of the direct capability to manufacture or otherwise acquire such devices poses a grave threat to the security interests of the United States and to continued international progress toward world peace and development. Recent events emphasize the urgency of this threat and the imperative need to increase the effectiveness of international safeguards and controls on peaceful nuclear activities to prevent proliferation. Accordingly, it is the policy of the United States to—

(a) actively pursue through international initiatives mechanisms for fuel supply assurances and the establishment of more effective international controls over the transfer and use of nuclear materials and equipment and nuclear technology for peaceful purposes in order to prevent proliferation, including the establishment of common international sanctions;

(b) take such actions as are required to confirm the reliability of the United States in meeting its commitments to supply nuclear reactors and fuel to nations which adhere to effective non-proliferation policies by establishing procedures to facilitate the timely processing of requests for subsequent arrangements and export licenses;

(c) strongly encourage nations which have not ratified the Treaty on the Non-Proliferation of Nuclear Weapons to do so at the earliest possible date; and

(d) cooperate with foreign nations in identifying and adapting suitable technologies for energy production and, in particular, to identify alternative options to nuclear power in aiding such nations to meet their energy needs, consistent with the economic and material resources of those nations and environmental protection.

STATEMENT OF PURPOSE

22 USC 3202.

SEC. 3. It is the purpose of this Act to promote the policies set forth above by—

(a) establishing a more effective framework for international cooperation to meet the energy needs of all nations and to ensure that the worldwide development of peaceful nuclear activities and the export by any nation of nuclear materials and equipment and nuclear technology intended for use in peaceful nuclear activities do not contribute to proliferation;

(b) authorizing the United States to take such actions as are required to ensure that it will act reliably in meeting its commit-

any rights which the United States may have under any agreement for cooperation in force on the date of enactment of this Act.

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(b) The President shall annually review each of requirements (1) through (9) set forth for inclusion in agreements for cooperation under section 123 a. of the 1954 Act and the export policy goals set forth in section 401 to determine whether it is in the interest of United States non-proliferation objectives for any such requirements or export policies which are not already being applied as export criteria to be enacted as additional export criteria.

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(c) If the President proposes enactment of any such requirements or export policies as additional export criteria or to take any other action with respect to such requirements or export policy goals for the purpose of encouraging adherence by nations and groups of nations to such requirements and policies, he shall submit such a proposal together with an explanat on thereof to the Congress.

(d) If the Committee on Foreign Relations of the Senate or the Committee on International Relations of the House of Representatives, after reviewing the President's annual report or any proposed legislation, determines that it is in the interest of United States non-proliferation objectives to take any action with respect to such requirements or export policy goals, it shall report a joint resolution to implement such determination. Any joint resolution so reported shall be considered in the Senate and the House of Representatives, respectively, under applicable procedures provided for the consideration of resolutions pursuant to subsection 130 b. through g. of the 1954 Act.

te, p. 139.

AUTHORITY TO CONTINUE AGREEMENTS

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vision.
USC 2153d.

SEC. 405. (a) The amendments to section 123 of the 1954 Act made by this Act shall not affect the authority to continue cooperation pursuant to agreements for cooperation entered into prior to the date of enactment of this Act.

(b) Nothing in this Act shall affect the authority to include dispute settlement provisions, including arbitration, in any agreement made pursuant to an Agreement for Cooperation.

REVIEW

USC 2160a.

SEC. 406. No court or regulatory body shall have any jurisdiction under any law to compel the performance of or to review the adequacy of the performance of any Nuclear Proliferation Assessment Statement called for in this Act or in the 1954 Act.

PROTECTION OF THE ENVIRONMENT

USC 2153e.

SEC. 407. The President shall endeavor to provide in any agreement entered into pursuant to section 123 of the 1954 Act for cooperation between the parties in protecting the international environment from radioactive, chemical or thermal contamination arising from peaceful nuclear activities.

TITLE V—UNITED STATES ASSISTANCE TO DEVELOPING COUNTRIES

POLICY; REPORT

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JSC 3261.

SEC. 501. The United States shall endeavor to cooperate with other nations, international institutions, and private organizations in estab-

lishing programs to assist in the development of non-nuclear energy resources, to cooperate with both developing and industrialized nations in protecting the international environment from contamination arising from both nuclear and non-nuclear energy activities, and shall seek to cooperate with and aid developing countries in meeting their energy needs through the development of such resources and the application of non-nuclear technologies consistent with the economic factors, the material resources of those countries, and environmental protection. The United States shall additionally seek to encourage other industrialized nations and groups of nations to make commitments for similar cooperation and aid to developing countries. The President shall report annually to Congress on the level of other nations' and groups of nations' commitments under such program and the relation of any such commitments to United States efforts under this title. In cooperating with and providing such assistance to developing countries, the United States shall give priority to parties to the Treaty.

Presidential report to Congress.

PROGRAMS

SEC. 502. (a) The United States shall initiate a program, consistent with the aims of section 501, to cooperate with developing countries for the purpose of—

Developing countries, energy development programs.

(1) meeting the energy needs required for the development of such countries;

(2) reducing the dependence of such countries on petroleum fuels, with emphasis given to utilizing solar and other renewable energy resources; and

(3) expanding the energy alternatives available to such countries.

(b) Such program shall include cooperation in evaluating the energy alternatives of developing countries, facilitating international trade in energy commodities, developing energy resources, and applying suitable energy technologies. The program shall include both general and country-specific energy assessments and cooperative projects in resource exploration and production, training, research and development.

Assessment and cooperative projects.

(c) As an integral part of such program, the Department of Energy, under the general policy guidance of the Department of State and in cooperation with the Agency for International Development and other Federal agencies as appropriate, shall initiate, as soon as practicable, a program for the exchange of United States scientists, technicians, and energy experts with those of developing countries to implement the purposes of this section.

Experts, exchange.

(d) For the purposes of carrying out this section, there is authorized to be appropriated such sums as are contained in annual authorization Acts for the Department of Energy, including such sums which have been authorized for such purposes under previous legislation.

Appropriation authorization.

(e) Under the direction of the President, the Secretary of State shall ensure the coordination of the activities authorized by this title with other related activities of the United States conducted abroad, including the programs authorized by sections 103(c), 106(a)(2), and 119 of the Foreign Assistance Act of 1961.

22 USC 2151a, 2151d, 2151q.

REPORT

SEC. 503. Not later than twelve months after the date of enactment of this Act, the President shall report to the Congress on the feasibility of expanding the cooperative activities established pursuant to section

Presidential report to Congress.
22 USC 3262 note.

502(c) into an international cooperative effort to include a scientific peace corps designed to encourage large numbers of technically trained volunteers to live and work in developing countries for varying periods of time for the purpose of engaging in projects to aid in meeting the energy needs of such countries through the search for and utilization of indigenous energy resources and the application of suitable technology, including the widespread utilization of renewable and unconventional energy technologies. Such report shall also include a discussion of other mechanisms to conduct a coordinated international effort to develop, demonstrate, and encourage the utilization of such technologies in developing countries.

TITLE VI—EXECUTIVE REPORTING

REPORTS OF THE PRESIDENT

Governmental nuclear non-proliferation activities.
22 USC 3281.

SEC. 601. (a) The President shall review all activities of Government departments and agencies relating to preventing proliferation and shall make a report to Congress in January of 1979 and annually in January of each year thereafter on the Government's efforts to prevent proliferation. This report shall include but not be limited to—

(1) a description of the progress made toward—

(A) negotiating the initiatives contemplated in sections 104 and 105 of this Act;

(B) negotiating the international arrangements or other mutual undertakings contemplated in section 403 of this Act;

(C) encouraging non-nuclear-weapon states that are not party to the Treaty to adhere to the Treaty or, pending such adherence, to enter into comparable agreements with respect to safeguards and to foreswear the development of any nuclear explosive devices, and discouraging nuclear exports to non-nuclear-weapon states which have not taken such steps;

(D) strengthening the safeguards of the IAEA as contemplated in section 201 of this Act; and

(E) renegotiating agreements for cooperation as contemplated in section 404(a) of this Act;

(2) an assessment of the impact of the progress described in paragraph (1) on the non-proliferation policy of the United States; an explanation of the precise reasons why progress has not been made on any particular point and recommendations with respect to appropriate measures to encourage progress; and a statement of what legislative modifications, if any, are necessary in his judgment to achieve the non-proliferation policy of the United States;

(3) a determination as to which non-nuclear-weapon states with which the United States has an agreement for cooperation in effect or under negotiation, if any, have—

(A) detonated a nuclear device; or

(B) refused to accept the safeguards of the IAEA on all of their peaceful nuclear activities; or

(C) refused to give specific assurances that they will not manufacture or otherwise acquire any nuclear explosive device; or

APPENDIX B

AID ENERGY AND ENERGY RELATED PROJECTS

FY 1978 AID ACTIVITIES

Programs with Developing Countries in Energy Production and Conservation, with Particular Emphasis on Programs in Research, Development and Use of Small-scale Renewable Energy Sources for Rural Areas.

		FY 1978 ($ in millions)
Total A.I.D. Renewable Energy Programs		19,693
AFRICA		5.448
Burundi		
698-0410	Alternative Energy Peat	.490
Ghana		
	Pyrolytic Convertor	.083
Mali		
688-0217	Renewable Energy	2.200
Mauritania		
	Renewable Resources (Energy Component)	1.000
Niger		
698-0410	Solar Energy A.I.P.	.500
Senegal		
685-0208	Small Irrigated Perimeter Solar Pump	.700
Project Design Services		.475
ASIA		12.550
India		
386-0465	Application of Science and Technology for Rural Dev.	2.000
Indonesia		
497-0268	Appropriate Technology I	.200
497-0266	Science and Technology (FY77)	1.200
Nepal		
367-0133	RAD/RCUP Design	.500
Philippines		
492-0294	Non-Conventional Energy Development	8.650

LATIN AMERICA	.265
Project Design Services	.265
NEAR EAST	.100
Project Design Services	.100
DEVELOPMENT SUPPORT BUREAU	1.330
RSSA with DOE	.500
Appropriate Energy Technology	.600
PASA with PC	.230

PROGRAM: CAPE VERDE (GOCV) — ACTIVITY DATA SHEET — FY 79

TITLE	FUNDS	PROPOSED OBLIGATION (in thousands of dollars)		
Sal Desalination/Power	Health	FY 79: 300	LIFE OF PROJECT: 3,000	Grant 500 / Loan 2,500
NUMBER 655-0005 GRANT [x] LOAN [x] / NEW [ ] CONTINUING [x]	PRIOR REFERENCE: FY 78 Africa Program, p. 151	INITIAL OBLIGATION FY 78	ESTIMATED FINAL OBLIGATION FY 79	ESTIMATED COMPLETION DATE OF PROJECT FY 81

Purpose: To establish a technical and economically viable public water and electric power system to serve the population of Sal Island.

Background and Progress to Date: Sal Island is one of the smaller of the ten Cape Verde Islands with 450 square kilometers (12% of the country's total land area) and a population of about 8,000 people. It has had virtually no rainfall for the past nine years. Groundwater resources are nearly depleted and wells usually are 15 to 17 meters deep. Much "water mining" has taken place in the past years, and by now salt water intrusion has reached a point where groundwater is brackish.

All electrical energy must be generated by importing fuel. There are several small, inefficient generators and a larger unit at the international airport. The present costs of electric power is very high and its availability is limited primarily to the government and the airport.

Sal Island has a very limited economy largely dependent upon the airport, which provides Cape Verde's main link with other countries.

The equipment for the combined water/power plant and the related technical services will be ordered during FY 1978.

Host Country and Other Donors: The Government of Cape Verde will provide $1.9 million for contract supervision, labor, materials, and land.

FY 1979 Program: A.I.D. funds will be used to complete the technical assistance and training.

Beneficiaries: About 8,000 people on Sal Island will benefit directly through access to cheaper, better quality water and power and additional employment opportunities. Also the project will facilitate the establishment of export oriented enterprises, increased commercial landings, and increased tourist traffic, activities which are expected to generate over $2.0 million annually in foreign exchange which will be used by the GOCV to finance throughout the country other socio-economic activities, especially the provision of water in poor communities.

Major Outputs:	All Years
Desalination and Power Plant	1
Water destribution - households reached	1,300
Power delivery and distribution system	1
Sanitary sewage collection treatment and irrigation system	1
Technical training (number of people)	12

A.I.D. Financed Inputs:	($ thousands) FY 79
Personnel: Short-term technicians (28 pm)	200
Participants: Short-term training (70 pm)	100
Total	300

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	2,700	-	
Estimated through September 30, 1978	2,700	2,000	700
		Future Year Obligations	Estimated Total Cost
Proposed Fiscal Year 1979	300		3,000

PRINCIPAL CONTRACTORS OR AGENCIES: To be selected

PROGRAM: THE GAMBIA (GOTG) — ACTIVITY DATA SHEET — CP 79 05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Gambia Reforestation	Sahel Development Program	FY 79: 600	LIFE OF PROJECT: 1,500
NUMBER 635-0205 — GRANT ☒ LOAN ☐ — NEW ☒ CONTINUING ☐	PRIOR REFERENCE: NONE	INITIAL OBLIGATION FY 79	ESTIMATED FINAL OBLIGATION FY 81 — ESTIMATED COMPLETION DATE OF PROJECT FY 82

Purpose: As part of an effort to deal with environmental degradation, this project will assist the Government of the Gambia (GOTG) in its reforestation program in order to increase the forested areas while also providing fuel wood and charcoal at reasonable prices.

Background: The Gambia once had adequate woodland resources, but the country is now having to accommodate an increasing urban and rural population. Over the past 15 years, it is estimated, there has been a 30% decrease in woodland area. A population density of 141 per square mile (282 per square mile of cultivable land), coupled with the increased use of animal traction in agriculture, has led to widespread forest clearing for agriculture and production of fuel wood and charcoal. The farmer sees the country's need for forest land as being in direct competition with his own need for farm land.

To address this the GOTG wishes to expand its modest on-going afforestation program; to undertake tests of exotic species for economic use in Gambian conditions and to protect designated forest preserves. The project will use an integrated approach, involving coordination with efforts of other agriculturally related development, namely, agricultural extension, crop protection, soil/water utilization management, and livestock husbandry.

Host Country and Other Donors: The Gambia is providing personnel, facilities and operational costs totalling an estimated $1,160,000. The United Kingdom is providing personnel costing about $50,000.

FY 1979 Program: Funding will provide for technical assistance in research, afforestation and extension. The large-scale training component will also begin in both Africa and the United States.

Beneficiaires: The immediate beneficiaries will be the Gambian staff who will be trained to continue after the departure of expatriate technicians. In the end, the direct beneficiaries will be the Gambian rural and urban consumers who will be assured of a stable, long-term supply of wood fuel and charcoal at reasonable prices. Benefitting in the longer run will be the country at large, to the extent that reliance on imports for logs and sawn timber is reduced and the environment is protected.

Major Outputs:

	All Years
Gambians trained	68
Economically viable tree varieties tested and identified	
Land afforested (hectares)	625
Demarcation of forest preserves	66

A.I.D. Financed Inputs:

	($ thousands) FY 79
Personnel:	
Two long-term technicians (24 pm)	150
Three short-term consultants (8 pm)	54
Training:	
U.S. academic training (24 pm)	24
In-country training (24 pm)	12
Commodities:	
Vehicles, field and laboratory equipment, office equipment	310
Other costs:	
Operating costs	50
Total	600

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	-	-	
Estimated through September 30, 1978	-	-	-
Proposed Fiscal Year 1979	600	Future Year Obligations: 900	Estimated Total Cost: 1,500

PRINCIPAL CONTRACTORS OR AGENCIES: To be selected

PROGRAM: MAURITANIA (GIRM)

ACTIVITY DATA SHEET

FY 79 BS

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)		
Renewable Resource Management	Sahel Development Program	FY 79 1,300	LIFE OF PROJECT 3,416	
NUMBER 682-0205	PRIOR REFERENCE	INITIAL OBLIGATION FY 79	ESTIMATED FINAL OBLIGATION FY 81	ESTIMATED COMPLETION DATE OF PROJECT FY 81
GRANT [X] LOAN [ ]	FY 78 Africa Program, p. 456			
NEW [ ] CONTINUING [X]				

Purpose: To survey renewable resources and implement pilot projects as the basis for an integrated program of renewable resources management and conservation for Mauritania.

Background and Progress to Date: The land, soils, forest, vegetation and water (renewable resources) have suffered severe damage during recent droughts. This project will assist the GIRM to assess these resources by satellite imagery and to reverse their deterioration. Methods will be tested at four pilot projects in the Sixth Region for sand dune stabilization, natural revegetation, forest management and range management. Replication of these will be carried out once their social and technical validities have been confirmed. During FY 78, the project design will be completed and initial funds will be obligated to begin remote-sensing operations and the pilot interventions, following which the project will help develop Mauritania's first national resources management plan.

Host Country and Other Donors: The GIRM provides the land and water for the pilot areas and has designated professional, technical and support personnel for program coordination, research and implementation. Staff will be recruited from the National Agricultural School at Kaedi, Mauritania, which will support inservice training. This school is assisted by a Food and Agriculture Organization project funded by the United Nations Development Program.

FY 1979 Program: U.S. contract and GIRM personnel will complete the resources survey and begin preparations for a national resources management plan using the data obtained. Funding for this fiscal year will complete the survey and the first year of operations on the four pilot projects.

Beneficiaries: There are a total of 180,000 people in the Sixth Region, of whom many will benefit directly from the vegetation, forest products, fodder and water developed at the project sites. The GIRM will be able to survey and manage resources and develop projects in other regions. By the end of the project, a national renewable resources plan can be carried out for the benefit of the entire population of Mauritania.

Major Outputs:

	All Years
Resources survey, inventory, and data base	1
Personnel trained	57
Pilot projects complete and facilities established	10
National plan for renewable resources	1

A.I.D. Financed Inputs:

	($ thousands) FY 79
Personnel:	
Resident contract team (52 pm)	416
Resources survey team (8 pm)	64
Training:	
Long-term third-country (72 pm)	51
Short-term in-country (40 pm)	22
Commodities:	
Vehicles and equipment	110
Construction:	
Pilot project preparation and well-digging	350
Other Costs:	
Seedlings and vehicle operating costs	287
Total	1,300

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	1,000	600	
Estimated through September 30, 1978	1,000	600	400
Proposed Fiscal Year 1979	1,300	Future Year Obligations 1,116	Estimated Total Cost 3,416

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected

PROGRAM: NIGER (GON)

ACTIVITY DATA SHEET

CP 79-03

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Niamey Department Rural Development	Food and Nutrition	FY 79 1,525	LIFE OF PROJECT 4,698
NUMBER 683-0705	PRIOR REFERENCE	INITIAL OBLIGATION FY 77	ESTIMATED FINAL OBLIGATION FY 80
GRANT [X] LOAN [ ]	Advice of Program Change to be transmitted		ESTIMATED COMPLETION DATE OF PROJECT FY 81
NEW [ ] CONTINUING [X]			

Purpose: To increase food production, raise rural incomes, and improve the rural standard of living in Niger's Niamey Department.

Background and Progress to Date: The famine caused by the recent Sahelian drought dramatized Niger's need to increase food production. Consequently, the Niger Government included in its national development plan several regional rural development projects designed to achieve food self-sufficiency. The project activities will include increasing crop production using animal traction, establishing credit and cooperative services at the village level, implementing village information and education programs, village soil conservation, minor irrigation works, and farmer literacy programs. The results of all project activities will be used to prepare a long range, comprehensive development plan for the zone. Initial months of project activity have been devoted to engaging personnel and procuring commodities.

Host Country and Other Donors: The GON will contribute 25% of the combined life-of-project costs. In accordance with government strategy of localizing development activities, similar projects are being carried out by France, the European Economic Community and the International Bank for Reconstruction and Development. Canada is also considering a fifth project.

FY 1979 Program: During the second year, activities initiated in the 50 villages selected under the FY 78 program will be reinforced and expanded to an additional 65 villages. This expansion will require intensive village organization and the establishment of 26 new village cooperatives, as well as training of 26 agricultural cooperative agents, several hundred village leaders, farmer demonstrators and progressive farmer couples.

Beneficiaries: The indirect beneficiaries are the inhabitants of the zone. This includes 58,300 farm families living in 700 villages spread over an area the size of Delaware and Maryland. The direct beneficiaries are the 102,000 inhabitants of the 210 villages selected for intensive project assistance in the first phase. The initial cost is $105 per year per directly benefitting farm family. A second phase of the project will reach a larger population base and reduce the per capita cost of project intervention.

Major Outputs:	All Years
Grain production increased	25,000 tons
Villages organized	210
Cooperatives established	40
Agricultural and Cooperative agents trained	80
Village land-use plans	30
Radio programs	20
Office and Training Centers built	9

A.I.D. Financed Inputs:		($ thousands) FY 79
Personnel:	6 U.S. long-term contract technicians (72 pm)	517
	4 U.S. short-term consultants (14 pm)	111
Participants:	26 long-term local (312 pm)	113
Commodities:	Vehicles, office supplies and equipment, irrigation equipment, fertilizer, vaccines	391
Construction:	Office and Training Centers	140
Other Costs:	Logistical support, operating and maintenance costs	253
	Total	1,525

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1977	998	-	998
Estimated Fiscal Year 1978	1,675	900	
Estimated through September 30, 1978	2,673	900	1,773
Proposed Fiscal Year 1979	1,525	Future Year Obligations 500	Estimated Total Cost 4,698

PRINCIPAL CONTRACTORS OR AGENCIES

Personal Services Contractors

PROGRAM: NIGER (CON)

ACTIVITY DATA SHEET

CP 79-05

TITLE	FUNDS	PROPOSED OBLIGATION (in thousands of dollars)		
Forestry and Land Use Planning	Sahel Development Program	FY 79 800		LIFE OF PROJECT 2,000
NUMBER 683-0228	PRIOR REFERENCE	INITIAL OBLIGATION FY 79	ESTIMATED FINAL OBLIGATION FY 80	ESTIMATED COMPLETION DATE OF PROJECT FY 81
GRANT [X] LOAN [ ]	NEW [X] CONTINUING [ ]	NONE		

Purpose: To assist the GON in the preparation of a 20-year plan for the rehabilitation and protection of the country's soils, water and natural vegetation.

Background: The recent drought has greatly accelerated the process of desertification, the impoverishment of the useable land surface and the reduction of the natural food supply. In spite of national programs in reforestation, there has been no provision for strengthening the institutional and technical capacity of the Niger Forestry Service (NFS) to plan and implement essential programs. In early 1977, an A.I.D.-sponsored FAO/A.I.D. contract mission completed a study of the GON's ability to undertake a program of basic resource management, and made recommendations for a comprehensive series of inputs to assist Niger in a long-term program of planning and action. The GON and A.I.D. have prepared a preliminary project document which covers an initial two-year phase by activities designed to: a) establish a basic resource inventory, b) establish a resource planning unit within the NFS, c) design and begin implementation of "model sites", d) sensitize Niger's technical agencies, as well as the general population, to the work required.

Host Country and Other Donors: The GON will contribute project personnel, and in-kind expenses including operating costs. The IBRD has committed funds to reinforce the NFS's logistical capacity and finance reforestation of 2,000 hectares. West Germany anticipates supporting a program of reforestation covering approximately 10,000 hectares. The European Economic Community (EEC) continues to fund localized soil conservation programs and various voluntary agencies execute village foodlots and soil conservation campaigns. Canada funds village foodlots in eastern Niger.

FY 1979 Program: Technical assistance will be provided to the NFS to begin the immediate construction and operation of the resource planning unit. With selective use of short-term consultants, a national basic resource inventory will provide opportunity for on-the-job training in resource planning techniques and use of specialized equipment and materials. Participant training for NFS staff will start. Field support, vehicles and equipment will be provided for the initiation of model tree nurseries and plantations. The vehicles will be used for intensified management of existing forest reserves.

Beneficiaries: Beneficiaries include NFS which will be equipped and trained for resource management. Niger's farmers and herders are the prime beneficiaries.

Major Outputs: All Years
Resource Planning Unit Established
Land-Use and Forestry demonstration sites
GON Forestry Service Training
Long-term Development Plan
Conservation Education

A.I.D. Financed Inputs:	($ thousands) FY 79
Personnel: 6 U.S. short-term consultants (25 pm)	200
Participants: 2 U.S. long-term academic (24 pm)	24
4 long-term local academic (48 pm)	26
Commodities: Vehicles, POL, specialized forestry equipment	300
Construction:	100
Other Costs: Field operations	150
Total	800

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	-	-	
Estimated through September 30, 1978	-	-	-
Proposed Fiscal Year 1979	800	Future Year Obligations 1,200	Estimated Total Cost 2,000

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected

ACTIVITY DATA SHEET

TITLE	FUNDS	PROPOSED OBLIGATION (in thousands of dollars)			CP 79 05
Small Irrigated Perimeters	Sahel Development Program	FY 79 500		LIFE OF PROJECT 5,859	
NUMBER 685-0208 GRANT [X] LOAN [ ] NEW [ ] CONTINUING [X]	PRIOR REFERENCE Advice of Change Transmitted August 4, 1977	INITIAL OBLIGATION FY 77	ESTIMATED FINAL OBLIGATION FY 80	ESTIMATED COMPLETION DATE OF PROJECT FY 81	

Purpose: Introduce farmer-managed irrigated crop production in the Bakel area to acquaint the farmers with the technologies and demonstrate the economic and technical feasibility of irrigated agriculture.

Background and Progress to Date: The project is located in the far eastern region of Senegal around Bakel on the Senegal River. This area is populated almost entirely by subsistence farmers who have survived since time immemorial on a marginal existence basis by planting dry season sorghum and millet and a sorghum crop under recession agriculture. Rice, traditionally grown by women in swampy areas, has suffered total loss four years in five due to the vagaries of the climate. The climate of the area is strongly influenced by the desert with great variations in temperature and high vulnerability to rainfall levels. Under A.I.D. and other donor assistance, a small pilot project was started two years ago to develop village-level irrigated perimeters using pumps to draw water from the Senegal River or from nearby swamps. The present project builds on experience gained to date and finances A.I.D. inputs for expansion into other villages. Pumps will be provided * for each perimeter to draw water from the river. The combined total of these small, village-level perimeters will be over 1,000 hectares but individual perimeters will vary in size with most of them being in the range of 30-50 hectares each. A.I.D. will finance central infrastructure, farm development including pumps and dike construction, technical assistance, health surveillance and a health component. Irrigated agriculture is seen as a major key to increased agricultural productivity. The difficulty in designing and implementing irrigated projects remains one of the prime constraints to increased use of hydraulic resources. The United States, with vast experience in both small and large scale irrigation, has been requested to help develop different irrigation schemes in the Valley, including the project at Bakel. Project technicians are now organizing farmers into production cooperatives. Equipment has been purchased. Topographic studies of the perimeters have been completed, and work is beginning on the irrigation and drainage canals and installation facilities for pumps and storage.

Host Country and Other Donors: Senegal is providing approximately $1.8 million for staff and agricultural inputs, for farm infrastructure and administrative operations.

FY 1979 Program: Funds will enable project technicians to continue such activities as organizing cooperatives, procuring equipment, and constructing the irrigation works.

Beneficiaries: The direct beneficiaries will be these farmers and their extended families participating in the village perimeter cooperatives. Women will also be integrated into the regular work pattern alongside men. Ultimate beneficiaries will include the 31,000 residents of the 23 villages who will benefit as the area's economy improves.

Major Outputs:	FY 77 (Cumulative)	All Years
Irrigated perimeters created		45
Farmers participating	150	900
Women directly participating	50	300
Farmer groups organized by village	7	23
Farmer group demonstration plots		20

A.I.D. Financed Inputs:

	($ thousands) FY 79
Personnel: Long-term technicians (24 pm)	120
Commodities: Pumps, shop tools, and spare parts	150
Construction: Construction of warehouses, dikes and related structures	230
Total	500

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	3,000	44	2,956
Estimated Fiscal Year 1978	500 c/	1,500	
Estimated through September 30, 1978	3,500	1,544	1,956
Proposed Fiscal Year 1979	500	Future Year Obligations 1,859	Estimated Total Cost 5,859

PRINCIPAL CONTRACTORS OR AGENCIES

SERDA, a Senegalese consulting firm

c/ Prior funding from regular program.

* SOLAR ENERGY PUMP INCLUDED, FUNDED FROM PROGRAM DEVELOPMENT AND SUPPORT PROJECT (REGIONAL)

PROGRAM: SENEGAL (COS)

ACTIVITY DATA SHEET

CP 79-05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Land Conservation and Revegetation	Sahel Development Program	FY 79 1,500	LIFE OF PROJECT 11,086
NUMBER 685-0219	PRIOR REFERENCE	INITIAL OBLIGATION FY 78	ESTIMATED FINAL OBLIGATION FY 82
GRANT [X] LOAN [ ] NEW [ ] CONTINUING [ ]	FY 78 Africa Program, p. 455		ESTIMATED COMPLETION DATE OF PROJECT FY 87

Purpose: To assist the Government of Senegal (GOS) in its planning for natural resource management and to attack four prime environmental problems by: (1) decreasing soil degradation at deep bore water points in rangeland areas; (2) preserving existing forests and wood resources against uncontrolled fires and woodcutting; (3) preventing further deterioration of soil and reduction of crop yields in Senegal's peanut and millet producing regions; and (4) conserving forest resources in the Cap Vert (Thies-Dakar) Region.

Background and Progress to Date: The recent drought in the Sahel exacerbated an already deteriorating ecology. The present situation is alarming. The degradation of Senegal's land and soil resources, due to uncontrolled grazing, wind erosion, and excessive use of forest resources is profound. The damage to forests, crops and livestock due to lack of fire control is great. Productivity in crop production in non-pastoral zones, due to uncontrolled burning and soil degradation, is evident and will worsen as additional stress is placed upon the enviroment unless land and soil stabilization is achieved. The project seeks first to overcome the prime constraint to rational natural resource management: lack of knowledge about the nature, quality, and location of these resources and their relationship one to the others and to the humans who use them. The GOS Water and Forest Service will implement the technical aspects of the project. Support to long-range planning efforts will be through the Ministry for Planning and Cooperation.

Host Country and Other Donors: Senegal will bear 25% of the project costs, represented by personnel, land and physical facilities, and operating costs. While no other donors will contribute directly to this project, all the major donors in Senegal are vitally interested in the problem of resource utilization and are financing complementary efforts to reduce resource degradation and to restore a sound ecological balance.

FY 1979 Program: Funds will provide for continuation of project activities including resource planning, training of personnel, and construction of firebreaks.

Beneficiaries: The project will directly affect poor farmers and herders who will benefit when the new land-use practices protect the land from further deterioration. Also, both urban and rural poor people will benefit from the availability of firewood and charcoal collected from supervised forests.

Major Outputs:	All Years
Supervisors Trained	14
Technical Personnel Trained	240
Kilometers of Firebreaks Constructed	1,080
Tree Seedlings Produced	4.5 mil.
Hectares Planted with Improved Species	22,000
Hectares Planted with Gum Arabic trees	800
Km. of Water Distribution System Constructed	80
Fire Fighting Brigades Organized	40

A.I.D. Financed Inputs:	($ thousands) FY 79
Personnel: Three long-term advisors (54 pm)	246
Training: U.S. Academic Training (72 pm)	72
U.S. short-term training (40 pm)	72
In-country training (400 pm)	200
Commodities: Heavy Equipment, Trucks, Pipes, Pumps, Storage and Water Tanks, Fencing, Fuel, Fertilizer, Seeds, and Training Equipment	550
Other Costs: Equipment operating costs and local salaries for site preparations.	360
Total	1,500

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	1,000	500	
Estimated through September 30, 1978	1,000	500	500
Proposed Fiscal Year 1979	1,500	Future Year Obligations 8,586	Estimated Total Cost 11,086

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected

F
01

PROGRAM: UPPER VOLTA (GOUV)

ACTIVITY DATA SHEET

CP 79.05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)		
Forestry and Land Use Planning	Sahel Development Program	FY 79: 700	LIFE OF PROJECT: 5,000	
NUMBER 686-0235	PRIOR REFERENCE	INITIAL OBLIGATION FY 79	ESTIMATED FINAL OBLIGATION FY 83	ESTIMATED COMPLETION DATE OF PROJECT FY 84
GRANT [X] LOAN [ ] NEW [X] CONTINUING [ ]	NONE			

Purpose: To develop a range management strategy to increase forestry production and to curtail erosion and desertification.

Background: Upper Volta's meager forest resources continue to be overexploited. Current reforestation efforts have not made a significant impact on satisfying firewood consumption requirements in urban centers or in the arid Sahelian zone, where the lack of ground vegetation contributes to widespread erosion and desertification. The proposed project addresses these problems on three levels: 1) The establishment of a forestry school to train GOUV and other Sahelian forestry agents; 2) increased forestry production through improved management of the National Forest at Koulima; 3) development of a range management strategy for Upper Volta's Sahelian zone. The overall objective of the project is to train qualified personnel for the formulation of a national natural resource development/utilization strategy. The project will also provide technical assistance, materials and funding support to assist the GOUV in the formulation and undertaking of projects to implement this strategy.

Host Country and Other Donors: A GOUV in-kind contribution of personnel, salaries, office equipment and logistic support will be made to this project. The Food and Agriculture Organization will also provide technical assistance and coordination support.

FY 1979 Program: The FY 79 program will be devoted to studies and construction. Long-term technical assistance and consultants will also be provided.

Beneficiaries: The immediate beneficiaries will be the students trained in forestry management and extension work. The population surrounding and including Bobo-Dioulasso and the Sahelian zone will also benefit from a greater availability of firewood and a lessening rate of over-exploitation of natural vegetation.

Major Outputs:

	All Years
Forestry school constructed and operating	1
Forestry agents trained	144
Hectares of forest placed under improved management	5,000
Range management strategy developed	1

A.I.D. Financed Inputs:

		($ thousands) FY 79
Personnel:	3 U.S. long-term contract technicians (30 pm)	200
	3 U.S. short-term consultants (9 pm)	50
Participants:	30 short-term local (90 pm)	36
	2 long-term U.S. (24 pm)	24
Commodities:	Equipment and vehicles	100
Construction:	School construction	100
Other Costs:	Operation and support costs	190
	Total	700

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	-	-	-
Estimated through September 30, 1978	-	-	-
Proposed Fiscal Year 1979	700	Future Year Obligations: 4,300	Estimated Total Cost: 5,000

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected

PROGRAM: AFRICA REGIONAL

ACTIVITY DATA SHEET

CP 79-03

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Economic Commission for Africa NUMBER 698-0340 GRANT [X] LOAN [ ] NEW [ ] CONTINUING [X]	Selected Development Activities PRIOR REFERENCE FY 78 Africa Program, p. 280	FY 79: 400 INITIAL OBLIGATION FY 69 ESTIMATED FINAL OBLIGATION FY 81 LIFE OF PROJECT: 3,644 ESTIMATED COMPLETION DATE OF PROJECT FY 82	

Purpose: To assist the Economic Commission for Africa (ECA) to make a meaningful contribution to the economic and social development of the African member states.

Background and Progress to Date: A.I.D. has provided limited assistance to ECA since FY 1969; a new, more focused approach was initiated in FY 1976. ECA has requested A.I.D. to provide technical and financial assistance in implementing new programs and activities in integrated rural development, staff training programs, and Africanization of the ECA Secretariat. Assistance is also requested to continue programs in strengthening the role of rural women in the development process, exploring non-conventional sources of energy and promoting the utilization of remote sensing in Africa. Efforts under the grant include a short-term economics program in the U.S. for a senior ECA official. Assistance also was provided for an expert who is currently providing technical advice to the ECA Secretariat and member states on remote sensing applications and to conduct a Regional Conference on the Integration of Women in Development, which was attended by delegates from the national women's commissions fo ECA member states.

Host Country and Other Donors: The United Nations provides for ECA's operating budget. Germany, Great Britain, France, and Sweden provide technical assistance and program support.

FY 1979 Program: A.I.D. funds will provide for training of experts to staff African economic cooperation organizations, activities involving the integration of women in development, and consultant services in agricultural marketing, non-conventional sources of energy, and remote sensing.

Beneficiaries: The economic and social development of ECA member states and, ultimately their rural populations will be enhanced by the increased capability of ECA to design and implement specific programs and activities in Africa over the next several years.

Major Outputs:

	FY 77 (Cumulative)	All Years
Africans trained	20	35
Seminars on women's commissions completed	7	12
Feasibility study on nonconventional sources of energy completed		1
African Remote Sensing Council established		1

A.I.D. Financed Inputs:

	($thousands) FY 79
Personnel: Two long-term U.S. advisors (24 pm), 1 short-term U.S. consultant (3 pm)	150
Training: Five long-term participants in the U.S. (60 pm), 20 short-term participants in Africa (40 pm)	100
Other Costs: Workshops, conferences, seminars, and transportation	150
Total	400

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	1,704	1,307	397
Estimated Fiscal Year 1978	400	308	
Estimated through September 30, 1978	2,104	1,695	409
Proposed Fiscal Year 1979	400	Future Year Obligations: 1,140	Estimated Total Cost: 3,644

PRINCIPAL CONTRACTORS OR AGENCIES

Economic Commission for Africa

PROGRAM: SAHEL REGIONAL ACTIVITIES

ACTIVITY DATA SHEET

CP 79.05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
ONVS Agronomic Research II	Sahel Development Program	FY 79 2,000	LIFE OF PROJECT 9,300
NUMBER 628-0605	PRIOR REFERENCE Advice of Program Change to be Transmitted	INITIAL OBLIGATION FY 78	ESTIMATED FINAL OBLIGATION FY 82
GRANT [X] LOAN [ ]			ESTIMATED COMPLETION DATE OF PROJECT FY 83
NEW [ ] CONTINUING [X]			

Purpose: To assist the Senegal River Basin community develop a continuing capacity for carrying out adaptive agricultural research.

Background and Progress to Date: Improvements in agricultural production and productivity depend on continued research in seed varieties, cultural practices, and furtherance of man's ability to understand and control his environment. A.I.D. began providing assistance in this area through the FY 77 Agronomic Research I Project through which, in coordination with UNDP, A.I.D. supplied equipment, materials, and local salaries to three agricultural research centers. The proposed Agronomic Research II Project contains several elements including an operational research program which is a combination of research activities begun in part under the Agronomic Research I Project, a crop development element that will identify more-productive plant species and farming practices principally for flood recession sorghum and forage crops, and a research component on adapting small farm machinery and implements to local conditions.

Host Country and Other Donors: UNDP, France, and Canada will provide experts and research personnel, ONVS will provide support costs, nationals for training and land for construction.

FY 1979 Program: A.I.D. will help establish a continuing relationship between ONVS and a U.S. agricultural school by funding a contract between the two for the services of one U.S. technician for each of the initial ONVS research centers, consultations (primarily graduate students), training/observation tours for African officials, equipment and vehicles, and other costs including operational costs and construction/implement of research facilities and technician housing.

Beneficiaries: The direct benefits for this project are intended for the three research centers in the Member states. Approximately 1.6 million basin residents will directly benefit from the ultimate results of the project.

Major Ouputs:

	All Years
Improved forage species identified	15
Improved food crops species identified	6
Qualified personnel returned from training	50
Field trials completed	40
Bioclimatological stations established	3

A.I.D. Financed Inputs:

		($ thousands) FY 79
Personnel:	3 Agricultural technicians	480
	Consultants (36 pm)	288
Training:	Long-term training for 3 persons 3 py)	30
	Observation tours (22 pm)	40
Commodities:	Vehicles, lab and field equipment, supplies	276
Other Costs:	Operational Costs	34
	Construction/improvement of research facilities	652
	Construction of 5 houses for technicians at $40,000 each	200
	Total	2,000

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	800	175	
Estimated through September 30, 1978	800	175	625
Proposed Fiscal Year 1979	2,000	Future Year Obligations 6,500	Estimated Total Cost 9,300

PRINCIPAL CONTRACTORS OR AGENCIES
To be selected

PROGRAM: REGIONAL ACTIVITIES

ACTIVITY DATA SHEET

CP 79-05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)		
Entente Food Production	Food and Nutrition	FY 79 200	LIFE OF PROJECT 16,680	G: 6,680 L: 10,000
NUMBER 698-0301 GRANT [X] LOAN [X]	NEW [ ] CONTINUING [X]	PRIOR REFERENCE FY 78 Africa Program, p. 231	INITIAL OBLIGATION FY 76	ESTIMATED FINAL OBLIGATION FY 79
				ESTIMATED COMPLETION DATE OF PROJECT FY 81

Purpose: To assist the Entente countries (Ivory Coast, Togo, Benin, Niger, Upper Volta) to implement a strategy of assistance to small farmers in order to increase their per capita production of staple food crops for domestic consumption.

Background and Progress to Date: On June 30, 1976 an $8.0 million loan and a $3.79 million grant was authorized to finance small farmer oriented food production sub-projects in the five Entente countries. During FY 1978 a last tranche of $2.0 million in loan funds and an additional $2.69 million in grant funds will be provided. Sub-project proposals submitted by the countries have been reviewed. Actual design of the sub-project proposals, nine in all, were completed under Entente Fund contracts with both a locally based American consulting firm and a local consulting firm. Two of the nine subprojects have been approved for implementation. The others are undergoing some design adjustments. In October 1977, the first subproject agreement was signed by the Entente Fund with Upper Volta for an Animal Traction activity. The A.I.D.-financed Entente Fund rural development team comprising a project manager, a rural development specialist and an agricultural economist, are working with host-country officials in sub-project design and implementation.

Host Countries and Other Donors: The Entente countries are providing a minimum of 25% of loan-financed and 10% of grant-financed sub-project costs. French Aid and Cooperation (FAC), European Development Fund (FED), Canada and the Netherlands also provide assistance in the general area of food production.

FY 1979 Program: Grant funds are requested for continued financing of the project's short-term experts and consultants, for sector studies and analyses.

Beneficiaries: Project beneficiaries are small farmers, their families, and consumers of domestically produced food crops. While it is not possible to predict accurately the numbers of beneficiaries until design work is completed on all of the sub-projects, the already approved Animal Traction sub-project in Upper Volta is expected to benefit some six thousand farmers--probably over 50,000 persons counting all family members. The Irrigated Rice Perimeter Extension Project in Niger is to benefit some 7,700 farm families--some 60,000 persons.

Major Outputs:	All Years
Animal husbandry extension program (Benin)	1
Farms utilizing improved production techniques (Ivory Coast)	1,800
New farm families given access to land (Togo)	1,500
Extension service up-graded (Togo)	1
Farm agents trained (Niger)	260
Central Veterinary pharmacy established (Niger)	1
Irrigated Rice perimeter rebuilt (Niger)	1
Rice production annual increase (Niger) tons	1,500
Livestock health treatment program established (Upper Volta)	1

A.I.D. Financed Inputs:	($ thousands) FY 79
Personnel: 4 short-term technicians (10 pm)	80
Participants: 7 short-term (46 pm)	70
Other costs: sector studies, analyses	50
Total	200

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1977	11,790	244	11,546
Estimated Fiscal Year 1978	4,690	5,430	
Estimated through September 30, 1978	16,480	5,674	10,806
Proposed Fiscal Year 1979	200	Future Year Obligations –	Estimated Total Cost 16,680

PRINCIPAL CONTRACTORS OR AGENCIES
Entente Fund

ACTIVITY DATA SHEET

Private Voluntary Agency Operational Program Grant (OPG)	FUNDS: Various	PROPOSED OBLIGATION (In thousands of dollars) FY 79: 10,037		LIFE OF PROJECT: -	CP 79.05
NUMBER: 698 0191					
GRANT [X] LOAN [ ]	NEW [ ] CONTINUING [X]	PRIOR REFERENCE: FY 78 Africa Program, p. 256	INITIAL OBLIGATION FY 75	ESTIMATED FINAL OBLIGATION FY Continuing	ESTIMATED COMPLETION DATE OF PROJECT FY Continuing

Purpose: To assist the poor majority in less developed countrys through projects developed by indigenous and/or U.S. private voluntary organizations (PVOs) in close collaboration with African governments.

Background and Progress to Date: Eighteen projects are in the implementation stage in 14 different countries. A total of $9.5 million in PVO/OPG funds have been granted to American and Indigenous Private Voluntary Agencies in Africa through FY 77. A majority of the projects are in the Food and Nutrition category and the other projects in the Health and Education and Human Resources Development categories.

Typical of the larger OPG projects in operation is the Acacia Albida Expansion project in Chad. This project in operation since FY 76 seeks to assist CARE, an American based PVOs in its program to assist Chadian farmers through establishment of a recognized low-cost improved technology using the Acacia Albida tree. This project through the Acacia Albida demonstration hopes to improve the farmers capacity to improve his agricultural output and to establish the concept of cultivating fire wood as a domestic crop with concomitant protection of the environment. To date a total of 3,462 hectares of trees have been planted out of a target of 4,200 hectares. The project will benefit 2,000 rural farmers as well as 10,500 dependents for a total impact of about 12,500.

Typical of smaller grants to an American PVO in cooperation with an indigenous private agency is the grant of $57,000 thousand to be U.S. YMCA in cooperation with the indigenous Liberia YMCA to conduct a feasibility study for possible rural development of approximately 1,000 access of land owned by the Liberia YMCA in Liberia. The Liberia government is currently building an access road to the property. Technical consultants and local Liberians are collaborating to come up with an acceptable plan of development for this important Liberia project.

FY 1979 Program: As PVO project proposals are approved, A.I.D. will allocate funds to the appropriate country or regional programs. Current estimates by appropriation category utilizing these funds follow:

A.I.D. Financed Inputs:	($ thousands) FY 79
Food and Nutrition	4,099
Health	2,537
Education and Human Resources Development	2,600
Selected Development Activities	900
Total	10,136

U.S. FINANCING (In thousands of dollars)				PRINCIPAL CONTRACTORS OR AGENCIES
	Obligations	Expenditures	Unliquidated	
Through September 30, 1977 A	-	-	-	
Estimated Fiscal Year 1978	6,996	-	-	
Estimated through September 30, 1978	6,996	-	-	
Proposed Fiscal Year 1979	10,136	Future Year Obligations	Estimated Total Cost	To be selected
		-	-	

Prior year obligations and expenditures are reported under individual country programs.

PROGRAM: AFRICA REGIONAL

ACTIVITY DATA SHEET

CP 79 05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Program Development and Support	Various	FY 79: 7,800	LIFE OF PROJECT: -

PROJECT NO. 698-0135	NEW ☐	PRIOR REFERENCE	INITIAL OBLIGATION FY 75	ESTIMATED FINAL OBLIGATION FY Continuing	ESTIMATED COMPLETION DATE OF PROJECT FY Continuing
GRANT ☒ LOAN ☐	CONTINUING ☒	FY 78 Africa Program, p. 254			

Purpose: This project enables A.I.D. to obtain the technical expertise and ancillary goods and services needed to develop and design projects and to undertake studies and analyses on which to base program strategies and project designs. More specifically, this project provides a mechanism for financing (1) special analyses related to development of sector and country program strategies; (2) feasibility studies; (3) project development and design activities; (4) assessments of the environmental and social impact of proposed activities; (5) evaluations of project activities; and (6) analyses and research related to specific problems affecting development efforts. The project on occasion is also used to finance selective technical assistance in priority development areas of particular interest to A.I.D., where such assistance cannot be closely identified with ongoing projects.

The individual activities most frequently undertaken within the framework of this project are related to planning and project design and involve financing of the services of short-term consultants and other associated study and project development costs. In selected cases, financing of consultants, with provision for supporting services, for assignments up to two years may be undertaken. For the purposes described above, A.I.D. may utilize the services of various U.S. firms or institutions through contractual arrangements or the services of personnel from other U.S. government agencies through Participating Agency Service Agreements.

While this project for the financing of studies, analyses and project design efforts is presented on a region-wide basis for Africa, the individual project activities stemming from these undertakings are described and presented for financing under the separate country or sub-regional sections of the presentation. For new FY 78 and FY 79 projects included under those sections for which final design or related studies must be completed prior to implementation, this project will provide the means for financing the services and related costs necessary to complete these efforts. Preliminary studies will also be financed hereunder which relate to project activities that may be proposed for FY 80 or subsequent year financing.

FY 1979 Program: The majority of the activities financed under this project are directly related to development of loan and grant activities. The project finances the cost of consultants, including associated expenses and supporting services, to undertake feasibility studies, special analyses and studies, project design efforts, evaluations, surveys, environmental and social assessments, and pre-project development assistance. Limited financing will also be provided for costs of seminar/workshops and conferences for recipient country and U.S. personnel who are involved with the planning, managing and evaluating of A.I.D. activities.

A.I.D. Financed Inputs:

	($ thousands) FY 79
Food and Nutrition	4,200
Health	1,200
Education and Human Resource Development	1,200
Selected Development Activities	1,200
Total	7,800

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	14,272	11,853	2,419
Estimated Fiscal Year 1978	8,150	5,829	
Estimated through September 30, 1978	22,422	17,682	4,740
Proposed Fiscal Year 1979	7,800	Future Year Obligations: -	Estimated Total Cost: -

PRINCIPAL CONTRACTORS OR AGENCIES: Various

PROGRAM: PHILIPPINES

ACTIVITY DATA SHEET

CP 79-05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Nonconventional Energy	Selected Development Activities	FY 79: 5,000	LIFE OF PROJECT: 10,000
NUMBER 492-0294	PRIOR REFERENCE	INITIAL OBLIGATION FY 78	ESTIMATED FINAL OBLIGATION FY 79
GRANT ☐ LOAN ☒	FY 78 Asia Programs p. 200		ESTIMATED COMPLETION DATE OF PROJECT FY 82
NEW ☐ CONTINUING ☒			

Purpose: To develop and apply nonconventional energy sources for use in rural areas.

Background: Ninety-five percent of the fuel currently utilized in the Philippines is imported oil. This situation is causing a serious deterioration in the country's balance of payments. While petroleum is expected to remain the major source of energy through the end of this century, it is urgent that alternative energy sources be developed, particularly for rural areas. The Government of the Philippines has established a Department of Energy (DOE) with broad responsibility for the development of both new energy sources and conservation programs to ensure the most efficient use of all energy. While the DOE will focus on continued development petroleum hydro, and geothermal resources, similar attention will be given to nonconventional and renewable resources will also demand their attention. A specific division of the DOE is charged with the responsibility of exploring the possibility of utilizing existing technologies in nonconventional areas to supply a portion of the country's energy needs. Non-conventional energy sources are particularly adaptable to rural areas.

Host Country and Other Donors: The GOP will seek to obtain research and training grants from other international agencies such as the UNDP and UNESCO and/or private foundations. While the funding level proposed under the A.I.D. loan will be adequate to support the project during the initial four years, a continuation of the program, which is deemed essential to the full realization of the benefits anticipated, will require commitments from other donors. The GOP contribution to the initial project is estimated at $3.67 million equivalent in pesos.

FY 1979 Program: A total of $5 million is requested to finance the foreign exchange costs of procurement of special equipment and instruments for the development of prototype cooling, heating and drying units utilizing solar distillation units; development of the Photovoltaic system for use in communications; construction of bio-gas and bio-conversion units; development of a small scale generating plant to be fueled from an energy plantation; further study of wind and ocean thermal gradients; consulting services and training.

Beneficiaries: Since this project concentrates on development and testing of small-scale prototypes, the actual number of beneficiaries affected will be relatively small. At this time, it is not known how many prototypes will be put into operation and in which areas, thus making it impossible to calculate a per family cost. The ultimate beneficiaries will be those rural residents living outside the existing electricity grids and/or individuals for whom use of conventional energy is either too expensive or inappropriate for certain tasks.

Major Outputs: Small-Scale Prototype units and pilot projects utilizing energy from renewable resources.

A.I.D.-Financed Inputs:

	($ thousands) FY 79
Consulting Services	75
Participant Training	50
Commodities	4,875
Total	$5,000

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	5,000	500	-
Estimated through September 30, 1978	5,000	500	
Proposed Fiscal Year 1979	5,000	Future Year Obligations: -	Estimated Total Cost: 10,000

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected.

PROGRAM: INDONESIA

ACTIVITY DATA SHEET

CP 79-..

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Science and Technology Practical Applications for Development	Selected Development Activities	FY 79 500	LIFE OF PROJECT 6,500 — 5,000 Loan, 1,500 Grant
NUMBER 497-0266 GRANT [x] LOAN [x]	NEW [ ] CONTINUING [x]	PRIOR REFERENCE FY 78 Asia Programs, p. 196	INITIAL OBLIGATION FY 77 / ESTIMATED FINAL OBLIGATION FY 81 / ESTIMATED COMPLETION DATE OF PROJECT FY 82

Purpose: To develop an indigenous capacity in selected scientific and technical institutions in Indonesia to plan and conduct research and development activities that will provide the basis for increased productivity and income to improve the quality of life of Indonesia's poor.

Background and Progress to Date: The Indonesian Government (GOI) has created over 150 research, engineering and service institutes to adapt and improvise technology which is most relevant to Indonesia's development. In FY 1977 A.I.D. was requested to assist in strengthening the existing system of institutions. They had been found lacking in capacity to translate goals into workable policies and programs. In cooperation with the GOI Minister of State for Research a project was developed composed of sub-activities dealing with applied research. These sub-projects are designed to enhance institutional capacity to apply science and technology to problems endemic in rural areas. Sub-project areas include alternative energy sources, aquatic resources development, quality control and standards for small labor-intensive industries, and research development policy.

Host Country and Other Donors: The GOI will contribute more than $2 million, in rupiah or in-kind, toward the total cost of this five-year undertaking.

FY 1979 Program: $500,000 in grant funds are proposed to finance short-term consultant services, and training of participants.

Beneficiaries: Beneficiaries will be Indonesia's rural poor whose well being will be improved by such activities as: 1) research applied to producing cheaper energy through methane or pyrolitic conversion; 2) providing better weather forecasts to enable fishermen and farmers to increase yields, and 3) creating at least 100,000 new jobs through the creation and expansion of small rural industries, such as batik and other textile production, clothing, leather and wood crafts, and local building materials.

Major Output:

	All Years
- Research studies completed	5
- Major scientific and technology policies established	3-5
- Technologies demonstrated	5
- Participants trained abroad	30-80
- Short term in-country training completed	400

A.I.D. Financed Inputs:

	($ thousands) FY 79
Technical Assistance (5 person-years)	400
Participant Training (125 person-months)	100
Total	500

*FY 1977 loan of $5 million authorized 9/21/77 but not obligated a/o 11/15/77.

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	5,000*	-	5,000
Estimated Fiscal Year 1978	600	500	
Estimated through September 30, 1978	600	500	5,100
Proposed Fiscal Year 1979	500	Future Year Obligations 400	Estimated Total Cost 6,500

PRINCIPAL CONTRACTORS OR AGENCIES

- National Academy of Science
- Denver Research Institute, University of Denver
- U.S. Geological Survey

PROGRAM: HAITI

ACTIVITY DATA SHEET

CP-79-05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Appropriate Technology	Selected Development Activities	FY 79: 490	LIFE OF PROJECT: 1,332
NUMBER: 521-0095	PRIOR REFERENCE: FY 78	INITIAL OBLIGATION FY: 79	ESTIMATED FINAL OBLIGATION FY: 81
GRANT [X] LOAN [ ]	Latin American Programs, p. 150	NEW [ ] CONTINUING [X]	ESTIMATED COMPLETION DATE OF PROJECT FY: 81

Purpose: This project will strengthen the ability of the Government's Conseil National de Development et de Planification (CONADEP) Office of Science and Technology (OST) to identify, site-adapt and introduce simple improved technological prototypes appropriate to the needs of Haiti's poor.

Background: Haiti, as one of the world's least developed countries, is anxious to benefit from the transfer of technology. The Government of Haiti (GOH) desires to select those kinds and levels of technology that will be most helpful to the rural population by involving small amounts of capital and large numbers of workers. Possible technologies identified for adaptation and introduction include windmills for electricity and pumping, use of solar energy for cooking and other purposes, recycling of agriculture water, and the development of locally-made simple tools and implements. This grant will provide technical assistance to the OST and establish an Appropriate Technology Center for selection and testing of technology prototypes for transfer to the rural communities.

Host Country and Other Donors: The GOH will contribute $345,800 for salaries and general support over the life of the project. The private and voluntary organizations in Haiti are expected to aid in the testing and dissemination of the prototypes.

FY 1979 Program: Technical assistance will be provided to OST to develop and test energy-producing prototypes and water recycling and tool production systems.

Beneficiaries: Technologies will provide the rural poor with cheaper energy sources for cooking, safer and more dependable supplies of water, and the means of increasing their income through increased production.

Major Outputs:	Cumulative All Years
Prototypes produced and ready for testing (number)	18

A.I.D. Financed Inputs:	($ thousands) FY 79
Long and short-term consultants (78 pms)	390
Commodities, vehicles, etc.	77
Training and evaluation	23
Total	490

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	623	280	
Estimated through September 30, 1978	623	280	253
Proposed Fiscal Year 1979	490	Future Year Obligations: 219	Estimated Total Cost: 1,332

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected

PROGRAM: HAITI

ACTIVITY DATA SHEET

CP 79-8

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)		
Environmental Preservation	Food and Nutrition	FY 79: 2,641		LIFE OF PROJECT: 7,165
NUMBER 521-0096	PRIOR REFERENCE	INITIAL OBLIGATION FY 79	ESTIMATED FINAL OBLIGATION FY 82	ESTIMATED COMPLETION DATE OF PROJECT FY 83
GRANT [X] LOAN [ ]	None			
NEW [X] CONTINUING [ ]				

Purpose: To assist Haiti in designing and executing agricultural development projects involving small farmers in mountain areas which preserve the fragile resource base in these areas.

Background: A population density of more than 1000 inhabitants per square mile of cultivable land, coupled with the limited amount of land appropriate for intensive food production, means that most of the 600,000 farm holdings in the country are located on slopes which are only suited for production of tree crops, grazing, and watershed protection. Many of these slopes are of necessity farmed intensively by their occupants with clean-tilled food crops such as cereal grains. Furthermore, the need for charcoal has resulted in removal of much of the natural cover from great expanses of hill land. These destructive agricultural practices have resulted in low water holding capacity of the land, excessive run-off, high rates of sheet and gully erosion, clogged streams, and damaged valley lands. Continuing erosion has seriously affected food production and jeopardizes the long-run capacity of Haiti to support its people. This project is designed to give the Department of Agriculture, Natural Resources, and Rural Development (DARNDR) the capacity to plan, develop, and implement agricultural production systems for these areas which maintain the productive capability of the land over the long term by preserving the natural resource base.

Host Country and Other Donors: It is expected that the Government of Haiti and community groups will contribute a significant percentage of the total project cost. The Inter-American Institute of Agricultural Science (IICA) has strengthened the technical input into the research phase of the project.

FY 1979 Program: The first two years of the project will concentrate on special studies, including a survey of hill agricultural techniques and the collection of baseline data. In 1979, A.I.D. assistance will consist of a full time agronomist and conservationist, short term consultants and training of DARNDR technicians. Major field operations will commence in the second year of the project and will involve the construction of 30,000 hectares of conservation structures and terraces during the life of the project.

Beneficiaries: Hill farmers--whose per capita annual income of $80 is substantially lower than the national average--will be benefited directly through an improved standard of living and by being provided with the means of maintaining that standard of living in future years. Farmers in the valleys below the treated watershed areas will benefit from the decreased flooding of their fields and siltation of irrigation works.

Major Outputs	Cumulative All Years
Completed studies in specific fields	-
Program of adaptive research implemented by DARNDR	1
Package of tree crops practices developed, tested and extended	1
DARNDR capacity established	1
Watershed restorations (number of hectares)	
Major Improvement ($250 per hectare)	30,000
Minor Improvement ($100 per hectare)	2.000

A.I.D. Financed Inputs:	($ thousands) FY 79
Technical Assistance (200 pms)	1,000
Training	125
Commodities	516
Other Costs:	
Special studies, evaluation and misc.	150
Local Labor for conservation structures	550
Ag. Credit Fund	200
Construction	100
Total	2,641

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	-	-	-
Estimated through September 30, 1978	-	-	-
Proposed Fiscal Year 1979	2,641	Future Year Obligations 4,524	Estimated Total Cost 7,165

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected.

PROGRAM: PERU

ACTIVITY DATA SHEET

CP 79.05

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Appropriate Rural Technologies	Food and Nutrition	FY 79 445	LIFE OF PROJECT 1,276
NUMBER 527-0162 GRANT ☒ LOAN ☐ NEW ☐ CONTINUING ☒	PRIOR REFERENCE FY 78 Latin America Programs, P. 270	INITIAL OBLIGATION FY 78	ESTIMATED FINAL OBLIGATION FY 81 / ESTIMATED COMPLETION DATE OF PROJECT FY 82

Purpose: To develop low-cost alternative agriculture and agro-industrial technologies to address problems of low productivity, underemployment, and disadvantageous marketing arrangements faced by the rural poor.

Background: In the past seven years Peru has carried out extensive social and economic reforms to increase incomes among the poor. In the sierra, however, conditions have remained relatively static. Among the principal constraints are the lack of (a) new on-farm technologies which would permit farmers to take fuller advantage of their limited land base; and (b) new off-farm technologies which would increase value added and provide greater opportunities for non-agricultural employment. This project will help develop Government of Peru (GOP) institutional capability to test new employment and income generating technologies with particular emphasis on the needs of the sierra poor. These include: development of low-cost farm implements; demonstration plots for double cropping on different types of soil; experimentation in tanning and production of furs and skins; products derived from maguey cactus; simple technologies to improve post-harvest storage, preservation, and processing of perishables produced in rural areas; improvement of ceramics technology; small scale artisan textile technologies, improved utilization of natural energies, including wind, water, temperature differences and sun; and low-cost construction materials for use in rural shelters and sanitation facilities. The Institute of Industrial and Technical Investigation (ITINTEC) will be the primary GOP coordinating body.

Host Country and Other Donors: The GOP will contribute $700,000 to help finance research and development costs, equipment, field testing and evaluation. The Swiss Government is planning to assist ITINTEC in the development of a vocational training center which will provide a pool of semi-skilled people. The International Potato Center (CIP) is developing dehydration processes for potatoes and other vegetables which can be adapted to various small agro-industrial enterprises identified under this project.

FY 1979 Program: Technical assistance will be provided to strengthen ITINTEC's capabilities to carry out appropriate technology programs. Feasibility studies will be completed. Prototype equipment will be developed and various technologies will be demonstrated. Working models of at least three new technologies will be tested and demonstrated.

Beneficiaries: Several thousand sierra poor (small farmers, landless rural workers, members of co-ops, women employed in rural cottage industries) will benefit directly from the project. As new technologies are increasingly adopted in the sierra the ultimate number of beneficiaries will be in the tens of thousands.

Major Outputs:

	Cumulative All Years
Prefeasibility studies completed	20
Feasibility studies completed	15
Research and development studies including demonstrated application of "new" technologies	6
Improved Institutional Capacity within ITINTEC	

A.I.D. Financed Inputs:

	($thousands) FY 79
Technical Assistance	80
Feasibility Studies	149
Working Models of new technologies (including prototype equipment)	135
Field Testing and Evaluation	25
Equipment, materials and supplies	32
Reports and administration services	23
Total	445

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	300	191	
Estimated through September 30, 1978	300	191	109
Proposed Fiscal Year 1979	445	Future Year Obligations 531	Estimated Total Cost 1,276

PRINCIPAL CONTRACTORS OR AGENCIES

To Be Selected

PROGRAM: TUNISIA (COT)

ACTIVITY DATA SHEET

CP 79

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Science and Technology Development - Phase II	Selected Development Activities	FY 79 550	LIFE OF PROJECT 2,000
NUMBER 664-0315 GRANT [X] LOAN [ ] NEW [X] CONTINUING [ ]	PRIOR REFERENCE None	INITIAL OBLIGATION FY 79	ESTIMATED FINAL OBLIGATION FY 81 / ESTIMATED COMPLETION DATE OF PROJECT FY 81

Purpose: To increase access of the Tunisian science and technology community to appropriate U.S. technology.

Background: Under the first phase of this project, activities are being carried out in the areas of systems analysis, computer technology, remote sensing, petroleum technology, and pollution control. Except for petroleum technology, which consists solely of U.S. training, each involves both U.S. and in-country training, the latter by short-term U.S. advisors. Each activity is being evaluated to assess its suitability for inclusion in this follow-on project to begin in late FY 79. In addition, investigation is underway of such new activities as solar and wind energy applications for inclusion in the second phase. Particular attention is being devoted to encouraging GOT efforts to create or designate a single institution to coordinate national scientific and technical activities.

Host Country and Other Donors: The GOT will provide technical and administrative staff, facilities, base equipment and support costs related to the operation and management of all components of this project. The UNDP is providing technical assistance in areas which complement A.I.D. inputs.

FY 1979 Program: Following evaluation of first-phase programs, consultant services and training will be initiated or continued, as appropriate, in support of output targets.

Beneficiaries: This project will increase the access of Tunisia's scientific and technical community to the means of increasing its contribution to national development. An intermediate beneficiary group will be government administrators who will be provided with tools for better management of development programs. The ultimate beneficiaries will be all elements of the population which derive economic and social benefits from the use of improved technology for problem-solving. Project emphasis on administrative decentralization, agricultural management and pollution control is designed to insure that the poor majority toward whom Tunisia's development plan is targeted share fully in the project's benefit

Major Outputs:

1. Application of systems analysis/operations research and computer techniques to decentralization and other government management priorities.

2. Application by Ministry of Agriculture of remote sensing techniques to crop forecasting, climatology, locust control, etc.

3. Studies undertaken of pollution problems in Gabes area and feasibility studies completed for the location of similar laboratories in other areas of industrial expansion.

4. Experimental program using renewable energy sources undertaken in rural areas.

5. Identification of new or expanded areas of U.S.-Tunisian scientific cooperation with application to Tunisian developmental programs.

A.I.D. Financed Inputs:

	($ thousands) FY 79
Short-term consultants (45 person-months)	360
U.S. participant training (60 person-months)	120
Lab and other equipment, books, and training aids	50
Local support costs	20
Total	550

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	-	-	-
Estimated Fiscal Year 1978	-	-	-
Estimated through September 30, 1978	-	-	-
Proposed Fiscal Year 1979	550	Future Year Obligations 1,450	Estimated Total Cost 2,000

PRINCIPAL CONTRACTORS OR AGENCIES

To be selected.

PROGRAM: YEMEN ARAB REPUBLIC

ACTIVITY DATA SHEET

CP 79-01

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)		
Appropriate Village Technology	Food and Nutrition	FY 79: 955	LIFE OF PROJECT: 1,600	
NUMBER: 279-0046 GRANT [X] LOAN [ ]	NEW [X] CONTINUING [ ]	PRIOR REFERENCE: None	INITIAL OBLIGATION FY 79	ESTIMATED FINAL OBLIGATION FY 81
				ESTIMATED COMPLETION DATE OF PROJECT FY 81

Purpose: To develop appropriate technologies for use in rural households and villages in such areas as improved food storage and processing, sanitation, and energy use.

Background: There is now little attention in Yemen given to improving the quality of life of rural people by identifying and extending appropriate village technologies. Significant potential exists for improvement in household food storage (where estimates of losses run as high as 25%), sanitation, energy (through conservation and identification of alternative energy sources) and for the reduction of menial labor requirements (e.g., grain threshing and grinding, carrying water).

Yemen's labor costs are high because of outmigration. At the same time, the flow of remittances back to Yemen make local investment in technology possible. This project is designed to identify village/farm problems and constraints to the development of appropriate technology, develop and introduce implements to increase the productivity of peasants and small farmers, and evaluate and test other appropriate technologies at the village level. The project will also focus on institutionalizing an ongoing village technology research and development effort. Recommended technologies would be turned over to the private sector for either import or local production and in-country marketing.

Host Country and Other Donors: The Yemen Government will provide counterpart staff and trainees, workshop facilities, and assistance with demonstrations. Other donors involved with mechanization--the Dutch, British, and West Germans--will assist in development and extension of improved technology.

FY 1979 Program: Baseline surveys, a technology inventory, and initial experimentation will begin under an institutional contract for technical services.

Beneficiaries: The major focus of the project will be on technologies designed to reduce inefficient menial labor demands on small farmers, peasants, and women in order to increase their productivity and well being. The number of beneficiaries and the A.I.D. cost per beneficiary cannot yet be computed.

Major Outputs:	All Years
Sector technology surveys (food, water/sanitation/energy)	3
Feasibility/alternative technology identification studies	7
Prototypes developed and tested	18
Pilot demonstrations in rural areas	12
Design packages to private industry	

A.I.D. Financed Inputs:	($ thousands) FY 79
Institutional contract	
Two technicians (24 pm)	300
Short-term consultants (20 pm)	125
Commodities (prototype equipment, vehicles)	400
Local costs (pilot testing and demonstration)	130
Total	955

U.S. FINANCING (In thousands of dollars)				PRINCIPAL CONTRACTORS OR AGENCIES
	Obligations	Expenditures	Unliquidated	
Through September 30, 1977				To be selected.
Estimated Fiscal Year 1978				
Estimated through September 30, 1978				
Proposed Fiscal Year 1979	955	Future Year Obligations: 645	Estimated Total Cost: 1,600	

PROGRAM: CENTRALLY FUNDED

ACTIVITY DATA SHEET

C.P. 0.01

TITLE	FUNDS	PROPOSED OBLIGATION (In thousands of dollars)	
Energy	Selected Development Activities	FY 79 3,575	LIFE OF PROJECT Open
NUMBER 931-5035 GRANT [X] LOAN [ ] NEW [ ] CONTINUING [X]	PRIOR REFERENCE FY 78 Interregional Programs, p. 77	INITIAL OBLIGATION FY 76	ESTIMATED FINAL OBLIGATION FY Open / ESTIMATED COMPLETION DATE OF PROJECT FY Open

Purpose: To help developing countries identify and resolve energy problems, particularly rural energy problems.

Background and Progress to Date: This project has four interrelated elements: (1) studies of energy needs in development; (2) efforts to strengthen LDCs abilities to analyze needs and manage energy programs; (3) field demonstrations of appropriate energy technologies; and (4) technical advice and support to A.I.D. missions. The focus of these elements is on the energy needs and resources of the poor.

An activity began in 1976 to analyze the energy needs in the food systems in four countries. An analysis in Senegal began in 1977. Field tests have been completed of promising energy technologies for use in the food system. In Nepal, 15 technicians were trained in methane generation from animal wastes and prototype units were constructed in four locations. Prototype solar cookers were developed for field testing in Haiti, and a field demonstration of solar cells to power water pumps and grain grinders was initiated in Upper Volta.

In 1978, 110 developing country decision makers will be trained in energy assessment/management and national policy formulation. A method has been developed to help A.I.D. countries fit rural energy needs into an analysis of their national energy needs. Training curriculum and selection of twenty participants have been completed.

Field demonstrations are underway of small-scale renewable energy technologies for a variety of development settings, such as medical posts, nutrition centers and small farms. The Department of Energy and other contractors are augmenting A.I.D.'s ability to respond to A.I.D. mission requests for technical advisory services.

Two Congressionally legislated studies, due in 1978, will describe first, energy needs, uses and resources in developing countries and second, the organizational options for a United States energy assistance program.

Other Donors: No formal coordination exists but periodic discussions among officials of the World Bank and specialized UN agencies promote awareness and reduce duplication of efforts.

FY 1979 Program: Technical advice to A.I.D. missions on energy problems will be expanded. Field tests, demonstrations and feasibility studies of appropriate energy technologies will continue. A method to analyze national energy needs will be tested in four countries; one will be selected from each A.I.D. assisted geographic region.

Beneficiaries: Emphasis is on programs and research which assist the rural poor in A.I.D. countries.

Major Outputs: Descriptions of energy resources and needs in development for up to eight countries. A tested course for developing country participants in forming national energy policy with emphasis on rural energy needs. Field-proven renewable energy technologies for use in development projects.

A.I.D. Financed Inputs:

	($ thousands) FY 79
R&D Grants & Contracts	3,150
Professional Services	425
Total	3,575

U.S. FINANCING (In thousands of dollars)

	Obligations	Expenditures	Unliquidated
Through September 30, 1977	1,420	363	1,057
Estimated Fiscal Year 1978	1,330	540	
Estimated through September 30, 1978	2,750	903	1,847
		Future Year Obligations	Estimated Total Cost
Proposed Fiscal Year 1979	3,575	Open	Open

PRINCIPAL CONTRACTORS OR AGENCIES

Peace Corps
NASA
Department of Energy
Brookhaven National Laboratory
Florida Institute of Technology
Georgia Institute of Technology

APPENDIX C

DOE TECHNICAL COOPERATION AGREEMENTS IN SOLAR ENERGY

2.1 Committee on the Challenges of Modern Society

2.1.1 Introduction

The NATO Committee on the Challenges of Modern Society (CCMS) was founded in 1969 to respond to complex technological and environmental problems facing industrialized societies. The CCMS became an effective mechanism for identifying these challenges and establishing cooperative programs which promote the sharing of efforts and resources to respond to various problems.

As early as 1973, CCMS recognized the need to meet the dual imperatives of alternative energy development and energy conservation. CCMS was the first international organization to initiate cooperative projects in solar energy, geothermal energy, and rational uses of energy.

It was agreed that the scope of the CCMS solar energy program would be limited to solar heating and cooling systems for buildings. Since space heating, cooling, and domestic hot water supply needs are responsible for a large proportion of the energy consumed in industrialized nations, any significant use of solar energy in place of fossil fuels in the buildings sector could have an important impact on international energy patterns.

The IEA, however, is now considered the focus of our international energy R&D cooperation and solar projects in CCMS are considered as candidates for transfer to IEA upon completion of the pilot stage. An exception will be made for information exchange activities, especially regional activities, that do not involve the U.S.

2.1.2 Solar Energy Pilot Study - Summary

Initiated: Fall of 1973. Memorandum of Understanding became effective July 1, 1975.

Participants: Australia, Belgium, Canada, Denmark, France, Federal Republic of Germany (FRG), Greece, Israel, Italy, Jamaica, Netherlands, New Zealand, Spain, United Kingdom (U.K.) and the United States (U.S.). Eight additional countries, plus the European Commission, participate as observers.

Objective: Encourage the cost-effective and practical application of solar energy to heating and cooling in residential, commercial, industrial, agricultural, and public buildings.

Scope: This agreement calls for work in the following areas:

- Exchange of information on national solar heating and cooling programs, and
- Exchange of information on solar system and subsystem experiments

Costs: Each country bears own costs. U.S. has spent $270,000.

Term: Five years with a 2-year follow up period

Activities:

- Developed CCMS Reporting Format,
- Sponsored International Solar Energy Conference on Performance of Solar Heating and Cooling Systems,
- Prepared 28 system performance reports,
- Held four annual meetings,
- Formed Zero Energy House group to exchange information on solar assisted minimum energy dwellings for Northern European-type climates,
- Formed the Mediterranean Applications group to study passive heating and cooling systems for Mediterranean-type climates, and
- Exchanged 60 reports on a variety of solar heating and cooling topics.

Benefits:

- Standardized format for the reporting of solar heating and cooling systems and subsystems performances data has provided guidelines for precise and complete reporting of essential data. Exchange of such performance reports among participating countries serves to augment R&D activities by sharing experimental results and avoiding duplication of effort. Utilization requires authors to conduct a coherent review of all aspects of instrumentation and performance in their own systems. The U.S. Solar Heating and Cooling Demonstration Program has since based its system performance reports on the CCMS format.

- Reports on national solar heating and cooling programs have enabled participants to compare their own national programs to those of other countries and to identify areas in which their programs could be strengthened. The reports also have enabled participants to identify areas suitable for bilateral or multilateral cooperation.

- Information exchange has been successfully expanded into specialized areas of solar heating and cooling, notably with respect to solar-assisted, minimum energy dwellings for Northern European climates (Zero Energy House Group).

- The Mediterranean Applications group has provided a forum for concerted efforts in passive heating and cooling systems and for adapting traditional regional architectural forms to both passive and active systems.

- The CCMS-sponsored International Solar Energy Conference on Performance of Solar Heating and Cooling Systems provided the opportunity for 10 Pilot Study countries to deliver presentations to over 200 attendees.

- A network of contacts in government, research institutions and industry in over 20 countries has been developed.

- Information exchange has enabled the U.S. to learn which applications of solar heating and cooling technology might be most fruitful for market penetration by the U.S. solar industry.

Problem Areas:

- The Memorandum of Understanding (MOU) which established the framework of the CCMS agreement contains no reference to financial and/or manpower commitments on the part of the signatories. This has resulted in a minimal level of participation by some countries.

Comments:

- Continuation of a number of the pilot study's successful cooperative activities will be undertaken by transferring those activities to the auspices of another international organization, such as the IEA, or by simply continuing those activities within the framework of the MOU.

2.2 Solar Agreements Under the International Energy Agency

2.2.1 Introduction

The IEA was established to implement the International Energy Program (IEP) adopted by the participating countries on November 18, 1974, the basic objectives of which are: (i) to take measures to meet oil supply emergencies; (ii) to reduce dependence on imported oil by undertaking long-term cooperative efforts on conservation of energy, on accelerated development of alternative sources of energy, and on research, development, and demonstration in the energy field; and (iii) to promote cooperative relations with oil-producing countries and other oil-consuming countries, including those of the developing world, through a purposeful dialogue. Within the context of the Agency's Long Term Co-operation Program, the participating countries have agreed to carry out national programs of energy research, development, and demonstration (as may be agreed upon by some or all of them) to undertake cooperative activities including jointly financed programs and projects in energy research and development.

In further support of this cooperation, the participating countries have agreed to develop and implement, as appropriate, a strategy for research and development. This strategy will be closely linked to and coordinated with the other parts of the Agency's Long Term Program. It will identify major new energy sources and conservation possibilities, explore their potential energy contribution and probable timescale of commercial implementation, define technological options, and identify possible new areas of fruitful cooperation.

The IEA's energy research, development and demonstration activities are to:

- o Develop a strategy for energy R&D,
- o Foster effective national programs of energy R&D, and
- o Undertake cooperative energy research, development, and demonstration projects in high-priority areas.

Seven agreements sponsored by the IEA are discussed in this section. These agreements provide for:

- o A Program to Develop and Test Solar Heating and Cooling Systems (Section 2.2.2),
- o A Program of R&D on Wind Energy Conversion Systems (Section 2.2.3),
- o Large-Scale Wind Energy Conversion Systems (Section 2.2.4),
- o Establishment of a Project on Small Solar Power Systems (Section 2.2.5),
- o A Program of Research, Development and Demonstration of Forestry Energy (Section 2.2.6),
- o A Program of R&D on Wave Power (Section 2.2.7), and
- o Establishment of the Biomass Conversion Technical Information Service (Section 2.2.8).

2.2.2 Implementing Agreement for a Program to Develop and Test Solar Heating and Cooling Systems - Summary

2.2.2.1 Summary

Signed: December 1976

Participants: Austria, Belgium, Canada, Denmark, EEC, FRG, Greece, Italy, Japan, Netherlands, New Zealand, Spain, Sweden, Switzerland, the U.K., U.S.

Objective: To gain data through exchange of information and cooperative R&D on solar heating and cooling systems and related meteorological data.

Scope: Specific tasks are outlined in five annexes to the Agreement:

Annex I - Investigation of performance of solar heating and cooling systems,

Annex II - Coordination of R&D on heating and cooling components,

Annex III - Performance testing of solar collectors,

Annex IV - Development of insulator handbook and instrumentation package.

Annex V - Use of existing meteorological information for solar energy applications.

Costs: Each country bears own costs. Administrative and technical costs of U.S. are approximately $112,000.

Term: Three years

Activities:

- Annex I activities - standardization of evaluation, measurement, and optimization procedures - will be completed by the end of 1978.
- Under Annex II, each of the 12 participants have exchanged summaries of their national R&D plans for solar heating and cooling components and summaries of current projects.
- Half of the collected tests specified under Annex III have been completed and overall evaluation has begun.

- Under Annex IV, a draft of the insolation handbook has been prepared and is now being reviewed. Publication is scheduled for Spring 1979. Specifications for the instrument package have been completed, and several countries are building and testing devices.

- Under Annex V, a catalogue of data sources is being prepared, along with a handbook for estimating solar radiation.

- Two additional projects are under consideration: validation of simulation programs for solar heating and cooling systems and performance testing of solar heating, cooling, and hot water systems using evacuated tubular collectors.

Benefits:

- Standardization of evaluation, measurement, and economic optimization procedures should aid in increasing cost-effectiveness of solar heating, cooling and hot water supply systems, thereby enhancing potential for increased use of solar energy in all participating countries. Increased cost-effectiveness is a major goal of U.S. solar heating and cooling programs.

- Exchange and review of national solar heating and cooling R&D program summaries of all participants provide systems development information from participating countries which are currently among the leaders in solar heating and cooling R&D, such as Japan and Germany. This is significant to U.S. solar cooling technology development which has lagged behind other technologies in U.S. R&D, and can benefit from significant work being done in other countries, such as Japan.

- Development of standard testing procedures for solar collectors provided the data necessary for system design and system performance prediction and will establish a basis for reliability and durability tests. Establishment of these international solar collector testing procedures ensures that higher quality solar equipment is available in international markets and enhances competition in those markets.

- Development of a standardized international insolation handbook with instrumentation package provides an increased understanding of insolation and related weather factors necessary for optimal use of solar energy utilizing standardized measurement methods.

- Catalogue of existing sources of meteorological data, along with a handbook of estimation methods and the development of uniform presentation methods for meteorological data will enhance efforts at optimal solar heating and cooling system design for various regions of the world and give the participating countries equal access to this information.

2.2.3 Implementing Agreement for a Program of Research and Development on Wind Energy Conversion Systems - Summary

Signed: October 6, 1977

Participants: Austria, Canada, Denmark, Germany, Ireland, Netherlands, New Zealand, Sweden, U.S., Japan (joined April 1978)

Objective: Promote cooperative RD&D and information exchange regarding wind energy conversion systems.

Scope: R&D efforts and information exchange are organized into four areas, outlined by tasks and subtasks in separate annexes. Each annex is signed as a separate agreement.

- Annex I - Environmental and Meteorological Aspects of Wind Energy Conversion Systems. Signed by all parties; lead: Sweden.
- Annex II - Evaluation of Models for Wind Energy Siting. Signed by Canada, Sweden, U.S., Japan; lead: U.S.
- Annex III - Integration of Wind Power into National Electricity Supply System. Signed by FRG, Netherlands, Sweden, U.S., Japan; lead: FRG.
- Annex IV - Investigation of Rotor Stressing and Smoothness of Operation of Large-Scale Wind Energy Conversion Systems. Signed by Denmark, FRG, Netherlands, Sweden, U.S., Japan; lead: FRG.

Costs: Total: $960,000; U.S. share: $214,000

Annex I-
Total cost: $258,000 (through 12/78)
$ 97,000 (est. calendar '79)
$ 10,000 (est. calendar '80)

Annex II-
No transfer of funds. Estimate two person-years per participant.

Annex III-
$209,193 (through 12/78)
$ 44,229 (est. calendar '79)

Annex IV-
$ 25,798 (through 12/78)
$146,712 (est. calendar '79)

Term: Initial term - 3 years.

Activities:

- o U.S. has designated Battelle Pacific Northwest Lab to carry out computer model evaluations specified in Annex II. A draft plan has been completed. Letters have been sent to participants inviting descriptions of computer models for site screening and data sets that can be used in verification. Final program of work will be approved at a July 1978 meeting of participants.

- o The FRG sponsored the first experts' meeting under the agreement to discuss substance of Annexes III and IV. Meeting was held June 8, 1978 at the University of Stuttgart. Information on economic modeling of utility interface was exchanged. Preliminary findings on techniques for reducing cyclic stresses in blades were discussed.

Benefits:

- o Information on aerodynamic interaction of multiple wind systems,

- o Access to wind/biomass test results (U.S. had not planned combined testing),

- o Independent validation of computer models,

- o Information on parallel research tools,

- o Confirmatory information on U.S. experiments,

- o Access to extensive European experience in wind energy systems,

- o Opportunity for U.S. to spot "holes" in domestic program,

- o Confirmation of preferred U.S. approaches and methods,

- o Cost reductions due to Japanese participation, and

- o Product demonstration, an important contribution to the early commercialization phase for wind power.

2.2.4 Implementing Agreement on Large Scale Wind Energy Conversion Systems - Summary

Signed: October 6, 1977

Participants: U.S., Denmark, FRG, Sweden

Objective: Further development of large scale wind energy systems.

Scope: Parties will undertake national projects on design, construction, or operation of at least one LS-WEC with a rated power of 1 MWe or more. Technical information and test result data will be exchanged. Information will be exchanged on national programs, program planning, and R&D.

Costs: No transfer of funds.

Term: Two years initially.

Activities:

- o U.S. has selected a contractor to perform the final design and fabrication of a 1.5 MW wind turbine with a 65-meter rotor diameter. A turbine with a 100-meter diameter rotor is in the early design stage.
- o Sweden anticipates construction of three turbines of approximately 3 MW.
- o Germany is designing and constructing a 3 MW turbine. The design will be completed in 1978.
- o Denmark is constructing three experimental turbines of about 0.6 MW. Construction began in 1977 and will continue through 1978.
- o Sweden and Germany have signed a separate agreement to share costs of each of their experimental machines, both owning complete rights to each machine.

Benefits:

- o Acceleration of development of technological improvements in rotor designs for megawatt output machines,
- o Testing of horizontal-axis machines,
- o Information on R&D for vertical axis machines (notably the Darrieus rotor),

- o Opportunity to evaluate results of a variety of rotor configurations in varied environments at small cost, and
- o Internationalization of domestic projects.

Comments: While there is an apparent opportunity for competition, experience has shown that machines most likely will be bought from neighboring countries because of parts replacement and maintenance considerations.

2.2.5 Implementing Agreement on the Establishment of a Project on Small Solar Power Systems - Summary

Signed: October 6, 1977

Participants: Austria, Belgium, FRG, Greece, Italy, Spain, Sweden, Switzerland, U.S.

Objective: Design, construct, test, operate, and comparatively evaluate two dissimilar types of solar power plants, each of similar electrical output (500 kWe), adjacent to each other on a site to be determined in the Province of Almeria, Spain.

Scope: Cooperative planning, budgeting, construction, and operation.

Costs: Total cost: Design phase - $1 million; U.S. share: $220,000

Construction phase - $30-40 million; U.S. share: to be determined

Term: An initial 6 years, extended thereafter by unanimous consent.

Activities:

- Designs of both systems have been frozen in preparation for the mid-term report.

Benefits:

- The central receiver system provided the U.S. with an example of an operating sodium system 2 years earlier than U.S. program plans,
- The distributed field system provided increased exposure for American firms, in particular, the Acurex Corporation,
- Future applications possible in LDCs,
- Groundwork for joint venture commercial possibilities,
- Opportunity to compare different systems for future use in U.S., and
- Additional access to Italian experience in heliostat/central receiver technology.

2.2.6 Implementing Agreement for a Program of Research, Development and Demonstration of Forestry Energy - Summary

Signed: April 13, 1978

Participants: Belgium, Canada, Ireland, Sweden, U.S.
Lead: Sweden

Objective: Cooperate in RD&D and exchange information on forestry energy (short-rotation forestry biomass and forestry residue to produce fuels, petrochemical substitutes, and other energy intensive products).

Scope: Information exchange and proposals for joint RD&D projects on system feasibility studies, growth and production, harvesting/on-site processing/ transportation, and conversion.

Costs: Total: $50,000 (U.S. $10,000)

Term: Initial 3 years

Activities:

- Forestry energy meeting held in February 1978. Four planning groups have been organized:

  1. Growth and production,
  2. Harvesting,
  3. Conversion, and
  4. Systems analysis.

  Each planning group met and reviewed national programs, set tasks, and reported on current research.

- Planning group on growth and harvesting met on April 21 to discuss specification for harvesters for use in short rotation forests.

- Planning group on systems analysis has scheduled a meeting for September 1978 in Ireland.

Benefits: Though this agreement is less than 6 months old, some anticipated benefits include:

- Significant improvements in U.S. biomass data base,

- Lowered costs to U.S. compared to unilateral effort,

- Development of cheaper and more efficient methods of cultivating, harvesting, and transporting biomass feedstocks,

- Development of more economical and reliable technologies for converting biomass to gas oil, char, and other products,
- Access to Finnish experience in short rotation growth,
- Access to Swedish experience in harvesting, and
- Access to Belgium's work with coppice and silex.

2.2.7 IEA Implementing Agreement for a Program of Research and Development on Wave Power - Summary

Signed: April 13, 1978

Participants: Canada, Japan, Great Britain, U.S.
Lead: Japan

Objective: Initiate cooperative RD&D and information exchange on wave power.

Scope: Improve wave power electrical generation by designing and testing wave-power-pumped air-storage using compressed air turbines installed on Japan's "Kaimei" wave-breaking buoy.

Costs: Total: $538,000 (U.S. $160,000)

Term: Initial 3 years

Activities:

- A meeting took place during the week of June 18, 1978 to initiate program planning.

Benefits: Though this agreement is less than 6 months old, some anticipated benefits are:

- Opportunity to test attractive U.S. designed compressed-air turbine,
- Access to Japan's Masuda buoy,
- Opportunity for U.S. to "keep its hand in" technology area at a small cost,
- Access to test results of a variety of systems used by other participants, and
- Small scale testing with parties to the agreement is an essential ingredient of the U.S. program plan.

Comments: Adequate information on the wave power resources near the coast of the continental U.S. is not available. Based on results of the experiments in this agreement and the determination that adequate resources exist, construction of a 500 kW wave unit will be considered.

2.2.8 Implementing Agreement for the Establishment of the Biomass Conversion Technical Information Service - Summary

Signed: May 24, 1978

Participants: U.S., Sweden, Ireland

Objective: Collect scientific and technical data related to RD&D in biomass conversion and provide information, referral services, and literature searches.

Scope: Areas covered include:

- o Biomass production,
- o Agriculture and forestry waste availability,
- o Harvesting and collection of biomass,
- o On-site processing,
- o Transportation,
- o Conversion techniques,
- o Marine biomass,
- o Algae production,
- o Environmental problems, and
- o Systems analysis.

Costs: Total: $30,000 (U.S. $13,000) per year

Term: Initial 3 years

Activities:

- o Information dissemination has begun in the context of the IEA forestry meeting.
- o A list of all possible conversion processes has been compiled.
- o Ireland is sponsoring a meeting in September 1978 on systems analysis applied to biomass conversion.

Benefits: Though this agreement is less than 6 months old, some anticipated benefits include:

- o Reduction of time necessary for systems integration into the domestic program;
- o Development of more advanced conversion techiques, and
- o Increased data base aiding domestic users through U.S. information dissemination efforts.

2.3 Bilateral Agreements

2.3.1 Introduction

This section provides summaries of the currently unsigned agreements with Japan for cooperative efforts in a variety of solar technologies, the agreements with France for joint research and testing of solar thermal conversion systems and focused heliostat risk assessment, the agreement with Spain for five solar energy projects, the agreement with Saudi Arabia, the agreement with the U.S.S.R. for joint solar technology development and transfer, and the LDC program. Additional bilateral agreements are currently being negotiated between the U.S. and Italy, Brazil and India. However, because the scope of those agreements has not yet been determined, they were not included in this section.

2.3.2 1) Memorandum of Understanding Between the United States Energy Research and Development Administration and the French National Center for Scientific Research for Cooperation in Joint Research on Solar Thermal Conversion Systems - Summary

2) Memorandum of Understanding Between the United States Energy Research and Development Administration and the French National Center for Scientific Research for Cooperation on Certain Safety Aspects of Solar Power Towers - Summary

Signed: May 1976 and September 1977.

Participants: U.S., France

Objective: Solar thermal:

- o Share information on research regarding the design and prototype construction of cavity boilers,
- o Test and evaluate several prototype system components, and

Solar power towers:

- o Assess the risks associated with heliostat fields and solar towers.

Costs: U.S. has spent approximately $50,000 to date

Term: Two years from date of signing, renewed by mutual consent

Activities: Solar thermal:

- o Testing and evaluation of
  - Radiation receivers,
  - Cavity/boiler/superheaters, and
  - Ancillary controls,

Solar power towers:

- o Conducting tests of 68 flat heliostats in Odeillo, France on
  - Flux intensity measurements of single heliostat beams versus distance at ground level and
  - Qualitative and quantitative characterization of light reflected into the airspace above the fields.
- o Similar tests are being conducted in Albuquerque, New Mexico for 78 focused heliostats.

Benefits: Solar thermal:

- o Development of an optimal cavity boiler,
- o Development of optimal subsystems associated with solar thermal conversion such as heliostat guidance and control equipment and heat exchangers,
- o Access to French experience with large solar furnaces,

Solar power towers:

- o Determination of danger thresholds and development of procedures for piloting aircraft over heliostat fields, and
- o Expansion of U.S. capacity to develop heliostat testing methods.

Comments: Potential areas for future U.S.-French cooperation in solar energy R&D are being discussed. It is hoped that a broader official agreement may be developed. Areas of mutual interest include:

- o Testing of parabolic dish collectors,
- o Testing of heat transfer fluids,
- o Comparison of analytical predictions and experimental measurements of convective and radiative heat loss of solar-thermal power-tower boilers,
- o International symposium on thermal electric solar energy systems,
- o Pericles type collectors,
- o Biophotalysis studies,
- o Climatology studies,
- o Parabolic mirrors (cylindrical or axisymmetric),
- o Systems for LDCs,
- o Development of hemispherical-collector solar thermal plants,
- o High temperature, second generation solar thermal plants,
- o Cross use of both countries' R&D facilities, and
- o Information dissemination.

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2.3.3 Agreement Between the United States Department of Energy and the Agency of Industrial Science and Technology, Japan in the Field of Solar Energy - Summary

Signed: Not yet signed

Participants: U.S., Japan

Objective: Establish a balanced exchange of solar energy technology for the mutual benefit of the parties.

Scope: Specifically, this agreement is expected to include the following systems:

- Photovoltaic power
- Solar thermal,
- Solar heating and cooling, and
- Service hot water supply.

Other potential systems may be:

- Ocean energy,
- Biomass conversion, and
- Wind power.

Costs: $40,000 per year to the U.S.

Term: Ten years; can be extended by mutual agreement of the parties.

Activities:

- Visits by specialists to each country, (under 1974 U.S./Japan umbrella agreement on energy R&D),
- Information exchange
- Development of plans to exchange information on test procedures, standards development, and standard equipment and devices.

Anticipated Benefits:

- Access to information regarding fabrication processes developed by the Japanese which have not yet been developed in the U.S.
- Access to Japanese experience in thin film photovoltaic cells, solar thermal furnaces, electric conversion, and ocean thermal electric conversion. Japan's "Project Sunshine" is expected to achieve substantial cost reductions for photovoltaic cells. Transfer to the U.S. of Japanese cost-reduction techniques would be a great asset to the U.S. photovoltaic development program.

- Information exchange on test procedures, standards development, and standard equipment and devices provides a basis for increasing the quality solar energy components and systems. This is potentially significant since Japan and the U.S.--along with France--are potentially the major competitors in the international solar market.

Problem Areas:

- The U.S. may transfer more technology to Japan than it will receive from that country because U.S. solar technology is, in general, more advanced than that of Japan. Any such imbalance in the information exchange could lessen the U.S. competitive position in the international solar market.

- Flow of information has tended to favor the Japanese, because there are more English-speaking Japanese solar experts than Japanese-speaking American experts.

- Opportunities for U.S. market development within Japan are very limited (with the possible exception of water heaters in rural areas, where demand is estimated to be 200,000-300,000 units per year).

2.3.4 Project Agreement Between the Saudi Arabian National Center for Science and Technology and the Saudi Arabian Ministry of Finance and National Economy, Jointly, and the United States Department of Energy and the United States Department of Treasury, Jointly, for Cooperation in the Field of Solar Energy - Summary

Signed: October 30, 1977

Participants: U.S., Saudi Arabia

Objective: Cooperation in solar technology development and facilitation of solar technology transfer.

Scope: All types of solar systems and technologies are included:

- o Centralized,
- o Dispersed,
- o Solar thermal,
- o Photovoltaics,
- o Biomass conversion,
- o Wind, and
- o Ocean.

Costs: Total cost is $100 million over 5 years, to be shared equally by the U.S. and the Saudi Arabians.

Term: Five years

Activities:

- o U.S. and Saudi representatives met in June, 1978, and reached agreements on the Technical Program Plan and Management Plan.
- o The Preliminary Management Plan established an Executive Board comprised of three representatives each from the U.S. DOE and the Saudi Arabian National Center for Science and Technology and one representative each from the U.S. Department of the Treasury and the Saudi Arabian Ministry of Finance and National Economy.
- o The Preliminary Technical Program Plan identified five major areas for solar research and development.
  - Solar energy availability in Saudi Arabia,
  - Thermal processes,
  - Storage,
  - Fuel production,

- Solar electricity generation, and

- Other alternative solar-related sources such as wind, geothermal, and ocean thermal energies.

Potential Benefits:

o Solar demonstration opportunities stimulating interest in the use of solar energy,

o Application of solar technologies in Saudi Arabia relevant to other OPEC nations and LDCs,

o Commercial potential in Saudi Arabia and other OPEC countries for U.S. solar manufacturers (significant in light of marketing efforts being made in Saudi Arabia by France, West Germany, Australia, Switzerland, Canada, India, Italy, Japan, the U.K., and the People's Republic of China).

2.3.5 Treaty of Friendship and Cooperation Between Spain and U.S. - Summary

Signed: September 1976 (Solar activities are one component of the broader treaty)

Participants: U.S., Spain

Objective: Test a variety of solar technologies in Spain in the context of the U.S.-Spain Treaty of Friendship and Cooperation.

Scope: Solar thermal central receiver system, wind and meteorology technologies, heating and cooling, and photovoltaics.

Costs: FY 78: $700,000.

Term: Five years

Activities:

- Team of U.S. solar specialists visited Spain in 1976 to assist the Spanish in:
  - Setting up a national program for solar R&D,
  - Identifying solar technologies and applications,
  - Setting priorities, criteria and procedures, and
  - Preliminary assessment of potential projects.
- A substantial number of visits to the U.S. have been completed by Spanish government representatives and solar specialists from Spanish private institutions.

Benefits:

- Opportunity for U.S. to test a 1 MWe central receiver system,
- Opportunity for U.S. consultants and manufacturers to provide hardware and software not available in Spain,
- Opportunity to demonstrate space heating and cooling systems, industrial process heat systems and solar assisted heat pumps (valuable opportunity to investigate a potential market for these near term technologies),
- Further research on solar energy conversion and heterogeneous catalysis,
- Further development of two-sided solar cells,

- Opportunity to determine which variations of state-of-the art technologies lead to optimal efficiencies and costs, and

- Opportunity to demonstrate U.S. technology in large potential market

2.3.6 Agreement Between the United States of America and the Union of Soviet Socialist Republics on Cooperation in the Field of Energy - Summary

Signed: June 28, 1974

Participants: U.S., U.S.S.R.

Objective: Cooperation in solar technology development and facilitation of solar technology transfer.

Scope: Development of different nonconventional fuel sources including:

- o Solar thermal, and
- o Photovoltaics

Costs: Each country bears its own costs. U.S. spends $30,000/year.

Term: Five year periods unless suitably terminated by either party.

Activities:

- o A number of exchange visits have taken place. The first occurred in January 1974 when, under the terms of the 1973 Science and Technology Agreement, a four-member NSF team went to the U.S.S.R. to establish the basis and format for future cooperation.
- o U.S.S.R. solar specialists visited the U.S. in June 1974 and February 1976.
- o U.S. solar specialists visited the U.S.S.R. in September 1974, July 1977, and September 1977.
- o The Soviets have expressed interest in expanding the agreement to include wind energy technologies.

Benefits:

- o The U.S. has access to Soviet R&D efforts in gallium arsenide photovoltaics, multiple-function silicon solar technology, Stirling engines applied to solar concentration systems, and open-cycle space cooling systems for buildings.
- o Due to restrictions on trade between the two nations, it is extremely unlikely that a solar technology exchange between the U.S. and the U.S.S.R. will lead to Soviet penetration of the American market or vice versa.

- Information has resulted in the assessment that in some areas Soviet solar technology is 2 to 5 years behind U.S. R&D efforts. This is significant for the direction of future cooperative activities and near-term ability to compete.

Problem Areas:

- Cooperation has been hampered by an unevenness on the part of the Soviets in their ability to cooperate.

2.4 International Energy Development Program

2.4.1 Introduction

The LDC energy program was initiated in response to Presidential Directive #8 issued in March 1977. At that time the President called for the U.S. Government to use its scientific, technical, planning and management expertise in cooperation with other industrialized countries to help LDCs meet their energy needs in a manner consistent with global resource, security, and environmental concerns.

2.4.2 Summary

Initiated: September 1977

Participants: Egypt, Peru, U.S.

Objective: Demonstrate that the U.S. can, through collaborative efforts with the LDCs, assist them in developing a set of credible energy strategies, using a systematic analytical approach.

Costs: For FY 78: $5 million; 12 manyears Federal staff; 40 man years contract staff

Activities:

- The primary activity in FY 78 with both Egypt and Peru is the preparation of a country energy and resource assessment. These assessments include an evaluation of the current (energy) resource position of the country, an analysis of energy supply and demand (for 1985 and 2000), a determination of the applicable energy technology and resource alternatives, an assessment of the environmental, social, and economic impacts of potential substitutions, and the development of energy options. These energy options are aggregated to form a set of practical energy strategies which the participating countries can use to form implementing strategies.

- In addition to the strategies themselves, implementation plans for each are developed, and those "next steps" which the host government should undertake in the near future are also set forth.

Anticipated Benefits:

- Assist LDCs in shifting from reliance on petroleum imports to reliance on indigenous energy resources of all types, including solar.

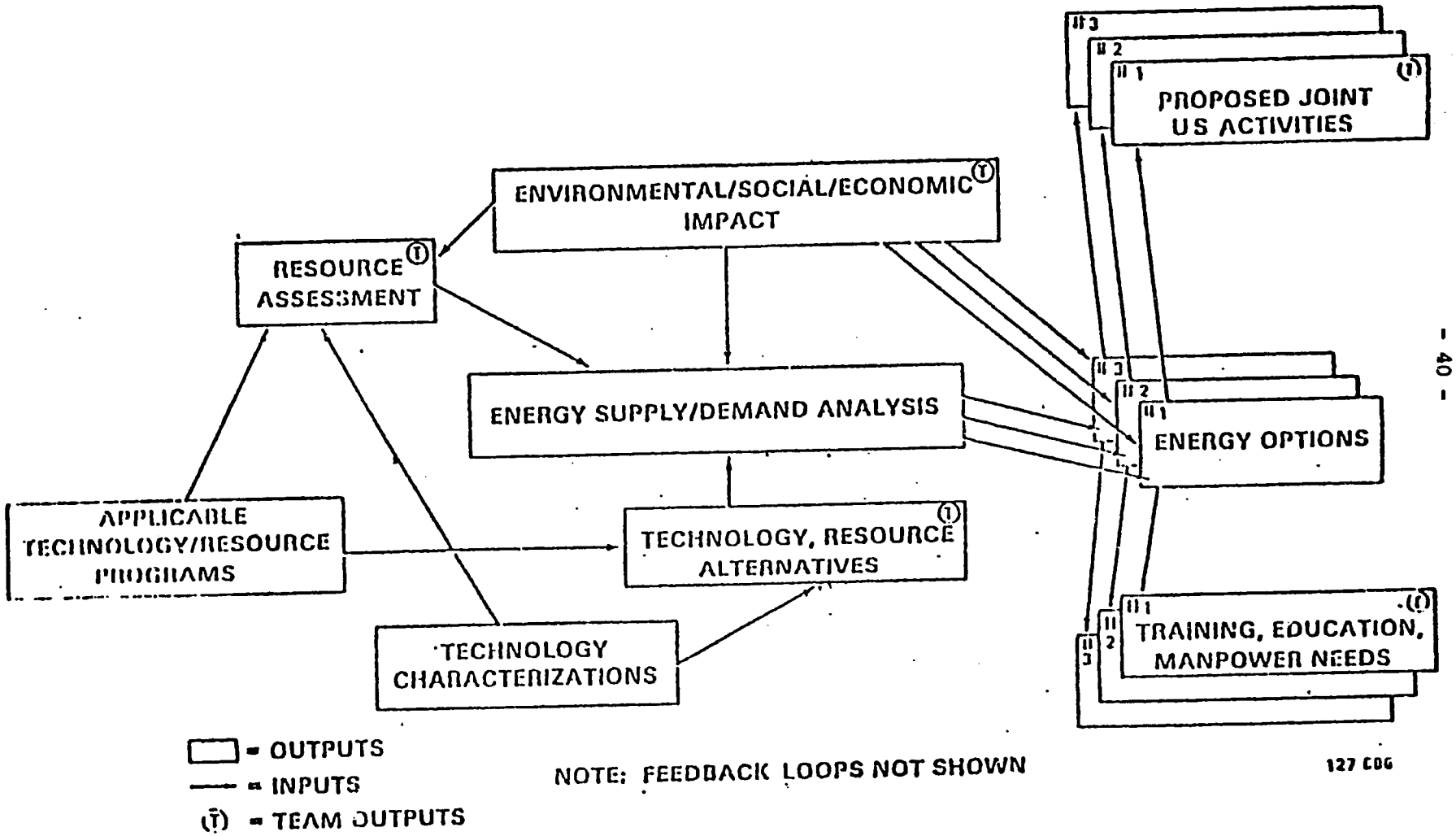
- Provides a framework for setting priorities in cooperative energy development between LDC's and possible donor nations and institutions.

- Provides policy makers in developing countries a sound information base for energy strategies.

- Evaluates the costs and benefits of various energy sources on a national basis.

APPENDIX D

INTERNATIONAL ENERGY DEVELOPMENT PROGRAM
COUNTRY ENERGY ASSESSMENT APPROACH OUTLINE


II 3
II 2
II 1
PROPOSED JOINT US ACTIVITIES
ENVIRONMENTAL/SOCIAL/ECONOMIC IMPACT
RESOURCE ASSESSMENT
ENERGY SUPPLY/DEMAND ANALYSIS
II 3
II 2
II 1
ENERGY OPTIONS
APPLICABLE TECHNOLOGY/RESOURCE PROGRAMS
TECHNOLOGY, RESOURCE ALTERNATIVES
TECHNOLOGY CHARACTERIZATIONS
II 1
II 2
II 3
TRAINING, EDUCATION, MANPOWER NEEDS
= OUTPUTS
= INPUTS
(T) = TEAM OUTPUTS
NOTE: FEEDBACK LOOPS NOT SHOWN
127 COG

PURPOSES OF ANALYSIS

ASSESS THE EFFECTS OF

- DEVELOPMENT OF CONVENTIONAL ENERGY SOURCES
- INTRODUCTION OF ALTERNATIVE ENERGY SUPPLY AND END USE TECHNOLOGIES (INCLUDING NON-COMMERCIAL SECTOR)

ON:

- TOTAL FUEL DEMAND AND FUEL MIX
- BASIC HUMAN NEEDS
- OIL IMPORT REQUIREMENTS
- CONSUMERS ENERGY BILL
- BALANCE OF PAYMENTS
- EMPLOYMENT IN ENERGY SECTOR
- CAPITAL REQUIREMENTS
- ENVIRONMENTAL QUALITY

CONSIDERING:

- BASIC UNCERTAINTIES
- AVAILABILITY OF DATA
- GOVERNMENT ALLOCATION AND PRICING POLICY
- ALTERNATIVE FUTURE WORLD OIL PRICE
- ALTERNATIVE RURAL AND URBAN DEVELOPMENT STRATEGIES
- ALTERNATIVE GDP AND SECTORAL GROWTH RATES

ANALYTICAL APPROACH

1. Establish current supply/demand posture
   - All energy uses and supplies
   - Historical economic and energy context
   - Process Detail

2. Project future reference demand
   - 1985, 2000, 2020
   - Based on energy services to be provided
   - Use National Economic Development Plan

3. Construct Future Reference Energy System
   - Technological Detail

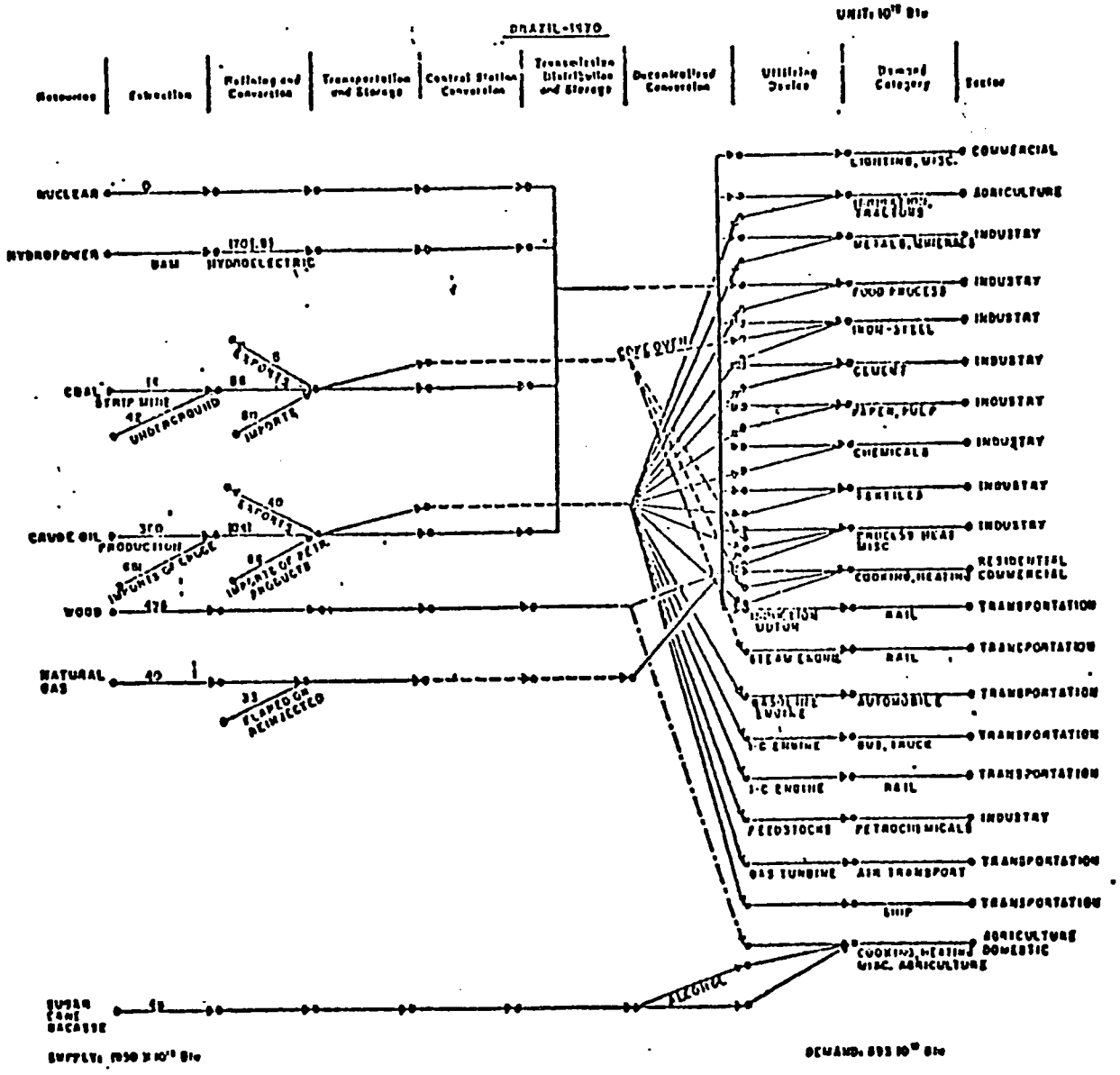
4. Derive System Requirements
   - Resources
   - Economic

5. Assess Resource Availability

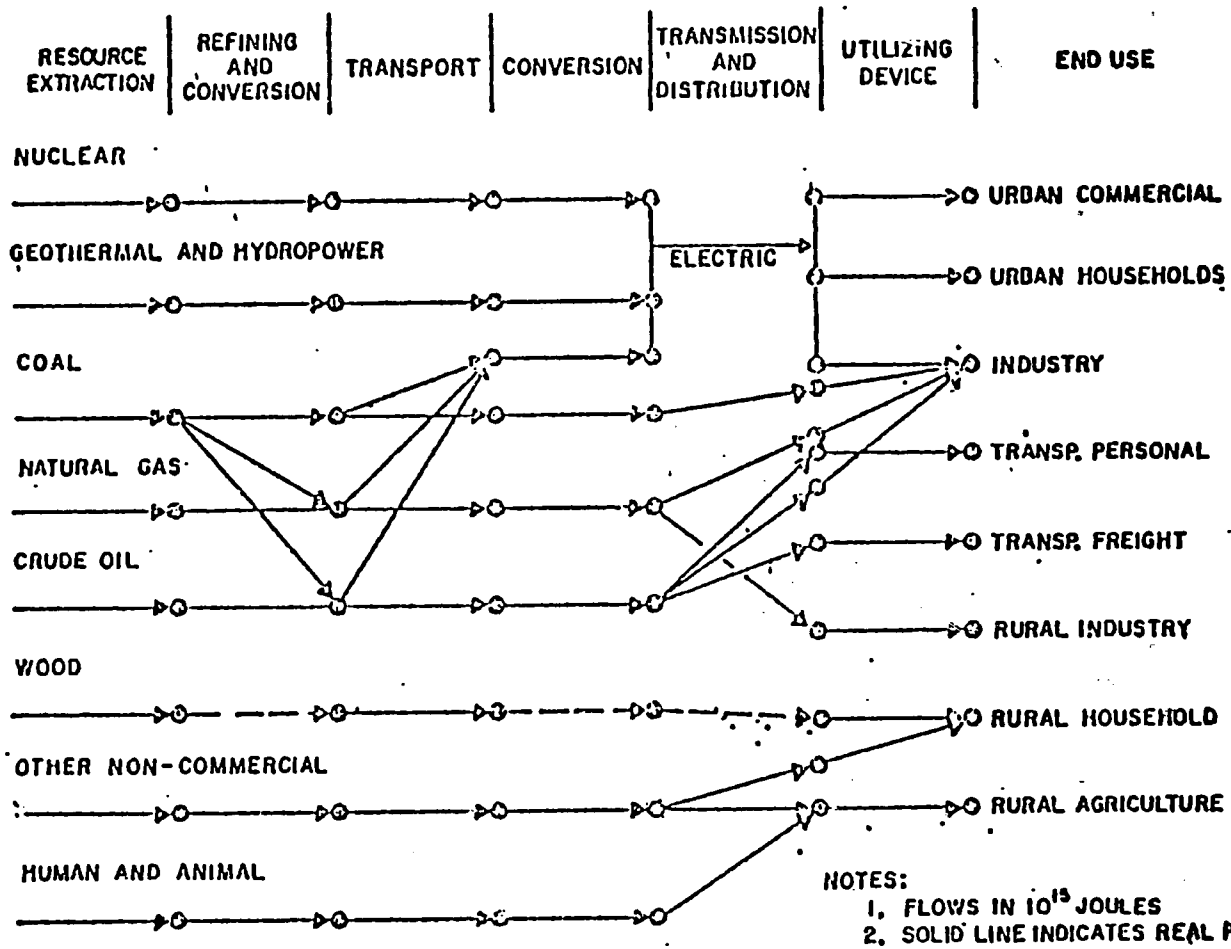
6. Analyze Alternative Resource, Technology Substitutions
   - Effects on Resources, Economics, etc.

CHARACTERISTICS OF REFERENCE ENERGY SYSTEM APPROACH

- Normative/Integrative
- End Use Detail at Functional Level.
  - Key to fuel substitution and conservation analysis
  - Reflects Important Social and Economic Development parameters
  - Can represent commercial or non-commercial demands.
- Technological Process Detail
  - Key to technology and fuel substitution analysis.
- Flexibility in Technology Assessment
  - Explicit assumptions
  - Readily extended to optimization format
  - Compatible with econometric approach.


BRAZIL-1970
UNIT: 10^{12} Btu
Resources
Extraction
Refining and Conversion
Transportation and Storage
Central Station Conversion
Transmission Distribution and Storage
Decentralized Conversion
Utilizing Device
Demand Category
Sector
NUCLEAR
HYDROPOWER
DAM
HYDROELECTRIC
COAL
STRIP MINE
UNDERGROUND
EXPORTS
IMPORTS
CRUDE OIL
PRODUCTION
IMPORTS OF CRUDE
IMPORTS OF REF. PRODUCTS
WOOD
NATURAL GAS
FLARED OR REINJECTED
SUGAR CANE BAGASSE
ALCOHOL
COKE OVEN
LIGHTING, MISC.
COMMERCIAL
AGRICULTURE
METALS, MINERALS
INDUSTRY
FOOD PROCESS
IRON-STEEL
CEMENT
PAPER, PULP
CHEMICALS
TEXTILES
PROCESS HEAT MISC
COOKING, HEATING
RESIDENTIAL COMMERCIAL
RAIL
AUTOMOBILE
BUS, TRUCK
PETROCHEMICALS
GAS TURBINE
AIR TRANSPORT
SHIP
COOKING, HEATING MISC. AGRICULTURE
AGRICULTURE DOMESTIC
SUPPLY: 1950 x 10^{12} Btu
DEMAND: 893 10^{12} Btu

LDC REFERENCE ENERGY SYSTEM (ILLUSTRATIVE)



NOTES:
1. FLOWS IN 10^{15} JOULES
2. SOLID LINE INDICATES REAL PROCESS
3. CONVERSION EFFICIENCIES SHOWN IN PARENTHESIS

EXAMPLES OF TECHNOLOGIES FOR REFERENCE ENERGY SYSTEM

- EXISTING TECHNOLOGIES

  EXTRACTION
  - EG: ONSHORE OIL
    OFFSHORE OIL
    SURFACE MINED COAL

  CONVERSION
  - EG: REFINING
    OIL STEAM ELECTRIC
    GAS TURBINE

  UTILIZATION
  - EG: COOKING STOVE
    OPEN HEARTH FURNACE
    GASOLINE AUTOMOBILE
    WOOD STOVE

- NEW TECHNOLOGIES

  EXTRACTION
  - EG: TERTIARY OIL RECOVERY
    SMALL SCALE OIL SHALE

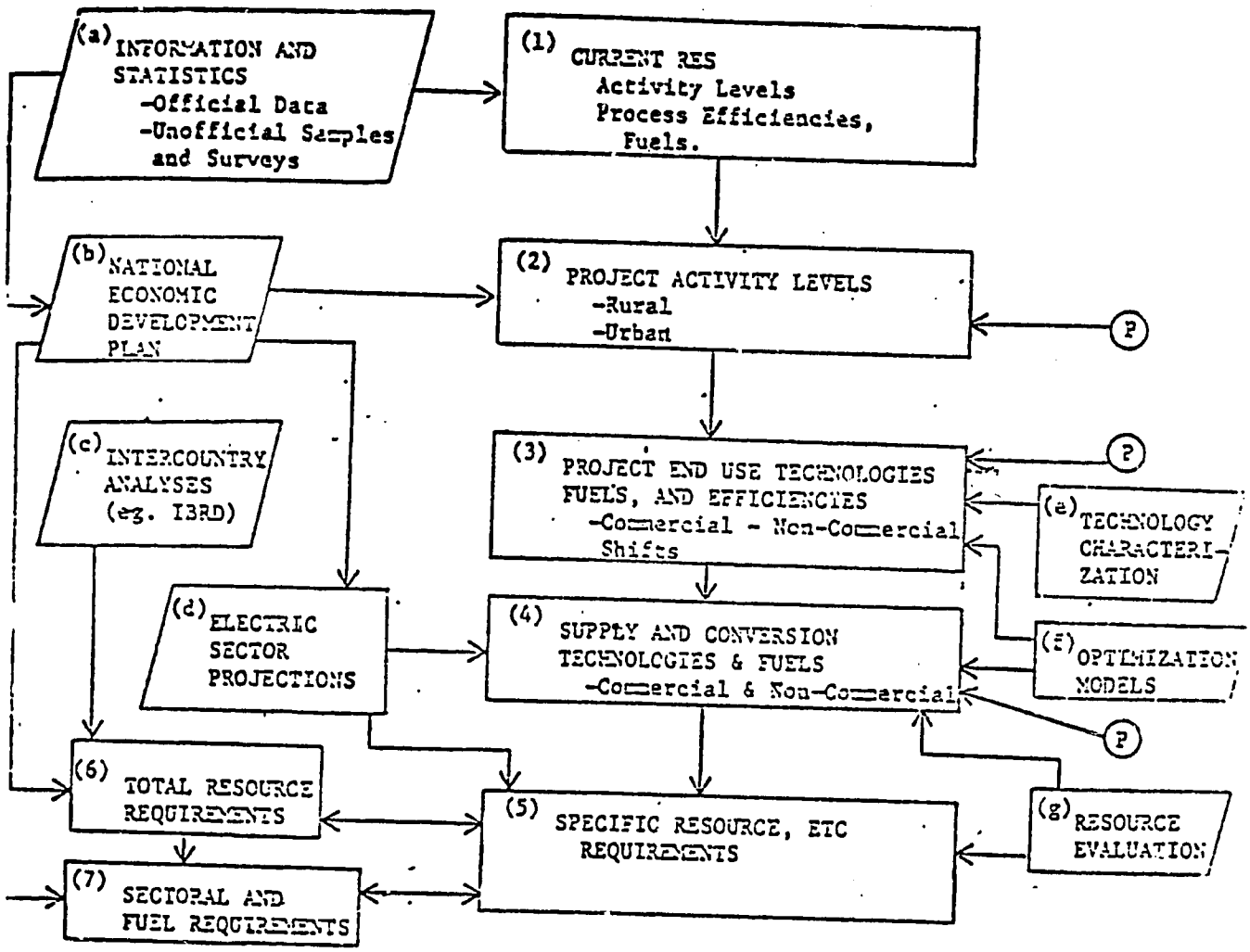
  CONVERSION
  - EG: FLUIDIZED BED
    COAL LIQUEFACTION

  UTILIZATION
  - EG: WOOD STOVES
    SOLAR WATER HEAT
    INDUSTRIAL COGENERATION

LDC-ESNS PROCESS ELEMENTS
(PER 10^{15} JOULES)

o	DEMAND FACTORS	DEMAND BASIS BASIC ENERGY DEMAND
o	ALLOCATION/EFFICIENCY FACTORS	MARKET ALLOCATIONS PROCESS EFFICIENCIES ANCILLARY ENERGY USE
o	COST FACTORS	CAPITAL OPERATING ENVIRONMENTAL CONTROL
o	MANPOWER	CONSTRUCTION OPERATING
o	ENVIRONMENTAL "IMPACTS"	AIR/WATER EMISSIONS SOLID WASTE ECOSYSTEM IMPACTS OCCUPATIONAL HAZARDS

LDC COUNTRY TECHNOLOGY ASSESSMENT
REFERENCE CASE PROJECTION METHODOLOGY



Note: Feedback Loops Not Shown.

Assumes no existing National Energy Plan.

Notes to Flowchart on Reference Case Projection Methodology

1. These are to be Reference Projections for policy analysis, predictions or forecasts.

2. Current RES designed in terms of activity levels, process efficiencies and fuels. Rural and urban sectors; commercial and non-commercial fuels are distinguished.

3. Projected activity levels are independent of fuels and based on economic development plan or social/economic goals: Reference Energy Systems will be established for 1985, 2000, 2020.

4. Rural and urban populations and activities will be distinguished.

5. The "technologies" and fuels used to provide energy to end use activities will be projected based on current trends, national plans, economic competitiveness, resource constraints, and social preferences. Human and animal power will be included.

6. Supply and conversion technologies will be selected on the same bases as end use technologies.

7. If available in-country, or if data and time permit their construction, optimization models of individual sectors in the entire energy system can be used to guide the choices of technologies and fuels.

8. The methodology provides an independent projection of electricity demand which can be compared with in-country electric sector projections. Comparison may lead to adjustment of electric shares in certain end uses.

9. Expected GDP growth rates from National Economic Development Plans or other sources will be used, along with the income elasticities of demand (e.g. from inter-country analyses) to project total energy resource requirements. These will be used as a check, and possibly for adjustment of total resource requirement implied by the projected RES.

10. Historical trends of sectoral growth and fuel use may be used to project independently future fuel-specific sectoral energy use for guidance in constructing the projected RES.

11. Implications of the reference projection to be calculated include:

    a) total energy resource requirements
    b) import and/or export requirements
    c) energy costs to consumers
    d) capital requirements
    e) balance of trade effects
    f) labor requirements
    g) environmental implications

12. Level of detail and reliability will depend on availability of data. Detail can be built up in those sectors which pertain to potential collaborative activities.

APPENDIX E

WORLD BANK PROJECTS INVOLVING SOLAR ENERGY

World Bank Projects Involving Solar Energy

The Bank is financing the development of solar energy in a variety of applications in the developing world.

Direct Use of Solar Energy

An industrial development project in Israel provides US$900,000 for applied research into the use of non-convective solar ponds as a means to collect and store energy. A commercial prototype heating and cooling system is being built in a hotel near the Dead Sea. The project also includes US$1.5 million for the development of solar powered engines, which are being designed to require little maintenance so that they can replace small diesel engines in various village applications.

A recently negotiated demonstration project will generate information concerning the feasibility of utilizing solar power to pump water, by field testing different technological approaches. The Bank will act as the Executing Agency for a US$1.25 million project funded by the UN Development Programme. Demonstration areas are proposed for India, Sudan, Mali and the Philippines.

A Bank-sponsored rural development project in the high semi-arid plains of Bolivia will spend US$165,000 to help a local institution adapt and develop low cost solar energy devices for heating, pumping, food drying, and greenhouse agriculture. The intent is to replace animal dung as the main source of household energy, freeing it for use as fertilizer.

The Bank promotes the use of solar hot water heaters in educational facilities as technological demonstrations. A project in Liberia, for instance, has financed the installation of solar devices in faculty living quarters of rural schools.

Indirect Use of Solar Energy

Wood will continue in the foreseeable future to be the main source of energy and the principal building material for a large proportion of the world's poorest people. Accordingly, the Bank has financed a series of 16 fuelwood projects to date, with a further 15 being planned. Several of these projects also include provisions for exploring the large potential savings in fuel attainable through the introduction of improved wood stoves and through simple wood preservation systems in buildings.

Several governments embarked upon reforestation programs in the past without paying sufficient attention to the many constraints posed by the conditions of the land and the availability of sound management. The result was often a degeneration of the plantations. The Nigeria-Lafia/Ayangba project exemplifies the careful planning involved in Bank-financed forestry projects. It concentrates on strengthening the forest service with a sound technology to undertake replenishment of the fuelwood resource base and, having demonstrated this on government land, subsequently developing a private and/or community reforestation program.

Rural Energy Studies

The Bank is assisting the Colombian government in its Rural Energy Planning Exercise. The objective is to develop a planning approach for identifying, preparing, and implementing bankable rural energy projects. The study recommends the establishment of a Central Unit to organize and promote research and development of rural energy equipment such as solar heaters, biogas devices, and windmills. The Bank has offered to assist in implementing this second phase of the exercise. Similar studies will likely be funded by the Bank in four additional countries through forestry project components.

As part of its general efforts to assist developing countries in preparing energy policies to meet their future needs, especially in the rural energy sectors, the World Bank has carefully monitored progress in technologies relating to "non-conventional" energy sources, among which is solar energy. Bank staff, for instance, have produced two reports that explore the techno-economics of photovoltaic technology as applied to rural education, health, forestry, and other applications in developing countries.

The Bank also finances studies that explore the utilization of solar energy in particular situations in member countries. The Khumbu Development Plan, for instance, was produced in conjunction with a tourism project in Nepal. Although tourists supply a major source of income to this region, they add substantially to the already excessive use of firewood. The progressive denudation of the steep Himalayan slopes will continue unless alternative energy sources are developed. The study thus proposes the introduction of flatplate solar collectors for heating and cooking in the lodges and campsites, as well as to initiate reforestation.

THE WORLD BANK AND SOLAR ENERGY

Introduction

1. As part of its general efforts to assist developing countries in preparing energy policies to meet their future needs, especially in the rural energy sectors, the World Bank has carefully monitored progress in technologies relating to so-called "non-conventional" energy sources, among which is solar energy.

2. The Bank intervenes in such fields as solar energy development only if it becomes apparent that developments which might be of value to developing countries are being overlooked or ignored, or if financing for their development and adaptation to the needs of developing countries is not forthcoming from other sources.

3. Widespread utilization of solar energy will depend on the development of improved technology and materials, and even more on a reduction in price of solar devices. This latter is critically important for the use of solar energy in developing countries. The present state of solar technology gives reason to think that the necessary advances in technology may be forthcoming in the not-too-distant future, and that it is now appropriate for the Bank to fund a modest field programme to demonstrate the feasibility of using solar energy in developing countries and to enable the inhabitants of those countries to gain operational experience in their use.

I. World Bank Projects Involving Solar Energy

4. (i) Over 60% of Bolivia's 5.6 million people live in the difficult rural conditions of the Altiplano, (high semi-arid plains over 12,000 feet above sea-level) where, despite average daily temperatures below 50° Fahrenheit there is a very low rate of energy consumption and the majority of the people depend on non-commercial energy sources. Fuels used in the home are those locally available, usually consisting of dried animal dung, grass knots, scrub twigs and roots. Currently, animal dung is the single most important sources of fuel for household consumption in these areas, but non-commercial energy resources in the rural areas are inadequate to meet household requirements, being sufficient only for limited cooking, but no heating, during the harsh winter months. Also, the use of dried animal dung as fuel eliminates its use as fertilizer. Alternative sources of energy for use on the Bolivian Altiplano are thus of critical importance. The Altiplano receives high levels of solar energy, ranging from about 400 calories per square centimeter per day in the winter months to more than 600 calories per square centimeter per day in summer; this is well above the minimum limits for operation of solar energy devices. The physical conditions of the Altiplano, with an average of 2,500 sunhours per annum, thus make the region especially suitable for the use of solar energy as one of the substitutes for conventional energy, and the Government places a high priority on solar energy development. A Bank-sponsored rural development project approved in

in December 1977 will spend US$165,000 over a four-year period in helping a local institution to adapt and develop low-cost energy devices for heating, cooking, pumping, food drying and greenhouse agriculture. First practical applications are expected to be operating by 1980.

5. (ii) Research on Solar Ponds and Rankine Cycle Turbines in Israel. An industrial development project in Israel supports a US$1.7 million program of applied research into non-convective solar ponds as a means of collecting and storing solar energy in the form of low-temperature heat. A solar pond is an artificial shallow pool of water which absorbs the sun's heat and transport it to a dense bottom layer of brine, which often reaches a temperature of 90°C (194°F). First results are promising and a commercial prototype of a solar heating and cooling system using solar ponds is being built in a hotel near the Dead Sea. The project also includes support for the development of solar powered engines, including construction of prototypes and market studies. The engines are being designed to require little maintenance and it is hoped could replace the small diesel engine in various village applications. The total Bank contribution to the overall cost of the whole project is US$5 million.

6. (iii) Solar Water Heaters in Education Projects. The Bank is increasingly involved in the construction of education facilities. The Bank promotes the use of decentralized energy systems, including solar energy, for such projects especially those in rural areas where they most are cost-effective. An education project in Liberia includes a component for financing the installation of solar water heaters in the houses of teaching staff in rural schools.

7. (iv) Demonstration of Solar Powered Pumping Equipment. (For small scale irrigation purposes in developing countries). The project will probably be funded by the UNDP with the World Bank as Executing Agency. Four demonstration areas are proposed in India, Sudan, Upper Volta, and the Philippines. The estimated cost is around US$1.25 millions. Since the details of the project are still under negotiation it is not possible to be more precise, but the overall objectives of the project will be to gain field operating experience and to act as a demonstration of the feasibility of utilizing solar energy for water pumping.

II. Studies Concerning the Global Applicability of Solar Energy in Developing Countries

8. (i) Study entitle "Energy and Development" by Dr. Jyoti Parikh of the International Institute for Applied Systems Analysis, Laxenburg, Austria. This is a study of overall energy needs in the developing countries with special emphasis on the needs of rural areas. While dealing with overall energy requirements, it contains a fairly extensive section on solar energy utilization and potential.

9. (ii) "Solar Energy Subsystems": Summary of International Program of Solar Energy Research and Development. Dr. Anwer Malik, Director of the Solar Energy Program of the Kuwait Institute of Scientific Research, acting as consultant to the Bank, summarized the status of the solar energy research programs in some 80 countries around the world. The report gives an account of the existing state of currently available solar technology.

10. (iii) Two studies by Bank Staff

- "Developing Country Applications of Photovoltaic Cells" 1/
- "Solar Photovoltaic Cells in Developing Countries" 2/

describe the potential applicability of photovoltaic technology to rural education, health, forestry and other applications in developing countries. These papers were originally presented to international symposia of solar energy manufacturers and researchers, and were intended to bring to the attention of these experts the importance of the developing country market to the commercial future of photovoltaic technology. A third study of Bank staff "Critical Factors in Economic Evaluation of Small Decentralized Energy Projects"3/, points out a number of pitfalls that face a researcher who seeks to justify the application of a small scale energy technology to a particular development need. It points out, for example, the necessity for careful pricing of inputs and outputs and realistic estimates of the physical quantity of useful output.

III. Studies of the Applicability of Solar Energy to Situations in Particular Countries

11. (i) Khumbu Valley Tourism Study (Nepal)

With funds provided under an IDA Credit for the first tourism project in Nepal (291-NEP), a study was carried out by Nepalese consultants on the development of trekking tourism in the Khumbu Valley, which leads to Mount Everest. The Khumbu development plan proposed solar energy as a substitute for firewood, the demand for which is leading to progressive deforestation of the steep slopes of the Himalayan region and the irreversible loss of the thin top soil in these areas. Trekking tourists represent a major source of income and employment for the inhabitants, and a source of foreign exchange earnings for Nepal. The tourists add substantially to the use of firewood, which is already excessive, and ecological damage will continue unless alternative energy sources are developed for cooking and heating. The development plan proposed the use of solar energy to produce heat and hot water for the tourist trekking lodges and camp sites.

12. (ii) "Potential Use of Solar Water Heaters in India" by Dr. P.K. Rohatgi, Director, Council of Scientific and Industrial Research Complex, Cochin, Kerala, India.

13. This was a study of the possibility for local manufacture and use of solar

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1/ Weiss, C., and Pak S., "Developing Country Apllications of Photovoltaic Cells", World Bank S&T Report No.7, Jan. 19.

2/ Weiss, C., "Solar Photovoltaic Cells in Developing Countries", World Bank S&T Report No.26, Nov.1.

3/ Pak, S. and Taylor C.R., "Critical Factors in Economic Evaluation of Small Decentralized Energy Projects", World Bank S&T Report No.25, Nov. 1976.

water heaters in India for domestic and industrial purposes. The survey involved some field investigations and an analysis of production costs and material requirements under Indian conditions, and of the potential market for solar water heaters in India.

14. (iii) Rural Energy Study in Colombia.

In cooperation with Colombian organizations the Bank is assisting a Rural Energy Study in Colombia which includes, among other objectives, the development and use of solar energy devices in rural areas. The main objective of the program however, is to set up the appropriate national institutions to plan and implement rural energy projects in a comprehensive manner. A first 180 page report dealing with one rural region (Antioquia) presents an in-depth analysis of the situation and proposes recommendation for tackling with it.

Note on Biomass

The above list does not include Bank activities to increase the production of biomass fuels (principally firewood) which some would also include under the general umbrella of "solar energy".1/ The Bank has or is financing 16 fuelwood components of Rural Development Projects and is planning to finance 15 others in the next few years (A list is attached on Annex 1).

1/ In effect there is no precise definition of solar energy. Broadly taking it could include hydroelectricity and even fossil fuels. The energy of the sun, of course, is derived from nuclear sources.

ANNEX

Bank-financed Projects with Fuelwood Components

1973	Mauritius Rural Development (Cr. 419-MAU)
	Niger Drought Relief (Cr. 441-NIR)
1975	Mali Livestock (Cr. 538-MLI)
	Niger Rural Development, Maradi I (Cr. 608-NIR)
1976	Korea Rural Infrastructure (Ln. 1216-KOR)
	Senegal Sine-Saloum Rural Development (Ln. 1113-SE)
	Nepal Rural Development I (Cr. 617-NEP)
	Colombia Rural Development I (Ln. 1352-CO)
1977	Tanzania Tobacco Processing (Cr. 658-TA)
	Sudan Savannah (Cr. 718-SU)
	Nigeria - Lafia and Ayangba Agriculture Development { Lafia (Ln. 1454-UNI); Ayangba (Ln. 1455-UNI)
	Brazil Minas Gerais Rural Development (Ln. 1362-BR)
	Chad Sahelian Zone Rural Development (Cr. 739-CD)
	Philippines Rural Development III (Cr. 1010-PH)
	Pakistan Hill Farming Tech. Development (Cr. 751-PAK)
	Kenya Bura Irrigation (Ln. 1449-KE)

Projects Under Identification, Preparation and Appraisal, January 1978, with Fuelwood Components

Tanzania Mwanza/Shinyanga Rural Development
Rwanda - Village Afforestation
Burundi Village Afforestation
Somalia Rural Forestry Component
Malawi Rural Forestry Component
Nigeria Ilorin and Bida Agriculture Development
Niger Forestry I
Mali Forestry I
Upper Volta Forestry I
Indonesia Yogyakarta Rural Development
Philippines Forestry II
Thailand Forestry I
India Forestry II
Bangladesh Forestry I
Jamaica Forestry I

ANNEX

APPROPRIATE TECHNOLOGY AND WORLD BANK ASSISTANCE TO THE POOR

FUELWOOD

1. FAO estimates indicate that about 1.5 billion of the world's poorer people use non-mineral fuel for their domestic needs. Their fuel sources comprise largely firewood, augmented with agricultural residues, forest litter and dung. Because of the expected persistent low incomes of this group and the anticipated relative price increases in fossil fuels, it has become increasingly apparent that firewood will continue to be a main source of energy to a large proportion of these poorer people in the foreseeable future. Besides being a primary source of fuel, wood is also the principal building material used by many of these people. Accordingly, the Bank is engaged in developing a series of fuelwood projects with member countries. To date, some 16 fuelwood components have been financed and a further 15 projects are in the stages of identification-appraisal, see Attachment 1.

2. Whilst the need to develop large-scale fuelwood programs is a matter of extreme urgency in many countries, there are several constraints inhibiting the pace at which fuelwood reforestation can be implemented. Important among these are: non-availability of land for tree growing in areas of excessive land pressure for food production; lack of management control over land selected for afforestation which has been customarily used for communal grazing and is often subject to annual burning to stimulate young herbage; absence of a sound technical package suitable for the area; weak management and extension and the resultant poor responses from beneficiary farmers in establishing, and more importantly, maintaining fuelwood plantations.

3. In response to the urgency of the need, several governments have embarked upon reforestation programs without paying sufficient attention to solving the constraints. This has resulted in very poor survival of the plantations. Since such programs commonly include a proportion of self-help by the beneficiary group, there is the danger that the momentum for the programs is lost both at the farmer participatory level and within the agencies promoting the programs. These failures highlight the importance of careful preparation of fuelwood projects so as to achieve defined objectives within least-cost formulae and the need to design projects to suit the circumstances of specific target groups.

4. The Bank-assisted Korea Rural Infrastructure project demonstrates a successful approach to fuelwood reforestation on private land based on: selected participatory groups, known as Village Forestry Associations (VFA), accepting accountability for maintaining the plantations; the mobilization of self-help labor; strategic inputs of management and planting material being provided by government. The approach, which is integrated with the Saemaul Movement (Rural Self-Help), has been developed after some ten years of persistent government endeavor to achieve reforestation through "Greening" programs which met with only limited success. Steps were taken in 1973 to minimize the constraints to the success of the earlier programs; legislation was strengthened to give closer management authority to the

government's forest service over private forests, which was particularly directed to absentee owners; VFAs were strengthened both in authority and technical staff; and, the extension wing of the forest service reinforced. A national survey was made to determine fuelwood requirements by location and establish priorities of action. At the village level, each village has a Saemaul Committee which decides on needs and priorities and formulates requests to District and County Committees; Forestry work is the responsibility of the VFA, operating within the Saemaul Movement. The VFA can obtain technical guidance from both foresters of the VFA Union, (which articulates upwards through district and county level to national level), or the forest service. Under the revised forest legislation requiring reforestation of steep non-agricultural land, most private owners find it to their advantage to have the VFAs undertake the planting operations. The annual planting rate attained over 40,000 ha in 1975 and has exceeded 50,000 ha in the last two years.

5. A different approach is being taken in other projects. For example, the Nigeria-Lafia/Ayangba forestry component concentrates on establishing fuelwood plantations on government land, although flexibility is provided in the project to promote tree planting on private lands. This approach has been taken because of the degeneration of community tree plantations which were established in the area under earlier programs. The objective of the component is to strengthen the forest service with a sound technology to undertake replenishment of the fuelwood resource base and, having demonstrated this on government land, subsequently to develop a private and/or community fuelwood reforestation program. In the Pakistan Hill Farming and Tanzania Mwanza/Shinyanga rural development projects, a blend of both government and private/communal plantations will be established. In these projects also, the emphasis is directed to building up the competence of the forest service in fuelwood reforestation whilst at the same time phasing in a growing proportion of self-help tree planting on private land as the technical and social constraints are solved.

6. A significant feature which has emerged from our work with fuelwood projects is the large potential savings in fuelwood which is attainable through the introduction of improved wood stoves; and in buildings, through simple wood preservation systems. Components to implement pilot schemes to explore this potential have been included in the Pakistan and Tanzanian projects referred to in para. 5. It is proposed to pursue this potential in future project design.

Attachment 1

Bank-financed Projects with Fuelwood Components

1973 Mauritius Rural Development
Niger Drought Relief

1975 Mali Livestock
Niger Rural Development, Maradi I

1976 Korea Rural Infrastructure
Senegal Sine-Saloum Rural Development
Nepal Rural Development I
Colombia Rural Development I

1977 Tanzania Tobacco Processing
Sudan Savannah
Nigeria - Lafia and Ayangba Agriculture Development
Brazil Minas Gerais Rural Development
Chad Sahelian Zone Rural Development
Philippines Rural Development III
Pakistan Hill Farming Tech. Development
Kenya Bura Irrigation

Projects Under Identification, Preparation and Appraisal, January 1978, with Fuelwood Components

Tanzania Mwanza/Shinyanga Rural Development
Rwanda - Village Afforestation
Burundi Village Afforestation
Somalia Rural Forestry Component
Malawi Rural Forestry Component
Nigeria Ilorin and Bida Agriculture Development
Niger Forestry I
Mali Forestry I
Upper Volta Forestry I
Indonesia Yogyakarta Rural Development
Philippines Forestry II
Thailand Forestry I
India Forestry II
Bangladesh Forestry I
Jamaica Forestry I