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U.S. INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

PROJECT PAPER

MOROCCO

RENEWABLE ENERGY DEVELOPMENT II

PROJECT # 608-0159

GRANT

1981

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

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PP

2. DOCUMENT CODE

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10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 -)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	600		600	6700		6700
(GRANT)	(600)	( )	(600)	(6700)	( )	(6700)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY		420	420		5550	5550
OTHER DONOR(S)						
TOTALS	600	420	1020	6700	5550	12250

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 80 F. GRANT	E. 1ST FY 80 G. LOAN	H. 2ND FY 81 I. GRANT	H. 2ND FY 81 J. LOAN	K. 3RD FY 82 L. GRANT	K. 3RD FY 82 M. LOAN
(1) ST	740	290		600					
(2) FN	740	290				1494		1500	
(3)									
(4)									
TOTALS						1494		1500	

A. APPROPRIATION	N. 4TH FY 83 O. GRANT	N. 4TH FY 83 P. LOAN	O. 5TH FY 84 R. GRANT	O. 5TH FY 84 S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1) FN	1500		1606		6700	
(2)						
(3)						
(4)						
TOTALS	1500		1606		6700	

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RENEWABLE ENERGY DEVELOPMENT PROJECT PAPER

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M O R O C C O

RENEWABLE ENERGY DEVELOPMENT (Project 608-0159)

Project Paper Amendment

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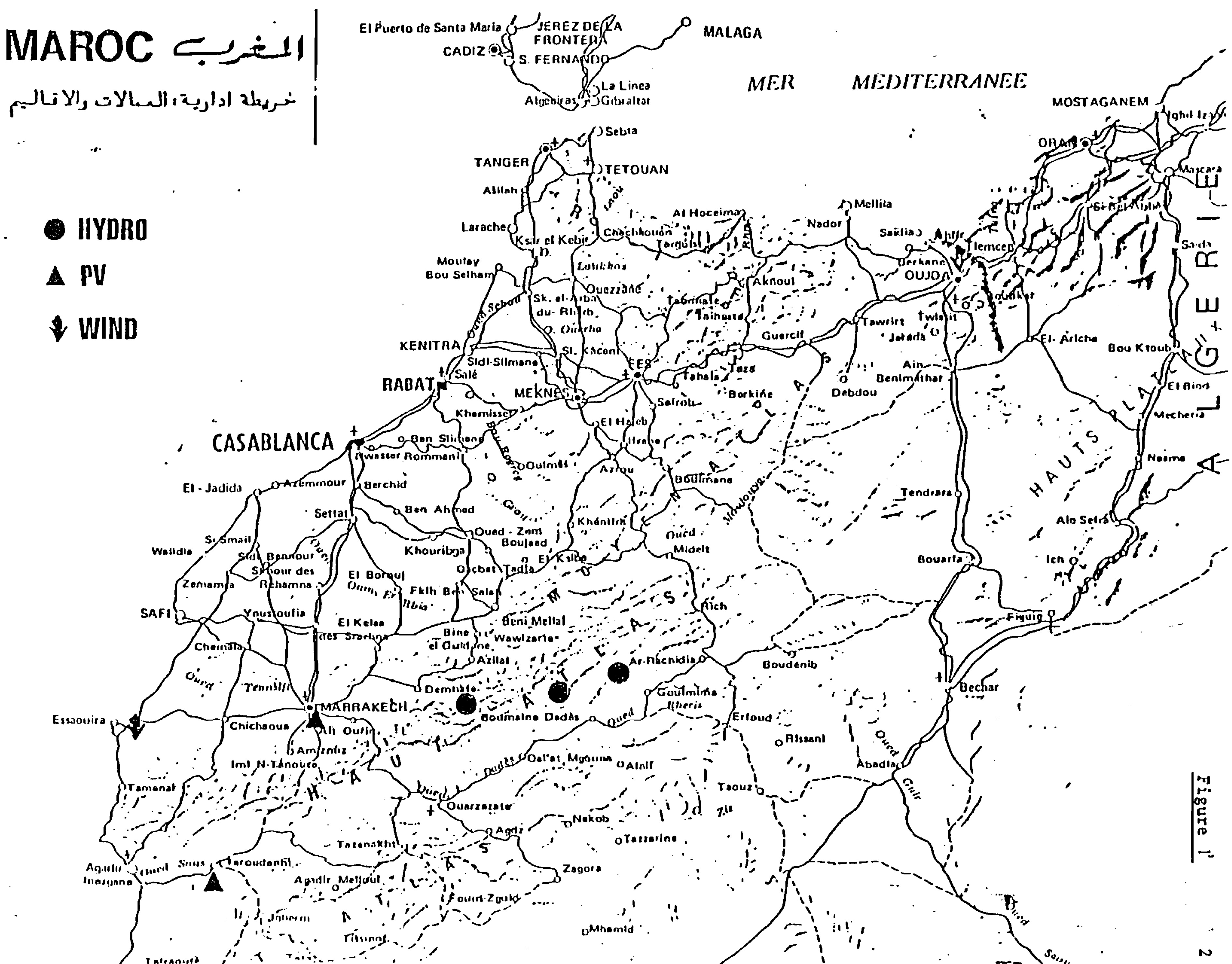

Figure 1

ABBREVIATIONS

. CDER	Center for Renewable Energy Development (Centre de Developpement des Energies Renouvelables)
. CTM	Charles T. Main International
. DOE	Department of Energy
. DH	Moroccan Dirhams
. DS/EY	Development Support Bureau, Office of Energy
. DSI	Development Sciences Incorporated
. FAA	Foreign Assistance Act of 1961, as amended
. FY	Fiscal Year
. GOM	Government of Morocco
. GSA	General Services Administration
. GSAI	GSA International
. ha	hectares
. IBRD	International Bank for Reconstruction and Development
. IQC	Indefinite Quantity Contract
. MEM	Ministry of Energy and Mines
. MI	Ministry of Interior
. Min Ag.	Ministry of Agriculture and Agrarian Reform
. NASA	National Aeronautics and Space Agency
. NRECA	National Rural Electrical Cooperative Association
. ONE	Office National de l'Electricité
. PASA	Participation Agency Service Agreement
. pm	person-month
. PP	Project Paper
. PV	Photovoltaic

Abbreviations (Contd.)

. RFP	Request for Proposals
. RSSA	Reimbursable Support Services Agreement
. SERI	Solar Energy Research Institute, Golden, Colorado
. TA	Technical Assistance

CURRENCY EQUIVALENTS

(As of April 15, 1981)

Currency Unit	=	Dirhams (DH)
DH 1	=	U.S. $ 0.208
DH 4.8	=	U.S. $ 1.00

MEASURES

1 kilometer	=	0.62 mile (mi)
1 cubic meter	=	35.315 cubic feet (ft^3)
1 barrel (bbl)	=	42 gallons (USgal) 0.159 cubic meter.
1 kilovolt (kv)	=	1,000 Volts (V)
Medium Voltage	=	In Morocco: 22-KV, 8.5-KV & 5.5-KV.
Low Voltage	=	In Morocco: 380/220-V.
1 Kilowatt (KW)	=	1,000 Watts (10^3W)
1 megawatt	=	1,000-KW (10^6W = 10^3 KW)
1 kilowatthour (kWh)	=	1,000 Watthours (10^3 Wh) 860.4 Kilocalories (kca)
1 megawatthour (MWh)	=	1,000 Kilowatthours
1 Gigawatthour (GWh)	=	1,000,000 Kilowatthours
1 kilovolt amperes(kVa)	=	1,000 Volt amperes (10^3VA)
1 Megavolt ampere (MVA)	=	1,000 kilovolt amperes
1 kilocalories (kcal)	=	1,163 Watthours
1 kilogram coal equivalent (Kgce)	=	7.10^3 kcal
1 hectare (ha)	=	2.47 acres
1 cubic meter (m^3)	=	264 gallons
1 gallon	=	.0038 cubic meters

MOROCCO RENEWABLE ENERGY DEVELOPMENT PROJECT PAPER AMENDMENT

I. SUMMARY AND RECOMMENDATIONS

A. Costs

The project total costs are as follows :

	Phase I[1] FY-80	Phase II FY 81-84	T O T A L
. AID Grant	$ 600,000	$ 6,100,000	$ 6,700,000
. GOM Budget[2]	420,000	5,130,000	5.550,000
TOTAL	$1,020,000	$11,230,000	$ 12,250,000

1. Authorized February 20, 1980.

2. In U.S. $ equivalent at US $1 equals 4.80 Moroccan Dirhams.

Grantee	Kingdom of Morocco
Principal Agency	Ministry of Energy and Mines (MEM)
Phase I Grant Amount	US $ 600,000
Phase II Grant Amendment	US $ 6,100,000 (of which US $1,500,000 in FY 81)

B. Project Purpose

Assist the Ministry of Energy and Mines to create a Center for Renewable Energy Development with the professional staff and facilities to carry out a wide range of applied research and pilot activities, studies and analyses to identify the most effective ways to exploit Morocco's renewable energy potential and develop programs to encourage its efficient use throughout the country.

C. Summary Description

The Center for Renewable Energy Development will be built by the Moroccan Government and equipped by A.I.D. Its staff will be trained and guided by resident and short-term AID-financed contract technical assistance advisors. Participant training will be provided in the United States and third countries.

The construction of the Center building, itself a model of energy-efficient design, will begin in early 1982 and is scheduled for completion in late 1983. Well before then, as its action program gets underway, the Center will become a strong, flexible institution designed to shape and be guided by Morocco's evolving energy needs. An assessment of the country's current and future energy requirements and resources now being financed by A.I.D. will yield results in 1982 which will assist the Center in defining targets for renewable energy use and helping shape GOM renewable energy policy. The Center is expected to play a catalytic role in expanding the use of renewable energy resources in the nation's economy as a substitute for imported fossil fuels.

Initial Center activities include pilot projects demonstrating four renewable energy technologies:

-- Small decentralized hydroelectric generation;

-- Direct use of solar energy, mainly photovoltaic cells and solar thermal collectors for productive use in rural areas;

-- Use of wind for electricity generation and water pumping;

-- Biomass conversion, beginning with improved charcoal production.

Initially, three 40-250 kilowatt small hydro units will be installed at sites in the High Atlas Mountains starting in mid-1982. They will be monitored for technical, social and economic replicability elsewhere. Two 40 kilowatt windmill units will pump water for irrigation and drinking on farms. Beginning in late 1981, small-scale photovoltaic units will pump water for drinking and irrigation and provide power for refrigeration in remote health dispensaries.

Several pilot projects in biomass conversion - including improved charcoal production, biogas generation and combustion of urban waste - are planned for initiation in 1982.

The project is designed for institution building and effective transfer of U.S. technology. Equipment for the Center and pilot projects totalling $2,455,000 will consist mainly of off-the-shelf items.

Peace Corps volunteers will assist in the implementation of selected pilot projects, particularly small-scale farm and village-sized activities financed through a Small Project Fund (See page 26), guided by the long-term contract technical assistance coordinator.

Project preparation began with an initial AID survey team which examined Morocco's energy development potential in the summer of 1978. A second A.I.D.-financed team carried out a feasibility study during the summer of 1979, which resulted in approval of a Project Paper for Phase I February 20, 1980. The present Project Paper Amendment describes Phase II activities. It amplifies, modifies and refines the material presented in Phase I Project Paper.

The Project reflects a GOM initiative with USAID. USAID provided project development assistance through teams from Charles T. Main International, Development Sciences Incorporated, GSA International and locally-contracted surveys and social analysis. Much of the substance of this amendment, including annexes, includes or reflects material developed by these teams. Further specific attribution is not hereafter made.

D. Project Implementation

GOM responsibility for management of this project rests with the Office of Energy Resources Development of the Directorate of Energy of the Ministry of Energy and Mines. The Center for Renewable Energy Development reports to this office. The research, development and evaluation activities to be carried out under this project will be managed by CDER.

The design and construction of CDER buildings and facilities will be carried out by private firms under contract to the MEM. The construction, installation and maintenance of the small hydro pilot and the larger solar and wind pilot projects will be carried out by the Office National de l'Electricité (ONE).

Coordination with other GOM agencies, such as the Ministry of Interior, the Ministry of Agriculture and Agrarian Reform and their local subsidiary agencies will be the responsibility of CDER with MEM support when necessary.

E. Beneficiaries

As an institution-building project to help the Moroccan Government develop the capability to exploit its renewable energy resources

more effectively, this project's most important benefits are long-run and indirect.

The CDER's most immediate beneficiaries are the 30 members of its staff who will be trained to assume major responsibilities in renewable energy development.

The pilot projects' most immediate beneficiaries are about 6,000 rural dwellers who will use energy produced by the small hydro, solar, wind and biomass pilot projects to be set up during the project's four year life.

The longer-term beneficiaries will be the 200,000 - 300,000/rural population of the 200 sites where productive small hydro generation units may be installed, the several hundred thousand people who may benefit from similar replication of solar, wind and biomass pilot activities, and, in the end, the entire population of Morocco who will benefit from the economic advantages of the more efficient use of the country's available energy.

F. Statutory Criteria

All statutory criteria have been met. Congressional notification has been made.

G. Country Team Views

USAID and the American Embassy in Morocco support this grant as consistent with U.S. policy objectives in Morocco.

H. Fund Availability

Funds for Phase I of this Project were obligated in April 1980. FY 1981 funds of $ 1.5 million for Phase II have been allotted to the USAID.

I. Analysis

The analysis in this Amendment concludes that the entire project is technically, financially and socially feasible and that planning is sufficiently developed for implementation of Phase II to begin. All significant issues have been identified and will be dealt with as outlined in Section V (Issues).

J. Waiver

A waiver will be requested to permit

inclusion of a price element in the proposals for executing the long-term technical assistance financed under the Project. See Section III.B.4. (Technical Assistance).

K. Recommendation

That this Project Paper Amendment be approved and that the level of AID-appropriated funding approved for this project over its five year life be increased from $ 600,000 to a new total of $ 6,700,000.

II. BACKGROUND

A. General

Morocco is a middle income country with a $14 billion gross domestic product in 1979-1980. Its present 21 million population is increasing at an annual rate of over three percent. Over the long term, Morocco has considerable resources on which to base steady economic growth, including phosphates and other minerals, potential for higher agricultural productivity, and substantial existing infrastructure.

The high cost of energy is a major problem for the Moroccan economy and a major reason for recently increased imports expenditures. Morocco is heavily dependent upon imported fuels. It must include constantly increasing petroleum prices in its economic calculations. To confront the energy problem the Government plans a program of energy conservation and domestic resource development: coal, petroleum exploration, shale oil deposits, hydro-electric power and renewable energy. The Government has recently intensified offshore and onshore oil and gas exploration via joint ventures with foreign firms. Morocco's increasingly serious search for new energy resources offers potential investment opportunities in oil prospecting, shale oil exploitation, uranium extraction, and solar energy.

The Ministry of Energy and Mines (MEM) is responsible for overall development planning, pricing, and investments in the energy sector. It has administrative control over a number of key public enterprises in the energy sector including the Office of National de l'Electricite (ONE), responsible for most electric power generation and transmission; the Bureau de Recherche et Participation Miniere (BRPM), which manages oil, gas and uranium exploration; the newly-created Office National des Recherches et de l'Exploitation des Hydrocarbures (ONAREXH), charged with the exploitation of Morocco's extensive oil shale deposits; and - most important for the proposed project - the Centre de Developpement des Energies Renouvelables (CDER), whose legal existence was formally approved by the GOM Council of Ministers in May 1981.

During 1978, the Government of Morocco designated a research facility site and set aside funds for a research program to increase use of renewable energy in Morocco. A consultant team sponsored by A.I.D. visited Morocco and assisted the Government to plan the Center and to identify pilot research activities. The resulting December 1978 report recommended an organization plan for the renewable energy center and concluded that small hydro sites in the Atlas Mountains should be investigated with a view to identifying suitable sites for feasibility studies, final design, and construction. Further preliminary survey and project identification work was carried out in 1979 which led to identification of this proposed renewable energy development project in Morocco (See DSI June 1979 report in Bibliography, Annex 20).

In the energy sector, the Government has itself concluded that the rural electrification program deserves major emphasis and that development of renewable resources may offer the best hope for a way to extend the benefits of power to the rural population and to agricultural production. This proposed renewable energy project is in accord with USAID/Rabat's basic program strategy on Morocco. It reinforces the policies and programs of the MEM in the rural electrification subsector.

This project represents a unique and timely marriage of Morocco's long-term development goals and A.I.D.'s program objectives in Morocco, coupled with the universal need to address higher and increasing energy costs. The proposed series of studies, training and technical assistance should launch the GOM renewable energy program on a sound economic and technical basis, utilizing U.S. technology to the maximum, and adapting that which is found to be practical to the environment of Morocco.

B. GOM Energy Sector Objectives

The energy demands of the monetized Moroccan economy are met mainly by petroleum products (82 per cent), coal (8 per cent) and hydro-electric power (9 per cent). The energy deficit, therefore, is mainly an oil deficit. Virtually all oil is imported. The volume of Moroccan oil imports has increased at 8-10 percent annually during recent years, and are now running at an annual rate of over $1 billion. Faced with this financial hemorrhage, Morocco must experiment with several other energy sources, looking toward the year 2000. It is thus important that Morocco not only assure itself of a reliable source of oil but also explore every possible domestic energy resource so as to reduce its dependence on external suppliers.

The period 1978-1979 was a turning point in energy policy. Increased interest in energy, including renewable energy, was stimulated, in part, by the realization that the cost of imported petroleum might soon exceed revenues from phosphate exports and that known domestic supplies of coal, gas, oil and wood, at present rates of utilization, will disappear in less than a generation. There are, to be sure, indications that Morocco probably has significantly larger deposits of coal and may even discover an oil field along with its other presumed mineral wealth. But proving the point takes time, effort and, above all, money.

The Ministry of Energy and Mines has begun to put in motion a national energy policy which is likely to affect every aspects of the Moroccan economy during the next few years. The 1978-1980 Three Year Plan emphasized the need to reduce Morocco's dependence on imported oil. This orientation will be pursued with greater vigor and determination in the 1981-1985 Five Year Plan period. The Plan involves programs which will (1) intensify oil and gas exploration, (2) develop Morocco's very large oil shale deposits, (3) accelerate rural electrification, particularly with small and medium scale

hydroelectric generation, (4) extract uranium from phosphates and introduce nuclear energy, (5) intensify exploration and production of coal, lignite and uranium, (6) develop renewable energy, particularly solar energy and biomass, and (7) encourage energy conservation.

Morocco is counting heavily on exploiting its oil shale resources and, at this point, may well actually apply retorting technology to commercial ends before the U.S. does. Whether these resources can be developed economically remains to be determined. The GOM therefore wishes to explore and develop the full economic potential of other energy resources, including renewable energy.

The GOM has already taken steps to explore the potential of renewable energies, including activities under Phase I of this Project. Small hydro is particularly attractive to the GOM (and to the USAID) because of its potential for contributing to the development of remote, poor areas in the context of the GOM's policy of reducing regional disparities in services. We would propose to play a role in directing Moroccan energy sources into channels which will be relatively more decentralized and available to broad segments of the rural population.

C. Other Energy Assistance to Morocco

The World Bank is a major contributor to GOM energy efforts, having lent nearly $200 million between 1974 and 1980 to Morocco for electric power generation, transmission and rural electrification and a further $65 million in 1981 for oil exploration and oil shale development. The Bank is now cooperating with the GOM to carry out a 15-year rural electrification program which will include a major expansion of hydroelectric generation capacity, through large scale hydro power and small dam development. At present, electricity provides a quarter of total energy supply and generation is rising at 10 percent per year. About 64 per cent of production is thermal, generated from coal and oil, and 36 per cent is hydroelectric. With greater use of hydro and development of oil shale potential, dependence on imported oil should be reduced. The Bank has indicated interest in financing an expansion of small hydro generation facilities if the AID-financed pilot projects yield encouraging results.

Morocco is following with interest activities in Europe, especially France, involving various forms of renewable energy. There is increasing evidence of interest on the part of private sector firms in France, Italy and Germany in equipment sales, local manufacture and pilot projects in small hydro, wind, solar and biomass development in Morocco, but lack of financing has inhibited significant action so far. A major French agreement recently signed with Morocco for cooperation over a broad range of industrial and mining activities envisions cooperation in energy development - but so far no funds have been committed.

The UNDP has installed a few demonstration solar flat plate collectors for water heating and UNICEF in financing a small program for the repair of windmills, of which there are many in Morocco which were installed in 1950s for mechanical water pumping.

AID has financed a pilot installation at an agricultural school near Rabat (through an OPG to the Catholic Relief Services) which includes solar flat plate collectors ans a solar parabolic oven designed by a French technical assistance group (GEFOSAT). The equipment is being installed by two young French volunteer engineers as part of a training program for Moroccan farm boys at the CIDERA school.

It is envisioned that the Peace Corps will play a role in the proposed Renewable Energy Development Project by guiding and encouraging small, grass-roots projects financed by the Small Project Fund described in Section III.B.7. An AID-financed project for Integrated Forestry Development proposed for FY 1982-1986 implementation will contribute to the expansion of biomass production, complementing the biomass conversion element of this Project.

The GOM has asked for U.S. assistance in planning and management of conventional as well as renewable energy. Beginning in 1981, AID is assisting the MEM to develop a national energy planning capacity, provide technical assistance for planning the development of oil shale, and finance training in energy technology management across the board. Together with the anticipated involvement of American private firms, and coordinated with World Bank activities, these programs are likely to have a major influence on Morocco's energy future and therefore on its economic development.

The GOM has budgeted a total of $31.8 million for renewable energy activities in the 1981-1985 Five Year Plan. During that period the GOM proposes the following program allocations.

	$000
Center for Renewable Energy Development	9,400
Solar Energy Development	5,000
Wind Energy Development	400
Small Hydro Development	16,000
Biomass Development	1,000
	31,800

Of these funds, the GOM has so far allocated $5,550,000 to the proposed Renewable Energy Development project. A summary financial plan for the project by component and category is shown on the following page and in Annex 1, Table 9.

III. PROJECT DESCRIPTION AND IMPLEMENTATION

A. Phase I and Phase II Activities

The project consists of two phases:

Phase I, financed with FY 1980 funds, began in June 1980 and includes:

1. A feasibility and preliminary design study for the Center for Renewable Energy Development and related pilot projects for small hydro, solar and wind powered pumping units (June-October 1980).

2. Survey, socioeconomic study and preliminary engineering design of the small hydro generation pilot projects (Dec.1980-May 1981).

3. Initiation of a work and training program in Morocco for the Center for Renewable Energy Development (begun April 1981).

4. Design of a training program in the United States for staff of the Center for Renewable Energy Development (January 1981).

5. Beginning of final design for the Center for Renewable Energy Development (June-August 1981).

Phase II, to begin in July 1981 after approval of this Project Paper Amendment and obligation of FY 1981 funds will include:

1. Additional training in Morocco and the United States for Moroccan professionals assigned to the Center for Renewable Energy Development.

2. Completion of final design, detailed specifications and bidding documents for the Center for Renewable Energy Development and related pilot projects for small hydro, wind and solar power generation.

3. Equipping the Center for Renewable Energy Development and related pilot projects.

4. Provision of U.S. resident, long-term technical assistance and short-term advisory services to support training, management and research activities as part of the institutional development of the Center and its program.

The Ministry of Energy and Mines budgeted $420,000 in FY 1980 for renewable energy development and acquired a site in Marrakech for the Center for Renewable Energy Development. A director and a deputy director were appointed to guide the project and legislation for the legal establishment of the Center was approved by the Conseil du Gouvernement. An initial staff of five engineers was recruited for the Center in late 1980 and an additional $ 830,000 was budgeted for renewable energy development in FY 1981.

During June-October 1980, Charles T. Main International, Inc. carried out feasibility and preliminary design studies for the Center for Renewable Energy Development, 3 small hydro pilot projects and 5 solar or wind-powered water pumping pilot projects. After these studies were reviewed by AID and the Moroccan Ministry of Energy and Mines, certain changes and revisions were made which are reflected in this Project Paper Amendment. Preliminary engineering design and preparation of equipment and construction specifications have been completed for the Center for Renewable Energy Development and the 3 small hydro pilot projects. Revised recommendations for solar and wind-powered pilot projects have been submitted and are contained in this Amendment. An initial action program of training and data-gathering has already begun at the Center, carried out by a skeleton Moroccan staff with U.S. guidance.

The Ministry of Energy and Mines has invited proposals from Moroccan architects to work with an American architectural firm on the final design of the Center later this year. The MEM plans to let contracts for construction of the small hydro units in late 1981, for the Center in March 1982, and for the solar and wind-powered pilot projects as soon thereafter as practicable.

Phase II of this project can begin upon approval of this Amendment and obligation of FY 1981 funds. Phase II will finance a 2-person technical assistance team and short-term consultants to guide the development of the Center for Renewable Energy Development; further participants training in the United States and third countries for Center staff; and equipment for the Center and the related pilot projects.

B. The Center for Renewable Energy Development

1. Objectives

The Center for Renewable Energy Development (CDER) represents a significant step forward in Morocco's efforts to reduce its dependence on imported fuels, and to make maximum use of the country's renewable resources for the production of usable energy, while at the same time preserving these resources from environmental degradation.

The objectives of the Center for Renewable Energy Development are to :

— Characterize the quantity and quality of Morocco's renewable energy resources;

— Identify and develop renewable energy technologies best suited to Morocco;

— Establish an objective performance measurement system for renewable energy techniques and equipment;

— Train a cadre of engineers, scientists and managers in the application and administration of renewable energy technology;

— Develop a Moroccan institutional capability to manage and coordinate renewable energy research activities that are applicable and relevant to Moroccan economic and social development;

— Integrate renewable energy techniques into Moroccan national sector policy and planning.

It has been suggested that at best renewable energy can substitute for only 8-15 percent of LDC energy needs to the year 2000 (See Palmedo, in bibliography). This estimate is in line with the MEM's plans for Morocco which call for 5 percent utilization of renewable energy excluding hydropower (MEM, Energies Renouvelables, See bibliography). That percentage could be considerably higher depending upon the relative speed of application of renewable energy and Morocco's oil shale, phosphate/uranium and limited petroleum alternatives.

The objective of the CDER, rather than to do pure research in the renewable energy field (although that is not excluded) is to provide technically competent monitoring of such research elsewhere and accelerate the adoption of favorable technologies by improving their performance, testing alternative designs and making them socially acceptable through demonstration. Where technical and economic analyses indicate that renewable energy applications will be financially preferable in 10 years or less, the time to begin the testing and demonstration of such technologies is now, if premature investments or inappropriate choice or scale of technologies are to be avoided.

AID is financing a national assessment of Morocco's current and future energy resources and requirements, which in 1982 will yield results which will assist the Center in defining targets for renewable energy use. Under the guidance of a U.S. contractor, a nucleus of Center staff is already taking part in the assessment and beginning to develop an ability to apply modern analytical techniques to the energy sector. The Center program will build upon the assessment in providing a basis for setting priorities and defining programs in renewable energy development and, as a center for applied technology and research, to explore ways to make optimum use of available renewable energy technologies.

The Center will have several important responsibilities:

1. Develop knowledge about Moroccan natural resources which can be used to produce energy.

2. Assess the applicability of renewable energy technologies for Morocco, and adapt these technologies so that they can serve Moroccan development.

3. Plan for the introduction of renewable energy into Moroccan development through demonstration and pilot projects, analyzing the social and economic effects, and recommending adjustments in technology application necessary to ensure success.

4. Disseminate information on renewable energy technologies and their applications to the Moroccan scientific, commercial, governmental and public sectors.

5. Conduct testing of renewable energy devices, and notify the Moroccan commercial and industrial sectors as to their performance; assist Moroccan business to establish standards of performance.

6. Assist government ministries with the planning and implementation of renewable energy projects on a large scale, providing data, and analytical and managerial skills to such ministries.

2. Organization

To carry out these responsibilities, the CDER will have its own facility, and a professional staff of some thirty professional and twenty support staff.

The Center will direct its activities toward the application of renewable energy technologies, rather than carrying out basic research in the technologies themselves. Basic research will be the province of Moroccan educational institutions, particularly Mohammed V University. The nation wide implementation of renewable energy will be the responsibility of governmental organizations where large-scale investments are required (e.g., small hydro, biomass plantations), and very possibly the industrial and commercial sectors where investments may be smaller, or divisible into manageable parts.

The CDER thus will occupy a middle position between basic research and nationwide acceptance of renewable energy, and its functions have been planned to enable it to meet the requirements that this implies. Its professional staff will be trained in resource assessment and associated technologies and will be able to work effectively with university personnel; they will also have a command of the planning and analytical functions which will enable them to advise ministries on renewable energy use on a regional or nationwide scale.

It is important that the full range of expertise developed at the Center be available to participate in interdisciplinary, task-oriented approaches to energy problem-solving. Under the guidance of the U.S. technical assistance contractor the staff of CDER will be structured to facilitate the use of the Center's resources to expand the application of renewable energy resources for rural/agricultural purposes, commercial purposes and fossil fuel displacement. The organizational structure of CDER will therefore retain a degree of flexibility and adaptability to be delineated more precisely as the Center's functions evolve under the guidance of the U.S. technical assistance contractor.

The Center will be organized and staffed around five basic functions:

- Administration and Support Services
- Technology Development
- Information
- Planning and Analysis
- Applications

In Annex 13 is a detailed functional description of the CDER staff positions.

ORGANIZATION OF THE CENTER FOR RENEWABLE ENERGY DEVELOPMENT

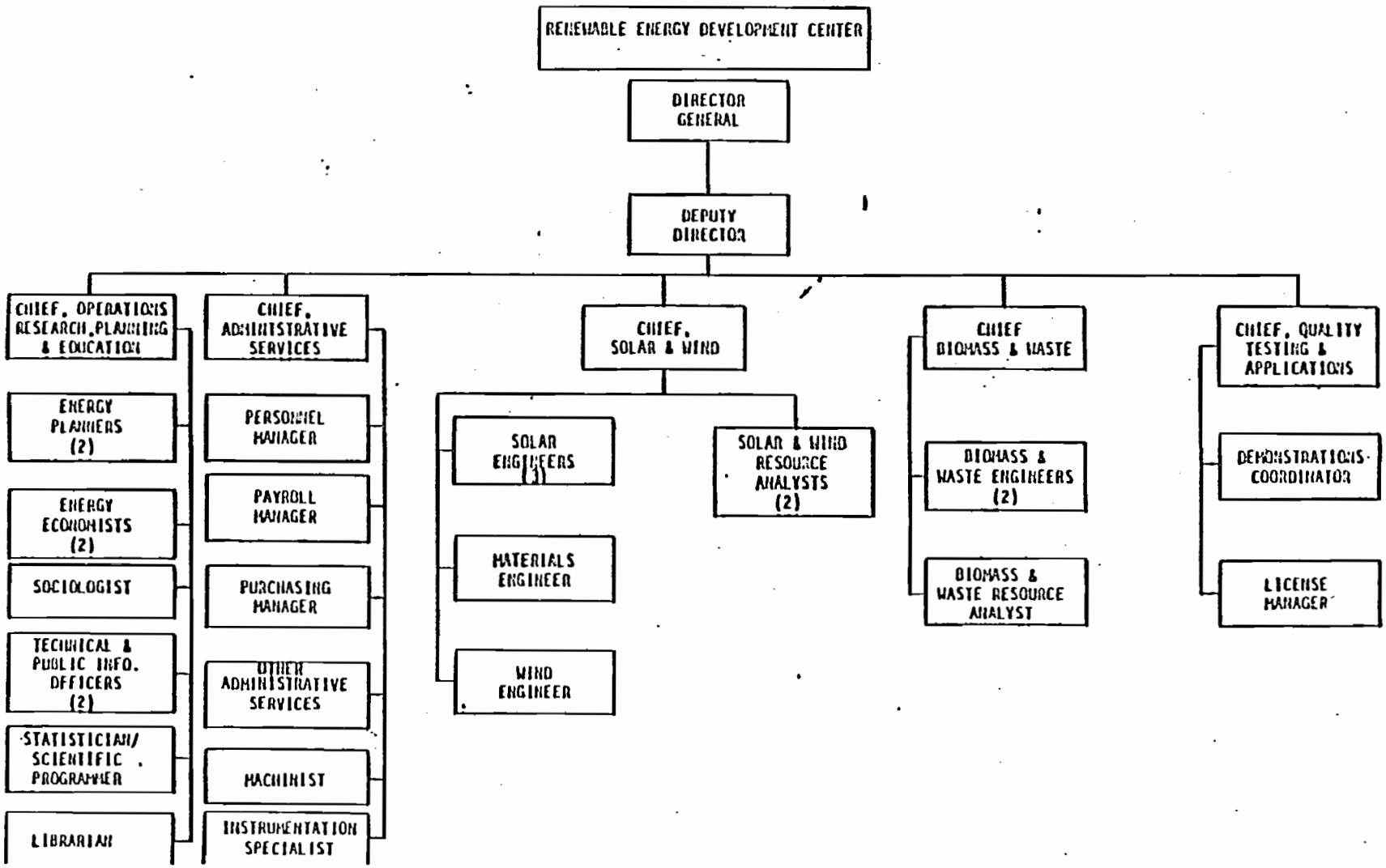

Figure 2

3. Training

A major purpose of the A.I.D. assistance program is the development of an institutional capability to introduce renewable energy into the Moroccan economy. When the building for the Center is completed in late 1983, a fully functioning institution should be in place to take advantage of the facilities. The design of the facilities implies a program of some breadth in the renewable energy field, covering a broad range of resources and technologies. Furthermore, it is expected that an evolution of concerns and growth of capacity will take place as needs and events clarify the future investments appropriate to Moroccan energy supply and demand patterns. It is anticipated that the staff will grow from an initial few (7 in May 1981) to increasing numbers (30 in 5 years) and from a narrow range of technical expertise to a broader set of skills to accomodate expanding demands. Consequently the recruitment, training, and evolution of personnel requirements are designed to meet projected needs over the next few years. A total of 12 academic trainees and 80 person-months of short-term training will be financed during the life of the project.

a. Short-Term Program and Training in Morocco

It is important that both program and building construction proceed in parallel so that the sequence of events does not inhibit progress. The short-term activities in Phase I are therefore designed to interrelate and reinforce each other.

One must distinguish between the physical construction of the Center, which will not be completed until late 1983 according to present schedule, and the implementation of the Center's action plan which has already begun. A detailed action plan for initiating the Renewable Energy Development Center has been developed. It has two major components : On-the-job training in Morocco as the Center's program activities are initiated; and short-term training in the United States.

The first part of this program is now under way in Morocco for CDER's first five professional staff financed with Phase I funds under the direction of short-term U.S. experts under an Indefinite Quantity Contract.

The training program has been planned with four principal purposes in mind:

1. Maximize the exposure of CDER staff to renewable energy concepts and renewable energy trade-offs in a Moroccan context in order to give purpose and direction to their U.S. training;

2. Provide exposure to the technical vocabulary they will be using in the U.S.;

3. Introduce them to the concepts and methods of national assessment in the renewable energy field and to make a start on their contribution to the assessment which should continue and grow after their return from the U.S.;

4. Provide sufficient flexibility in scheduling that we can minimize lost time due to normal delays, interruptions, non-deliveries, or changed schedules encountered.

With these priorities in mind, training activities are being carried out during the period April-August 1981 in the following four areas:

1. Insolation and wind resource measurement;
2. Case studies of energy outpots in target industries with possible solar potential;
3. A survey of local availability of solar materials, conventional solar materials substitutes, and solar manufacturing processes;
4. Repair and installation of solar equipment for CDER in Marrakech.

b. Participant Training Outside Morocco

Training in the United States will begin with observation tours to renewable energy installations for the Director and Deputy Director of CDER in the summer and fall of 1981. The initial CDER staff of five engineers will attend a three month program in renewable energy technology at the University of Florida in the fall of 1981 and return to Morocco to work with U.S. contract technical assistance advisors in early 1982.

Another 6 CDER staff members will be recruited and will begin training in early 1982 to be available for work in 1983 when the Center laboratories are expected to be operational.

During the life of the project, 12 Moroccans will be given Master's degree training in the United States in various aspects of renewable energy development. They will return to join the CDER staff. Designing and pursuing viable energy strategies requires a wide range of skills at various levels, in such areas as energy planning, project management, engineering, environmental analysis, economic and social science disciplines, energy equipment operation and maintenance, and other aspects of renewable energy development.

The project will also finance 20 person-months per year of short-term and in-service training for the staff of CDER and other groups working with CDER on renewable energy development.

Training and observation tours will also be arranged in other Third World countries where renewable energy progress is being made. waiver to permit participant training in Geographic Code 941 countries is included in the Project Authorization Amendment (Annex 8). Waivers will be sought on a case by case basis for observation training in Europe when plans are more precisely defined.

It is important that Moroccan staff be recruited and trained rapidly enough to effectively decrease the CDER's dependence on the U.S. technical assistance contractor staff well before the end of the project. To this end, a condition precedent to disbursement of funds for the Center will specify that the MEM develop a plan for the recruitment, training and assignment to the CDER of Moroccan staff.

Training in Morocco, the United States and elsewhere will be designed and managed by the U.S. long-term technical assistance contractor.

4. Technical Assistance

The Center's action plan will be carried out with the help of a team of American technicians under contract to the GOM.

The technical assistance to be financed by this project will consist of the services of two long-term resident, French-speaking renewable energy experts and 25 person-months per year of short-term consultants who will assist the director of CDER to plan the structure, staffing, research capability and administrative management for the CDER; formulate a five-year renewable energy research and development program, including sub-project activities, methodologies, timetables and budget estimates; and formulate and carry out professional training program.

The two person team will consist of team leader with a background in energy planning and management, and an engineer with expertise in renewable energy development. Additional special skills required for carrying out the CDER program will be provided by consultants who will serve for periods up to 6 months. The long term technical assistance contractor will also be responsible for (1) managing participant training in the United States and elsewhere; and (2) arranging for the procurement of most project commodities.

A Prequalification Notice was published in the Commerce Business Daily January 12, 1981 and the MEM prequalified 6 firms in early April. Requests for Technical Proposals will be issued in July 1981 to qualified firms upon approval of this PP and an host country contract will be signed with the MEM in December 1981 (See Implementation Plan, Annex 3).

A waiver will be sought to permit inclusion of a price element in proposals for the long-term technical assistance contract.

Moroccan law requires that proposals for contracts with the Government of Morocco contain a price element. In addition to causing legal problems, the absence of such an element would undermine AID's overall host country contracting philosophy, as outlined in Policy Determination 68.

AA/NE has recently approved the inclusion of price in technical services proposals for the Range Management Improvement (608-0145) project, among others, essentially for the reasons described above.

Contract staff are scheduled to arrive for duty in Morocco in February 1982. Construction of the Center's facilities will begin in March 1982, and the Moroccan nucleus CDER staff of five will return from the United States to work with the U.S. contract staff. In early 1982, a second cycle of CDER staff will depart for a 6-month training program in the United States. By then, selection should be under way, with the participation of the contract staff, for candidates for U.S. academic training to begin in September 1982.

The U.S. contract staff will be responsible for procurement of all equipment for the Center and related pilot projects except that which must be ordered well in advance of the contractor team's arrival in Morocco to avoid unacceptable and unnecessary project implementation delays. (Equipment shown in Annex 5 as having procurement priority 1). To this end USAID will order approximately $100,000 of equipment and materials for the Center to enable the U.S. contract to function effectively during the first 6 months after their arrival. All other equipment for the Center will be procured by the U.S. contractor beginning in 1982.

The U.S. contract staff will have arrived by March 1982 and will participate in the procurement and installation of the solar and wind equipment and arrange for CDER monitoring and evaluation of the pilot activities. They will work closely with CDER and MEM to insure that appropriate maintenance and surveillance provisions are made, and to develop further cooperative working relationships with other arms of the GOM which will have been established during the course of 1981 by MEM, CDER, and operational agencies of the Ministries of Agriculture and Interior.

Within three months of their arrival in Morocco, the contract team will have reviewed the project's progress and have developed, in close coordination with the Director of CDER, a detailed action plan for the remainder of 1982 and a preliminary action plan for the remainder of their contract period (1982-1984). It is likely that, as the CDER evolves and Moroccan staff play an increasing role in its operations, the role of the U.S. contract staff will also change. For this reason, long-term and short-term contractor staff needs will be reexamined after two years as part of the project evaluation. Revisions in the contract requirements may be made at that time.

An important element of the contractor's initial activities will be to develop a series of recommendations for action in the field of biomass. The AID/USDA Bioenergy Team report (Biomass for Energy in Morocco, August 1980) made a number of recommendations for MEM action which are summarized in Section III E-2. The MEM has, however, not yet decided on a program to explore biomass possibilities for Morocco, nor has staff so far been allocated to do so. Funding has been earmarked within this project for a biomass program based on certain of the Bioenergy Team's preliminary recommendations subject to further detailed reviews by the technical assistance contractor. This figure is, needless to say, illustrative, but indicates that biomass exploitation is intended to be an important part of the Center's activities. Action in this area will be coordinated with biomass production activities carried out under the proposed Integrated Forestry Development Project (608-0165) scheduled to begin in collaboration with the GOM Ministry of Agriculture's Forest Service.

5. The Center's Physical Facilities

The Renewable Energy Development Center is to be housed in facilities which will be built in Marrakech next to the School of Mines. The structure will be carefully designed as a model of energy-sensitive architecture, incorporating principles of solar design and energy-efficient use of local materials. It will serve as an example for emulation by Moroccan architects and builders in government and in the private sector. At the same time, its laboratory facilities will provide Morocco with an adaptable and flexible instrument for pursuing the development of the country's renewable energy resources.

The form of the building has been designed following the functions described above. It will include laboratory facilities which will permit the Center staff to carry out a broad range of research and development activities:

- For technology testing and development of solar thermal, photovoltaic and wind systems, a fluid system laboratory, an air system laboratory, an electrical laboratory and a materials laboratory.

- For technology testing and development of biomass and waste utilization, a biocombustion laboratory and a biochemical laboratory.

The laboratories will be supported by a machine shop and an instrument shop.

The Center will provide facilities for publication, training and education activities as well as a library for acquisition and maintenance of current information on renewable energy activities. The data processing needs of the Center will not require a computer. Its computation needs will be handled by hand and desk-top calculators adequate to the task.

On-site housing for senior staff members will be designed by the same Moroccan-American architectural team which produces the Center's final designed. They will be financed and constructed by the GOM.

Under Phase I of this project, Charles T. Main produced a feasibility and preliminary design for the Center during the summer of 1980. The GOM has made it clear that this Center is to be a model of energy efficient design, to incorporate a variety of passive and active uses of solar energy, energy conservation and use of local materials so as to inspire Moroccan architects and planners both in the private sector and in the Ministry of Housing and Regional Development to apply these methods and practices nationwide. The main feasibility study and preliminary design did, indeed, incorporate certain passive and active solar design features:

Passive Design

- Optimize natural lighting through layout,
- Optimize cooling through a well insulated wall and roof system,

- Natural air circulation,
- Building orientation.

Active Solar Design

- Solar thermal hot water heating and cooling,
- Solar electric (photovoltaic) power for irrigation pumping for the Center grounds, energency lighting, battery charging and laboratory experimentation,
- Automatic control of artificial lighting.

AID and GOM reviewed the Main design and concluded that a different approach to design was required if the Center were truly to conserve energy, use local materials and construction techniques, incorporate traditional Moroccan design concepts and exemplify appropriate building in Morocco's solar environment.

An American architectural firm with considerable experience in energy efficient design in the Middle East has been asked to redesign the Center with these factors in mind. This firm will work closely with the Moroccan architect selected by the MEM to produce the Center's final design and supervise its construction. The American team will work initially in Morocco for a month in June 1981, and then in Houston where the Moroccan architect will participate actively in the preparation of design plans. Costs of the American firm's services are financed centrally by the AID Office of Energy. The Moroccan architect will be contracted and financed by the MEM. Construction will be carried out under MEM financing by a Moroccan contractor and supervised by the Moroccan architect.

The Ministry of Energy and Mines will finance the costs of land acquisition, design, construction and facilities (summarized in Table I B) estimated at $2,720,000. AID will finance solar collection devices for the buildings, laboratory equipment and a research library at a total estimated cost of $1,195,000 (Table 1 A). Laboratory equipment is itemized in Annex 5. It is likely that the redesign of the Center may increase the cost of its construction somewhat. The cost of the AID-financed items, however, will not change.

6. The Site

The designated site adjacent to the School of Mines in Marrakech was evaluated by the Charles T. Main team as to adequacy for the various activities of the Center: wind, solar, biomass; ownership; availability of utilities; accessibility; drainage; sociological and environmental compatibility.

Main concluded that the designated site is adequate for the construction and operation of the proposed facility. This conclusion is substantiated by the brief description of each of the above items' evaluation in Annex 15.

7. The Small Project Fund

An important part of the Center's action program will be to engage the interest and energy of a broad range of individuals and organizations, both private and public, in renewable energy development activities. This leverage will be particularly essential in view of the modest size of CDER staff. It will be particularly relevant in connection with encouraging the widespread use of truly micro installations equipment and practices which can be applied on individual farms, in individual households and in small industry. To support activities of this kind a Small Project Fund will be established. This fund will be administered by CDER under USAID guidance and with USAID support in its initial years. The Fund will provide small grants and finance small contracts ranging from $500 to $20,000 which will support the development of small pilot projects, innovative approaches, applied research, production and market studies and diffusion of information on renewable energy methods and practices. Grants will be made by a CDER Project Selection Committee which will include at least one representative from the U.S. contractor staff. It is expected that as the Center's capacity is strengthened over time the Moroccan staff will play an increasing role in the decision-making process. These proposals will be judged on the basis of selection criteria developed by the Center with assistance from the U.S. contractor and approved by USAID. Selection criteria will be based on economic, financial and technical feasibility and social and environmental impact. The project should be likely to yield results which:

(1) can be replicated in Morocco and are responsive to Moroccan economic and social needs,
(2) can increase the utilization of a renewable energy resource, and
(3) hold the potential for being further developed and spread by the private sector.

The project should have a potentially favorable cost-benefit ratio and employ a level of technology which is feasible in Morocco. These guidelines are included in the Project Agreement (See Section 4.4 in Annex 7). Annex 14 provides further guidelines from which the selection criteria are to be developed.

The Peace Corps is ready and willing to play a key role in helping develop and carry out community level pilot projects of this type. A few volunteers have already been trained in small scale renewable energy technologies in the United States. Working with local groups, they have built and experimented with a prototype solar flat plate collector for hot water at a village school, and a biogas digestor at a government-run farm.

Lack of resources however sharply limits the activities of this kind which can be undertaken. The Peace Corps has an Associate Director for Appropriate Technology who is prepared to work with CDER and USAID to develop an expanded program of small-scale, low cost, village-level pilot activities which could be carried out with help from Peace Corps volunteers and modest AID financing. The Ministry of Energy and Mines has encouraged such program and has expressed considerable interest in the few initiatives which have so far been undertaken. There are one or two others: USAID has financed a pilot project involving a solar

oven and solar hot water heaters at a small agricultural school near Rabat - under the CIDERA Rural Development OPG (608-0158) administered by Catholic Relief Services - where two young French engineers with a background in solar energy are giving hands-on training to rural youths in the construction and use of these renewable energy devices. The UNDP two years ago installed an array of solar flat place collectors for hot water heating at a Ministry of Health dispensary near Rabat. To be maximally useful, small pilot activities of this kind should be planned, coordinated, monitored, evaluated and publicized by a central responsible authority like CDER. The Small Project Fund is designed to accomplish this end. See Annex 14 for a description of its operation. A total of $320,000 will be reserved for the Small Project Fund during the life of the project.

USAID will provide initial funding for the Small Project Fund of $20,000 so that certain selected activities can begin under CDER auspices, in 1982. The CDER will submit quarterly reports to USAID on the activities and awards of the Small Project Fund. Subsequent replenishment of the Fund will be subject to annual evaluation of its operations.

8. The Pilot Project Fund

A. Purpose, Function and Procedure

Wind and solar pilot project activities will be an important part of the CDER program. Although initial pilot project activities have been developed and are outlined in Section III D, it is clear that more adaptive research needs to take place to discover cost-effective ways of exploiting Morocco's solar and wind energy potential. Pilot and demonstration activities are an essential element of this process. A needs assessment now being carried out under the AID-financed Energy Policy and Planning project (see page 67) will highlight potential areas for large impact.

The same is true for biomass activities. As stated in Section III E-2, a AID/USDA biomass team recommended a variety of ways in which Morocco can move to explore prospects for making more emergy effective use of its biomass resources. The team recommended certain pilot activities in these areas for immediate and medium-term implementation. Sites will be chosen and detailed feasibility studies carried out to permit beginning pilot activities in early 1982 under the CDER technical assistance contractor. The Pilot Project Fund will be used to finance pilot activities identified by CDER during the life of the project. It is distinguished from the Small Project Fund in that (1) it will finance activities monitored or managed directly by CDER, and which have their origin in feasibility studies carried out or commissioned by CDER, and (2) it is not limited as to the size of cost of pilot activities to be financed, as is the Small Project Fund. Initial projects to be financed under the Pilot Project Fund are described below. Center staff with assistance from U.S. contractors will prepare the necessary feasibility and design documentation for these and subsequent pilot activities to be financed under the Pilot Project Fund.

A joint CDER Moroccan-American committee will be established for that review of proposed pilot projects in the various forms of renewable energy which CDER will test. The committee, on which USAID will be represented, will review proposals against USAID-approved criteria to ensure technical and economic feasibility, proper design, replicability, and consistency with CDER objectives. To the extent possible, pilot activities will be clustered and developed as part of integrated programs which will be approved by the CDER Director and, when AID funds are required, by the USAID Director. The general guidelines from which selection criteria for the Pilot Project Fund as well as the Small Project Fund are to be developed are included in the Project Agreement (See Section 4.4 in Annex 7). The committee will provide for appropriate monitoring and evaluation of all pilot projects and the dissemination of their results.

As conditions precedent to the disbursement of funds for each pilot project for solar, wind, biomass or other forms of renewable energy the Government of Morocco, acting through CDER, will be required to prepare a plan of action acceptable to USAID which :

1. Assigns responsibility for construction of pilot facilities;

2. Provides for financing of this construction;

3. Assigns responsibility for maintenance of pilot facilities and describes how it is to be done;

4. Identifies who will benefit from the pilot project and what the costs will be for them;

5. Clearly describes the responsibilities of whatever governmental or private entities are actively involved in implementing the pilot project.

B. Initial Biomass Pilot Program

A total of $30,000 of FY 1981 funds will be allocated to the Pilot Project Fund. All of this amount will be used for a pilot program in improved charcoal production, considered by the AID/USDA biomass team to have moderate to high near-term potential. An initial feasibility study will be carried out in June 1981 by a U.S. biomass expert provided under an Indefinite Quantity Contract (See Section III E.3).

Sites will be selected and a program developed based on design studies to be undertaken by CDER in collaboration with the Ministry of Agriculture's Forest Service and financed under the Pilot Project Fund.

Equipment will be procured in early 1982, when the charcoal production pilot program will be implemented as part of the CDER program under the guidance of the long-term technical assistance team. The program will be expanded in the following year using FY 1982 funds as shown in Table 1.C.

C. Second Stage Solar Pilot Project

As noted in Section III.E.5 (Further Solar and Wind Pilot Projects), the possibilities of solar energy utilization in Morocco are clearly not limited to the small photovoltaic pumps and refrigerators to be financed in FY 1981.

A team from the Solar Energy Research Institute (SERI) will make a preliminary study later in 1981 and specific pilot technologies and sites for pilot activities will be examined as an early activity of the long-term technical assistance team. One project to be considered

is described below. It was recommended initially by the Charles T. Main team but requires further examination of its economic aspects. If it is determined to hold potential for replicability, this project, or a variant thereof, will be financed under the Pilot Project Fund from FY 1982 funds (See Table 1.C.).

The pilot project site is located at Rabt Tehtani, in Oujda Province, near the Algerian border, about 80 kilometers south of the provincial capital of Oujda. The site provides potable water for domestic and livestock purposes to nomadic families in the area. The number of people using the site varies from 500 to 1,000 and livestock varies from 15,000 to 20,000 sheep and goats. About 75 per cent of the rural population in Oujda Provinte are nomadic and Rabt Tehtani is typical of the general conditions.

The proposed application is for potable water pumping. The renewable energy pumping system has been designed to provide a pilot project which is both reliable and modular. Conditions at Rabt Tehtani permit the use of both solar and wind generation to generate electricity directly to storage. The hybrid wind and photovoltaic system is placed on a ridge near the wells. This type of siting allows maximum advantage to be taken of the wind and solar conditions and provides flexibility to tap a number of wells without requiring costly relocation.

The Rabt Tehtani site offers both excellent wind and solar potential, characteristics which are common to much of Morocco. When wind speed is insufficient, batteries provide power to the water pump. The batteries are charged by the photovoltaic system and by wind turbine energy in excess of pumping requirements. Monitoring of (1) the hybrid system's performance, (2) the coincidence of wind and solar energy availability, and (3) the use for pumping of wind, solar and battery stored energy will provide reliable field data upon which replication of hybrid systems at future sites can be based.

A 10 kilowatt wind turbine and a 1 kilowatt photovoltaic hybrid system is proposed and will supply power for a 3.4 horsepower water pump motor. Energy storage is provided by a 400 ampere hour battery bank and the existing 40 cubic meter water tank. With proper management, the water and electric energy stored are adequate to meet projected needs for two days, under adverse conditions. Tables ID-IE describe equipment, load forecast and operation of the proposed hybrid solar and wind pumping system.

The project is not expected to place an inequitable financial burden on users. Under the current proposed plan for development, the provincial government is expected to provide both technical support and meet any operating costs. The proposed installation is not expected to take any valuable agricultural or grazing land out of production nor it is expected to interfere with present water use or grazing patterns. Full community support of the project is anticipated.

FINANCIAL PLAN - CENTER FOR RENEWABLE ENERGY DEVELOPMENT - AID FINANCING ($000) TABLE 1A

Fiscal Years	80	81		82		83		84		85		86		LOP
	Obl.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.
1. Total AID	540	680	560	1500	850	1700	2010	1400	1450		850		100	5820
2. Preparatory Studies	465		465											465
a. Feasibility and Preliminary Design (CIM-Completed June/Nov.80)	435		435											435
b. Initial Center Work Plan (DSI completed Nov.80/Jan.81)	30		30											30
3. Technical Assistance		300		325	355	515	545	735	590		385			1875
a. 2 resident advisors		200		200	220	205	245	335	260		215			940
b. 25p M/Yr short term consultants		100		125	135	310	300	400	330		170			935
4. Training	60	180	60	280	185	400	300	365	300		340		100	1285
a. In-country training for Center staff (DSI) (Apr.-July 81)	45		45											45
b. 12 Academic (M.S.) Trainees		100		200	100	250	200	260	170		240		100	810
c. 20 p M/Yr short term training	15	80	15	80	85	150	100	105	130		100			430
5. Equipment & Materials	15	150	35	595	180	435	820		160					1195
a. Laboratory & Demonstration Equipment	15	140	35	545	150	365	750		130					1065
b. Library Acquisition		10		50	30	70	70		30					130
6. Other		50		300	130	350	350	300	400		120			1000
a. Small Project Fund (see Section III.B.7)		20		100	30	100	100	100	150		40			320
b. Pilot Project Fund (see Section III.B.8)		30		200	100	200	250	200	200		80			630
c. Project Evaluation (see Section VI)						50			50					50

NOTE : See Annex 1 for financial tables for the total project.

FINANCIAL PLAN - CENTER FOR RENEWABLE ENERGY DEVELOPMENT - GOM FINANCING ($000) TABLE 1B

	Fiscal Years							
	80	81	82	83	84	85	86	LOP
1. Total GOM	420	830	860	1095	465	460	470	4600
2. Center design and Construction	220	790	700	710				2420
3. Land acquisition	200							200
4. Furnishings of Center				75	25			100
5. Maintenance and Utilities				20	50			70
6. Salaries and staff related costs		30	60	100	130	150	160	630
7. Participant travel		10	10	10	10	10	10	60
8. Other			90	180	250	300	300	1120
a. Small Project Fund (see Section III.B.7)			40	80	80	100	100	400
b. Pilot Project Fund (see Section III.B.8)			50	100	150	200	200	700
c. Project Evaluation (see Section VI)					20			20

Table 1C

Pilot Project Fund - Initial Funding (Dollars)

		FY 1981	FY 1982
1.	Initial Biomass Pilot Program	30,000	
	a. Pilot Project Design Studies	5,000	
	b. 5 portable metal kilns for charcoal production (at $ 2,000 each)	10,000	
	c. 1 Missouri kiln for charcoal production (at $ 15,000)	15,000	
2.	Biomass Program Expansion		100,000
	a. Pilot project feasibility and design studies		5,000
	b. 5 portable metal kilns for charcoal production (at $ 2,000 each)		10,000
	c. 4 Missouri kilns for charcoal production (at $ 15,000 each)		60,000
	d. 5 wood burning stoves (at $ 2,000 each)		10,000
	e. 10 biogas digesters to produce methane-rich fuel gas from small family-run farms (at $ 1,500 each)		15,000
3.	Second Stage Solar Pilot Project Program		100,000
	Rabt Tehtani project (Oujda Province)		
	a. Final design		5,000
	b. Imported Equipment		70,000
	c. Imported monitoring instruments		15,000
	d. Local costs		10,000
4.	Total Initial Biomass and Solar Costs	30,000	200,000

C. Small Decentralized Hydro Power.

1. Background.

The quantity of energy generated by small hydroelectric installations in Morocco is minimal. In 1977, of 1,374 billion kWh produced by hydroelectric plants, only 45 million kWh, or 3 per cent, was produced by small hydroelectric installations under 1 megawatt capacity.
While all significant large scale centralized hydro sites have been or are being developed, small hydro holds considerable potential in Morocco.

In late 1978 following the visit of an AID financed team to investigate renewable energy development prospects in Morocco, the MEM instructed the Office National de l'Electricité (ONE) to examine the possibility of developing micro-hydro plants in areas of the country not likely to be reached in the medium term by the national electrical system. An AID small hydro specialist estimated in 1979 that nearly 200 sites existed at which decentralized hydro generators could produce electricity at least 9 months of the year, (See DSI, Renewable Energy and Morocco Development, 1979). During the summer of 1979 ONE conducted a preliminary site survey to identify 20 sites worthy of further investigation as pilot project sites. The sites were located in the High Atlas, the Middle Atlas and the Rif Mountains. ONE ranked the sites considering the size of population to be served by the facility ; the importance of the community ; the relative magnitude of construction costs, given the likely dimensions and magnitude of intake structures, basins and distribution lines ; water availability, head and power potential ; difficulty of construction, and the feasibility of providing electricity to the site from the existing grid as judged by the site's distance from the existing grid and the characteristics of the terrain to be crossed.

A Charles T Main small hydro team visited the 10 most promising sites in July-August 1980 to examine their characteristics. Data were collected through field visits, review of existing documents, and meetings with various GOM agencies. Field investigations considered the basic design and construction requirements, transmission line requirements and water requirements. Socioeconomic and demand forecast studies were carried out by means of field visits to candidate sites, interviews with various officials and others familiar with local conditions, the examination of existing documents in Rabat and Casablanca (ONE Headquarters), and a brief review of relevant published literature.

2. Socioeconomic Site Selection Considerations.

A set of broad socioeconomic criteria were developed for ranking sites according to their potential to make use of electricity to stimulate local economic development, and according to their suitability for research and demonstration and future replicability.

The socioeconomic conditions judged to be important preconditions to meeting the project goals were :

1. Wealth and Interest :

There must be sufficient wealth and interest in the community to enable users to pay for electricity and to make the small capital investments in electrical tools or machinery for use in agricultural processing and/or small-scale commercial or industrial applications.

2. Accessibility :

There must be evidence of access to modern as opposed to traditional technology and a positive attitude towards technological innovation. There should be sufficiently reliable year-round access to the site to permit research and monitoring of community response to electrification and maintenance of the facility.

3. Resource base :

A sufficient resource base should be available to provide opportunities to allow for processing of goods or for applications in other productive areas (i.e. tourism) using electric power.

4. Marketing channels :

Marketing channels through which new products could be sold should be present.

5. Settlement pattern :

The settlement pattern should be sufficiently nucleated to make the extension of electricity practical.

6. Regional importance :

The community should be regionally important serving as a government and market center. The government infrastructure can help initiate economic development applications of electricity and can help provide the foundation for project monitoring and research.

In the mountain valley areas considered for small hydro development, a productive base already exists which the introduction of electricity could stimulate. The configuration of these new uses cannot be precisely forecast, but the kinds of activities that may occur are generally known. These include use of refrigeration to store meat, milk, butter, potatoes, fresh fruits and vegetables, as well as soft drinks prior to sale ; electric saws, lathes, drills and sanders to fabricate wooden furniture and for other woodworking ; arc welding and grinding wheels to repair agricultural implements and tools, and to fabricate simple ironwork ; and a variety of electric motors to power flour milling facilities, fan drying or ventilation of produce, butter churning, milk pasteurizing, cheese making, nut cracking, wool spinning, weaving and looming, potable water pumping, meat slicing and wheat threshing.

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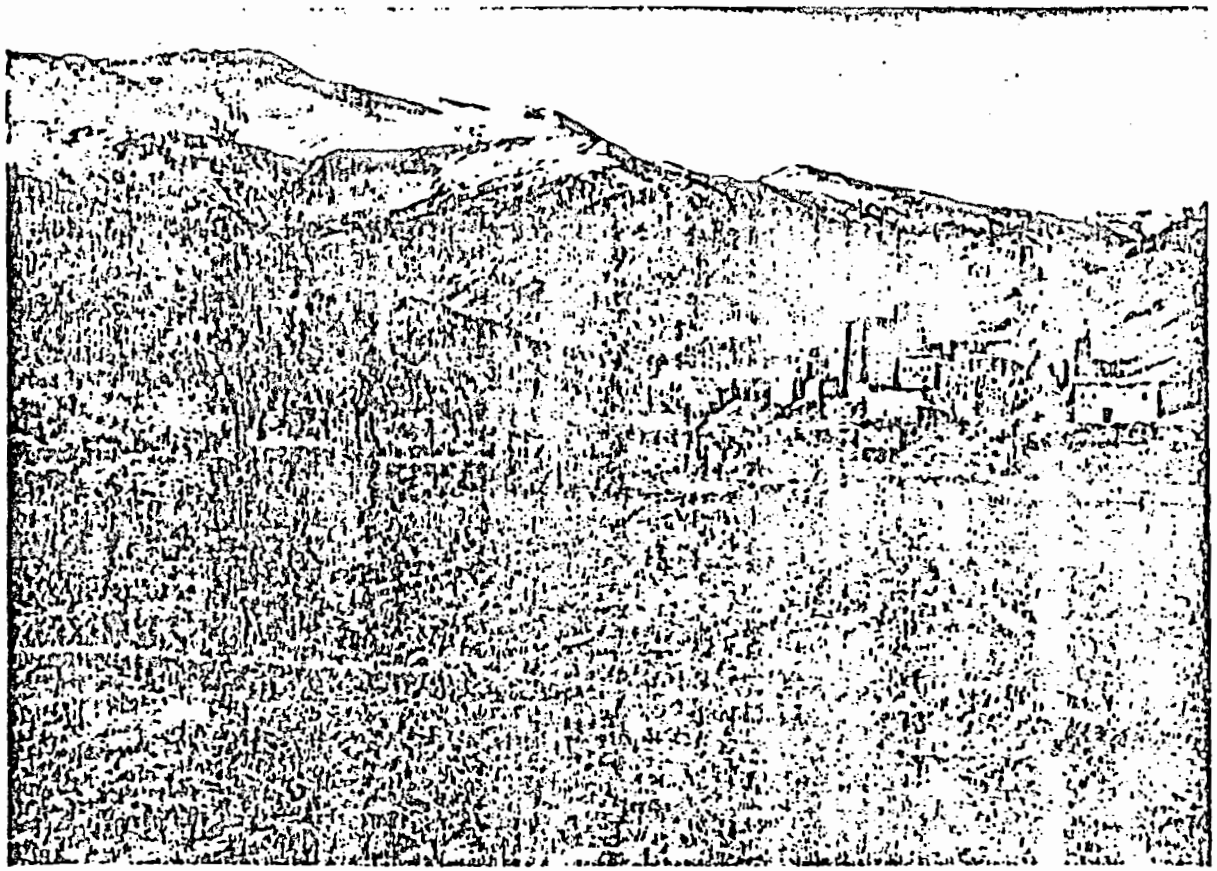
3. Economic and Financial Considerations.

a - First Higher Cost Approach. From the 10 sites visited by the Main team, 4 were selected as the most promising : Tabant-Ait Imi and Tillouguit (Azilal Province) on the north slope of the High Atlas Mountains and Msemrir (Ouarzazate Province) and Arhbalou-n-Kerdouss (Errachidia Province) on the south slope of the High Atlas, (See Fig. 1). The MEM wishes to locate each pilot site in s separate province, and Tillouguit was therefore dropped in favor of the more economically promising Tabant-Ait Imi.

The economic and financial soundness of each of the microhydro projects were evaluated by the Charles T main team with respect to :

1. Least cost comparison : does the micro-hydro installation constitute the least cost solution in terms of discounted, life-cycle investment and operating costs ?
2. Financial soundness : are expected revenues from the sale of electricity sufficient to amortize investment, including an adequate return on investment, and to cover operation and maintenance costs ?
3. Economic return : do the project's net economic benefits provide an internal rate of return comparable to what might be expected for other infrastructure investments in Morocco ?

To determine whether the micro-hydro plants should be compared to the grid extension or diesel generation, the cost of these two latter alternatives were compared. The grid is so distant for all three sites selected (48-55 km as the crow flies) that the capital costs of subtransmission line construction approached those for the micro hydro plants. Implementation of Morocco's IBRD-financed rural electrification program over the next 15 years will not bring the grid any closer to these 3 sites. If the distance is factored upward by 25 % to reflect variations in terrain, the transmission line costs exceed those for the hydro plants. Thus for these sites, diesel generation was selected as the basis for comparison with hydro.
In this comparison, reliability is an important factor in which small hydro enjoys a significant advantage. In a ONE/World Bank Survey of 187 villages served by free standing diesel generators, the quality of electricity supply was found to be poor and unreliable with one third of the units in poor condition and the rest overloaded and deteriorating rapidly. Small hydro units are generally for freer of repair and maintenance problems and the usable life commonly extends to 20-30 years.



1. Near Tabant Ait Imi, a small hydro site in the fertile Bou Guemez Valley of the High Atlas Moutains

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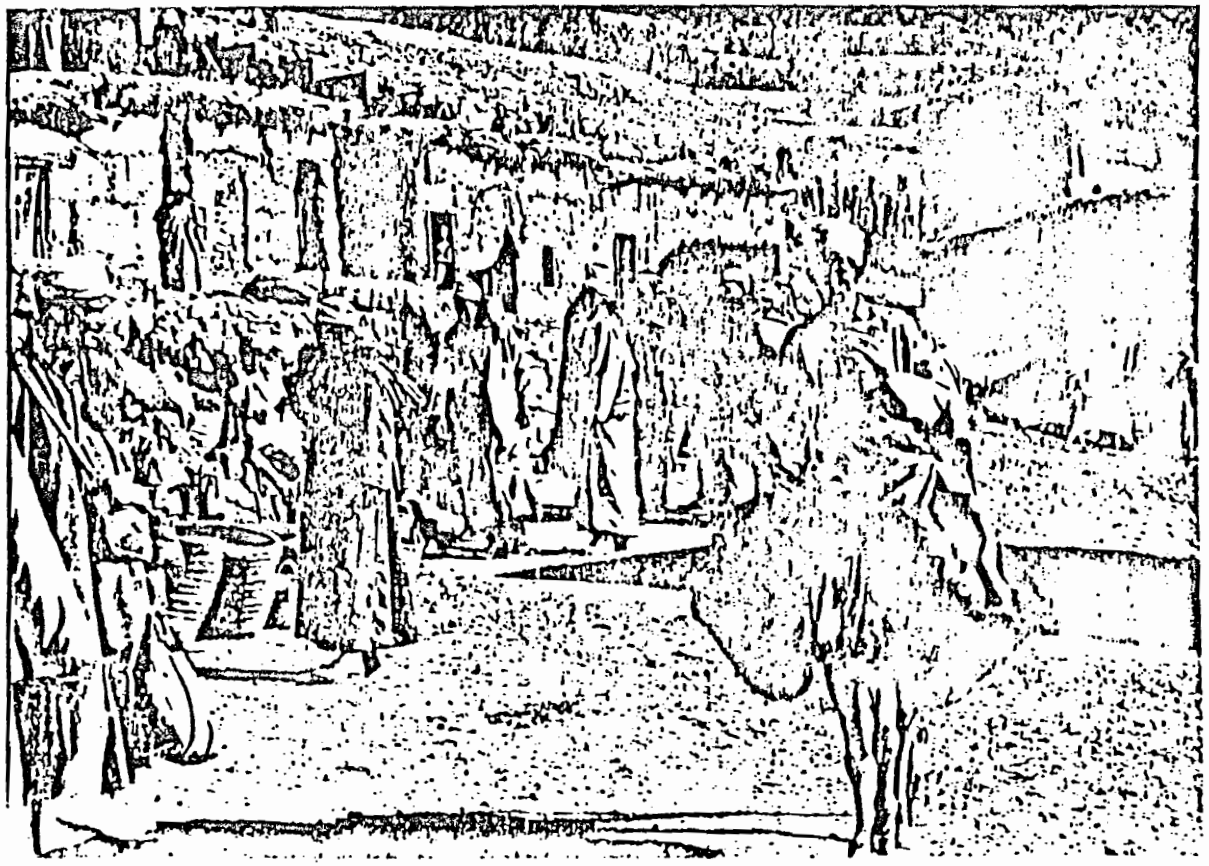

2. The Tabant souk, one of the larger markets in the Bou Guemez Valley

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b - Revised Lower Cost Approach. Upon review, Charles T Main designs for the pilot hydro application were seen to be very conservative. The units were found to be large and contained components which could be eliminated, downsized or replaced with more economical and readily available substitutes. It was therefore decided to engage another firm with substantial experience in the microhydro field (less than 500 kilowatts) to reevaluate the applications and prepare designs and cost estimates for three selected sites. Site surveys were carried out in December 1980 with the help of a Moroccan survey team and the participation of the Moroccan Office National de l'Electricité. The U.S. engineering firm recommended smaller-scale off-the-shelf power generation units designed to require more modest civil works than Charles T Main had proposed andcosting approximately one-fifth as much as the earlier estimates (See Table 2 and Annex 17).

Of the three recommended sites, Main calculations for Msemrir indicated a negative rate of return for economic and financial calculations, with diesel being the preferred rate of return, below the opportunity cost of capital. Financially, it would not cover full cost using Main's recommended installation. Arhbalou was also found to be sub-marginal financially. Its economic IRR was positive but again less than the opportunity cost of capital.

However, the U.S. AID recommended installations dramatically reduce the costs and at a greater rate than the number of beneficiaries, with the result that cost recovery is enhanced.

c - Beneficiary Demand Forecast. To develop a forecast of electricity demand, the Main team estimated different types of end-uses : (1) residences, (2) public lighting, (3) government administration, and (4) commerce and agro-industry. Projections of residential demand were based upon estimates of population growth, the proportion of total households to be connected over the 15 year forecast period, and average projected electric energy usage per connected household over time. Street lighting requirements were forecast on the basis of the length of village roads, rate of installation and use. Government offices and households of government officials were projected to make immediate use of electricity. From this high initial level of consumption, government administration requirements were assumed to increase at a conservative rate of growth. Government administration was deemed to comprise, on the average, a dispensary, a primary school, housing for 2 government officials, a mosque and koranic school, and 8 separate office units. Commercial and agro-industry loads were projected by examining availability, usage patterns, and opportunities for use of refrigeration for small scale commercial applications, electric hand tools for repair shop and artisanal manufacturing operations, and electric motors for various commercial, pumping, artisanal and agricultural processing functions. A saturation level for each kind of appliance was projected for five year intervals.

Demand forecasts are necessarily imprecise. "The demand for power is not always immediately evident because micro hydroelectric systems generally bring electrical power for the first time" (1).
Thus other energy sources likely to be replaced by cheaper or more convenient electricity must be estimated first and then increased by estimates of new usage. The latter is difficult to forecast, especially in Morocco where no studies exist of what actually happens when a village is electrified (2). For this reason a hydroelectric program is normally introduced in two stages. "Pilot installations are used to assess load patterns and growth, installed capital costs, and running costs in addition to testing hardware" (3).
The three proposed micro hydro installations follow this pattern.

The Main report based demand forecasts on existing village activities and projected growth with standard and reasonable assumptions tied to the three principal benefits of electrification — cash savings resulting from substitution from diverted or new usage, and convenience, the latter being the most difficult to forecast. By substitution less costly installations than those originally suggested, the cost side of the Main calculations have been considerably reduced, resulting in lower cost per KW and lower cost per beneficiary while retaining the demand estimations but for a reduced population of beneficiaries.
In the two cases where U.S. AID final recommendations match the Main recommendations the lower cost units will produce less electricity resulting in earlier demand saturation. The Main report found that for these two sites, micro hydro even with the higher cost installations first envisioned, had lower life of project discounted costs than the alternatives of grid extension or diesel generation. Once the initial investment is made, hydroelectric power is one of the few energy sources whose future costs decrease in real terms (4)

In the case of Msemrir, the lower cost installations finally recommended resulted in a more favorable projected return for a pilot site which met other demonstration and dispersion criteria. If a scale of financial viability exists, the three sites selected would doubtless be among the best but not necessarily the three best.

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(1) "Community Load Determination, Survey and System Planning", by R. Holland, R. Armstrong, Evans, K. Marshall, P. 60 on Small Hydro Electric Powerplants (Proceedings of meetings in Ecuador, 1980) NRECA and AID.

(2) CDER will commission studies of the villages electrified by the small hydro pilot projects as part of its evaluation program.

(3) op. cit.

(4) "Economic and Financial Feasibility Study Methodologies", D.C. Avslam and M. Henwood, P. 101 in Small Hydroelectric Powerplants.

This is appropriate for a pilot project where experience, demonstration and replicability are the issues.

Cost recovery projections for small hydro are reassuring. Electricity tariffs have been increased several times in recent years. The increases reflect : 1/ rising fuel costs, 2/ an end to cross subsidies by smaller users for industrial and municipal purchasers and 3/ a general GOM policy, backed by the World Bank and IMF, to eliminate subsidies. The World Bank Rural Electrification project forecasts cost recovery for a program extending grid electricity to 360,000 inhabitants of 220 villages based on standard tariffs and profits from connection charges.

The average cost per rural connection in 1979 was found to be 4,750 dirhams (about $ 1000), excluding import duties and taxes which brought the cost to DH 5600. House wiring cost about DH 900 but charges averaged DH 1200. Average cost of delivery to a low voltage customer in 1977 was DH .259/kwh while the tariff was DH .459. Tariffs increased DH .63/kwh in 1979 and DH .683/kwh in 1980 reflecting increased fuel costs, which may be taken as a proxy for consumer willingness to pay. Since the proposed hydro installations were found to be cheaper than grid or diesel alternatives, there is every reason to believe that a tariff set at about DH .68/kwh adjusted for inflation, would be paid and would cover operating costs and most if not all capital costs.

On the socioeconomic side, thetime constraint of four months imposed by the terms of Charles T Main's Indefinite Quantity Contract did not allow careful socioeconomic examination of the tentatively selected sites. U.S. AID therefore contracted with Dr. Abdellah Hammoudi, a Moroccan sociologist on the faculty of the Institut National Agronomique et Vétérinaire Hassan II, to investigate the social and economic aspects of the sites.

It is clear from investigations so far that 1/ conflicts over land do not exist because the pilot sites will be on government owned land ; 2/ possible conflicts over water between irrigation and electrical generation needs can be avoided through proper design and location of the hydro installations ; and 3/ there is strong enthusiasm for the small hydro units among the populations of the villages which will benefit. Plans for construction of the facilities and distribution of the electrical power generated will be carefully reviewed with local authorities and representatives of the beneficiary villages to make sure that the projects are well understood and enjoy firm local support.

Annex 17 provides more details on the three individual villages where pilot installations are to be placed. The pilot units will provide a total beneficiary population of about 3,300 people with an average of 330 installed kilowatts.

The overall construction and installation cost of the units will be about $240 per person.

The eventual beneficiaries of these pilot projects will be the estimated 200,000 population of 200 sites in Morocco where small hydro-units may later be installed.

4. Implementation.

In the light of the technical and socioeconomic reports and recommendations of the Ministry of Energy and Mines, Ministry of Interior and ONE will agree on specific operational responsibilities for financing, installation, maintenance and management of the pilot units. A plan of action satisfactory to U.S. AID will be a condition precedent to procurement of any equipment for the pilot sites.

Construction of civil works will be carried out by Moroccan firms under contract to ONE. Small provincial contractors and local labor from the villages concerned will be used to the extent practical to maximize local employment. Equipment installation will be supervised by the U.S. design engineer. ONE will construct power distribution lines and facilities. Start up for the first unit is scheduled for August 1982, with the other to follow shortly thereafter.
Total cost for all 3 units is estimated at $790,000, $475,000 in foreign exchange and $315,000 in local costs. (See Table 3 for cost details).

Competence and familiarity with small hydo installation design is a highly specialized field. For the sake of efficiency, to avoid expensive delays in appropriate design and execution, it is anticipated that NRECA will provide final engineering design, preparation of specifications, supervision of construction and installation and start-up of equipment. The selected small sydro sites are in remote High Atlas mountain valleys accessible with difficulty if at all during the winter. To permit arrival and installation of the small hydro equipment during the 1982 construction season, it is essential that procurement be initiated no later than October 1981, well before the arrival of the U.S. technical assistance contractor assigned to CDER. USAID will therefore procure the small hydro equipment directly.

5. Administrative Feasibility.

ONE is a semi-public organization under the direction of the MEM, and is responsible for the installation and maintenance of all electrical generation equipment in the country. It is an organization of excellent technical and administrative quality. ONE will be responsible for the management and execution of the small hydro pilot projects. ONE engineers carried out the initial 1979 study which

recommended 20 potential sites for the pilot projects, and ONE engineers participated in the survey and mapping of the 3 selected sites. ONE will arrange for the construction and installation of the generation and distribution facilities. ONE is experienced at local contracting and plans to contract for these activities. ONE will receive funds from the MEM for all local costs of construction, installation and maintenance of the small hydro installations, and will provide technical staff for maintenance and repair of the small hydro installations.

Day to day operation of the units and collection of charges for the electricity will be the responsibility of local village government authorities which are under the authority of the Ministry of Interior, among the most efficient ministries in the government. Local groups in the3 areas concerned are experienced in the cooperative management of irrigation facilities for the equitable allocation of water. The generation and distribution of electricity will be handled in the same way, with a local person being trained by ONE to assume the role of guardian/technician for normal maintenance and minor repair. Local village government has the authority to collect taxes, to admimister regional development funds allocated by the Ministry of Interior and from the local sale of village - owned forest products.

There is thus sufficient local practical and administrative capability for the effective management of the small hydro pilot facilities.

The CDER will be actively involved in monitoring and evaluation of the small hydro pilot projects. It will coordinate with ONE in gathering and analyzing data on pilot project performance, demand and utilization of power generated and studies directed to the expanded use of small hydro generation in follow on programs.

Table 2

Small Hydro Pilot Projects Characteristics and Cost estimates

	Tabant	Msemrir	Arhbalou	TOTAL
Head (feet)	100	15-17	60-70	
Flow (cubic feet/sec.)	8	35	10-18	
Size (KW)	100 (2 50 KW units)	40	120-250	
Turbine type	Pelton	Francis	Pelton	
Cost of equipment (Dollars) (including shipping & insurance)	67,000	22,000	386,000	475,000
Cost of Civil Works (Dollars)	155,000	100,000	60,000	315,000
Total cost (Dollars)	222,000	122,000	446,000	790,000
Dollars/KW	2,220	3,050	1,784 - 3,717	

TABLE 3 A

Financial Plan - Small Hydro Pilot Projects - AID Financing ($000)

	FISCAL YEARS														LOP
	80		81		82		83		84		85		86		Obligations
	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl	Exp.	Obl	Exp.	
1. Total AID	20		560	55		525									580
2. Preparatory Studies	20		35	55		475									55
a. Feasibility and preliminary design (CTM - completed June-Nov. 80)	1/														
b. Site survey and mapping (Boghdadi- completed Dec. 80)	5			5											5
c. Socioeconomic study - (Hammoudi - completed Dec. 80 - May 81)	15			15											15
d. Final engineering design and specification			35	35											35
3. Equipment for 3 pilot sites			475			475									475
4. Supervision of equipment installation and start-up			50			50									50

1/ Shown under CDER Financial Plan (Table 1)

TABLE 3 B

Financial Plan - Small Hydro Pilot Projects - GOM Financing ($000)

	80		81		82		83		84		85		86		LOP Total
1. Total GOM					815		11		12		13		14		865
2. Construction of 3 hydro sites civil work					315										315
3. Electric Distribution systems					378										378
4. Access Roads					112										112
5. Maintenance and repair					10		11		12		13		14		60

D. Solar and Wind Power Pilot Projects.

1. Background.

Morocco presents considerable potential for the widespread exploitation of solar and wind energy. The solar regime in Morocco is excellent, particularly inland. The average solar radiation in Morocco is estimated to be above the minimum level used by the U.S. Department of Energy (430 Langleys/day or 157,000 Langleys/year) as a criteria for selecting sites for solar demonstration projects. In Marrakech where solar radiation measurements have been made the annual average levels are 488 Langleys/day, 13 per cent above the DOE criteria. (see page 52).

Wind in a number of areas in Morocco, particularly along the coasts, is sufficiently high in velocity and duration to permit both direct mechanical pumping and electrification. Wind data from long term meteorological records for several sites show average velocities for numerous sites in Morocco of speeds rated as excellent for wind powered water pumping and, in several of these locations, wind powered electrification.

2. The Evolving Economics of Sun and Wind.

The selection of water pumping as a primary application for solar and wind pilot projects is based on several factors. The most important are existing demand and directly productive use.

End uses of pumped water include :

A. Potable water
B. Livestock watering
C. Irrigation

U.S. AID is currently developing a rural potable water project, Douar Water Systems (608-0167). An estimated 10% of installations are suitable for wind powered pumping where water table depth is not too great, wind speeds average 12 mph and villages are not on the electric grid. Under these circumstances wind power is an economically viable alternative to diesel pumps at present(1). The principal problem to be overcome is that of maintenance which bedeviled existing Aeromotor windmills installed in Morocco during the 1960s.

The economics of solar and wind energy must be approached with caution, however. A recent analysis, DSI, the Economic Costs of Renewable Energy, (See bibliography, Annex 20) found that photovoltaic (PV) pumping would be more economic than diesel/gasoline internal combustion (IC) pumping for farmers or society in the late 1980s. In general

(1) DSI "The Economic Costs of Renewable Energy". The same report indicates that PV pumping could be economic before the end of the 1980's but the planning cycle, based on experience, should begin now.

for pumping applications, the smaller the job the more suitable renewable energy became. The projection of future relative economic advantage of PV over IC pumping was relatively independent of fuel price projections since fuel is a relatively small proportion of system cost. Rather, the rate of technology development and application and assumptions about future PV modules and balance of system (BOS) costs were critical to the analysis.

The same principal applies to livestock watering, a principal application of windmills in Morocco as on the Great Plains in the United States. Large remote potential grazing areas, especially in the wind swept northeast plateau, are reduced in productivity because of insufficient stock watering possibilities.

Irrigation for crop production is a directly productive use where demand is demonstrated and expanding. Morocco has about 500,000 hectares under irrigation by private farmers within large government managed perimeters controlled by dams. An additional 150,000 hectares, approximately, often within or adjacent to the perimeters, are irrigated by private farmers. Such land may also be group managed but is privately financed(1). The preferred mode of irrigation is by electric pump where grid electricity is available. However this method is heavily constrained by limited extension of low voltage grids (2). In some areas, traditional gravity flow and lifting devices are used but this is rare, given their low output and the surface water or water table characteristics required. The most common pumping technology is by free standing or tractor driven diesel pumps. This technology spreads year by year, impelled by economic returns and drought risk for dry farming, wherever farmers can amass sufficient resources to pay for the equipment. It is estimated that there are about 20,000 diesel pumps in operation and that pumps and acreage will expand by about 10% per year during the 80's. Experience and demonstration of wind and solar pumping projects needs to begin now if substantial substitution for diesel power is to begin before the end of the decade. In addition to lower financial costs to farmers. such substitution offers economic, foreign exchange and employment benefits in oil imports foregone and opportunities for local manufacture of some components.

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(1) Credit for pump irrigation is available from a government-backed credit authority.

(2) Cost factors have inhibited provision of low voltage power for the rural areas traversed by high voltage lines.

3. Site Selection Considerations.

This project will test the use of wind-powered electric water pumping at two pilot sites ; photovoltaic-powered water pumping by five small, portable units; and five photovoltaic-powered refrigeration units for medical purposes. The two wind powered pumping units will be installed at the sites described below. The portable photovoltaic pumping units will be installed as pilot demonstrations at 1/ the Center for Renewable Energy Development in Marrakech ; 2/ an experimental and demonstration farm in Agadir province and 3/ on other farms to be selected in consultation with the Ministry of Agriculture. The refrigeration units will be installed in remote public health dispensaries to be selected in consultation with the Ministry of Health.

Site selection criteria for wind and solar powered pumping were based largely on the availability of on-site technical assistance. Site attributes were investigated both in the field and, when possible, through examination of meteorological wind speed and direction data, as well as agricultural, hydrological and electric grid data.

The following criteria were adopted :

1. Meteorological suitability - To ensure sufficient solar radiation wind.
2. Typicality - To maximize possibilities for replication to a variety of other sites.
3. Socioeconomic conditions - No problems concerning ownership, rights and water use ; the proposed application should not be disruptive nor result in any dislocation of the users or surrounding population ; the local community should be able to participate in managing the new technology ; on site support should be adequate to insure proper monitoring and management ; and the local community should be willing to participate in the project and recognize potential benefits.
4. Accessibility/Distribution - Sites should be sufficiently accessible so that the CDER can monitor performance, acceptability and impact ; and so that maintenance and repair can be carried out effectively. Sites should also be distributed regionally to provide a variety of conditions to test applicability.
5. Systems considered - Water pumping renewable energy systems analyzed included d.c. and a.c. electrical energy production by solar photovoltaic modules, wind turbine generators and solar thermal Rankine cycle power plants. Wind mechanical systems do not represent a new technology - some 200 such systems are in operation in Morocco - and their demonstration for water pumping was considered unnecessary. Sites were selected and differing technologies, equipment and applications were chosen so that the CDER would have monitoring records from a range of pilot projects available for evaluation. Future decisions as to replication can then be based on a review of the field testing of a variety of renewable energy and pumping configurations.

6. Economic and cost analysis - Preliminary 20-year life cycle cost analyses were conducted for each of the recommended sites except the CDER site itself. All future costs were accounted for and the present worth of renewable energy systems were compared to equivalent diesel alternatives. The use of life cycle cost analysis permits an equitable comparison of a low capital investment but fuel intensive diesel plant with that of a high capital but no fuel cost solar or wind power plant over the life of the systems.

7. Sociological Review - The sociological review of the proposed water pumping sites included field visits to sites, meetings with government officials and others familiar with local conditions, and a review of relevant documents and literature. There was an opportunity to visit most of the sites considered as potential locations for renewable energy water pumping technologies. In the course of these visits, informal interviews were held with local officials and residents.

Information was gathered about present water use, rights, pumping practices and priorities ; beneficiaries and how they might benefit (irrigation of agricultural land, time saving in transporting water for domestic and livestock purposes, etc...) ; general economic patterns and income (e.g., pastoralism, agriculture, small commercial operations) ; demographic characteristics of the local population (e.g., total population/household size, age/sex, migration patterns) ; receptivity towards the proposed project ; present or future areas of conflict that might follow as a result of the project ; existing infrastructure to manage the proposed technology ; and general experience and predispositions of the population regarding technological innovation.

8. Environmental review - Each site investigation considered possible impacts on the environment and evaluated whether the proposed action would result in any significant environmental harm.

4. Wind Power Pilot Project Sites.

Using the above criteria, the Charles T.Main study suggested the installation of wind powered water pumping systems at two sites :

SITE	APPLICATION	TECHNOLOGICAL SYSTEM
1. Oujda (Oujda Province)	Water pumping for human and animal water supply	40 Kw wind electric pump
2. Sidi Bounouar (Essaouira Province)	Irrigation or potable water supply	40 Kw wind electric pump

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The economic viability of the third site - a hybrid of wind and photo-voltaics - requires further analysis before a decision to proceed. However it is proposed, based on Main's findings, to install the first two wind electric pumping units described below.

A. PK 8 Route d'Ahfir, Oujda Province

A 40 kw wind electric generator is to be installed for potable water pumping at a site 8 km north of Oujda, a provincial capital in the north-eastern part of the country. The well at the site now provides water for human and animal consumption, serving I,400 people who live on 4 livestock farms in the vicinity and 500-600 nomads who move through the area regularly. The total animal population (sheep, goats, cattle and mules) relying on the well is 20,000-25,000. There is no electricity. The present system for obtaining and distributing water includes two diesel engine driven pumps, four concrete storage tanks and an underground pipe distribution network. Families collect water from the four storage tanks and cart it for domestic use. The pumps are operated and maintained by the provincial office of the Ministry of Agriculture and a resident technician is in charge of their operation. The water distributions network is maintained by the provincial government. The well is 62 meters deep.

The proposed project for establishing a wind pumping facility for potable water is sociologically sound. The project will not place a financial burden on the users. All costs will be met by the provincial government. The institutional infrastructure necessary to operate, maintain and administer the proposed facility is already in place. The present resident technician will be trained to perform basic operations and to recognize and report any abnormalities to the CDER.

Applications such as the one proposed for water pumping can be expected to be widely disseminated throughout the area in the future. Potable water is generally obtained from hand-drawn wells which often are several kilometers from home. In addition to representing a substantial expenditure of human time, a substantial amount of human energy is spent in securing water. The local population and the provincial authorities, including the Governor, have expressed a keen desire for the installation of the pilot project, which is perceived to be more reliable and less costly than the diesel installation.

B. Sidi Bounouar, Essaouira Province

The proposed site is on a cooperative farm 30 miles northeast of Essaouira, a provincial capital on the Atlantic coast. A wind electric generator is to be installed for pumping water. There is excellent wind potential at this site and sufficient power can be produced to meet potable water pumping needs and much of the existing need for electrification of cooperative members' homes. If well tests demonstrate adequate capacity to meet planned irrigation needs, a 40 kw wind generator will be installed to produce potable water, electricity and irrigation water pumping.

The farming cooperative of Sidi Bounouar has 450 hectares of land and 20 families for a total of 156 people. The general economic picture of Sidi Bounouar compares favorable with other small farmers in the area. The existing institutional infrastructure of the cooperative includes a cooperative administrative committee and a resident technical advisor to supervise crop planning and management and general assistance. The committee and technician also supervise water use.

The project is not expected to place an inequitable financial burden on users. Interest in the project is high among all cooperative members and governmental officials. The proposed installation will not take any agricultural land and no problems are anticipated in local acceptance of the project.

The Sidi Bounouar site is fully supported by the Governor of Essaouira Province and is now under the supervision of the provincial office of the Ministry of Agriculture.

The cooperative has already petitioned the Provincial Agricultural Development Service of Essaouira for a diesel irrigation water pumping installation. Under the planned arrangement, the government would assume all administrative and technical costs and would assign a government mechanic to operate the facility. The cooperative would assume all costs for equipment, parts and maintenance, and fuel. Installing a wind electric generator instead of a diesel unit will provide an excellent opportunity to demonstrate the appropriateness of renewable energy systems for agriculture and potable water and, at the same time, eliminate the need for additional government expense of assigning a full-time resident technician to operate the diesel engine.

Sidi Bounouar should be an excellent test case for replicability. The local setting is representattive of much of the rural coastal plan where water pumping is required for potable and agricultural applications.

Cost estimates and technical information for both of these wind powered pumping units are given in Table 4 and Annex 16.

C. Action Plan

The Center for Renewable Energy Development, with assistance as may be required from U.S. contractors, will develop final design and specifications for equipment and civil works for the two sites described above, based on Main's feasibility studies and preliminary designs. In cooperation with other appropriate GOM agencies, CDER will develop detailed plans for implemention, management and monitoring of the two pilot projects. The U.S. technical assistance contractor assigned to CDER will procure equipment for delivery by September 1982. Moroccan technicians responsible for installation and maintenance of equipment will undergo training in Morocco and will participate in the construction and installation of equipment in early 1982, guided by U.S. supplier representatives and U.S. contract technical assistance staff who will arrive at CDER in early 1982. Peace Corps volunteers will assist in training, installation and subsequent monitoring of pilot projects.

5. PHOTOVOLTAIC-POWERED PILOT PROJECTS

The use of photovoltaic power in agriculture at this time can include the following applications:

1. Pumping

   a. Low lift pumps for irrigation expansion
   b. Cattle watering
   c. Household uses

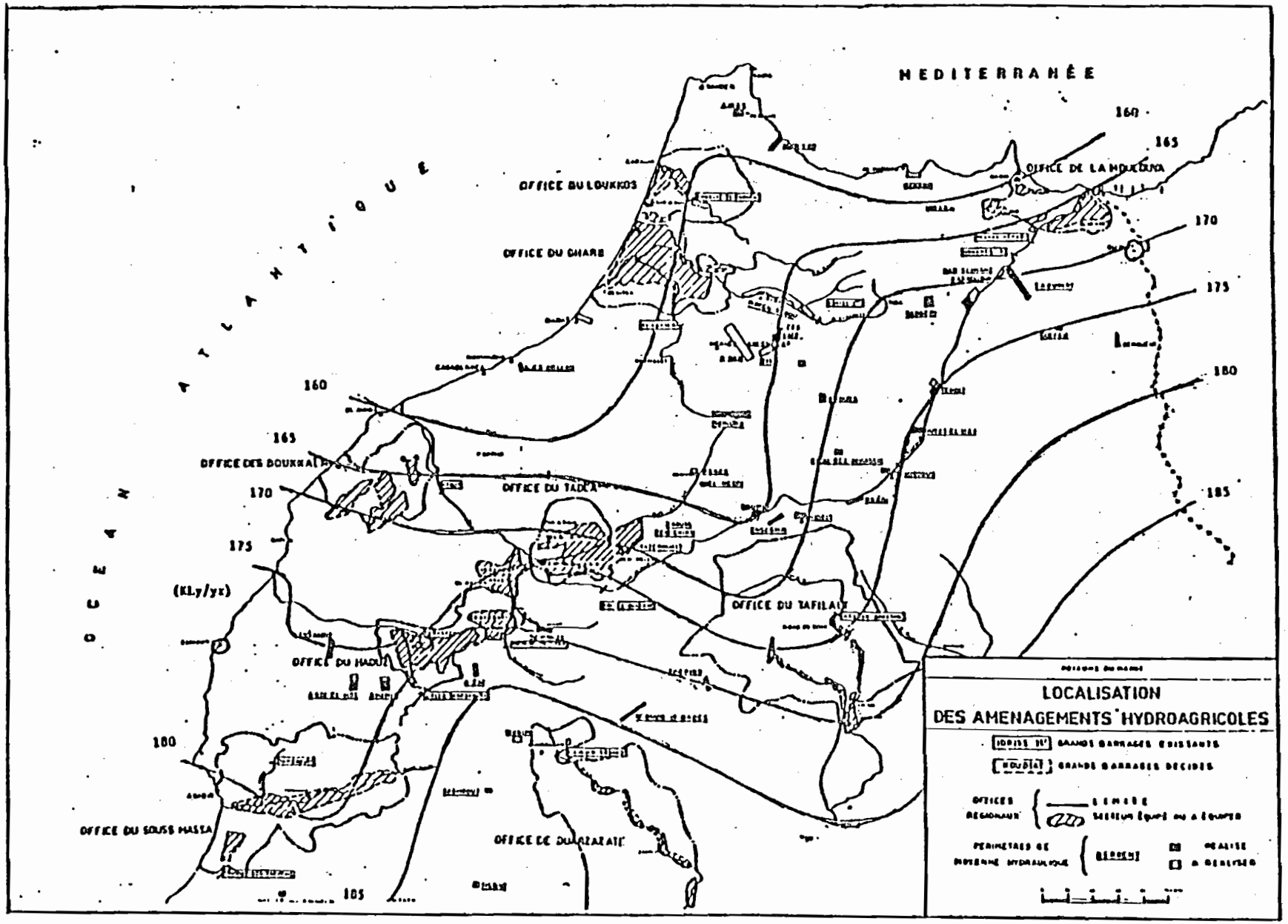
2. Centralized battery charging (for small power needs)

3. Refrigeration

   a. Individual health facilities, small stores, restaurants and household use
   b. Centralized crop storage, fish preservation

4. Standalone power systems

There are many other potential uses of electricity for motors, grain milling, etc.; however adequately demonstrated technology systems are not available nor are widespread needs for these demonstrated in Morocco.



SOLAR RADIATION INTENSITY LINES (ISOHELS) FOR MOROCCO

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Appropriate applications in economic terms are defined by the specifics of the application; size, site, use, performance expectations, etc., must all be considered before an application is "appropriate."

If water demand is large at certain times and minimal at other times as is the case with certain crops; if water demand is constant irrespective of the weather or season; or if water demand extends beyond daylight hours, photovoltaic pumping is either inappropriate or storage (of electricity or water) is necessary. To find the set of conditions in which photovoltaic pumping is appropriate, both agricultural and technological specialists must work together. At this time in the development of photovoltaic powered irrigation systems, there is no a priori appropriate system; rather there are only appropriate combinations of circumstances and system components. In selecting and designing applications, it is necessary to be sure that the combination of use and technology will be appropriate.

Photovoltaic-powered pumping units will be installed at the following sites:

Center for Renewable Energy Development, Marrakech

Excellent solar radition in Marrakech make this an ideal site for a photovoltaic-power system. A 5 kw photovoltaic module mounted on the Center's roof will permit pumping of either of the Center's two wells or charging of the Center's batteries. The water pumped will meet someof the needs for potable, landscape

garden amd construction uses. This system can also be used for many research and teaching applications.

Crafa (Agadir Province) and other sites

The Crafa site is located on an experimental and demonstration farm near Taroundant in Agadir Province, about 80 km in from the Atlantic coast in a rich agricultural area. The farm area is 68 hectares. However, within the area served by the demonstration farm, there are about 800 farm families (about 8,000 people) working 7,300 hectares of irrigated land. A planned extension of the irrigation system will bring an additional 20,000 hectares of land under irrigation and involve an additional I5,000 families. The Crafa program brings groups of farmers to the facility for instruction in new technologies for crop production and farm management.

Farmers receive water from the government system of canals and either use gravity or diesel pumps to deliver water to their fields. Occasionally, some electric pumping is done. Farmers are increasingly concerned with rising costs of pumping. According to Crafa officials, the diesel costs are becoming increasingly prohibitive and there will be a growing demand for alternative energy sources.

Main's study recommended irrigation water pumping using a I5 kw solar photovoltaic system to irrigate 5 hectares of land together with a system to provide heat for an on site greenhouse. However, they pointed out that small, independent farmers cannot realistically be expected to set aside a portion of their land experimenting with a solar application given that the value of irrigated land is DH 50,000 ($I2,500) per hectare locally. It is also unlikely that a farmer could be persuaded or should be persuaded to make the $200,000 investment required by Main's recommended array.

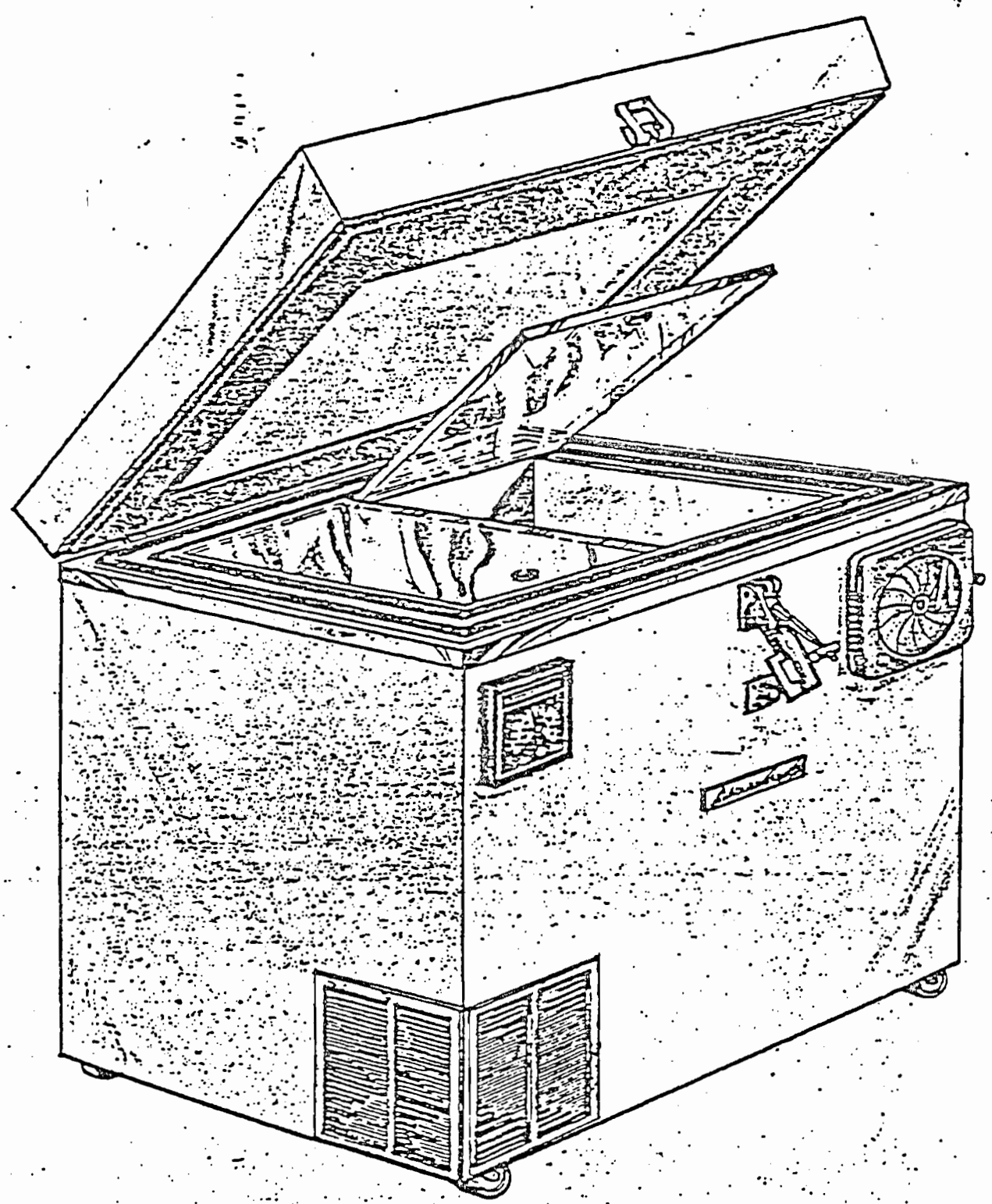
If a 15 kw solar photovoltaic pumping system is beyond the reach of small and medium scale producers and uneconomic even for large scale producers, it would seem to be an inappropriate application of photovoltaic technology, and should not be considered even for a pilot project. Smaller scale applications of photovoltaic modules have a much greater potential for economic use, and the powering of low-lift portable pumps is one of these. Although the cost per installed watt is the same as for larger installations, portable 250-500 watt pumping units costing $6,000 have real application for extending irrigated areas by raising water from canal to field and from lower fields to higher fields rather than for raising water from the depths of a well. Pumping units of this type have been developed as off the shelf items and are in use in a number of irrigated areas in the Middle East and Asia (See Annex I8). It is proposed to install 5 of these units at the

Crafa demonstration site and other locations to be selected in areas already under irrigation. The Crafa 5 hectare parcel is typical of farm sizes in the irrigated southern plains of Morocco where many small farmers obtain irrigation water from government operated canals. The Sidi Bounouar wind generation site on the other hand is typical of irrigation systems managed jointly by independent farmers. Thus, the two sites provide an opportunity to test renewable energy technologies for two different irrigation systems (individual and group).

Photovoltaic-powered refrigeration units are another viable rural use of solar energy. Small volume units requiring little electric power have been designed for use in remote health stations without access to an electrical grid. One type which will be considered for use is illustrated on the following page. Capacity is about 100 liters. Cost, about half for the refrigerator unit and half for photovoltaic modules, is about $6,000. The Ministry of Health will monitor the use of five pilot units in remote medical facilities. NASA-Lewis Research Center and the U.S. Communicable Disease Center (CDC) have an on-going A.I.D.-financed program to locate PV powered refrigeration units in health facilities around the world. This program is meant to introduce this technology in developing countries where it can be useful and to begin to encourage its application. Morocco meets the criteria used by NASA and CDC to site units. The five PV pilot refrigeration units will be procured by the U.S. technical assistance contractor in early 1982 based on NASA specifications so that they will arrive in Morocco and be ready for installation later that year.

6. Further Solar and Wind Pilot Projects

The possibilities of solar energy utilization in Morocco are clearly not limited to small photovoltaic pumps and refrigerators. Other possibilities for technically and economically viable uses of photovoltaics and other forms of solar energy will be explored by the Center for Renewable Energy Development with the assistance of U.S. specialists. A team provided by the Solar Energy Research Institute (SERI) has been asked to make a preliminary study later in 1981 and design a national solar and wind measurement program, a prerequisite for further action in this area. Specific technologies and sites for pilot activities will be examined as an early activity of the long-term technical assistance team scheduled to begin work at CDER in early 1982.



ADLER-BARBOUR DCM-12SM
SOLAR PHOTO-VOLTAIC POWERED REFRIGERATOR-FREEZER

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In addition to the projects listed in Table 4, additional wind and solar pilot and demonstration activities will be developed during the life of the project for funding under the Pilot Project Fund, described in Section IIIB8. A total of $300,000 is reserved for wind and solar activities during the life of the project, beginning with $I00,000 in FY I982.

Table 4

Wind and Solar Projects - Characteristics and Cost Estimates

A. Wind

I. Location: PK 8, Route d'Ahfir, Oujda Province
Type: 40 Kilowatt wind powered pumping unit for Portable Water
Cost: Equipment: $72,600 (AID)
Civil Works: $I2,225 (GOM)
Total $84,825

2. Location: Sidi Bounouar, Essaouira Province
Type: 40 Kilowatt wind powered electric pumping unit for Potable and Irrigation Water
Cost: Equipment: $98,370 (AID)
Civil Works: $ 58,650 (GOM)
Total $I57,020
Total Wind Pilot Projects $24I.845

B. Solar

I. Location: Crafa Experimental Farm, Agadir Province and other photovoltaic demonstration sites to be selected
Type: Pumping of irrigation and potable water 5 portable photovoltaic-powered pumps x $6,000 each $30,000 (see annex I8) 5 photovoltaic-powered refrigertors for medical purposes x $6,000 each $30,000
Total $60,000 Solar Pilot Projects (AID)

Total costs of wind and solar pilot projects listed above $30I,845 of which A.I.D.-financed equipment $230,970

TABLE 5 A

Financial Plan - Wind and Solar Pilot Projects - ($ 000) - AID Financing ($000)

	80		81		82		83		84		85		86		LOP
	Obl.	Exp	Obl	Exp	Obl	Exp	Obl	Exp	Obl	Exp	Obl	Exp	Obl	Exp	Obligation
1. Total AID	20		260	190		90									280
2. Preparation Studies	20		30	50											50
a. Feasibility and preliminary design (CTM - June - Nov. 80)	1/														
b. Final design and specifications	20		2/ 30	50											
3. Equipment			230	140		90									230
a. 2 wind pumping units			170	100		70									
b. 5 PV portable pumps			30	20		10									
c. 5 PV refrigeration units			30	20		10									
4. Wind and solar pilot projects to the identified and financed under pilot projects Fund (non-add)					(100)	(70)	(100)	(100)	(100)	(90)		(40)			(300) 1/
a. Feasibility studies					15	10	10	15	10	10					35
b. Equipment					85	60	90	85	90	80		40			265

1/ Shown under CDER Financial Plan - Table 1

2/ For preparation of center equipment specifications.

TABLE 5 B

Financial Plan - Wind and Solar Pilot Projects - GOM Financing ($000)

	FISCAL YEARS							
	80	81	82	83	84	85	86	LOP
1. Total GOM			72	3	3	3	4	85
2. Construction of 2 wind power sites-civilworks			70					70
3. Operation and Maintenance			2	3	3	3	4	15
4. Wind and solar pilot projects to be identified and financed under the Pilot Project Fund (non-add) (See Section III B.8.)			(25)	(50)	(75)	(100)	(100)	(350) 1/

1/ Shown under CDER Financial Plan - Table 1

E. Biomass Conversion Pilot Projects

I. Background

Today more than 50% of the total energy consumed by many of the developing nations is supplied by their bio-resources. In Morocco a very large measure of energy is thought to come from biomass and animal waste.

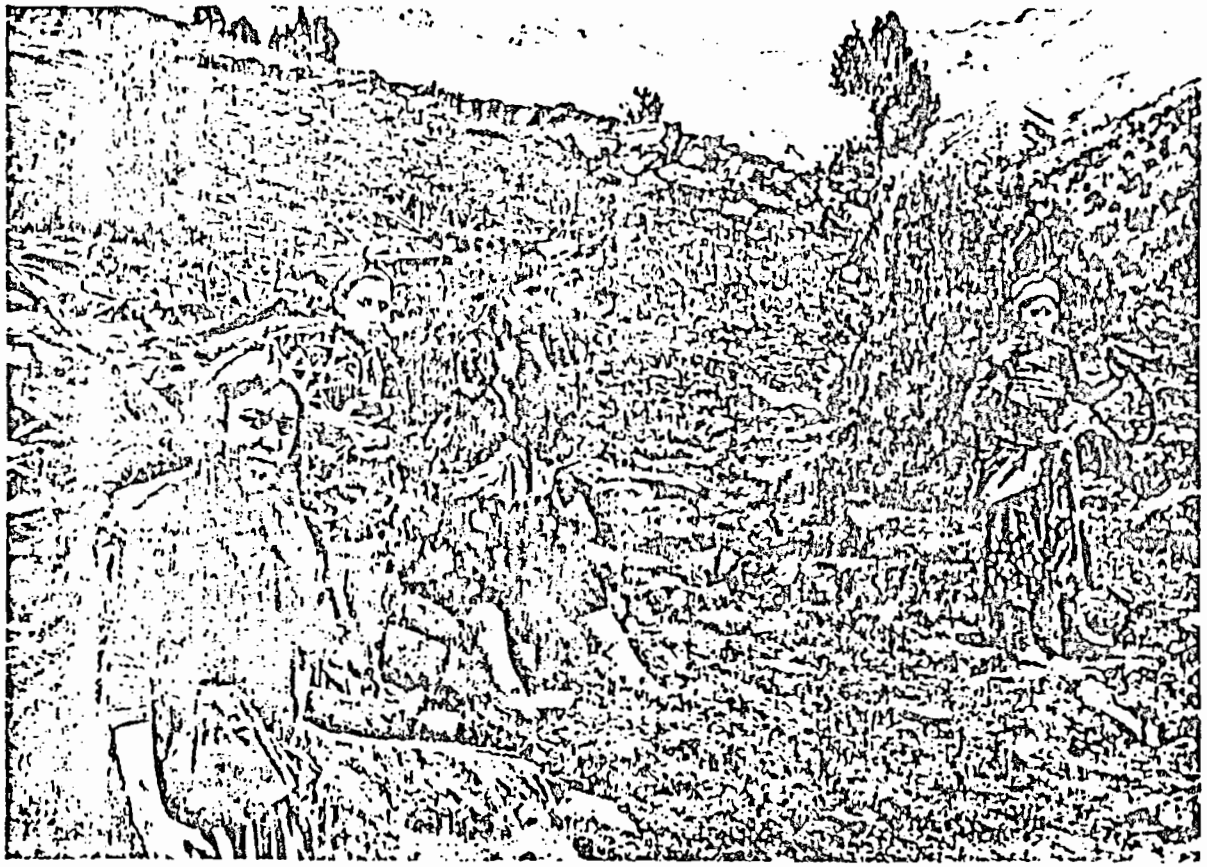
This supply of energy principally goes to Morocco's rural and poor urban population and is used primarily for domestic purposes. i.e cooking and hot water. In addition, some of this energy is used for small-scale industries such as tanning, soap making and food processing.

As in most developing countries, Morocco has not yet measured the availability of biomass nor studied seriously its potential uses as an energy source. Wood and other vegetation is currently used as a biomass energy source. However, it is consumed at a rate that far exceeds its normal replacement capacity.

Despite reforestation efforts, Morocco is losing at least 30,000 hectares of already scarce forest resources per year. Its forests are insufficient to meet the country's needs for wood fiber and household energy. Annual recorded production of firewood averages about a million cubic meters per year. About 60 per cent of this is converted into charcoal. Prices for charcoal have increased almost twice as rapidly as the average cost of living.

An AID/USDA biomass study team visited Morocco in July-August 1980 to advise the GOM and USAID on biomass needs in facility design of the proposed Renewable Energy Development Center, to recommend the range of biomass conversion technologies feasible in Morocco and to indicate biomass pilot projects which might be carried out by the GOM.

The team found that, while animal waste and municipal solid waste offered certain opportunities for biomass exploration, the greatest opportunity for energy from biomass lay in the use of woody material from plantation growth and residue. The team proposed a technical assistance project to increase the present area of



4. Women gathering wood in the High Atlas Mountains. Wood for cooking and heating is becoming increasingly scarce.

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plantations by 300,00 hectares in I0 years. The biomass from 300,000 hectares would fuel, for example, at least 6 power plants of 25 megawatts capacity and make a significant contribution to the energy balance in Morocco by reducing the import of petroleum by nearly I0 per cent. USAID has proposed an Integrated Forestry Development project (608-0I65) for FY I982-I986 funding based on these recommendations.

The forestry project will closely complement the Renewable Energy Development project's biomass conversion activities by expanding wood production for energy uses.

Growing evidence worldwide indicates a strong positive correlation between household energy prices and deforestation in developing countries. The proposed forestry project will help offset rising charcoal prices and will directly affect the success of the biomass components of the Renewable Energy Development project. The biomass component of this project will seek to apply new techniques of converting woody biomass to energy in the Moroccan context. Of particular interest to the GOM is new and currently available village-level charcoal conversion technology. Present Moroccan conversion techniques are primitive and result in wasted wood fiber (wood is burned in mud retorts). The new technology to be applied will preserve small scale village characteristics but greatly reduce these losses. The net result is greater charcoal production from the same amount of wood, and should ease pressure on forest resources.

With respect to the conversion of biomass for energy, the team identified a number of tested conversion technologies which showed promise for implementation or adaptation in the next I0 years under Moroccan conditions, and produced a list of potential biomass conversion projects. Possible applications range widely in scale and cost from woodburning stoves for household use $2000 to anaerobic digestion facilities for the city of Marrakech. ($I,500,000)

2. Feasible Development Projects

The following list indicates feasible development projects for biomass conversion in Morocco, covering a range of scale, complexity and cost. Local conditions will have to govern the choice of projects to implement.

POTENTIAL BIOMASS CONVERSION PROJECTS

Combustion:

Woodburning stoves
- Moderate/high near-term potential
- Cost of $2000
- Requires 3 dry metric tons/year (dmt/yr) wood
  - I hectare tree plantation.

With respect to the conversion of biomass for energy, the team identified a number of tested conversion technologies which showed promise for implementation or adaptation in the next 10 years under Moroccan conditions.

High Potential

- Stationary internal combustion engines retrofitted with air-blown gasifiers (irrigation pumping, electric power production)

- Portable metal kilns for charcoal making.

Moderate to High Potential

- Stoves for heating and cooking.

- Retrofitting existing oil-fired industrial boilers with air-blown gasifiers.

- Retrofitting vehicles with gasifiers.

- Densification of agricultural residues, sawdust, charcoal dust, etc...

- Missouri kilns for charcoal making.

Moderate Potential

- Methane fermentation of animal wastes and low lignin content vegetable or plant wastes.

- Mass burning of biomass and wastes to produce steam ; in shop fabricated boilers with grates or shop fabricated furnace with waste heat boiler.
  Moderate near-term potential
  Cost $300,000
  Requires 2800 dmt/yr wood
  875 hectares tree plantation

- Field erected fluidized bed burners with waste heat boilers, producing steam, using olive pits, nut shells, waste wood.
  Moderate near-term potential
  Cost $1,000,000
  Requires about 9100 dmt/yr biomass from processing plant waste with high moisture content.

- Biomass derived char/fuel oil slurry in an oil fired boiler
  Moderate near-term potential
  Cost $1,000,000 to 2,000,000
  Requires about 16,000 dmt/yr wood
  5,000 hectares tree plantation

Gasification

- Air-blown gasifiers to produce fuel gas for diesel electric generators in rural areas.
  High near-term potential
  Cost $600,000 to $900,000 (250 Kw engine)
  Requires 875 hectares tree plantation

- Air-blown gasifiers on vehicles or trailers
  Moderate/high near-term potential
  Cost $5,000 - $10,000 (300 hp engine)
  Requires 164 dmt/yr wood
  51 hectares tree plantation.

- Air-blown gasifiers to fuel existing oil fired industrial boilers
  Moderate/high near-term potential
  Cost $250,000
  Requires 4030 dmt/yr wood
  125 hectares tree plantation

Anaerobic Digestion

- Digester to produce methane rich fuel gas from shredded municipal solid waste
  Moderate/high near-term potential
  Cost about $1,500,000
  Requires 9000 dmt/yr solid waste from Marrakech or same size city

- Digester to produce methane rich fuel gas from large farm or feedlot
  Moderate near-term potential
  Cost varies from $25,000 to $100,000
  Requires 80 dmt/yr manure from 100 cattle

- Digester to produce methane rich fuel gas from small family run farms
  Moderate near-term potential
  Cost highly variable, up to $2000
  Requires 8 dmt/yr manure from 10 cattle

Pyrolysis

- Portable metal kilns for charcoal production
  High near-term potential
  Cost less than $2000
  Requires 288 dmt/yr wood
  90 hectares tree plantation

- Missouri kiln for charcoal production
  Moderate/high near-term potential
  Cost $10,000 to $15,000
  Requires 1248 dmt/yr wood
  390 hectares tree plantation

TABLE 6

FINANCIAL PLAN - BIOMASS CONVERSION PILOT PROJECTS
A.I.D. FINANCING[A] ($ 000)

	FISCAL YEARS														
	80		81		82		83		84		85		86		LOP
	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obl.	Exp.	Obligation
1. TOTAL A.I.D.	20			20											20
a. Feasibility & Design Studies	20			20											20
b. Biomass pilot projects to be identified & financed under the Pilot Project Fund (non-add)			(30)		(100)	(80)	(100)	(120)	(100)	(100)		(50)			(330)
a. Feasibility Studies			5		15	10	10	20	10	20					40
b. Equipment			25		85	70	90	100	90	80		50			290

A GOM financing for biomass conversion activities will be provided through the Pilot Project Fund (See Section III.B.8) for which a life of project GOM contribution of $700,000 is shown in Table 1 B (Financial Plan - CDER-GOM Financing). About half of this amount will be tentatively reserved for biomass activities.

Densification

Densification equipment to produce fuel pellets or briquettes from agricultural residues, sawdust, charcoal dust, or crops like alfa

Moderate near-term potential
Cost up to $2,000,000
Requires $12,500 dmt/yr residue

Clearly further study will be required to help the MEM establish an order of priorities for pilot activities in biomass conversion. The Center for Renewable Energy Development will take a leading long-run role in moving ahead on the biomass front, using the expertise of the technical assistance contract team to be assigned there. In 1982 the contract team will develop a plan of action for biomass activities to be carried out under the aegis of the Center in cooperation with the Ministries of Agriculture and Interior. Plans are likely to include small-scale, village level applications of biomass technology, better charcoal-making methods efficient Lorena-type stoves, biogas digesters, some of which may be carried out with the participation of Peace Corps volunteers with support from the Small Projects Fund.

3. Next Steps and Funding

The USDA team underlined the urgency of beginning activities on the biomass front and recommended pilot projects which could be undertaken without delay, particularly in small-scale charcoal production. A biomass expert provided under an Indefinite Quantity Contract in June 1981 will develop specific proposals for pilot activities in charcoal production based on the USDA report and further investigations in Morocco in June 1981. These recommendations will provide a basis for early action by CDER and the long-term technical assistance contract team beginning in early 1982.

To finance equipment and related costs required for early pilot and other biomass activities to be developed subsequently, $30,000 will be reserved under the Pilot Project Fund in Fy 1981 and a total of $330,000 during the life of the project. See Section III B.8. for a description of initial pilot projects to be financed

IV. ADMINISTRATIVE FEASIBILITY

A. Moroccan Government Capability

The Ministry of Energy and Mines is responsible for the overall coordination of this project.

GOM responsability for development and management of this project rests with the Office of Energy Resources Development of the

Directorate of Energy of the Ministry of Energy and Mines. The Center for Renewable Energy Development reports to this office.

As project implementation gets underway, operational authority will be increasingly delegated to CDER as the operating capacity of CDER is strengthened by increased staff. Coordinating and action authority will be delegated increasingly to CDER for all aspects of the project. Contracting authority will remain with the Ministry of Energy and Mines. Thus the MEM will contract for the architectural design and the construction ofthe CDER buildings, but the research and development activities of the CDER will be carried out by CDER staff directly.

The individual nominated to direct the Center for Renewable Energy Development has successfully managed sugar refinery construction projects and will receive training in renewable energy technologies by attending schools and visiting renewable energy facilities in the United States and elsewhere. Based on the foregoing, we have concluded that the MEM has the experience and requisite administrative capability to execute this project.

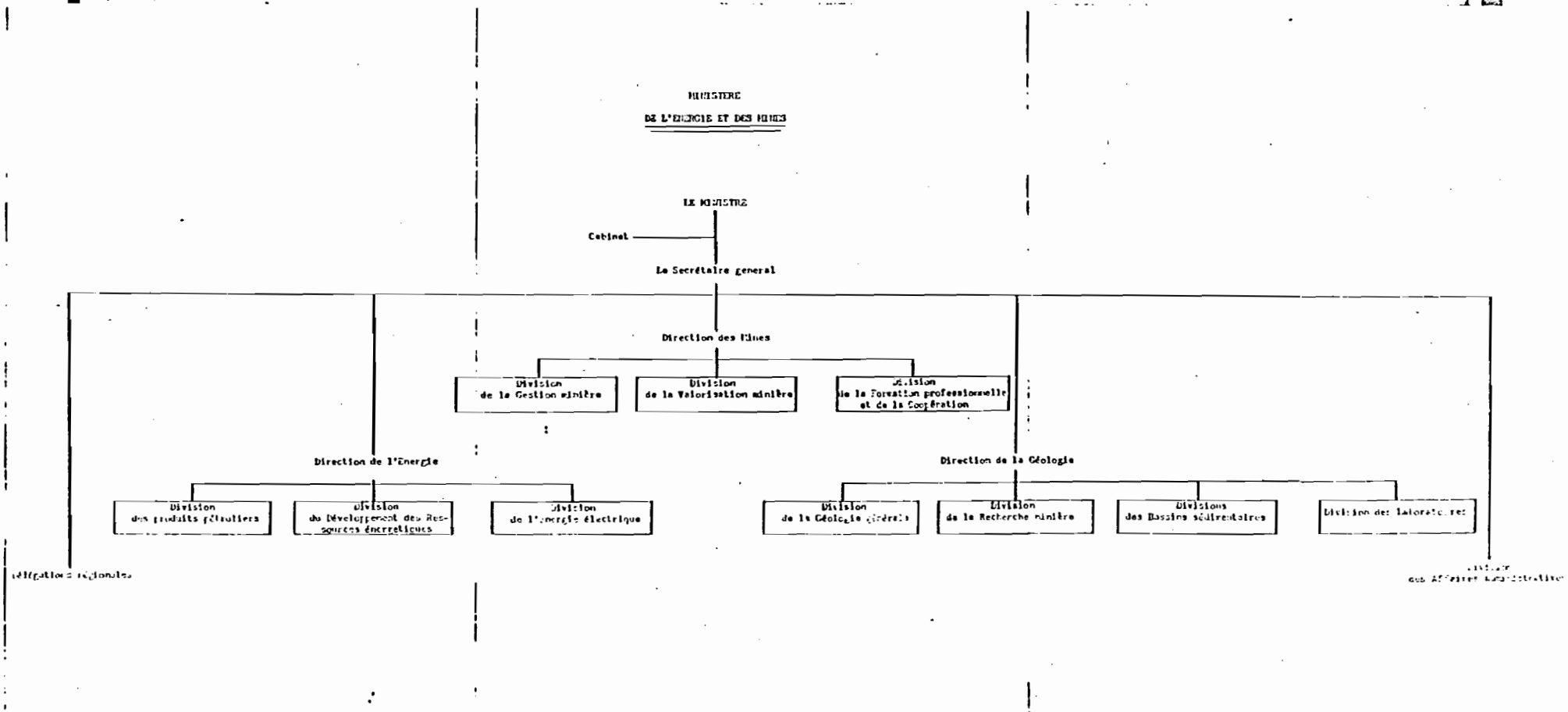
The construction, installation and maintenance of the small hydro pilot projects, and the larger solar and wind pilot projects will be the responsibility of the Office National de l'Electricité (ONE) - a semi public agency which reports to the Ministry of Energy and Mines.

Implementation of the small hydro, solar, wind and biomass pilot activities will be coordinated by CDER with the Ministry of Interior, as may be required.

Provincial governors and village authorities are under the direction of the Ministry of Interior. The Water and Forest Service is under the direction of the Ministry of Agriculture and Agrarian Reform. Clear delineation of responsibilities is a condition precedent for implementation of all pilot projects (See Annex 7).

U.S. AID is in direct contact with CDER and MEM on all matters relating to this project. On matters relating to the pilot projects, CDER and U.S.AID are in direct touch with provincial governors, their staffs, local authorities and the target population. In the case of small hydro sites, for example, public meetings were held during the visit to the 3 selected sites of the survey mapping team and of the U.S. AID contract sociologist, at which the details of the proposed pilot projects were thoroughly discussed. The same approach will be used when additional sites are selected for solar and biomass pilot activities. Thus, participation on all levels is achieved in a way which will insure effective and responsive project execution.

Like ONE, the Center for Renewable Energy Development is a subsidiary of the MEM. Until it is legally established, its staff are employees of the MEM. Legal establishment requires a texte d'Institution and a décret loi to be approved by 1/ the Conseil du Gouvernement, chaired by the Prime Minister — done September



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24, 1980; 2/ the Conseil des Ministres, chaired by His Majesty Hassan II - done May 20, 1981; and 3/ the Parliament - expected by late 1981. With formal legal establishment, CDER will acquire its own budget and the capacity to offer substantial recruitment incentives to attract top quality Moroccan staff, thus adding substantially to its institutional capacity.

B. AID Capability

Given the uncertainties and evolving nature of renewable energy activities, this project must by its very nature be designed to permit flexibility and adaptation. Given the high priority which both AID and the GOM accord to rapid, effective action to exploit renewable energy resources, we have deliberately tried to design this project with a view to reduce delays, telescope actions and yield useful results at the earliest possible dates. Phase I has therefore been carried out by means of a combination of IQCs, centrally funded assistance from AID/W staff and local contracts, all coordinated by the U.S. AID Program Office. Our experience to date has shown that this approach is indeed effective - the diversity of specialities and talents required for the various aspects of project development and the first stages of implementation can best be orchestrated by U.S. AID with timely, competent backstopping from the appropriate AID/W offices. The IQC's available through DS/EY and NE/TECH will further be used to provide a range of services following the schedule outlined in the Implementation Plan (Annex 3) before the arrival of the long-term technical assistance contract staff. Beginning in Spring 1982, the contract staff will reside in Marrakech, and will arrange for specialized consultant services for further project elaboration. USAID will assume a largely expediting and monitoring role. In the meantime, however, U.S. AID will describe scopes of work, request IQC services, procure essential equipment and arrange training so as to maintain project momentum.

AID's energy portfolio in Morocco has expanded during 1981 so that it now includes three major elements:

1. Renewable Energy Development (608-0159)

2. Energy Policy and Planning (936-5703)

Under this centrally-funded project a U.S. contractor is carrying out a national energy assessment which will yield, by early 1982, data and analysis on which CDER will draw in shaping its program. Beginning in FY 1982, the Energy Planning Assistance II project (936-5728 will provide continuing U.S. participation with the MEM in energy planning and policy formation and will ensure effective coordination and interlinkage with CDER activities.

3. Conventional Energy Technical Assistance (936-5724)

Under a Memorandum of Understanding with the GOM to be signed in July 1981, this centrally-funded project will provide technical assistance to the MEM in conventional energy, primarily oil shale development. It will be complemented by centrally-funded Training in Conventional Energy (936-9997) to strenghten Moroccan staff and institutional capability in the MEM and its dependent public enterprises concerned with oil shale and fossil fuels.

Certain of the activities carried out under each of the projects will have implications for the others. Energy planning, conventional energy development and renewable energy development are all interrelated, and continuing coordination will be essential. To ensure effective interlinkage, the resident coordinators for these projects will participate on a steering committee, chaired by the U.S. AID energy project manager, who will oversee and coordinate all AID energy activities in Morocco.

U.S. AID project management has so far been carried out by the Program Officer with the assistance of one local Foreign Service National, the Program Specialist/Chief Procurement Officer. The Program Officer will depart from Post late June 1981, and be succeeded immediately by a General Development Officer who will assume certain multi-sector project management responsibilities, including the energy portfolio. The Program Specialist/Chief Procurement Officer will continue to be actively involved in this project and will monitor all AID-financed equipment procurement.

The Regional Legal Advisor and the Regional Engineer will participate in various aspects of project implementation such as contract negotiation and review later in 1981.

V. ISSUES

A. GOM Funding for CDER & the Pilot Projects

The GOM has budgeted $1,250,000 (DH 6,000,000) for renewable energy activities in 1981.* Most of this will be carried over for expenditure in 1982, as shown in Table 10 B, Annex 1. In FY 1981, however, the CDER staff have had initial difficulties in securing the release of funds required for initial activities and staff training. Clearly, arrangements must be made for the timely release of funds as the project moves into the implementation stage and contracting begins for the design and construction of the Center, the construction and installation of pilot projects, etc. The MEM has assured USAID that they are most desirous of disbursing funds as rapidly as possible for the development of the CDER.

To make sure that GOM funds are made available as needed for effective execution of the project, conditions precedent to disbursement of U.S. funds have been included on this point in the Grant Agreement (Annex 7 Sections A.3, B.2 and C.2)

B. GOM Staffing for CDER

The MEM has found it difficult so far to recruit staff for the CDER, partly because the CDER has not yet been formally constituted as a legal entity and cannot therefore offer its staff the salary levels and incentives necessary to attract sufficient high quality candidates for staff positions. The Center cannot function effectively unless this problem is dealt with. The legislative process is underway, the Director and Deputy Director of the CDER have been formally appointed to their positions by King Hassan II. The MEM has assured USAID that formal establishment of the CDER is expected before the end of 1981, and that a vigorous recruiting campaign will begin immediately thereafter.

A condition precedent to disbursement of funds requires action on the legislative process to establish the CDER and the Grant Agreement commits the GOM to provide sufficient staff for the Center, following a phased recruitment and training plan.

C. Local Participation in Decisions on Small Hydro and Other Pilot Projects

The Hammoudi report states that, although a high degree of enthusiasm for the small hydro pilot projects exists among the local population where they are to be installed, there is concern at one site (Arhbalou-n-Kerdouss) that water needs for generation might conflict with water needs for irrigation. Clearly, no pilot project should be installed unless it if fully accepted by the indigenous population. The small hydro installation is being designed so that it will not conflict with irrigation needs. Before construction begins at the site, the proposed pilot installation design will be thoroughly reviewed with the local

*This includes a carryover of $420,000 (DH 2,000,000)

authorities and with the beneficiary population so that the advantages, disadvantages, water and land requirements, and the extent of local responsibilities for the installation can be fully aired. The pilot unit will not be installed without full local acceptance.

Conditions precedent to disbursement of funds are included in the Grant Agreement requiring a plan of action for all pilot projects setting forth local responsibilities, who will benefit from the installations, and the projects' acceptability to the local population. (Annex 7, Sections B.1 and C.1).

D. Responsibilities for Construction, Repair and Maintenance of Small Hydro and Other Pilot Projects

For pilot projects to function effectively and fulfill their objectives, clear arrangements must be made for assigning responsibilities for the planning, financing and execution of construction, repair and maintenance of the facilities to be tested. In the case of small hydro, an Interministerial Committee for Rural Electrification met in early 1981 to review these matters, but, as with many interministerial enterprises, no tangible results were forthcoming. The MEM has indicated that their intention is to provide the Office National de l'Electricité with budgeted funds for the capital costs of the small hydro installations, that ONE would be responsible for major repairs, and the local communities for normal maintenance. Formal assignment of authority and responsibilities in these matters has not yet been made. Further discussion among the MEM, ONE, local authorities and USAID will be required to work out detailed operational arrangements. Similar arrangements will be required for the effective functioning of each pilot project, no matter how small. Conditions precedent for disbursement of funds addressing these points have been included in the Grant Agreement (Annex 7, Sections B.1, B.2, C.1 and C.2).

VI. EVALUATION PLAN

The growth of the Center for Renewable Energy Development will be an evolutionary process which should be the subject of frequent reexamination and correction. During implementation, adjustments and refinements at the input/output level will be achieved through routine project monitoring (on a frequent and regular basis) of contractor performance, expenditures, and CDER activities and developments as a viable, on-going institution. This monitoring of project progress throughout the implementation stage will be carried out in conjunction and consultation with the CDER staff and the Ministry of Energy and Mines.

As the project progresses, a more purpose level evaluation of CDER institutionalization and performance will be undertaken. Such an evaluation would assess the CDER's ability to initiate, implement and analyze studies of Moroccan renewable energy resources and needs and to translate the results of those studies into workable pilot projects capable of eventual expansion to the broader national scene.

The first evaluation should take place two years after the U.S. technical assistance team begins working at the Center. Subjects for evaluation include :

1. The extent to which the objectives of the project are being accomplished.
2. The progress toward the institutionalization of CDER (its staff, program and facilities).
3. The evolving role of the contractor, so as to determine possible changes in the requirements for long-term resident advisors as well as short-term consultants.

4. The functioning and achievements of the Pilot Project Fund and the Small Project Fund.

5. The effectiveness of the pilot projects, their monitoring by CDER and the results and impact achieved, particularly with regard to prospects for replication.

6. Identification of necessary corrections or changes in the project's implementation or objectives.

This first objective evaluation will take place a few months after the Center's new physical facilities are completed. Its results will be used to reorder priorities of activities carried out so far by the Center's staff and develop a new program for the Center and related activities, adjusting their evolving role for maximum contribution to Morocco's exploitation of its renewable energy resources.

The evaluation team should include both Moroccan and American members. Among them there should be:

1. A person with a background in energy technology;

2. An energy economist;

3. A sociologist

4. An energy policy expert

5. An individual with past experience in the evaluation of comparable projects.

A total of $50,000 is provided for project evaluation in FY 1983 (See Table 1A, Section 6c).

A further evaluation of purpose-to-goal level achievements will take place toward the end of the life of project. This evaluation will focus on the institutionalization of the CDER — on how productively the returning trainees are employed at the Center, on how well the various outputs work together to create an on-going Center, on how successful the Center is in establishing replicable, cost-effective pilot projects. The scope and method of this evaluation will be developed and refined by USAID in collaboration with CDER.

PROJECT PAPER AMENDMENT

Renewable Energy Development (608-0159)

Annexes 1 - 20

USAID/Morocco
April 23, 1981

ANNEXES

1. Financial Tables
   Table 8. - Cost Summary, Phase I
   Table 9. - Financial Plan, Total Project By Project Component and Category of Assistance
   Table 10 A-B - Financial Plan, Total Project by Component & Fiscal Year.
2. Action Schedule
3. Implementation Plan
4. Contractors and Sources of Services
5. Procurement Plan and Center for Renewable Energy Development Equipment List.
6. a. Mission Director's Determination to Waive Host Country Contracting.
   b. Mission Director's Section 611 (e) Certification
7. Covenants and Conditions Precedent
8. Project Authorization Amendment and AA/NE Action Memorandum
9. Draft Project Agreement Amendment
10. Initial Environmental Examination
11. Logical Framework
12. Statutory Criteria
13. Organization of the Center for Renewable Energy Development
14. Small Projects Fund, Features and Criteria
15. Site Evaluation of the Center
16. Cost Estimates and Technical Information on Wind Power Pumping Sites
17. Site Descriptions - Small Hydro

    Part I - Tabant
    Part 2 - Msemrir
    Part 3 - Arhbalou-n-Kerdouss
18. Portable Photovoltaic Pumping Unit (Description and Picture)
19. Morocco: Economic and Social Data
20. Congressional Notification and PP NEAC Cable
21. Bibliography

ANNEX 1

FINANCIAL TABLES

Table 8

COST SUMMARY, PHASE I

		Costs ($000)
1.	Feasibility and Preliminary Design Studies	435
	Center for Renewable Energy Development Small hydro pilot projects Solar and wind pilot projects	
	Charles T. Main International June - October 1980 (completed)	
2.	Center for Renewable Energy Development	105
	a. Design of Center's initial training and work plan Development Sciences Inc. November 1980 - January 1981 (completed)	30
	b. Training program in Morocco for Center staff Development Sciences Inc. April - July 1981	45
	c. Equipment for training program in Morocco 2 portable, self-powered meteorological stations, USAID procurement	15
	d. Participant training in the United States	15
3.	Small Hydro Pilot Projects	20
	a. Site survey and mapping Boghdadi Surveyors - December 1980 (completed)	5
	b. Socio-economic survey - Hammoudi - December 1980 - May 1981 (completed)	15
4.	Solar and Wind Pilot Projects	20
	Final design and specifications	20
5.	Biomass Conversion Pilot Projects	20
	Feasibility and design studies	20
	TOTAL PHASE I	600

ANNEX 1

TABLE 9

FINANCIAL PLAN - OBLIGATION BY PROJECT COMPONENT AND CATEGORY OF ASSISTANCE

(in thousands of Dollars)

	A.I.D.-Financed					Total	Total	Total
	Preparatory Studies	Technical Assistance	Training	Equipment	Other	A.I.D.	GOM	Life of Project
Center for Renewable Energy Development	465	1,875	1,285	1,195	370 1/	5,190	3,900 2/	9,090
Small Hydro Pilot Projects	55	50	-	475		580	865	1,445
Solar & Wind Pilot Projects	50	35	-	495		580	435	1,015
Biomass Pilot Projects	20	40	-	290		350	350	700
Total	590	2,000	1,285	2,455	370	6,700	5,550	12,250

1/ Includes $50,000 for Project Evaluation and $320,000 for the Small Project Fund.

Excludes $630,000 (A.I.D. contribution) for Pilot Project Fund (shown on Table 1A) which is shown here under preparatory studies and equipment for Solar and Wind ($300,000) and Biomass Pilot Projects ($330,000).

2/ Excludes $700,000 (GOM contribution) for Pilot Project Fund (shown on Table 1 B) which is shown here under Solar and Wind ($350,000) and Biomass Pilot Projects ($350,000).

FINANCIAL PLAN - TOTAL PROJECT BY COMPONENT AND FISCAL YEAR

ANNEX I - TABLE 10 A

AID FINANCING ($000)

FISCAL YEARS

	80		81		82		83		84		85		86		L O P
	OBL.	EXP.	OBL.	EXP.	OBL.	EXP.	OBL.	EXP.	OBL.	EXP.	OBL.	EXP.	OBL.	EXP.	OBLIGATION
1. Total AID	600		1500	825	1500	1465	1700	2010	1400	1450		850		100	6700
2. Center for Renewable Energy Development	540		680	560	1500	850	1700	2010	1400	1450		850		100	5820
3. Small Hydro Pilot Projects	20		560	55		525									580
4. Solar and Wind Pilot Projects	20		260	190		90									280
Solar/Wind Pilot Projects Fund Allocation (non-add)					(100)	(90)	(100)	(130)	(100)	(100)		(30)			(300)
5. Biomass Pilot Projects	20			20											20
Biomass Pilot Projects Fund Allocation (non-add)			(30)		(100)	(80)	(100)	(120)	(100)	(100)		(50)			(330)

FINANCIAL PLAN - TOTAL PROJECT BY COMPONENT AND FISCAL YEAR

ANNEX I. - TABLE 10 B

GOM FINANCING ($000)

	FISCAL YEARS							
	80	81	82	83	84	85	86	L O P
1. Total GOM	420	830	1047	1109	480	476	488	5550
2. Center for Renewable Energy Development	400	830	1860	1095	465	460	470	4600
3. Small Hydro Pilot Projects			815	11	12	13	14	865
4. Solar & Wind Pilot Projects			72	3	3	3	4	85 (350)*
5. Biomass Pilot Projects								(350)*

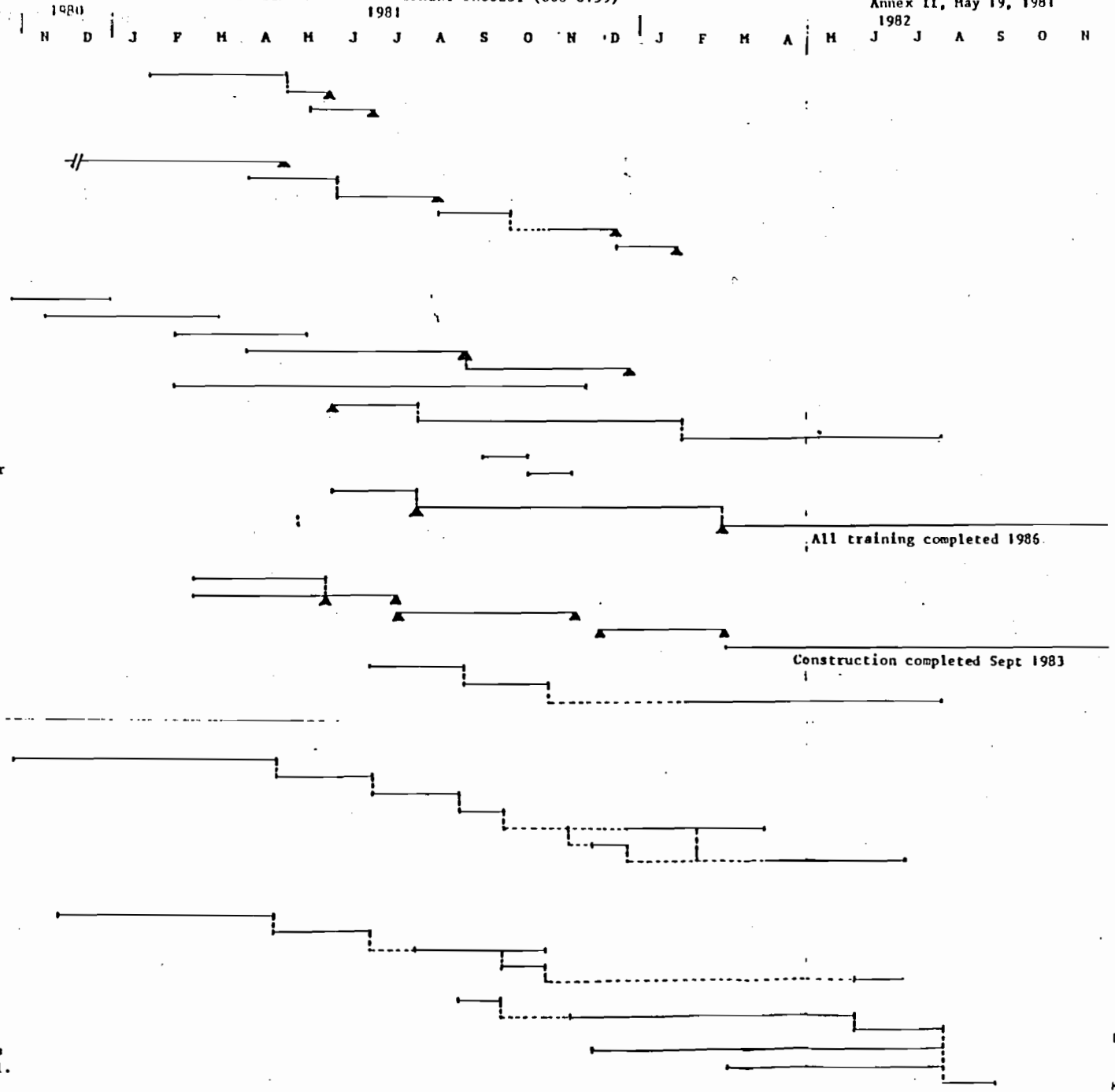
*Additional pilot projects in solar, wind and biomass will be identified and financed under the Pilot Project Fund for which $700,000 of GOM funds are shown in CDER Financial Plan - Table 1.B.

Annex 2

Action Schedule, a graph of
Implementation Plan (Annex 3)

ACTION SCHEDULE - RENEWABLE ENERGY DEVELOPMENT PROJECT (608-0159)

Annex II, May 19, 1981



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ANNEX 3

RENEWABLE ENERGY DEVELOPMENT (0159)

IMPLEMENTATION PLAN

I. Preparation of Project Paper Amendment (Phase II)

Sept. 3 (80)	USDA biomass report completed in draft.
Oct. 6	DS/EY submits final report to USAID
Oct. 10	Draft report translated and transmitted to MEM.
Oct. 31	CTMain final report submitted to USAID.
Dec. 20	DSI draft report of Center action plan submitted (TI).
Jan. 26 (81)	DSI report on Center training and US training submitted (T1 & T2)
Feb-Apr.	USAID prepares PP, and Project Agreement, reviews with MEM, and approves.
Apr. 30	GSA International hydro redesign report and cost estimates submitted.
May 1	PP submitted to AID/W for review.
June 4	NEAC review and approval of PP.
June 15-30	Congressional Notification and waiting period (15 days).
July 15-30	USAID negotiates ProAg with GOM.
Aug. 1	ProAg signed.

II. Contracting for Long-Term Technical Assistance for Center (Host Country Contract)

1.	Oct. 1 (80)	Prequalification Notice and Questionnaire drafted by USAID and submitted to AID/W.
2.	Nov. 24	AID/W revised Prequalification Statement; USAID and MEM approved statement.
3.	Dec. 15-22	AID/W processed notice.
4.	Jan. 12 (81)	Notice published in Commerce Business Daily.
5.	Feb. 15	Deadline for submission of statements.
6.	Apr. 4	MEM selects short list of contractors (7 weeks).
7.	June 15	MEM advises contractors of their retention or exclusion.

RFP Notification Process

8.	June (81)	USAID drafts RFP;
9.	July	RFP reviewed in AID/W; RFP translated into French and reviewed with MEM.
10.	Aug. 1	RFP sent to preselected contractors.
11.	Sept. 25	Contractor proposals mailed to MEM, copies to AID/W for transmittal to USAID.
12.	Oct. 15	Bid deadline (70-day period).
13.	Oct. 15 Nov. 15	GOM reviews proposals, rates and selects contractor. USAID reviews proposals separately (4 weeks).
14.	Nov. 20	AID/W and USAID approve selected firm.

Contract Approval Process

15.	Nov. 30	Selected contractor sends representative to Rabat to negociate contract with GOM.
16.	Dec. 15	GOM approves contract.
17.	Dec. 20	Contract signed. USAID approves contract.
18.	Jan. 10 (82)	Letter of Commitment issued.
19.	Feb. 1	Contractor staff arrives in Morocco.

III. Training Activities

1.	Oct. 31 (80)	CTMain final report submitted to USAID. Report transmitted to MEM Nov. 4.
2.	Nov-Dec.	MEM selects initial nucleus of 5 staff members for Center and they begin English language training.
3.	Nov. 17-25	DSI develops initial action plan for Center under IQC.
4.	Dec. 20	Draft report of initial action plan (dated Nov. 28) submitted to USAID. Transmitted to MEM for review and approval Dec. 31.
5.	Jan. 26 (81)	DSI final report on action plan and training in U.S. submitted to USAID.
6.	Feb. 17	USAID begins equipment procurement - 2 small, self-powered meteorological stations for use initial CDER action plan. (3 mos. delivery time). Equipment to be delivered May 10.
7.	Feb. 20-28	DSI works out final details of training program with CDER and MEM.
8.	Mar. 15	MEM concurs in action program for training at Center.
9.	Apr. 1 - Sept. 1	Assignment of the 5 CDER employees to begin 5 month training program in Rabat and Marrakech under DSI supervision.
10.	Apr-May (81)	CDER staff nucleus to begin solar and wind resources evaluation. One U.S. expert for 1 week (Apr. 1-8) to help select sites for meteo stations.(May 10)2 meteo stations equipment delivered. One U.S. expert (May 10-30) 3/4 time to help assemble and install stations, (1 at CDER, 1 at MEM/Rabat) and initiate monitoring program.
11.	Apr-Nov.	1 CDER staff member to work with E31/DSI energy assessment team - 8 mos - on National Energy Planning Program.
12.	June	Recruit and begin English training for a second cycle of CDER staff to be sent for 6 mos. of U.S. training beginning Feb.-Mar. 82. NOTE : U.S. academic training program for additional CDER staff to be developed by long-term technical assistance contractor. However, if training is to begin Jan. 82 (staff to arrive in Morocco Jan. 82), then candidates should be recruited and begin English training by June 1981.

13.	Sept-Oct.	Observation tour in U.S. for CDER Director (Ms. Fakihani) (1 month).
14.	Sept-Dec.	Training program in U.S. for 5 CDER staff (4 mos.)
15.	Oct-Nov.	Observation tour in U.S. for CDER Deputy Director, Mr. Mzabi (1 month).

IV. Final Design and Construction of Center for Renewable Energy Development

1.	Oct. 31 (80)	CTMain final report submitted to USAID. Report transmitted to MEM Nov. 4.
2.	Dec (80) - Feb. (81)	Critical review of CTMain report by MEM and AID.
3.	Mar-May	DS/EY arrange for U.S. architectural firm to assist with energy efficient redesign of Center. MEM prequalifies and selects Moroccan design architect.
4.	June 1	MEM negotiates contract with Moroccan architect for final design, preparation of construction specs and construction supervision of Center.
5.	June 15	MEM signs contract with Moroccan architect.
6.	June 15- Oct. 15	Final design and cost estimates for Center by Moroccan architect in cooperation with U.S. architectural firm provided under DOE/SERI RSSA (Central Funding).
7.	July 1- Sept. 1	Priority equipment procurement preparation. Under PASA services, DOE/SERI will prepare detailed specs and list of equipment for priority procurement(Priority 1 on CTMain list). For all other equipment, SERI will write detailed specs, including any installation, servicing and training to be required from suppliers. All other equipment for CDER to be procured by U.S. technical assistance contractor.
8.	Sept. 1 (81) Nov. 1	USAID to prepare procurement documents and place orders for critical items only.
9.	Oct. 15- Nov. 15	MEM receive final design for Center.
10.	Dec. 1	MEM issues IFB for Moroccan construction contractor based on final design.
11.	Mar. 1 (82)	MEM signs construction contract. Supervision by Moroccan architect and U.S. architectural firm with oversight by AID Regional Engineer.
12.	Mar. 1 (82)- Sept. (83)	Construction (18 mos.).

V. Solar and Wind Applications

1.	Oct. 31 (80)	CTM solar and wind report submitted to USAID. Reviewed by USAID.
2.	Feb. 6 (81)	CTMain solar and wind report (revised version) in English received by USAID Feb. 1. French version mailed Feb. 5. Transmitted both to MEM Feb. 26.
3.	March	AID and MEM review CTMain report.
4.	April	DS/EY reviews CTMain report with assistance of SERI.
5.	Sept.	SERI to send team to Morocco to design National Solar and Wind Measurement program and recommend plan of action for pilot activities.
6.	Oct.-Nov.	AID and MEM to agree on plan of action. MEM and other GOM authorities and USAID to agree on responsibilities for initial construction, installation, operation, maintenance and monitoring.
7.	Mar.-Apr. (82)	Final design, specs and cost estimates preparation by U.S. contractor at CDER.
8.	April	TA contractor to procure equipment for additional solar and wind pilot projects. Issue IFBs - assume 6 mos. delivery time.
9.	Sept.	Equipment arrives. Moroccan technicians from responsible GOM implementing agencies (CDER and others) receive on-the-job training for installation and maintenance.
10.	Oct.-Nov.	U.S. technical assistance contractor supervises construction and installation with possible support from U.S. suppliers.
11.	Dec. (82)	Pilot units installed. CDER begins monitoring and evaluation of pilot units.

VI. Small Hydro Pilot Installations

1. Oct. 31 (80)	CTMain final report in English submitted to AID. Report translated and transmitted to MEM Jan. 8 (81).
2. November	Reviewed by USAID.
3. Nov. 25-Dec. 13	NRECA small hydro expert and Moroccan surveyor team (Boghdadi - USAID contract) survey 3 pilot sites, produce maps, photos and stake out location of critical elements. Sites: Tabant Msemrir Arhbalou-n-Kerdouss
4. Nov. (80)-May (81)	A. Hammoudi, Moroccan sociologist, (USAID contract) studies social and economic feasibility of sites.
5. May 20	NRECA expert completes preliminary engineering design and cost estimates.
6. June	Preliminary engineering design and social/economic feasibility studies reviewed by AID and MEM.
7. June-July	MEM/ONE/Min. Interior/local authorities and USAID agree on implementation arrangements including; land acquisition (where required), resolution of possible conflicts between use of water for irrigation and generation, responsibilities for financing and initial installation of generating units, distribution facilities and access roads, maintenance of units, power rates, collection, related development activities and uses of electricity.
8. July	AID contracts with NRECA for final engineering design, specifications, supervision of construction, equipment installation and start-up.
9. July-Oct.	NRECA completes engineering design and prepares construction and equipment specs for 3 sites. Sends specs and engineering design drawings for 1st site to MEM and USAID as soon as completed.
10. Oct. 1-June (82)	USAID procures equipment - turbines, generators, controls, etc. for 3 sites. Eight-month delivery time - equipment arrives June.
11. Oct. 1 (81)	ONE invite bids for civil construction contracts (1 for each site), including erection of equipment and access roads. ONE installs power distribution system.

12.	Nov. 15 (81)	GOM awards contract for 1st site construction.
13.	Dec. 1- June 1 (82)	Construction (6 mos.)
14.	June 1- Aug. 1	Completion of construction and erection of equipment (2 mos.)
15.	Dec. 1 (81) Aug. 1 (82)	Supervision by U.S. firm of construction and equipment erection (periodic site visits during 8 mo. period).
16.	Mar. 1- Aug. 1	ONE installs power distribution lines and facilities (5 mos.).
17.	Aug. 1- Sept. 2 (82)	Start up supervised by U.S. small hydro engineer and ONE.

ANNEX 4

CONTRACTORS AND SOURCES OF SERVICES

Services	Period	Cost ($)
General		
Feasibility studies preliminary designs for Center for Renewable Energy Development, Small Hydro Pilot sub-projects and Solar and Wind Pumping sub-pilot projects.	June-October 1980 (completed)	435.000
. Indefinite Quantity Contract with Charles T. Main International.		
Center for Renewable Energy Development		
1. Preparation of initial work plan for Center and participant training program for Center staff.	November 1980 January 1981 (completed)	30,000
. Indefinite Quantity Contract with Development Sciences Incorporated.		
2. Implementation of initial in-country training program for Center staff.	April-August 1981 (underway)	45,000
. Indefinite Quantity Contract with Development Sciences Incorporated.		
3. Architectural team to assist with final design.	June 15-Oct.15 1981	(150,000) (Central funding)
. RSSA with DOE/SERI.		
4. Preparation of detailed specifications for Center laboratory equipment.	July-Sept. 1981	30,000
. PASA with DOE/SERI.		
5. Long-term technical assistance for Center.	January 1982 - December 1985	1,875,000
. Host-Country Contract with a U.S. Firm.		
Small Hydro Pilot Sub-Projects		
1. Small hydro site survey and mapping	Dec. 1980 (completed)	5,000
. Direct AID contract with A. Boghdadi, Moroccan Surveyor.		

Services	Period	Cost ($)
2. Small hydro socio-economic study	December 1980-April 1981 (underway)	15,000
. Direct AID contract with A. Hammoudi, Moroccan sociologist.		
3. Small hydro preliminary engineering design	Feb-Apr. 1981 (completed)	(15,000) (Central Funding)
. NRECA.		
4. Preparation of final engineering design, detailed equipment and construction and supervision of equipment erection and start-up.	July-Sept. 1981 Feb.-June 1982	35,000 50,000
. Host Country Contract with a U.S. firm.		
Solar and Wind Powered Pilot Sub-Projects		
Preparation of final design and detailed specifications.	July-Sept. 1981	20,000
. PASA with DOE/SERI.		
Biomass Conversion Pilot Projects		
AID/USDA Bioenergy Team	August 1980	(Central Funding)
. RSSA with USDA.		
Feasibility and design studies.	May-June 1981	20,000
. Indefinite Quantity Contract.		
TOTAL CONTRACT SERVICES (Excluding Central Funding)		$ 2,560,000--

Annex 5

Equipment Procurement Plan

Equipment will be procured for the project components shown below. AID procurement will be carried out directly by USAID only for (1) the small hydro pilot projects in order to permit arrival and installation of equipment in the summer of 1982, thus avoiding the loss of one construction season; and (2) equipment and materials determined by USAID to be critical for timely and efficient project implementation through June 1982.

After arrival of the long term technical assistance contract team at the Center for Renewable Energy Development in early 1982, the contractor will handle all procurement for the Center and related pilot projects directly-- approximately $1,900,000 of laboratory equipment and other commodities -- using standard U.S. government procurement procedures.

The Ministry of Energy and Mines will arrange for Moroccan customs clearance, pay custom duties and arrange for inland transport to the sites where it will be used.

Equipment and Mode of Procurement	Procurement Period	Cost (in Dollars)
1. Center for Renewable Energy Development		
a. Equipment for initial in-country work plan (2 portable self-powered meteorological measuring stateions) (Completed)	Feb. -May 1981	15,000
. Direct AID procurement based on specifications prepared by DSI.		
b. Laboratory equipment, library acquisition and solar collection devices	July 1981-Sept. 1983	1,180,000
Procurement to be phased over construction period to insure arrival when required. For details see Charles T. Main equipment list pages 5-3ff of this annex. The CDER technical assistance contractor will manage all procurement except as noted above.		
2. Small Hydro Pilot Projects		
Turbines, generators and related equipment.	Oct. 1981-June 1982	475,000
. Direct AID procurement based on detailed specifications prepared by NRECA.		

Equipment and Mode of Procurement	Procurement Period	Cost (in Dollars)
3. Solar and Wind Powered Pilot Projects		
a. Photovoltaic-powered portable pumps and refrigerators.	Mar. June 1982	60,000
. Procurement by TA contractor based on detailed specifications provided by DS/EY.		
b. Equipment for wind powered units	Mar.-Aug. 1982	170,000
. Procurement by TA contractor based on detailed specifications prepared by DOE/SERI.		
c. Equipment for wind and solar pilot projects to be identified and financed under Pilot Projects Fund.	April 1982-April 1985.	265,000
. Procurement by TA Contractor.		
4. Biomass Conversion Pilot Projects		
a. Equipment for initial pilot projects identified by IQC Contract consultant	Mar.-Aug. 1982	25,000
. Procurement by TA contractor.		
b. Equipment for subsequent pilot projects to be identified by long term technical assistance Contractor and financed under Pilot Projects Fund.	April 1982-April 1985.	265,000
. Procurement by TA Contractor.		
TOTAL EQUIPMENT COST:		$2,455,000 -

7.4 Preliminary Equipment List

In the interval before purchasing actually begins, this list should be considered flexible enough to allow both additions and deletions: additions as thought goes into the initial form of the program; deletions as new instruments which combine functions become available.

This preliminary list contains those equipments which are essential for the laboratory regardless of any particular program, but when specific programs are planned, they will probably require additional equipment.

This preliminary list does not "give the Center full capacity to carry out adaptive, applied research in every type of renewable energy equipment and technology." Some, such as photovoltaic synchronous satellites, the power tower or ocean thermal energy conversion are excluded for obvious reasons. Some, perhaps not so obvious, are excluded in the interests of fiscal responsibility and the desire to avoid a "wish list." They involve personal judgments and are obviously subject to review.

Brand names or model numbers, when given do not necessarily imply the acquisition of that particular model or brand. Rather, they provide a convenient way of indicating a size, a level of quality, or a range of specifications for the preparation of bids prior to procurement. At the time of bidding all electrical equipment shall be specified in terms of the Moroccan power grid (50 cycle, 220 volt, single phase or three phase as required).

Prices listed are for the summer of 1980 and are given in U.S. dollars. We recommend that for budgetary planning purposes an annual inflation rate of 15 percent be applied to these figures.

We also recommend that procurement of these items be phased to match the training, building construction, and program development timetable. Three different procurement periods have been identified by appropriate coding.

1) Items marked with a (1) should be ordered so as to arrive in Marrakesh before September 1981. The "nucleus" of the four engineers and an energy planner referred to in Section 1.3.4 will have completed their training at that time and will need to address themselves immediately to the acquisition of resource data and the assembly of apparatus which has special demonstration value. They will oversee the erection of the instrumentation tower and the installation of the solar and meteorological recording equipment. They will also be involved in the installation of recording and sensing equipment into relay racks which will fit into the van or 4 x 4 truck so that data acquisition can begin in other parts of the country. They will also assemble monitoring equipment for evaluating the performance of the solar panels already owned by the Center in order to develop familiarity with test procedures prior to the installation of new equipment in the air and water systems laboratories.

2) The bulk of the equipment list is coded (2). These items should have a procurement schedule calculated to achieve delivery immediately after the Center is completed. These items are largely "general purpose". They are essential for the operation of the Center; and nothing would be gained by waiting until a later date to order them since their prices are not expected to fall.

3) Acquisition of items coded (3) should be deferred until the Center is staffed, all trainees have returned from the U.S., and the consultants have made their contributions. These items are the most sophisticated in the list. Their need is predicated on an anticipated rate of progress in developemnt of the program, and the opinions of the consultants should weigh heavily in the decisions to purchase.

			procurement priority
(a)	General		
10	Typewriters (French Keyboard)	$ 8,000	2
1	Word processor	18,200	3
2	Copiers	3,000	2
17	Hand calculators		
	11 H/P 41c @ 300	3,300	1
	5 H/P 38c @ 150	800	
	1 H/P 92 @ 500	500	
1	Desk top calculator Digital Equipment MINC-11	11,000	2
2	Microfiche readers, WSI Mini Cat TN	600	2
2	Microfilm readers, Xerox 350	1,200	2
1	Microform Reader/Copier, Minolta RP405	3,400	2
1	Interactive terminal for data base interrogation (library)	1,200	3
		$51,200	
(b)	Vehicles		
1	4 x 4 1 tonne truck	$10,000	2
1	3/4 tonne panel truck	9,000	1
1	compact auto	6,000	2
1	1-1/2 tonne fork lift (battery powered)	11,000	1
		$36,000	
(c)	Machine Shop		
1	Bridgeport vertical milling machine (3.3 m bed) with grinding & indexing attachments (metric)	$ 9,000	2
1	engine lathe with attachments (metric) (20 cm swing, 1.65 m bed)	6,000	2

1	drill press (2 cm chuck) and attachments, Powermatic 1200	15,000	2
1	band saw (1 m throat) DoAll Metalmaster	3,500	2
1	power hack saw, Kalamazoo Model 310	2,000	2
1	metal forming brake (1.3 m) DiAcro	800	2
1	sheet metal shear (1.3 m) DiAcro	800	2
2	bench grinders, Delta	400	2
1	portable A-frame and hoist	1,000	2
1	Heliarc welder, Miller, Model 320A/BP	12,000	2
1	oxygen-acetylene welder	200	1
1	heat treating oven 4000 watts	600	2
1	thermocouple welder, Rocky Mountain Orthodontics 506A	600	2
1	belt sander, Delta	500	2
1	20 cm table saw, Craftsman	400	2
1	band saw (wood)(30 cm throat), Craftsman	200	2
1	jointer (2 cm), Craftsman	300	2
1	fume hood (2 m)	1,000	2
1	anodizer (2m x 2m x 1m)	4,500	3
1	plating tank and controls (2m x 2m x 1m)	3,600	3
1	paint spray booth (3 m minimum)	1,200	2
	miscellaneous power and hand tools (drills, routers, reamers, end mills, gauges, micrometers, surface plate, dial indicators, etc.)	10,000	2
		$73,600	

(d) Stockroom

Initial stocking: electronics components, glassware supplies, plumbing fittings, (ells, tees, valves, gauges) electrical fittings (breakers, switches, relays, etc.), metal stocks (rod, bars, tubes, sheets), chemical supplies	$25,000	2

(e) Instrument Shop (Standards and Test Equipment)

1	potentiometer and ancillary equipment - Leeds & Northrup Type K-5	$ 6,000	2
1	Voltage calibrator General Radio 1822	3,500	2
1	impedance bridge Hewlett Packard 4260A	1,600	2
1	frequency meter H/P 5314A	500	2

2 platinum resistance thermometers L & N 8160	1,200	2
1 ice-point thermocouple calibrator, Omega TRC	700	2
1 Angstrom pyrheliometer, Eppley	4,800	3
1 Datapulse Mod 101 pulse generator	900	2
1 RMS voltmeter H/P 3403C	3,000	2
1 logic troubleshooting Kit H/P 5011 T	800	2
1 curve tracer Tektronix 576	6,500	2
1 storage oscilloscope + cart Tektronix 5111	1,700	2
1 oscilloscope + cart Tektronix 5110	900	2
1 dual beam oscilloscope Tektronix 5112	1,600	2
1 X-Y recorder H/P 7004 B	3,300	2
Precision resistance, capacitance and inductance standards	4,000	2
1 Mueller Bridge	3,000	2
Set of 12 plug-ins for Tektronix 5000 series oscilloscopes	3,600	2
	$47,600	

(f) Air-Water-Materials and Electrical Laboratory Equipment

Equipment for panel truck: 2 Pyranometers Pyrheliometer Strip chart recorders Mountings	$ 9,200	1
Battery bank for electrical lab 40 heavyduty (80-100 amp-hr.) (installed on site by staff)	4,000	2
Meters, converters and switch gear for battery bank (installed on site by staff)	6,000	2
Test stands for collector test mounting (fabricated & installed by staff) materials	4,000	2
Solar hardware for permanent installation at the Center (experimental use only)		
Wind 5KW	8,000	1
Photovoltaic 5KW (based on projected price of $2/ peak watt)	10,000	2
Flat plate collectors (10 M^2) (installation by Center staff)	4,000	2
6 ice-point reference junction and amplifier Omn. Amp 2B	12,000	2

4	digital thermocouple meters Omega 175	800	1
4	digital thermocouple meters Omega 2170	1,600	2
4	digital multimeters, Fluke 8024A	800	1
4	digital microvolmeters		
	3-Keithley 177	1,200	2
	1 H/P 3465A	600	
3	signal generators Tektronix TM 504	700	2
12	plug-ins for TM504	7,200	2
10	DC Laboratory power supplies Lambda LP412A	3,000	2
4	oscilloscopes, Tektronix 5110 + plug-ins (16)	4,700	2
4	X-Y recorders H/P 7015B	4,800	2
8	strip chart recorders, dual channel H/P7100	28,000	two 1 six 2
8	data loggers, H/P 41 series	16,000	two 1 six 2
4	process controllers L & N 400 series	10,000	2
	Flow meters		
	1 hot-wire	3,000	2
	16 rotameters	8,000	2
	4 positive displacement	3,200	2
	4 turbine	2,000	2
	1 Doppler	2,000	2
	4 Venturi	2,000	2
1	steel tower for instruments (40 ft.)	2,500	1
	1 recording anemometer	1,200	1
	1 recording humidity meter	1,500	1
	1 recording barometer	1,000	1
	1 recording temperature meter	1,000	1
10	pyranometers, Eppley	12,000	2
2	pyrheliometers (Eppley NIP) plus mounts	6,000	2
10	cassette recording modules for the radiometers above LiCor LI-1776	1,500	two 1 eight 2
2	Campbell Scientific CR-27 microloggers	4,000	2
1	paint tester (ASTM specs)	1,500	2
1	Spectrophotometer (H/P or Perkins Elmer)	8,000	2
1	Monochrometer, (UV through IR) Gaertner	4,000	2
1	optical bench, Oriel	2,000	2
1	reflectometer	2,500	2
1	microscope, Bausch & Lomb	1,200	2
1	metallographic microscope Bausch & Lomb	1,200	2

1	precision balance, Beckman	1,200	2
1	pan balance, Mettler	400	2
1	scanning electron microscope	100,000	3
1	vapor deposition vacuum system for anti reflecting coating work (Varian 3118)	40,000	2
6	equipment consoles (assembled by Center staff)	4,000	2
	Start-up supplies (lab tools, small hardware, meters, variacs, lab jacks, parts cabinets, guages, etc.)	15,000	2
		$368,500	

(g) Bio Combustion Laboratory

1	Mechanical Convection Oven, Blue M.	$ 900	(g) Bio Combustion Lab and (h) Bio-chemical lab are procurement priority 2.
1	Vacuum drying oven, VWR Scientific	700	
1	Vacuum pump for above, Welch Duo Seal	800	
2	Muffle Furnaces, Thermolyne 1630	1,300	
1	25 Tonne Laboratory Press with 6.5 cm Test Cylinder (for pelletizing), Carver C.	1,200	
1	Two Jar - Two Tier Jar, Mill and accessories (for particle size reduction)	1,400	
1	11 kg Top Loading Balance, Mettler P11N/SW	4,500	
1	1.2 kg Top Loading Balance, Mettler P 1210	2,700	
1	Electronic Analytical Balance Mettler AC88	3,600	
1	Particle Size Analyzer consisting of:		
	Alpine Air-Jet Sieve A-200	3,500	
	Micro Mesh Sieve Adapter Kit	400	
	320 mm Fine Filter Attachment	1,400	
	Alpine High Efficiency Cyclone GAZ-125	1,600	
	Ultrasonic Screen Cleaner Sonorex RK106	700	
	Complete Set of Stainless Steel Screens (Mesh 10-425 + 5-35 micron)	5,000	
1	Calorimeter System consisting of:		
	Adiabatic Oxygen Bomb Calorimeter, Parr 1241	3,600	
	Master Control unit for above, Parr 1680	4,800	
	Additional Oxygen Bombs (2), Parr 1108	1,300	
	Water Heater, Parr 1541	300	
	Water Cooler, Parr 1551	600	
	Oxygen Regulator, Parr 1825	200	

	Ignition Unit, Parr 2901	100
	Wet Test Meter, Precision 63126	1,100
1	3 Zone Tube Furnace 1100°c (15cm x 60 cm), Lindburg 55773	1,500
1	Gas Chromatograph - Refinery Gas Analyzer (Carle Instruments Series S)	8,000
	Accessories:	
	Regulators (2), Variflo	400
	Compound Pressure Guage, Heise CMM 8.5	1,000
	Tubing and Valves, Swagelok	1,000
	Vacuum Pump, Welch Duo Seal 1308-01	800
	Miscellaneous Small Parts (glassware, laboratory hardware, special purpose tools, gas cylinders, chart paper, etc.)	7,500
		$61,900

(h) Bio Chemical Laboratory

1	Chemical Oxygen Demand Apparatus (Oceanography International)	$ 1,400
1	Kjeldahl Nitrogen Determination Apparatus (6 unit)(Labcone)	4,400
1	Turbidimeter (Integrating Sphere) HF Instruments - CCST-3000	4,500
1	Gas Chromatograph, H/P 5840A	10,000
	including:	
	Dual Nitrogen Phosphorus Detector, OPT 218	5,000
	FID Jets (2) and Flow Controller, OPT 037/040	300
	Glass Capillary Inlet System, OPT 035	2,200
	Gas Regulators, Variflo	400
	Syringes, Hamilton 700	200
1	Low Temperature BOD Cabinet, Precision 815	2,000
1	Analytical Set (water action) for alkalinity, chloride, ammonia, turbidity determinations (Bausch & Lomb)	1,300
1	Mechanical Convection Oven, Blue M.	900
1	Vacuum Drying Oven VWR Scientific	700
1	Vacuum Pump for above (Welch Duoseal 130B-01	800
2	Muffle Furnaces, Thermolyne PA160	1,300
2	Wet Test Meter, Precision Scientific 63115	2,200
1	Explosion Proof Refrigerator, Lab-Line 3359	1,100

1	Centrifuge IEC/Damon 8196 including:	3,500
	8 place rotor for 50 ml tubes	700
	4 place rotor for 250 ml tubes	700
1	11kg Top Loading Balance, Mettler P11N/SW	4,500
1	1.2 kg Top Loading Balance, Mettler P1210	2,700
1	Electronic Analytical Balance, Mettler AC88	3,600
1	Microwave Oven	400
1	Incubator	1,500
1	Autoclave 1m x 1.3m x 2m, Aminco	7,000
1	Microscope, Bausch & Lomb	2,000
1	Coulter Counter	4,000
3	14 liter Fermenters	1,500
1	Floor Mounted Top Loading Centrifuge	6,000
1	Floor Mounted Flask Shaker	4,000
Miscellaneous Small Parts (glassware, laboratory hardware, gas cylinders, etc.)		12,500
		$93,300

$757.100

at 3.74 dirhams per dollar = 2,832,000 d

	($000)
Development laboratory equipment	
Purchase cost	757,000
Shipping	65,000
Installation	10,000
Contingency (10%)	83,000
TOTAL	915,000
Solar collection devices	150,000
Total equipment	1,065,000

ANNEX 6

MISSION DIRECTOR'S DETERMINATION TO WAIVE HOST COUNTRY CONTRACTING

For Phase II of this Renewable Energy Development Project, we have carefully reviewed the factors affecting the procurement of commodities and technical assistance. Consistent with our determination of December 14, 1979 (Annex I to Phase I Project Paper), we have determined that the host country has the capacity to contract for the technical assistance element of the Project. Nevertheless, in order to (i) prepare certain pilot project designs and equipment specifications and (ii) deliver commodities in country when the technical assistance team arrives so as to maintain the momentum of the Project, I have decided to waive the presumption in favor of host country contracting, as described in Policy Determination 68, with certain respect to (i) services to be obtained under IQC and RSSA and (ii) commodities required for the project. I have also taken into consideration the fact that the Ministry of Energy and Mines has limited experience with international contracting.

Harold S. Fleming
Director

4/23/81
Date

CERTIFICATION PURSUANT TO SECTION 611(e) OF
THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Harold S. Fleming, Director, the principal officer of the Agency for International Development in Morocco, having taken into account, among other things, the maintenance and utilization of projects in Morocco previously financed or assisted by the United States, do hereby certify that in my judgment Morocco has both the financial and human resources capabilities to effectively maintain and utilize the project, which consists of, inter alia: (a) the Center for the Development of Renewable Energy and (b) pilot activities in biomass, small hydroelectric, solar and wind energies. This judgment is based upon considerations discussed in the Project Paper to which this certification is attached.

Harold S. Fleming
Director

Date 4/23/81

Annex 7 Revised

Covenants and Conditions Precedent

The project consists of several separate components which may proceed at different speeds of implementation. Conditions precedent to disbursement of funds for all purposes except training will therefore be linked (except for the condition set forth in Section 4.1 below) to specific project elements as stated in the following text, which is numbered as it appears in the draft Project Amendment (Annex 9 Revised).

Section 4.1 Specimen Signatures

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement, the Government of Morocco will, except as the Parties may other agree in writing, furnish to AID, in form and substance satisfactory to AID, a statement of the names of the persons holding or acting in the office of the Grantee specified in Section 8.2, and of any additional representatives, together with a specimen signature of each person specified in such a statement.

Section 4.2 The Center for Renewable Energy Development (CDER)

a. Prior to the first disbursement of funds, or the issuance of documentation pursuant to which funds may be disbursed under the Project Agreement to finance commodities or technical assistance for the CDER, the Government of Morocco shall provide to AID evidence, in form and substance acceptable to AID, that:

1. Establishment of the CDER has been officially approved by both the Conseil du Gouvernment and the Conseil des Ministres; and

2. Any and all land required for the CDER has been acquired by the Government of Morocco and will be made available for the Project; and

3. A staffing plan, acceptable to AID, which indicates a time-phased sequence for recruitment and training, has been prepared; and

4. Funds required to staff, operate and maintain the CDER have been budgeted and will be made available by the Government of Morocco on a timely basis.

b. Prior to any disbursement of funds, or the issuance of documentation pursuant to which funds may be disbursed under the Project Agreement to finance commodities or technical assistance for the CDER on or after July 1, 1982, the Government of Morocco shall provide to AID evidence, in form and substance acceptable to AID, that the CDER has been officially established and/or ratified by act of Parliament and constitutes a legally recognized de jure entity under the laws of the Kingdom of Morocco.

Section 4.3:

Pilot Projects

a. Pilot Projects for Small Hydroelectric Power Generation

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance pilot projects for small hydroelectric power generation, the Government of Morocco shall provide to A.I.D. in form and substance satisfactory to A.I.D.:

1. Evidence that designation has been made of:

   (a) The organizations responsible for the construction of the pilot generating plants, related canals, distribution systems, access roads and other civil works; and

   (b) The organizations responsible for maintenance of pilot facilities.

2. Evidence of a developed plan of action which includes:

   (a) A description of the responsibilities and authorities for each organization designated above, together with a statement of how these organizations will perform their responsibilities; and

   (b) Identification of the beneficiaries of the pilot projects, and establishment of the governing criteria for the rate structure which will encourage maximum productive use of available electricity.

3. Evidence that the funds necessary to finance the dirham costs required for the construction, operation and maintenance of the pilot projects as set forth in the plan of action have been budgeted by the Government and/or the local authorities and will be available for project implementation on a timely basis.

4. Evidence that the land required for the pilot projects and related facilities (canals, including inter alia access roads, and distribution systems) is available for the projects.

b. Pilot Projects for Solar, Wind, Biomass and Other Forms of Renewable Energy

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance pilot projects for solar, wind, biomass or other forms of renewable energy, the Government of Morocco shall provide to A.I.D. in form and substance satisfactory to A.I.D.:

1. Evidence that designation has been made of:

   (a) The organizations responsible for the construction of the pilot facilities;

   (b) The organizations responsible for the maintenance of the pilot facilities.

2. Evidence of a developed plan of action which includes:

   (a) A description of the responsibilities and authorities for each organization designated above, together with a statement of how these organizations will perform their responsibilities; and

   (b) Identification of the beneficiaries of the pilot projects, the work which they will undertake and the costs which they will incur in connection with the pilot projects; and

   (c) A description of the responsibilities of whatever governmental or private entities will participate actively in the implementation of the pilot projects.

3. Evidence that the funds necessary to finance the dirham costs required for the construction, operation and maintenance of the pilot projects as set forth in the plan of action have been budgeted and will be available on a timely basis.

4. Evidence that land and related facilities required for the pilot projects is available.

Section 4.4:

Pilot Project Fund and Small Project fund

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance activities under the Pilot Project Fund or the Small Project Fund, the Government of Morocco shall, furnish to A.I.D., in form and substance acceptable to it, evidence of the selection criteria to be employed for the projects, the administrative arrangements and procedures by ehich project selection will be made, and the accounting arrangements which will be used for financing the projects.

Article 5: Special Covenant

Section 5.1:

Project Evaluation

The Government of Morocco shall agree to cooperate with USAID in carrying out a program of periodic evaluation of the degree to which this project has attained its planned objectives. The pilot and demonstration activities will be evaluated with a view toward assessing their impact and the prospects for future replication of the technologies tested.

August 6, 1981

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, NE

From: NE/TECH, Lewis P. Reade

Subject: Authorization of Renewable Energy Development Project (0159) for Morocco

Problem: Your authorization is requested for the Morocco Renewable Energy Development Project (608-1059). The grant for Life of Project Funding is $6,700,000.

Discussion: Your approval is requested for authorization of Phase II of the Renewable Energy Development project (608-0159) in Morocco. A Project Paper for Phase I of this project was authorized February 20, 1980 for $600,000 of FY 1980 funding under the Selected Development Activities (Sec. 106) account.

Feasibility studies and preliminary design activities were carried out under Phase I during 1980-1981, resulting in the present Project Paper Amendment which amplifies, modifies and refines the material previously presented in the Phase I Project Paper. Life of project funding is requested in the amount of $6,700,000 to finance the establishment of a Center for Renewable Energy Development (CDER) in Marrakech, training of its staff and development of its action program by a U.S. technical assistance contractor, and implementation of related pilot projects to test exploitation of small hydro, solar, wind and biomass energy resources. The project is designed for institution building and effective transfer of U.S. technology. Equipment for the Center and pilot projects totalling $2,455,000 will consist mainly of off-the-shelf items. Peace Corps volunteers will assist in the implementation of selected pilot projects, particularly small-scale farm and village-sized activities financed through a Small Project Fund.

The Moroccan Ministry of Energy and Mines will finance $5,550,000, equivalent to 45 percent of the $12,250,000 life of project cost. During the 1981-1985 Five Year Plan, the GOM plans $31.8 million for renewable energy development activities.

The Project Review Committee met May 28, 1981 and the Near East Advisory Committee reviewed the project June 4, 1981. The project was approved subject to the reservations set forth below. The Project Paper Amendment has in consequence been revised as noted.

1. USAID project management interventions should be simplified and reduced, particularly as regards the administration of the Pilot Project Fund and the Small Project Fund and in the Procurement of commodities.

a. To simplify and reduce USAID involvement in project implementation:
--Projects financed under the Pilot Project Fund will be approved by the USAID Director, but will to the extent possible be clustered and developed as part of integrated programs.
--Grants under the Small Project Fund will be made by a Project

Selection Committee on which the U.S. technical assistance contractor, resident at the Center for Renewable Energy Development, will be represented. The center will submit quarterly reports to USAID on the activities and awards of the Small Project Fund.

b. To lighten USAID's burden, most commodity procurement will be handled by the U.S. technical assistance contractor, whose field staff is to arrive in Morocco in February 1982. However, to ensure that contract staff have certain essential materials to work with upon their arrival, two exception will be permitted: --(1) USAID will procure equipment for the small hydro pilot projects amounting to approximately $475,000 in order to permit its arrival and installation in the summer of 1982, thus avoiding the loss of one construction season; and (2) USAID will procure equipment and materials amounting to approximately $100,000, determined by USAID to be critical for timely and efficient project implementation during the first six months of the contractor's residence in Morocco. These consist primarily of items required to initiate a solar and wind measurement program, a prerequisite for further action on solar and wind energy activities. (See Annex 5 pages 5-3 through 5-7 for items marked procurement priority 1).

As specifications and procurement documents will be prepared in both cases by outside staff (NRECA for the small hydro and SERI for CDER equipment) USAID's workload will be reduced to easily manageable dimensions.

2. Guidelines should be provided to the U.S. technical assistance contractor and to CDER from which to develop selection criteria for activities financed under the Small Project Fund and the Pilot Project Fund.

The Project Agreement (Section 4.4) now contains guidelines from which project selection criteria for both funds are to be developed. See also Section III.B.7 and 8 of the Project Paper which discuss the two Funds.

3. U.S. technical assistance contract staff will at first consist of two experts(a planning person and a technical person) resident at CDER and supplemented by short-term specialized consultants. The precise needs for the contract staff may evolve as CDER develops, and consequently, the contractor's role should be permitted to change over time.

The evaluation Plan (Section VI) provides for an examination of the evolving role of the contractor, so as to determine possible changes in the requirements for long-term resident advisors as well as short term consultants.

4. The Ministry of Energy and Mines should be encouraged to move vigorously to recruit and train staff for the Center.

The Project Agreement (Annex 9) preamble confirms the GOM's intention to develop and strengthen the institutional and staff capacity of CDER as rapidly and effectively as possible. The Project Agreement provides in a condition precedent (Section 4.2a.3) that the GOM will prepare a staffing plan indicating a time-phased sequence for recruitment and training.

5. A waiver is requested to permit inclusion of costs in proposals for the long-term technical assistance contract.

Moroccan law requires that proposals for contracts with the Government of Morocco contain cost estimates. Despite discussions by USAID personnel and the RLA with the GOM concerning the Agency requirement for the exclusion of estimated budgets in technical proposals for host country contracts (Handbook II, Chapter 1,2,3), the Government of Morocco has taken a firm position that proposing firms must submit estimated budgets as part of their technical proposals and that such information will be taken into account during the selection process. GOM procurement laws, which the RLA has reviewed, provide for selection of a firm performing professional services to be made both on the basis of cost as well as technical considerations.

You have the authority to grant this exception per Delegation of Authority No. 38 and consistent with Section 2.3 of Handbook II, Chapter 1.

AA/NE has recently approved the inclusion of price in technical services proposals for the Range Management Improvement project (608-0145), among others, essentially for the reasons described.

The attached Project Authorization Amendment No.1 provides for inclusion of a cost proposal.

6. Arrangements should be made to strengthen coordination among the multiple energy activites.

The legal establishment of CDER by the Parliament will considerably strengthen CDER's authority and capability to coordinate renewable energy development activities with the Moroccan Government and in the private sector. The Council of Ministries, chaired by King Hassan II, approved the establishment of CDER in May 1980. Parliamentary approval is a condition precedent to disbursement of funds after July 1, 1982. (See Section IV A and Annex 7 of the PP.)

Coordination of CDER activities with other AID-financed activities in Energy Policy and Planning and Conventional Energy Technical Assistance will be ensured by the resident team leaders for these projects constituting a steering committee, chaired by the USAID energy project manager, who will oversee and coordinate all AID energy activities in Morocco. (See Section IV B of the PP.)

The NEAC concluded that the entire project is technically, financially and socially feasible and that planning is sufficiently developed for implementation of Phase II to begin. All significant issues have been identified and dealt with as described above and in Section V of the Project Paper. All statutory criteria have been met, and Congressional notification has expired. There are no current human rights issues under Section 116 of the Foreign Assistance Act which would preclude provision of this assistance to Morocco.

FY 1981 Funds of $1,494,000 for Phase II of this project have been allotted to USAID/Rabat.

Recommendation: That you indicate your approval of this Project Paper Amendment by signing the attached Project Authorization Amendment.

Clearance:
NE/TECH/HRST, Barry Heyman
NE/PD, Selig A. Taubenblatt
NE/NENA/TM, James R. Phippard
GC/NE, Judd Kessler
NE/DP, Bradshaw Langmaid
DAA/NE, Alfred D, White Alfred D. White
Drafted by:NE/TECH/HRST, George Self:7/16/81:Ext. 28164

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON D C 20523

ASSISTANT
ADMINISTRATOR

AMENDMENT

TO

PROJECT AUTHORIZATION

Name of Country: Morocco

Name of Project: Renewable Energy Development

Number of Project: 608-0159

1. Pursuant to Section 106 of the Foreign Assistance Act of 1961, as amended (FAA), the Renewable Energy Development Project for Morocco was approved by the Assistant Administrator, Bureau for Near East, on February 20, 1980, for total authorized funding of $600,000. That authorization, pursuant to Section 103 of the FAA, is hereby amended by adding $6,100,000 in grant funds over a five-year period from the date of this authorization amendment for total authorized project funding of Six Million Seven Hundred Thousand United States Dollars ($6,700,000) subject to the availability of funds in accordance with the A.I.D. OYB/allotment process, to help in financing foreign exchange costs for the Project.

2. The Project Authorization is further amended by substituting the following provisions for corresponding numbered paragraphs thereof:

Paragraph 2: "The Project consists of the development of a program for the exploitation of energy resources, particularly renewable resources, in Morocco. Such program includes commodities and technical assistance for the Center for Renewable Energy Development (CDER) and other commodities and technical assistance for renewable experiments in Morocco."

Paragraph 3.a: "Goods and services, except for ocean shipping, financed by A.I.D. under the Project, shall have their source and origin in the United States or Morocco, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the Project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States."

3. The Project Authorization is further amended by adding the following conditions precedent to disbursement of funds authorized by this amendment:

A. Specimen Signatures

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed

under the Project Agreement, the Government of Morocco will, except as the Parties may other agree in writing, furnish to A.I.D., in form and substance satisfactory to A.I.D., a statement of the names of the persons holding or acting in the office of the Grantee specified in Section 8.2, and of any additional representatives, together with a specimen signature of each person specified in such statement.

B. The Center for Renewable Energy Development (CDER)

a. Prior to the first disbursement of funds, or the issuance of documentation pursuant to which funds may be disbursed under the Project Agreement to finance commodities or technical assistance for the CDER, the Government of Morocco shall provide to A.I.D. evidence, in form and substance acceptable to A.I.D., that:

1. Establishment of the CDER has been officially approved by both the Conseil du Gouverment and the Couseil des Ministres; and

2. Any and all land required for the CDER has been acquired by the Government of Morocco and will be made available for the Project: and

3. A staffing plan, acceptable to A.I.D., which indicates a time-phased sequence for recruitment and training, has been prepared; and

4. Funds required to staff, operate and maintain the CDER have been budgeted and will be made available by the Government of Morocco on a timely basis.

b. Prior to any disbursement of funds, or the issuance of documentation pursuant to which funds may be disbursed under the Project Agreement to finance commodities or technical assistance for the CDER on or after July 1, 1982, the Government of Morocco shall provide to A.I.D. evidence, in form and substance acceptable to A.I.D., that the CDER has been officially established and/or ratified by act of Parliament and constitutes a legally recognized de jure entity under the laws of the Kingdom of Morocco.

C. Pilot Projects

a. Pilot Projects for Small Hydroelectric Power Generation

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance pilot projects for small hydroelectric power generation, the Government of Morocco shall provide to A.I.D. in form and substance satisfactory to A.I.D.:

1. Evidence that designation has been made of:

   (a) The organizations responsible for the construction of the pilot generating plants, related canals, distribution systems, access roads and other civil works; and

   (b) The organizations responsible for maintenance of pilot facilities.

2. Evidence of a developed plan of action which includes:

   (a) A description of the responsibilities and authorities for each organization designated above, together with a statement of how these organizations will perform their responsibilities; and

   (b) Identification of the beneficiaries of the pilot projects, and establishment of the governing criteria for the rate structure which will encourage maximum productive use of available electricity.

3. Evidence that the funds necessary to finance the dirham costs required for the construction, operation and maintenance of the pilot projects as set forth in the plan of action have been budgeted by the Government and/or the local authorities and will be available for project implementation on a timely basis.

4. Evidence that the land required for the pilot projects and related facilities (canals, including inter alia access roads, and distribution systems) is available for the projects.

b. Pilot Projects for Solar, Wind, Biomass and Other Forms of Renewable Energy

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance pilot projects for solar, wind, biomass or other forms of renewable energy, the Government of Morocco shall provide to A.I.D. in form and substance satisfactory to A.I.D.:

1. Evidence that designation has been made of:

   (a) The organizations responsible for the construction of the pilot facilities;

   (b) The organizations responsible for the maintenance of the pilot facilities.

2. Evidence of a developed plan of action which includes:

   (a) A description of the responsibilities and authorities for each organization designated above, together with a statement of how these organizations will perform their responsibilities; and

   (b) Identification of the beneficiaries of the pilot projects, the work which they will undertake and the costs which they will incur in connection with the pilot projects; and

   (c) A description of the responsibilities of whatever governmental or private entities will participate actively in the implementation of the pilot projects.

3. Evidence that the funds necessary to finance the dirham costs required for the construction, operation and maintenance of the pilot projects as set forth in the plan of action have been budgeted and will be available on a timely basis.

4. Evidence that land and related facilities required for the pilot projects is available.

D. Pilot Project Fund and Small Project fund

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance activities under the Pilot Project Fund or the Small Project Fund, the Government of Morocco shall, furnish to A.I.D., in form and substance acceptable to it, evidence of the selection criteria to be employed for the projects, the administrative arrangements and procedures by which project selection will be made, and the accounting arrangements which will be used for financing the projects.

4. The Project Authorization is further amended by adding the following special covenant:

Project Evaluation

The Government of Morocco shall agree to cooperate with USAID in carrying out a program of periodic evaluation of the degree to which this project has attained its planned objectives. The pilot and demonstration activities will be evaluated with a view toward assessing their impact and the prospects for future replication of the technologies tested

5. Section 612(b) Determination

I hereby determine in accordance with Section 612(b) of the Foreign Assistance Act of 1961, as amended: (1) the expenditure of United States Dollars for the procurement of goods and services in Morocco, as authorized above, is required to fulfill the purposes of this Project; (2) the purpose of this Project cannot be met effectively through the expenditure of United States-owned local currencies for such procurement; and (3) the administrative official approving local cost vouchers may use this determination as the basis for this certification as required by Section 612(b) of the Act.

6. Cost Proposal

Pursuant to A.I.D. Delegation of Authority No. 38 and consistent with Section 2.3 of Handbook 11, Chapter 1, I hereby authorize an exception to the contracting policy expressed in Handbook 11, Chapter 1, Section 2.3, to permit the inclusion of a price element in proposals for host country contracts for executing the long-term assistance financed under the Project.

Except as hereby amended, the authorization cited above remains in full force and effect.

Alfred DeWitt for

W. Antoinette Ford
Assistant Administrator
Bureau for Near East

AUG 13 1981
Date

Annex 9

Project Agreement Amendment (Draft)

First Amendment Dated_____ to the Project Grant Agreement dated April 22, 1980

("The Agreement")

Between

The Kingdom of Morocco, acting through the Ministry of Energy and Mines (Grantee")

And

The United States of America, acting through the Agency for International Development ("A.I.D.")

WHEREAS, A.I.D. is agreeable to providing an additional increment of funding for the Project and

WHEREAS, the parties confirm their mutual commitment to the project described in Section 2.1 which has been initiated in Phase I and is to be expanded in Phase II and

WHEREAS, the Grantee confirms its intention to develop and strengthen the institutional and staff capacity of the Center for Renewable Energy Development as rapidly and effectively as possible; and

WHEREAS, A.I.D. financing in the amount of $6,700,000 is planned over the life of the project, subject to funds being made available by the Congress, and the mutual agreement of the Parties to proceed,

NOW THEREFORE, the Parties hereto agree as follows:

I. Article 2 is amended by adding Section 2.3 as follows:

Section 2.3 - Incremental Nature of the Project

a. AID's contribution to the Project will be provided in increments, the initial one being made available in accordance with Section 3.I of this Agreement. Subsequent increments will be subject to availability of funds to AID for this purpose, and to the mutual agreement of the Parties, at the time of

each subsequent increment, to proceed.

b. Within the overall Project Assistance Completion date stated in this Agreement, AID, based upon consultation with the Grantee, may specify in Project Implementation Letters appropriate time periods for the utilization of funds granted by AID under an individual increment of assistance.

2. Section 3.I - the Grant is amended to read as follows:

To assist the Grantee to meet the costs of carrying out the Project, AID, pursuant to the Foreign Assistance Act of 1961, as amended, agrees to grant the Grantee under the Terms of this Agreement not to exceed Two million one hundred thousand United States dollars ($2,100,00) ("Grant"). The Grant may be used to finance foreign exchange costs as defined in Section 6.I and local currency costs, as defined in Section 6.2, of goods and services required for the Project.

3. Section 3.3 - Project Assistance Completion Date is amended by deleting "September 30, 1980" and substituting "September 30, 1986" in lieu thereof.

4. Article 4 - Conditions Precedent to Disbursement - is amended by adding Sections 4.2, 4.3 and 4.4 as follows:

Section 4.2 <u>The Center for Renewable Energy Development (CDER)</u>

a. Prior to the first disbursement of funds, or the issuance of documentation pursuant to which funds may be disbursed under the Project Agreement to finance commodities or technical assistance for the CDER, the Government of Morocco shall provide to AID evidence, in form and substance acceptable to AID, that:

1. Establishment of the CDER has been officially approved by both the Conseil du Gouvernment and the Conseil des Ministres; and

2. Any and all land required for the CDER has been acquired by the Government of Morocco and will be made available for the Project; and

3. A staffing plan, acceptable to AID, which indicates a time-phased sequence for recruitment and training, has been prepared; and

4. Funds required to staff, operate and maintain the CDER have been budgeted and will be made available by the Government of Morocco on a timely basis.

b. Prior to any disbursement of funds, or the issuance of documentation pursuant to which funds may be disbursed under the Project Agreement to finance commodities or technical assistance for the CDER on or after July 1, 1982, the Government of Morocco shall provide to AID evidence, in form and substance acceptable to AID, that the CDER has been officially established and/or ratified by act of Parliament and constitutes a legally recognized de jure entity under the laws of the Kingdom of Morocco.

Section 4.3 Pilot Projects

a. Pilot Projects for Small Hydroelectric Power Generation

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance pilot projects for small hydroelectric power generation, the Government of Morocco shall provide to AID in form and substance satisfactory to AID:

1. A plan of action that:

   (a) Designates the organizations responsible for the construction of the pilot generating plants, related canals, distribution systems, access roads and other civil works; and describes clearly their responsibilities within this project; and

   (b) Designates the organizations responsible for maintenance of pilot facilities, describes how it is to be done, and describes clearly their responsibilities within this project; and

   (c) Identifies the beneficiaries of the pilot projects and establishes the governing criteria for the rate structure which will encourage maximum productive use of available electricity.

2. Evidence that the funds necessary to finance the dirham costs required for the construction, operation and maintenance of the pilot projects as set forth in the plan of action have been budgeted by the Government and/or the local authorities and will be available for project implementation on a timely basis.

3. Evidence that the land required for the pilot projects and related facilities (canals, access roads, distribution systems, etc.) is available for the projects.

b. Pilot Projects for Solar Wind, Biomass and Other Forms of Renewable Energy

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance pilot projects for solar, wind, biomass or other forms of renewable energy, the Government of Morocco shall provide to AID in form and substance satisfactory to AID:

1. A plan of action that:

   a. Designates the organizations responsible for the construction of the pilot facilities and describes clearly their responsibilities within this project; and

   b. Designates the organizations responsible for the maintenance of the pilot facilities describes how it is to be done, and describes clearly their responsibilities within this project; and

   c. Identifies the beneficiaries of the pilot projects, the work which they will undertake and the costs which they will incur in connection with the pilot projects; and

   d. Describes clearly the responsibilities of whatever governmental or private entities will participate actively in the implementation of the pilot projects.

2. Evidence that the funds necessary to finance the dirham costs required for the construction, operation and maintenance of the pilot projects as set forth in the plan of action have been budgeted and will be available on a timely basis.

3. Evidence that land and related facilities required for the pilot projects is available.

Section 4.4 Pilot Project Fund and Small Project Fund

Prior to any disbursement of funds or to the issuance of any documents pursuant to which funds may be disbursed under the Project Agreement to finance activities under the Pilot Project Fund or the Small Project Fund the Government of Morocco shal except as the parties may otherwise agree in writing, furnish to AID, in addition to the applicable items set forth in Section 4.3 evidence in form and acceptable to AID, of the selection criteria to be employed for the projects, the administrative arrangements and procedures by which project selection will be made, and the accounting arrangements which will be used for financing the projects.

Selection criteria will be based on economic, financial and technical feasibility and social and environmental impact.

5. Sections 4.2 - Notification - is renumbered Section 4.5

6. Section 4.3 - Terminal Date for Conditions Precedent - is renumbered Section 4.6 and amended as follows

If the conditions specified in Sections 4.1 through 4.5 have not been met within 90 days from the date of this Amendment, or such later date as A.I.D. may agree to in writing, A.I.D., at its option, may terminate this Agreement by written notice to the Grantee.

7. Article 6: Foreign Exchange Costs is amended by changing its title from "Foreign Costs" to "Procurement Source" to reade as follows:

ARTICLE 6: Procurement Source

Section 6.1: Foreign Exchange Costs

Disbursement pursuant to Section 7.1 will be used exclusively to finance the costs of goods and services required for the Project having their source and origin in the United States and Selected Free World Countries (Codes 000 and 941 of the A.I.D. Geographic Code Book as in effect at the time orders are placed or contracts entered into for such goods and services ("Foreign Exchange Costs")), except as A.I.D. may otherwise agree in writing, and except as provided in the Project Grant Standard Provisions Annex, Section C.1 (b) with respect to marine insurance. Ocean Transportation costs will be financed under the Grant only on vessels under flag registry of the United States or Morocco, except as A.I.D. may otherwise agree in writing. If A.I.D. determines either that there are no vessels under flag registry of Morocco generally available for ocean transportation or that Morocco has no access to U.S. flag service, A.I.D. in a Project Implementation Letter may agree to finance under the Grant ocean transportation costs on vessels flag registry of any country included in A.I.D. Geographic Code Book 941.

Section 6.2: Local Currency Costs

Disbursement pursuant to Section 7.2 will be used exclusively to finance the cost of goods and services required for the Project having their source and, except as A.I.D. may otherwise agree in

writing, their origin in Morocco ("Local Currency Costs").

8. Article 7: Disbursement is amended by renumbering Section 7.2 - Other Forms of Disbursement as Section 7.3 and inserting a new Section 7.2 - as follows:

Section 7.2 - Disbursement of Local Currency Costs

a. After satisfaction of conditions precedent, the Grantee may obtain disbursements of funds under the Grant for Local Currency Costs required for the Project in accordance with the terms of this Agreement, by submitting to AID, with necessary supporting documentation as prescribed in Project Implementation Letters, request to finance such costs.

b. The local currency needed for such disbursement may be obtained by AID from local currency already owned by the United States Government. The United States dollar equivalent of the local currency made available hereunder will be the amount of United States dollars required by I.D. to obtain the local currency.

9. Article 7 is further amended by adding Section 7.4 - Rate of Exchange which reads as follow:

Except as may be specifically provided under Section 7.2, if funds provided under the Grant are introduced into Morocco by A.I.D. or any public or private agency for purposed of carrying out obligations of A.I.D. hereunder, the Grantee will make such arrangements as may be necessary so that such funds may be converted into cur-

rency of Morocco at the highest rate of exchange which, at the time the conversion is made, is not unlawful in Morocco.

10. Section 5.1 - Project Evaluation - is amended as follows:

The Government of Morocco shall, in addition, covenant to cooperate with U.S.A.I.D. in carrying out a program of periodic evaluation of the degree to which this project has attained its planned objectives. The pilot and demonstration activities will be evaluated with a view to assessing their impact and the prospects for future replication of the technologies tested.

INITIAL ENVIRONMENTAL EXAMINATION

Projected Location:	Morocco
Project Title:	Renewable Energy Development II
Funding:	FY 80 through FY 84. Life of Project Funding by USAID is US$6,700,000
Life of Project:	Four Years
IEE Prepared by:	J. A. Sleeper, Environmental Officer, USAID/Rabat
Date:	April 20, 1981

Environmental Action Recommended: The proposed project will not have an adverse effect upon the environment. Therefore, a Negative Determination is recommended, with the proviso that certain considerations be incorporated into final project design and implementation (see para C5). As described in this annex and throughout the narrative of this PP, the proposed project is essentially a research project under which pilot demonstrations of small scale hydro power, wind and solar power and biomass conversion will be set up.

Concurrence:

Harold S. Fleming
Director

4/23/81
Date

A. Description of Project

Under the proposed project, a Center for Renewable Energy Development will be constructed and run in Marrakech by the Ministry of Energy and Mines. AID will provide technical assistance, participant training and commodities to assist the Center in developing a pilot research and demonstration program for commercially viable uses of renewable energy. Pilot projects will be undertaken in small scale hydro power systems (3 pilot sites); wind powered pumping of potable and irrigation water (2 sites). biomass conversion; solar powered pumping of potable irrigation water; and other applications of solar energy.

B. Center for Renewable Energy Development

Under the proposed project, the actual facility to house the Center for Renewable Energy Development will be constructed, as well as support buildings, site support areas (eg. solar arrays) and personnel housing. The Center and support housing will be located on 4.68 hectares of relatively level land with available water, electric power, transportation and municipal sewer services. Property ownership of the site is currently being transferred from the Ministry of Islamic Affairs to the Ministry of Energy and Mines.

Minimum negative environmental impact by the proposed Center is foreseen. There will be no direct economic or residential dislocation or disruption due to construction or subsequent operations.

No significant effects are anticipated for the small business and local people now found immediately adjacent to the site. It is expected that some residents will derive direct and long term economic benefits from the Center through employment during construction and operation. The Center will generate new employment opportunities for service personnel.

No high noise level experimental equipment will be used in the laboratories. The total number of Center employees will be modest (50-100 maximum at some future date) and will not create any local traffic problems. The architectural style of the Center's villas is in keeping with Moroccan tradition, and is expected to blend in with the nearby campus of the School of Mines and other adjacent buildings. The building to house the Center will be a model of energy-efficient design.

C. Small Scale Pilot Hydro Power Generation Systems

1. Introduction. Field visits were made to ten prospective sites (villages) in rural Morocco where the installation of small scale hydro systems is feasible. Sites were ranked according to the following criteria: hydrology; locations for intake structures, penstocks, storage reservoirs (if any), powerhouses, and other civil works; available head; water availability, adequacy and reliability; engineering and cost considerations; geographic distribution (to meet pilot demonstration objectives); socioeconomic

conditions; and the potential for significant environmental impact. The three villages ranked the highest and consequently chosen for pilot systems were: 1) Msemrir (200 households), located in Quarzazate Province on the southern slope of the central High Atlas along the Assin-Imedrhas River; 2) Tabant-Ait-Imi (182 households), located in Azilal Province on the northern slope of the central High Atlas along the Bou-Wgammez River; and 3) Arhbalou-n-Kerdouss (178 households) located in Errachidia Province on the southern slope of the central High Atlas.

The economies of all three villages are based to varying degrees upon a mixture of semi-pastoralist herding of sheep and goats and rainfed cereal cultivation, supplemented by intensive irrigated vegetable production with some doubled-cropped grains and forages. There is no indication that an inequitable financial burden will be placed upon users of the proposed pilot systems in any of the three villages. Local economies have been judged sufficient to both absorb the costs of electrification and support modest investments in electrical applications which should contribute to broadening the local economic base. In all three villages, social attitudes towards the proposed pilot systems are quite favorable. The present system of irrigation management by mayor's office (caidat) functions well in all three villages and is a good indication of local abilities to organize and manage effectively. Operation, maintenance and technical expertise will be provided by the ONE (National Office of Electrification).

The site at Msemrir will improve and upgrade an existing diversion structure currently used for irrigation from the Assin-Imedrhas River to a produce approximately 125 KW of power. At the Tabant-Ait-Imi and Arhbalou sites, spring sources adjacent to the villages already used for irrigation will be developed to provide 100 and 120-250 KW respectively.

The proposed sites will not require relocation of any housing or other existing structures and is not expected to have any negative impact on downstream users below the systems. Erosion control measures during construction will be used in all areas of ground disturbance and should minimize the degree of soil loss. These measures may include scheduling construction during the dry seasons, seeding or revegetation mulching, avoidance of excessive slopes and terracing. To date, there is no evidence of critical habitat, rare or endangered species occuring within the vicinity of the Msemrir site. Visual contrast of the proposed development with the surrounding environment can be mitigated through use of construction design and materials most compatible with the are.

2. Msemrir. The major environmental impacts at Msemrir will occur as a consequence of construction of a small reservoir and powerhouse, and improvement of an existing access road and diversion channel from the Assin-Imedrhas River. Proposed civil works are comprised of existing stone masonry diversion structure; an intake; a power channel; structures for irrigation water on the power channel; a storage reservoir; a steel penstock; and powerhouse.

Access to the site for construction purposes will probably be via an existing jeep trail on the opposite bank. This trail can be widened and upgraded with a minimum of disturbance and without taking any irrigated or other agricultural land. There should be no serious problems in crossing the river which appears to have a solid bed of small rock. No necessity is foreseen for any bridge construction or filling in of the river bed to make a temporary crossing.

Improvement of the power channel and construction of reservoir and powerhouse is expected to take a small amount of irrigated land. However, careful planning should keep land taking to a minimum.

Construction activities adjacent to the river required for the canal and diversion structure may periodically introduce some sediment to the stream. This disturbance can be kept to a minimum through use of soil stabilization practices (avoidance of excessive slopes, seeding, mulching, dry season construction) along the power canal.

It is not anticipated that improvement of the diversion structure will significantly affect the stream habitat of any fish. Some vegetation will be cleared for both construction and improved access. Coupled with grading activity, the potential for soil erosion is increased. Again, these impacts can be minimized through soil stabilization efforts.

3. Tabant-Ait Imi. The proposed water source for power generation is a spring which discharges into a small tributary above the village of Ait Imi. Design of the system consists of : a reinforced concrete and stone masonry intake structure near the mouth of the spring ; a power channel consisting of an underground concrete pipeline ; structures along the power channel to meet existing irrigation water demand ; a storage reservoir, a penstock, a powerhouse and tailrace.

Access to the spring source will require the construction of approximately 1 Km of new road. Through development of a sensitive road alignment and design, impacts to adjacent land use (agriculture, grazing, sparsely-settled housing) and indigenous vegetation cover will be minimal with the exception of the actual land taking required for the road. Some noise and dust may also result during construction of the road and in transporting materials. Construction of the canal, reservoir and powerhouse will also require a -

minimal amount of land taking. Impacts to existing land use will again be kept to a minimum through sensitive setting and construction practices.

Provision for release of irrigation waters in the design of the power canal will mitigate any conflict with existing irrigation practices. During construction of the intake structure, some sediment may be introduced to the spring flow. This will be a short term effect which should have minimal impact on downstream users.

4. Arhbalou-N-Kerdouss. The spring to be developed is located about 75 m from the existing dirt road at Arhbalou village. Under the project the following civil works will be constructed : reinforced concrete intake structure near the mouth of the spring ; an open channel with stone masonry along approximately one third of its length ; a storage tank ; a steel penstock ; a powerhouse ; and a tailrace channel.

Access to the spring for construction purposes will require a temporary roadway, which should be aligned to take no or very little irrigated land. The suggested route for the road begins before approaching the village and arches toward the spring, thus avoiding irrigated land. Some noise and dust may also result during construction of the road and in transporting materials.

The planned intake structure will not have any large scale impact on vegetation except for some shrubs now scattered around the mouth of the spring. These shrubs should be easily re-established.
Widening the present canal from the intake will take a small amount of irrigated land, but careful planning should avoid unnecessary destruction of valuable land. Construction of the rest of the canal structures, storage tank, powerhouse and tailrace will also require a minimal amount of land taking. However, this land is not used for agricultural or residential purposes.

5. Summary of Impacts of Small Scale Hydro.

	Village			
Impact Areas	Msemrir	Tabant	Arhbalou	
Land Cleaning	N	L	L	(NOTE: See footnote
Altered use of water	L	L	L	page 10-9 for
Sediment	L	L	L	explanation of
Aquatic life	M	L	L	abbreviations)

6. Recommendations for Project Design and Implementation. When weighed against the benefits of project development, the reasonably foreseeable environmental effects of the three pilot small-scale hydro-power systems are minimal. However, it is recommended that the following courses of action be taken during project design and implementation :

a) Prior to final design and start of any construction, actual current meter measurements of spring discharges/stream flow

should be made monthly at each of the 3 sites.

b) Prior to final design and start of any construction, measurements must be also made of the quantity of water used in irrigation in order to make accurate estimates of power generation month-by-month, and to ensure that water requirements for power generation do not conflict with those for irrigation.

c) During implementation, the potential for conflict over priorities for water use in irrigation vs. power must be carefully monitored.

NOTE : Section C above, is based upon analyses found in the following documents :

A. HAMMOUDI - Micro Power Plants : Report on Arhbalou-N-Kerdouss and Msemrir.
C. T. MAIN, Inc., - Small Pilot Hydro Power Generation System. Renewable Energy Development Project, Morocco, 1980.
D. ZOELLNER - "Environmental Assessment of Small Scale Hydropower", Small Hydroelectric Powerplants, National Rural Electric Cooperative Association, 1980.

D. Solar and Wind Pumps

Under the proposed project, new solar and wind powered technologies for use in irrigation or potable water pumping will be demonstrated in a pilot program. Three sites with different pumping technologies have been recommended :

Site	Application	Technology System
Oujda	Water pumping for human and animal water supply	40 Kw wind electric pump
Sidi Bounouar (Essaouira)	Irrigation and potable water supply	40 Kw wind electric pump
Marrakech (Renewable Energy Center)	Water supply	5 Kw photovoltaic electric pump

These pilot demonstrations will provide hands-on performance data for solar and wind powered technologies in Morocco. Because of the very small size of this pilot program, little significant effect upon the environment is foreseen.

The solar powered refrigerators for health centers will emit no fumes, vapors or noises. They will not be dangerous or environmentally damaging. The PV power system will be totally enclosed, away from human contact and has no environmentally damaging emissions. Electric shocks can be received if the PV panels are improperly handled, however they will be shielded such that contact with current carrying components cannot be accidentally made. The PV modules contain extremely small amounts of hazardous materials, however there is no chance that these can be released to the environment or that living organisms can be affected by them.

The batteries for electricity storage contain sulphuric acid, however they are in every way similar to automobile batteries except that they are much more strongly constructed. Because those coming in contact with the batteries can be instructed as to the possible dangers and because the population is already familiar with batteries, the potential for environmental damage is extremely small.

E. Biomass Conversion

Several pilot research activities involving biomass conversion (improved charcoal production, more efficient stoves, biogas digestors and other pilot activities to be defined) are planned under the project. Because of the pilot nature of these research activities, none can be expected to have detrimental effect upon the environment with the following possible exceptions.

The GOM is very interested in developing new technologies for village-level charcoal conversion. Present techniques of charcoal production are primitive and result in wasted wood fiber (wood is burned in mud retorts). The new technology to be developed under the proposed project will preserve the small-scale characteristics, but greatly reduce these losses. Should this technology become widely adopted, the net result would be greater charcoal production from the same amount of wood, thereby easing pressure on forest resources.

It must be recognized that the opposite effect -- increased cutting for charcoal production -- could conceivably occur with widespread adoption of the new technology. This danger is great because both the demand for household energy and imported natural gas prices are continually rising. Charcoal and butane/propane are the two major sources of household energy in the country and are relatively substitutable. Unit prices for retail charcoal have increased by almost 90 per cent (twice as rapidly as the cost of living) from 1971 to 1979, but retail prices of natural gas have more than doubled over the same period, in part because a larger percentage of total gas consumption is imported (72 per cent in 1978). Thus, the improved charcoal conversion technology could accelerate wood cutting by lowering the price of charcoal relative to gas and by removing the currently existing convertion constraint.

However, USAID judges that the new technology is not likely to contribute to deforestation for the following reasons. USAID is currently developing a $US 6 million project with the GOM Forest Service to streamline their reforestation effort. Furthermore, the record of the Forest Service for protecting reforested areas has generally been very good. Finally, the discovery of new deposits of natural gas in commercial quantities in Essaouira Province promises to enable Morocco to become less dependent on expensive imported gas.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-Areas*	Impact Identification & Evaluation**
A. Land Use	
1. Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	N
c. Land clearing	L
d. Changing soil character	N
2. Altering natural defenses	N
3. Foreclosing important use	L
4. Jeopardizing man or his works	N
5. Other factors	None

Impact Areas and Sub-Areas (Cont.) *	Impact Identification and Evaluation **
B. Water Quality	
1. Physical state of water	L
2. Chemical and biological states	N
3. Ecological balance	L
4. Other factors	None

* See explanatory notes for this form

** Use the following symbols: N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

C. ATMOSPHERE

1. Air additives	N
2. Air pollution	N
3. Noise pollution	N
4. Other factors	None

D. NATURAL RESOURCES

1. Diversion, altered use of water (irrigation)	L
2. Irreversible, inefficient commitments	N
3. Other factors	None

E. CULTURAL

1. Altering physical symbols	N
2. Dilution of cultural traditions	N
3. Other factors	None

F. SOCIO-ECONOMIC

1. Changes in economic employment patterns	N
2. Changes in population	N
3. Changes in cultural patterns	N
4. Other factors	None

G. HEALTH

1. Changing a natural environment	N
2. Eliminating an ecosystem element	N
3. Other factors - Small quantities of Fertilizers and plant protection materials	N

H. GENERAL

1. International impacts	N
2. Controversial impacts	N
3. Larger program impacts	N
4. Other factors	None

I. OTHER POSSIBLE IMPACTS (not listed above)

_____	None

10-11

UNITED STATES GOVERNMENT

memorandum

DATE: May 29,1981

REPLY TO ATTN OF: NE/PD/PDS, Stephen F. Lintner, SFL
Bureau Environmental Coordinator

SUBJECT: MOROCCO - Renewable Energy Development II - Project Paper (608-0159) - Environmental Clearance

TO: NE/TECH/HRST, George Self,
Project Chairperson

I have reviewed the proposed project and concur with the recommendation of the Mission that it be given a "Negative Determination" in compliance with the requirements of 22 CFR 216, "A.I.D. Environmental Procedures".

cc: GC/NE, B. Janigan
AID/Rabat, J. Sleeper, Mission Environmental Officer
AID/Tunis, S. Carlson, Regional Legal Adviser

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114

☆U.S. Government Printing Office: 1980—341-526/6183

AID 1020-2011-72)

ANNEX 11

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 80 to FY 86
Total U S Funding 6,700,000
Date Prepared: April 22, 1981

Project Title & Number: Renewable Energy Development (608-0159)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: Reduce Morocco's dependence on imported fuels by making maximum use of the country's renewable resources for the production of usable energy while at the same time preserving these resources from environmental degradation.	Measures of Goal Achievement: -- Reduction of Morocco's petroleum imports during the period through 1990 -- Increased use of Morocco's renewable energy resources during the period through 1990	Examine national data	Assumptions for achieving goal targets: That GOM national policy will be able to affect oil consumption
Project Purpose: Create a Center for Renewable Energy Development (CDER) with the professional staff and facilities to carry out a wide range of applied research and pilot activities to identify how best to exploit Morocco's renewable energy potential and encourage its efficient use.	Conditions that will indicate purpose has been achieved: End of project status. -- CDER built by end 1983 with trained staff and a Moroccan institutional capability to manage renewable energy research. -- CDER making an active contribution to development of GOM renewable programs and policies.	Assessment of CDER facilities, staff capability, activities and impact by expert evaluation team	Assumptions for achieving purpose: That results of CDER activities will be used by GOM for policy and program formation in the energy sector
Outputs: -- One CDER with staff, buildings and laboratory equipment actively engaged in an effective program to integrate renewable energy techniques into sector policy and planning. -- A pilot project program in small hydroelectric generation, wind and solar energy and biomass.	Magnitude of Outputs: -- 1 CDER with trained staff and laboratory facilities -- 3 small hydro pilot projects -- 2 wind powered pump water pumping pilot projects -- Photovoltaic pilot projects - 5 portable pumps, 5 refrigerators and others to be determined	Direct observation	Assumptions for achieving outputs: That GOM will budget sufficient funds and logistical backstopping for CDER and the related pilot projects.
Inputs: -- 2 U.S. resident advisors -- 100 person-months short term consultants -- Participant training in Morocco and the U.S. (12 degree candidates, 80 person-months short term) -- Feasibility studies, engineering and architectural design and imported equipment for the Center and related pilot projects	Implementation Target (Type and Quantity) CDER programs to: -- Characterize quantity and quality of renewable energy resources -- Identify and develop renewable energy technologies -- Establish performance measurement system for renewable energy techniques and equipment -- Train a cadre of engineers, scientists and managers in application and administration of renewable energy technology	Assessment of CDER facilities staff capability activities and impact by expert evaluation team	Assumptions for providing inputs: That GOM will provide sufficient staff for CDER to carry out its planned program

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Annex 12, Revised

Statutory Checklist

5C(1) - COUNTRY CHECKLIST

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? — N/A

2. FAA Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the United States unlawfully? — N/A

3. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement? — N/A

4. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government? — N/A

5. FAA Sec. 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? — N/A

A.

6. FAA Sec. 620(a), 620(f); FY 79 App. Act, Sec. 108, 114 and 606. Is recipient country a Communist country? Will assistance be provided to the Socialist Republic of Vietnam, Cambodia, Laos, Cuba, Uganda, Mozambique, or Angola? N/A

7. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression? N/A

8. FAA Sec. 620 (j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property? N/A

9. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? N/A

10. FAA Sec. 620(o); Fishermen's Protective Act of 1967, as amended, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters: N/A

a. has any deduction required by the Fishermen's Protective Act been made?

b. has complete denial of assistance been considered by AID Administrator?

11. FAA Sec. 620; FY 79 App. Act, Sec. 603. (a) Is the government of the recipient country in default for more than 6 months on interest or principal of any AID loan to the country? (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds? N/A

12. FAA Sec. 620(s). If contemplated assistance is development loan or from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the N/A

A.12.

amount spent for the purchase of sophisticated weapons systems? (An affirmative answer may refer to the record of the annual "Taking Into Consideration" memo: "Yes, as reported in annual report on implementation of Sec. 620(s)." This report is prepared at time of approval by the Administrator of the Operational Year Budget and can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

13. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? N/A

14. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? N/A

15. FAA Sec. 620A, FY 79 App. Act, Sec. 607. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? N/A

16. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA? N/A

17. FAA Sec. 669, 670. Has the country, after August 3, 1977, delivered or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards? Has it detonated a nuclear device after August 3, 1977, although not a "nuclear-weapon State" under the nonproliferation treaty? N/A

B. FUNDING CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

a. FAA Sec. 102(b)(4). Have criteria been established and taken into account to assess commitment progress of country in effectively involving the poor in development, on such indexes as: (1) increase in agricultural productivity through small-farm labor intensive agriculture, (2) reduced infant mortality, (3) control of population growth, (4) equality of income distribution, (5) reduction of unemployment, and (6) increased literacy? YES

B.1.

b. FAA Sec. 104(d)(1). If appropriate, is this development (including Sahel) activity designed to build motivation for smaller families through modification of economic and social conditions supportive of the desire for large families in programs such as education in and out of school, nutrition, disease control, maternal and child health services, agricultural production, rural development, and assistance to urban poor?

N/A

2. Economic Support Fund Country Criteria

a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights?

This section not applicable

b. FAA Sec. 533(b). Will assistance under the Southern Africa program be provided to Mozambique, Angola, Tanzania, or Zambia? If so, has President determined (and reported to the Congress) that such assistance will further U.S. foreign policy interests?

c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

d. FY 79 App. Act,Sec. 113. Will assistance be provided for the purpose of aiding directly the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?

e. FAA Sec. 620B. Will security supporting assistance be furnished to Argentina after September 30, 1978?

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PRODUCT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure)?	YES
2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	YES
3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	Legislation officially establishing the Center for Renewable Energy Development (CDER) is a condition precedent to disbursement of funds in the Project Agreement.
4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?	N/A
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	N/A
6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	NO

A.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	Project has the potential to improve technical efficiency of industry, agriculture and commerce by increasing availability of energy resources.
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	U.S. firm will supply services under project.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	Host country to make required in-kind contribution.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	Morocco is a near-excess country; no local currency expenditures are to be financed.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes
12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?	N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained	One purpose of project is to make energy available to rural areas with an equitable distribution to include rural poor.

B.1.a.

basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

Project components will assist GOM develop renewable technologies for irrigation, rural electrification for cottage industries, and increased resource availability and efficiency.

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

N/A

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

N/A

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

Project specifically directed at items described in (i)

(ii) to help alleviate energy problems;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

B.1.b.(4).

(v) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

c. [107] Is appropriate effort placed on use of appropriate technology?

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

The Host Country will provide at least 25% of costs for entire project.

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

NO

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.

Project seeks to improve energy research and application abilities of country people.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and self-sustaining economic growth?

YES

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.

N/A

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

N/A

B.

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance support promote economic or political stability? To the extent possible, does it reflect the policy directions of section 102? N/A

b. FAA Sec. 533. Will assistance under this chapter be used for military, or paramilitary activities? N/A

STANDARD ITEM CHECKLIST

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	YES
2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?	YES
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the United States on commodities financed?	YES
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?	Not Financed
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	NO
6. FAA Sec. 603. (a) Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.	N/A
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the	YES

A.7.

facilities of other Federal agencies will be utilized, are they paritcularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available? — YES

9. FY 79 App. Act Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States? — YES

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest? — YES., The construction design financed.

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? — Not financed.

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the United States not exceed $100 million? — N/A

C. Other Restrictions

1. FAA Sec. 122 (e). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? — N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? — N/A

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foriegn aid projects or activities of Communist-bloc countries, contrary to the best interests of the United States? — YES

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the United States, or guaranty of such transaction? — YES

C.

5. Will arrangements preclude use of financing:

a. FAA Sec. 104(f). To pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization? YES

b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? YES

c. FAA Sec. 660. To finance police training or other law enforcement assistance, except for narcotics programs? YES

d. FAA Sec. 662. For CIA activities? YES

e. FY 79 App. Act Sec. 104. To pay pensions, etc., for military personnel? YES

f. FY 79 App. Act Sec. 106. To pay U.N. assessments? YES

g. FY 79 App. Act Sec. 107. To carry out provisions of FAA sections 209(d) and 251(h)? (Transfer of FAA funds to multilateral organizations for lending.) YES

h. FY 79 App. Act Sec. 112. To finance the export of nuclear equipment, fuel, or technology or to train foreign nations in nuclear fields? YES

i. FY 79 App. Act Sec. 601. To be used for publicity on propaganda purposes within United States not authorized by the Congress? YES

ANNEX 13

Organization of the Center for Renewable Energy Development

Senior Management

The Director General is responsible both for the overall direction and administration of the Center, and also for representing the Center in its relations with the Ministry of Mining and Energy, other Ministries, the business community and other Moroccan institutions, and foreign energy institutions. He is supported in these functions by the Deputy Director. The Deputy Director is responsible for the internal management of the Center, including support services in the form of the machine shop and instrumentation laboratory. He is also in charge of all professional aspects of the Center which are not technology-centered: education, energy planning, economic and social research, information, data acquisition and analysis, and the library. In addition, his responsibilities include all technology-related activities: demonstration projects, applications research, resource assessment, and quality testing and commercialization.

These two persons constitute the senior administration of the Center. It is apparent, however, that additional management is necessary to cover the wide span of activities to be undertaken. For this reason, five middle management positions have been designated: Chiefs for Operations Research, Planning and Education; Administrative Services; Solar and Wind; Biomass and Waste; and Quality Testing and Applications. Four of these middle management positions are staffed with professionals who will receive training either in Morocco or abroad; the fifth (Chief, Administrative Services) will be an experienced administrator who should not require special training. The responsibilities of each of the four professional sub-areas are reviewed below.

Operations Research, Planning & Education

1. The Chief, Operations Research, Planning and Education will be both a manager and a professional in the field of Operations Research.

Managerial duties will fall mostly in the area of budget preparation and reporting to senior management. Professionally, this person will be an operations research analyst, who will analyze problems of renewable energy systems.
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2. The Energy Planners will collect, organize and analyze data on the roles of renewable energy in Moroccan development. These planners will act as resource experts for Ministry planners, and will be particularly valuable as intermediaries between local and regional authorities, and the central government. They will obtain data on energy consumption patterns in various sectors of the Moroccan economy: industry, commerce, transportation, households and agriculture.

3. The Energy Economists will work closely with the planners, in that they will determine the economic impacts of renewable energy projects on development. They will also perform analysis of costs and benefits of large-scale projects, thus aiding in the investment decision process, whether by the Government of Morocco or by international development agencies.

4. The Sociologist will work to determine how renewable energy can be introduced most successfully, given cultural and familial patterns of group behavior in both rural and urban areas. The involvement of the sociologist in all project decisions is necessary so as to lessen the chances for unforeseen adverse effects on the lives of Moroccan citizens.

5. The Technical and Public Information Officers will have two basic responsibilities. One will be to organize, write and publish technical information as developed by the Center, so as to serve the Moroccan and international scientific, technical and development communities. The second will be to provide needed information to the Moroccan public on renewable energy, in a form in which it can be readily understood.

6. The position of Statistician/Scientific Programmer combines the functions of the formerly designated Engineering and Scientific Programmer, and Applied Energy Statistician. This person will perform statistical analyses and write statistical reports on energy resources and use, and will be able to operate a small desk-top computer for the solution of engineering, management and other problems.

7. The Librarian will be responsible for the acquisition of library materials in a variety of formats: films, microfiches, unpublished reports, journals, books, and so forth. He or she will organize the published works of the Center, and maintain the library as a service to the other professional staff. This person will see to it that the Center maintains information-sharing links with other libraries, universities, and research centers throughout the world.

Solar and Wind

1. The Chief, Solar and Wind will have responsibility for resource assessment, technology development, and technology applications in these two areas. He or she will have a staff of seven professionals working with the Energy Planners, Economists and Sociologist; he or she will plan and execute renewable energy demonstration projects in ways that best fit development patterns. This person will supervise the work of specialists in the section: solar engineers, a wind engineer, a materials engineer, and resource analysts. Where large-scale introduction of technologies are planned, he or she will work directly with other Ministries (or will designate other staff members to do so) on technical problems.

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2. The Solar Engineers will work to adapt solar thermal and photovoltaic technologies to Moroccan climatic, environmental and development conditions. They will also adapt passive solar technologies in such areas as building design, working with Moroccan architects and industrialists. They will devise special approaches to renewable energy suitable to Morocco, and will write papers on their accomplishments. Some of their time will be spent in the field on the implementation of pilot projects. At least one person will be responsibile as well for liaison in the small hydro area.

3. The Wind Engineer will perform similar functions with respect to wind technology, in the areas of mechanical energy and electricity generation.

4. The Materials Engineer will investigate the effect of Moroccan soil, climatic and environmental conditions on materials used in renewable energy devices. He or she will be concerned with developing new combinations of materials, or adapting construction methods of such devices, so as to increase reliability and energy output. This person will work both in a materials testing laboratory, and in the field.

5. The Solar and Wind Resource Analysts will initially spend much time in gathering data on solar and wind resources of the country. In the case of wind, this will require the establishment of long-term measurement procedures. Charts, graphs, computer printouts and other displays of information will be produced to serve the needs of other Center personnel as well as the larger Moroccan community. These persons will be especially valuable in planning for the sizing of installations whether village-wide, region-wide, or for a single farm or building.

Biomass and Waste

1. The Chief, Biomass and Waste, will have responsibilities similar to those of his Solar and Wind counterpart; resource assessment, technology development, and technology applications. The technologies under this section include combustion systems, biogas, biochemistry, and integration of biomass-fueled energy systems with other systems. He or she will have a staff of three professionals.

2. The Biomass and Waste Engineers will develop systems for urban and agricultural wastes, utilizing either boilers or biogas generators for the production of energy. They will also develop novel combustion systems which may be integrated with wind installations; one of these persons at least will therefore have some liaison responsibilities in this area.

3. The Biomass and Waste Resource Analyst will be responsible for measuring the caloric content of various prospective fuels, determining their present availability, and at what cost they are available, and planning for their increased production, such as through biomass plantations. He or she will thus work both in the laboratory and in the field, and will write and publish reports on all forms of biofuels, including urban wastes.

Quality Testing and Applications

1. The Chief, Quality Testing and Applications is responsible for the management of the efforts of the Center which contribute to the widespread acceptance and use of renewable energy devices, through the Moroccan industrial and commercial sectors. He or she will also coordinate the testing of devices at the Center, and will notify standards for tests, and performance characteristics to the commercial sector.

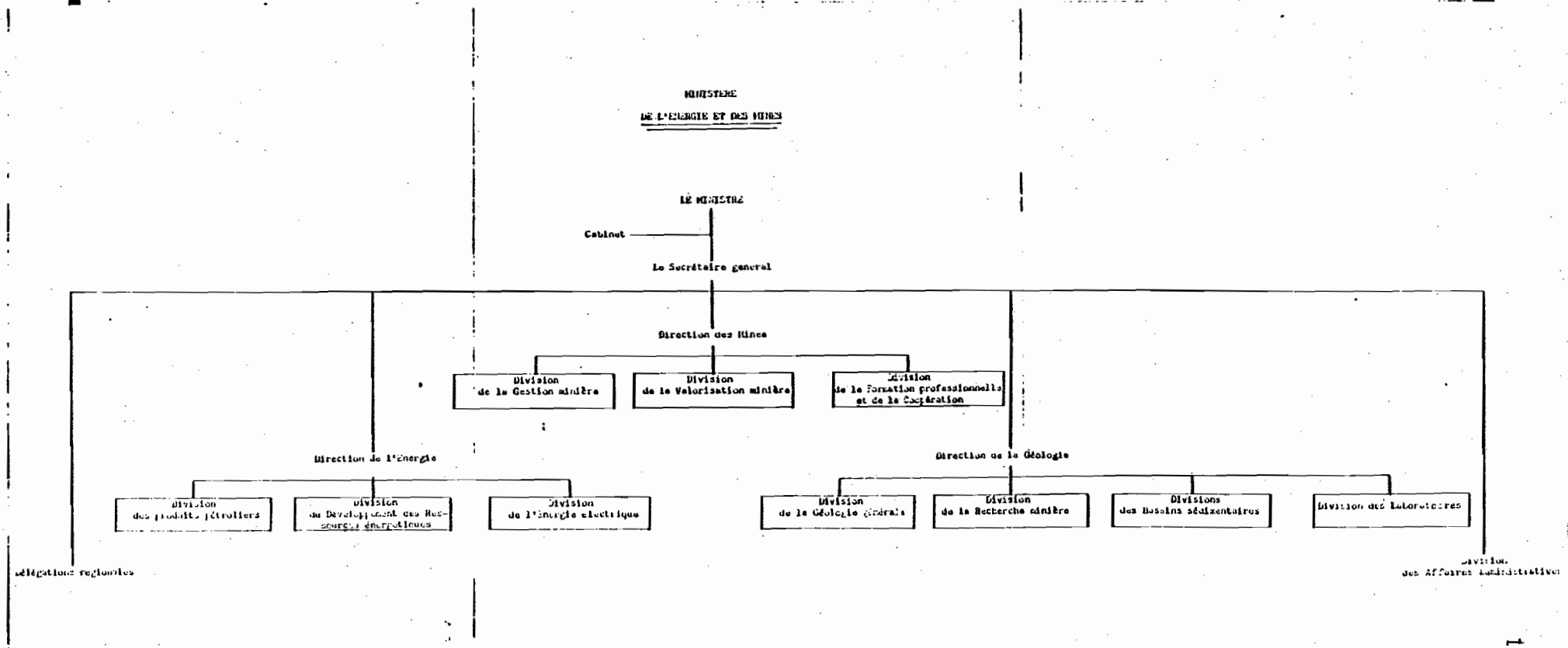
2. The Demonstration Coordinator coordinates the testing of devices outside the laboratory, under field conditions. This person arranges for construction and instrumentation at the testing site.

3. The Licensing Manager prepares for the Ministry's granting of licenses, seals of approval, or other documentation which relate to the standards for the manufacture and sale of renewable energy devices in Morocco.

The above constitutes the present staffing plans for the CDER.

The Center will not commence operations with all the above personnel in place. Difficulties of recruitment, differing lengths of training time, and priorities set by the Government of Morocco will determine the composition of the staff actually present at the commencement of operations. This is by no means a flaw in the development of the Center, as there will inevitably be a

startup period of many months, during which time professionals will be establishing their operations, getting acquainted with equipment, and beginning to contact persons in universities, government departments, and the various economic sectors with which they will be working. It is likewise possible that experience may eventually dictate an expansion of the Center, or changes in its constitution. This will become clearer over the first five years of operation. The professional staff outlined above, however, should be able to adapt successfully to any changes which are presently foreseeable.



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ANNEX 14

Small Projects Fund, Features and Criteria

The Small Projects Fund follows the model of the United States Department of Energy Small Grants Program for Appropriate Technology in Energy, the United States National Science Foundation Grant Program for Scientific Research and Development of Appropriate Technologies, and AID Renewable Energy Development project funding criteria. It is anticipated that Peace Corps volunteers will be actively involved in developing and helping carry out some of the projects financed through the Fund. The Fund will be managed by CDER, guided by the technical assistance contractor and USAID. It will have the following features:

- -- Formal solicitation of grant applications
- -- Requests for proposals
- -- Broad distribution of the solicitations through newspaper announcements and mailings to potential respondents
- -- Initial review of applications by CDER energy experts and U.S. contract technical assistance staff advisors
- -- Circulation of applications to experts to elicit their comments and recommendations for funding
- -- Final selection of awards in a Merit Review by CDER and AID-financed experts
- -- Awards paid in quarterly advances
- -- Quarterly progress reports
- -- Final payment upon receipt of a final report
- -- Renewal of grants and contracts upon justification and successful completion of the first endeavor proposed
- -- Grant levels of $500 to $20,000 to individuals, businesses, government agencies, private voluntary organizations, and non-profit institutions.

All projects proposed must have clearly stated goals which can be and are expected to be achieved within a specified time period. These goals should be responsive to locally felt needs and able to be understood, accepted and implemented with a minimum of outside assistance.

In addition to the selection guidelines stated in Section III B.7 certain criteria will be set up for the offerors or initiators who apply for support from the Small Projects Fund:

- -- The project proposed must be compatible with GOM energy development priorities and the objectives of the Renewable Energy Development project
- -- The project staff must include at least as many Moroccan citizens as foreign residents

-- Offerors must demonstrate that the project meets an expressed need of some portion of the Moroccan poor population. The expression of the need, the scope of the problem and the potential supportive acceptance of the project by the intended beneficiary population must be documented.
-- The offeror must document a financial or in-kind commitment which is commensurate with the scope of the project and the amount of the request. One form of documentation would be prior commitment of funds and/or personnel for the same or similar project.
-- The offeror must have the capacity to keep records and accounts or include in the application a request for funds to have such records kept by a person responsible to the offeror so as to be able to show where, how and for what purpose project funds were disbursed, as a component of the quarterly and final reports.

Small Projects Fund Grant Program

The general areas and types of endeavors to be supported by the Small Projects Fund Grant Program will include:

Concept Development

Awards will be made for the development of an idea, concept or investigative finding which may be applied to the design of a particular renewable energy or energy-saving technology, of an end-users' training program or of a method to promote and disseminate renewable energy or energy-saving technologies among the Moroccan population.

Research and Development

Research and development projects will normally be limited to the applied research necessary to adapt a particular technology to the Moroccan environment, or to produce prototypes, or to acquire the knowledge necessary as a component of production, dissemination or training. Support will be available for the experimental construction or manufacture of prototypes with Moroccan raw materials, restricting the component of imported materials to 20 percent of the total value of the raw materials when existing plans, blueprints or earlier generations of the device have been developed by the initiator. Awards will be made to test a newly developed or newly adapted technology under operating conditions to demonstrate that its application is technically, economically and environmentally feasible; that the renewable energy or energy-saving technology is acceptable to the Moroccan rural population and meets a definite need of this beneficiary population.

Production and Market Studies

Projects may be proposed by private entrepreneurs attempting to produce and to market renewable energy or energy-saving technologies for the consumer market. Normally, these would be limited to market surveys, the refining of the production processes or product design and the purchase of necessary capital equipment. The prospects for commercial success should be high and the potential multiplier effect should be apparent. Priority will be given to organizations with the capacity to develop into commercially

ANNEX 14

viable enterprises and to projects that create jobs, generate income, in cash or kind, or substantially reduce the cost of an item to the consumer or which can be self-sustaining. Private entrepreneurs will be required to demonstrate that conventional bank loans are not available for the project proposed; in some case, private entrepreneurs can apply to the Small Projects Fund for the technical assistance required to prepare successful loan applications for renewable energy production and marketing related projects.

Information Techniques

Innovative ways of promoting renewable energy and energy conservation will be supported through pilot projects in single communities, through special training programs for end-users, radio broadcasts, slide shows, and the preparation, printing and distribution of manuals and brochures for selected target groups. The Fund will promote the use of pilot projects to diffuse a new renewable energy or energy-saving technology into specific rural communities and to study the process and any impediments to acceptance on the part of the beneficiary population.

The transfer of renewable energy and energy-saving technology to technicians and extension agents in Morocco will be supported, especially through the preparation, printing and distribution of newsletters or circulars outlining an appropriate technology; and through conferences and workshops on specific applications of renewable energy and energy-saving technology which bring together selected target groups from several different locations and institutions in Morocco.

ANNEX 15

Site Evaluation - Center for Renewable Energy Development

A. The following paragraphs summarize evaluation criteria used to select the site proposed for the Center.

1. Adequate for the Center's activities - Sufficient property is available for the Center, support buildings, site support areas including solar arrays, and villas. In addition, the Center has a certain amount of expansion capability for future growth. The site is relatively level and open and has excellent sun exposure. Wind exposure is relatively good, but with some wind screening effect from palm tree clusters of generally less than 15 meters in height. The proposed type of usage of the site (Development Center and Support Housing), is compatible with the proposed development plan for that area.

2. Site Ownership - The property ownership is in the process of being transferred from the Ministry of Religion to the Ministry of Mines. The total property consists of 4.68 hectares, of which a parcel of 1.00 hectares immediately adjacent to the School of Mines will be reserved for the school, thus leaving a parcel of 3.68 hectares for the Center.

3. Utilities Availability - Ample electric power, water, municipal sewer service and telephone service are now available for the Center.

4. Accessibility - The selected site is located directly adjacent to Route No. 7, a principal highway connecting Marrakech and Casablanca on the outskirts of Marrakech. It thus affords proximity to a nearby population center from which to draw staff. Marrakech hotels would provide temporary housing for visitors.

5. Drainage - The site has gentle slopes and will be graded during construction to be free-draining.

6. Other Location Considerations - The site is well situated in respect to the academic community by being located immediately adjacent to the School of Mines and also being located in an area of rapidly developing housing for academic and other professional people.

Minimum impact by the proposed Center is foreseen. There will be no direct economic or residential dislocation or disruption due to construction or subsequent operations.

ANNEX 15

No direct negative impacts are anticipated for the small business and local people now found immediately adjacent to the site. It is expected that some residents will derive direct and long term economic benefits from the Center through employment during construction and operation. The Center will generate new employment opportunities for service personnel.

The proposed Center is expected to have a broadly positive impact for the planned urban subdivision to be constructed nearby. No high noise level experimental equipment will be used in the laboratories. The total number of Center employees will be modest (50-100) and will not create any local traffic problems. The architectural style of the Center's villas is in keeping with Moroccan tradition and is expected to blend in with the campus of the School of Mines and the buildings of the subdivision.

The Center will probably be perceived as a complementing institution to the School of Mines. Aesthetically, the Center will be a dramatic improvement in the present appearance of the site.

No recognizable significant adverse environmental effects are projected as a result of the Center's construction, operation or maintenance.

B. SUPPLEMENTAL 20 HECTARE SITE

Consideration has been given to the acquisition and use of a 20 hectare site located approximately 20 km west of Marrakech. Its greatest usefulness would appear to be a satellite area for any pilot projects which MEM and CDER might plan, but which would be too large to be located at the CDER site, for example: a small power tower, a gasahol pilot plant, a biomass cultivation test plot or a solar powered irrigation system. The site is 10-12 km beyond the industrial park area on the western side of the city and is in a sparsely occupied farming area. The site is owned by the Ministry of Finance. If the site is approved as the experimental parcel for the CDER, the Ministry of Finance has agreed to transfer ownership of the 20 hectare to MEM. The 20 hectare parcel is now rented to a local farmer for rainfall agriculture. There are no people living on the site itself. The proposed development of the site will take the 20 hectare of farmland out of use. The farmer presently renting this land will have to look for alternate hectarage. This is not expected to present a hardship as there are considerable amounts of farmland available in the general area. It is not anticipated that any negative disruptions or dislocations will be experienced by adjacent occupants as a consequence of the project. The proposed development should result in new employment opportunities for some local residents.

ANNEX 15

The proposed development for the 20 hectare site is considered to be socially sound. The site consists of cleared land used for minimal grazing of livestock and subsistence farming. The AID/USDA Bioenergy Team Report, Biomass For Energy in Morocco, August 1980, (see bibliography) recommends the acquisition of this site for biomass test plantings and also for possible large scale pilot testing of a variety of chemical processes. The sociological and environmental assessments indicate that this site is acceptable for large scale biomass resource development, and the wind and solar development.

TECHNICAL INFORMATION

WIND POWER PUMPING SITES

1. Center for Renewable Energy Development, Marrakech. 16-1

2. Sidi Bounouar, Essaouira Province. 16-3

3. PK 8 Route d'Ahfir, Oujda Province. 16-7

4. Rabt Tehtani, Oujda Province 16-11

   Hybrid wind power/photovoltaic pumping site for possible future consideration for funding under the Pilot Project Fund

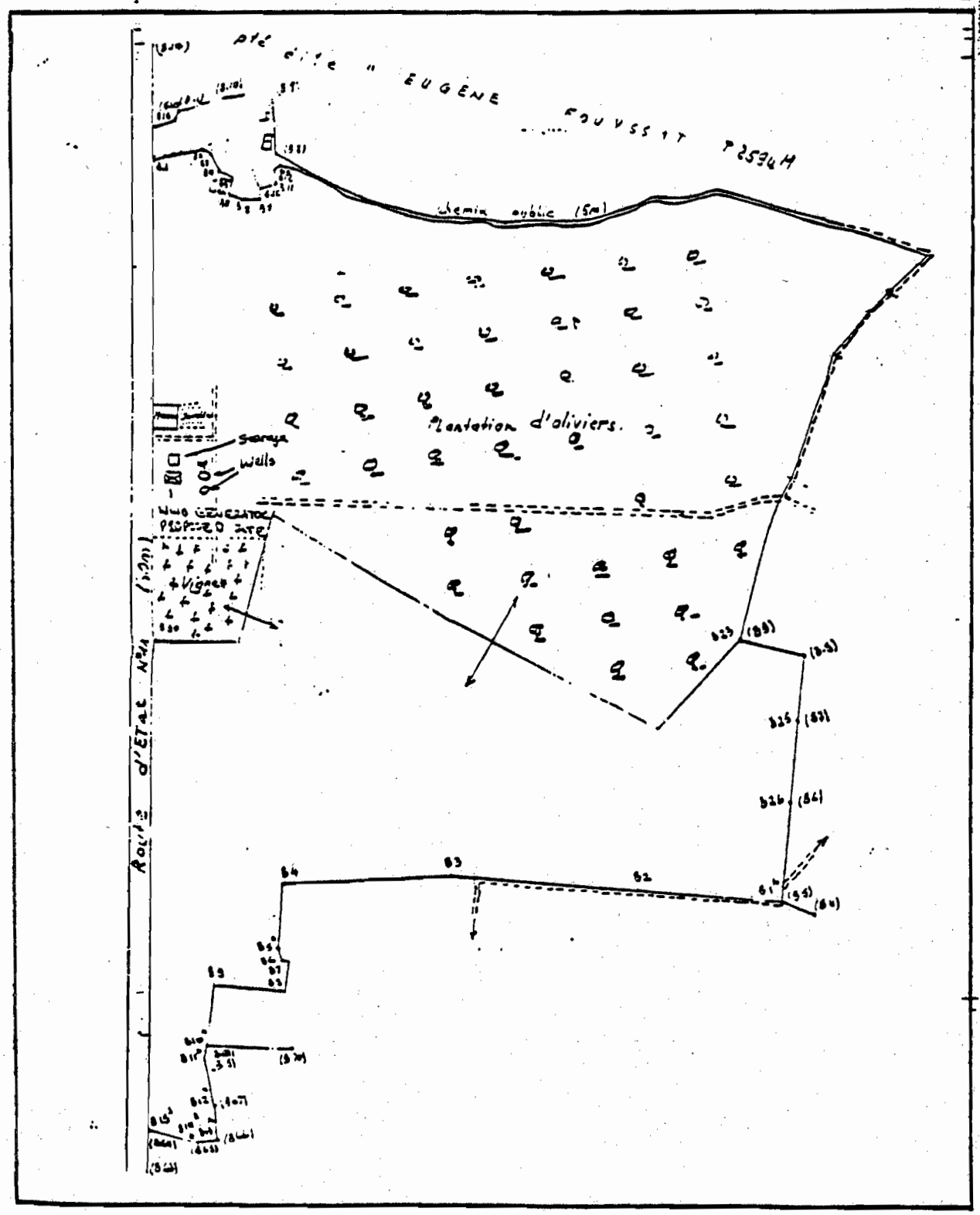
EQUIPMENT FOR RENEWABLE ENERGY CENTER

EQUIPMENT	DESCRIPTION	CAPACITY
Photovoltaic	125 volts d.c.	5 kW
Batteries	Common batteries used in the Center	
Water Pump	Total head = 30 meters Discharge = 1 liter per sec	1 hp 0.75 kW
Pump Motor	125 volt d.c. permanent magnet motor	1 kW

OPERATION SEQUENCE FOR RENEWABLE ENERGY CENTER

EQUIPMENT	MODE OF OPERATION
Assumptions	1. The photovoltaic is a source of energy for the renewable energy center. The output terminals will be connected to 125 volt d.c. main bus bar. 2. A bank of 125 volt d.c. batteries will be connected to the d.c. bus bar. 3. The water pump is a load connected to a 125 volt d.c. bus bar. 4. The entire electric system in the Center is considered a central system.
Photovoltaic	The output will directly feed onto the d.c. bus bar for direct utilization or storage. The energy output should be continuously recorded.
Water Pump	With small capacity, it can be operated at any time. The time of operation and the energy used should be recorded.

FARM LAYOUT SIDI BOUNOUAR



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CHARACTERISTICS AND CAPACITY OF EQUIPMENT FOR IRRIGATION

PUMPING AT SIDI BOUNOUAR SITE

ITEM	DESCRIPTION	CAPACITY
Wind Turbine Generator	40 kW wind generator at 9 m/sec Cut in speed of 3.5 m/sec Cut out speed of 18 m/sec	40 kW peak 18.3 kW average nearby site
Batteries	125 Volts 62 cells 2.1 Volts per cell in series	500 Ampere Hours
Water Pump	Total head 45 meters Discharge 11.6 liters per sec	15 hp (11 kW)
Pump Motor	125 Volt d.c. permanent magnet	20 hp (15 kW)
Panelboard	125 Volts, 50 Amperes	
Storage Tank* for Irrigation Water	Elevation of the bottom of the tank is 10 meters above well outlet	600 m^3

NOTE:* = Existing 200 m^3 water storage tank is sufficient to store potable water for 8 days, including 20% loss allowed for evaporation.

LOAD FORECAST: SIDI BOUNOUAR

IRRIGATION, POTABLE WATER AND ELECTRICITY

ITEM	CONDITIONS		CAPACITY REQUIRED (KW)
Water Pump	Total Head	45 meters	
	Pumping Rate =	11.6 liters per sec	Pump = 15 hp Motor = 15 kW
Lighting	20 houses, 4-20 watt fluorescent lamps per house	80 watts each	Total Load 1.6 kW
Auxiliary Power	One blender	1.0 kW	Total Load
	Battery charging	1.0 kW	2.2 kW
	Lighting	0.2 kW	

NOTE: (1) Existing 200 m^3 water storage tank is adequate to store water for 8 days, including 20% loss allowed for evaporation.

(2) A 600 m^3 water storage tank is proposed to store water for irrigation.

SYSTEM OPERATION FOR IRRIGATION PUMPING AT SIDI BOUNOUAR SITE

EQUIPMENT	MODE OF OPERATION
Wind Turbine Generator	Automatically starts or stops at cut in or cut out wind speeds.
Water Pump	The water pump is operated manually by a pump control switch. The switch can only be closed for operation when the wind speed exceeds 6 meters per second and the water level of the storage tanks are below preset level.
Storage Tank (Potable Water)	Existing 200 m^3 water storage tank should always be maintained at high level. The water can never be used for irrigation.
Storage Tank (Irrigation)	The tank should be filled up before the irrigation starts.
Lighting	5 hours per day. When necessary, the operating time or the number of lamps used should be reduced.
Batteries	The batteries will not supply loads when its specific gravity is below preset value. The specific gravity can be read from an indicator installed at pilot cell.
Auxiliary Power	Auxiliary power can be used when the water pump is not in operation and the batteries are in fully charged condition (indicated by specific gravity).

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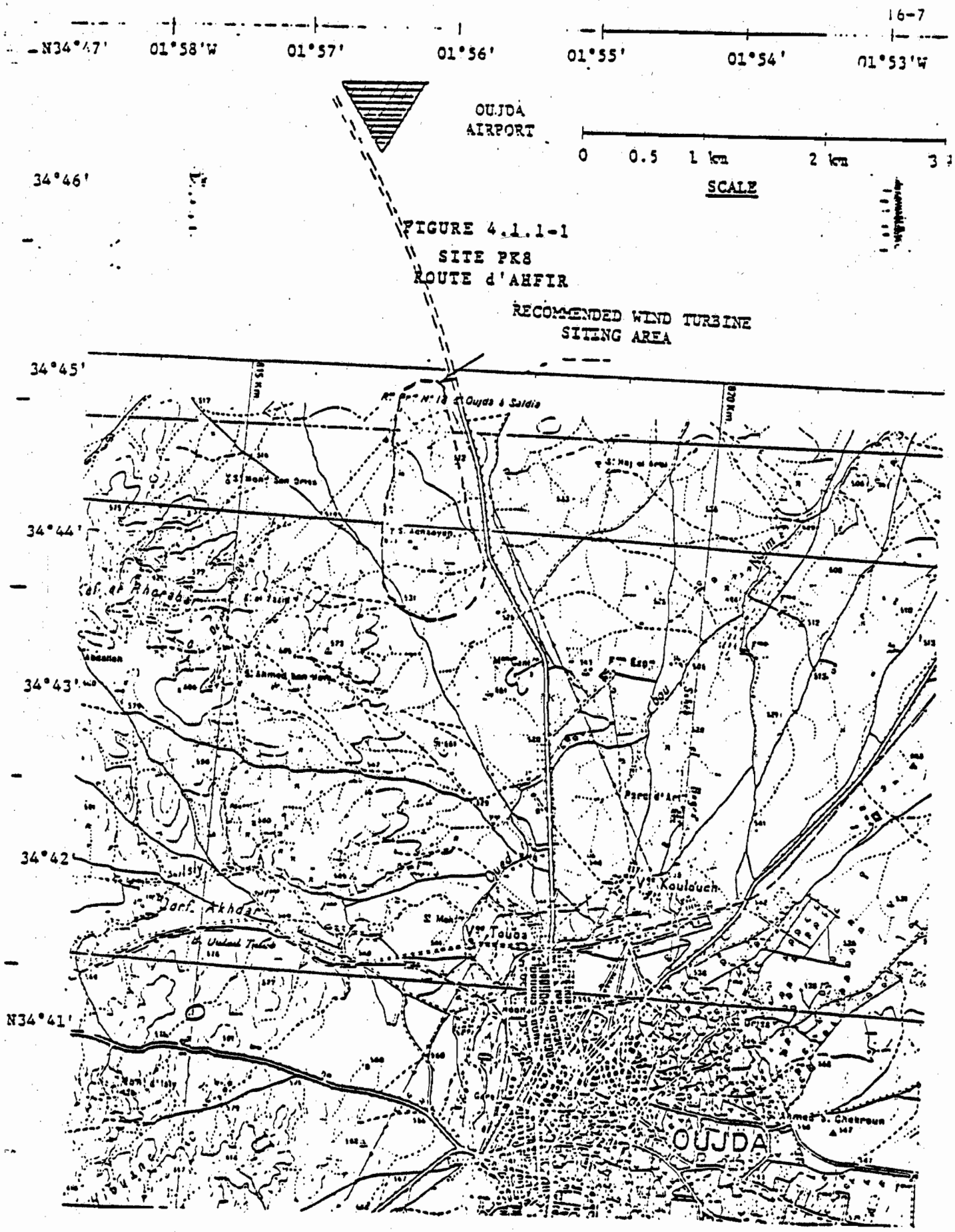

FIGURE 4.1.1-1
SITE PK8
ROUTE d'AHFIR

LIST OF EQUIPMENT FOR POTABLE WATER AT PK-8 ROUTE d'AHFIR SITE

EQUIPMENT	TECHNICAL INFORMATION	CAPACITY
Wind-Turbine Generator	40 kW wind generator at 9 m/sec Cut in speed of 4.5 m/sec Cut out speed at 17.5 m/sec 3-phase, 208 Volt, 50 Hertz synchronous generator	40 kW peak 13.97 kW Average at Site
Water Pump (Lift)	Total head = 80 meters Discharge = 5 liters per sec	10.8 hp (8 kW)
Pump Motor (Lift)	3-phase, 50 Hertz, 208 Volt Wound rotor motor Variable speed, Variable output	13.5 hp (10 kW)
Pump - (Distribution)	Total head = 30 meters Discharge = 5 liters per sec	4 hp (3 kW)
Pump Motor (Distribution)	3-phase, 208 Volt, 50 Hertz Squirrel cage motor	5 hp (4 kW)

LOAD FORECAST FOR POTABLE WATER AT PK-8 ROUTE d'AHFIR SITE

ITEMS	DESCRIPTION
Present Requirement	5 liters per sec - discharge, 12 hours operation 216m^3/day
Water Storage	4 - tanks 100 m^3 each Total 400 m^3 with 15% evaporation loss Total capacity (net) 340 m^3 Good for 1.6 days (normal use) 2.0 days (emergency conditions)
Pumping Capacity	With adequate wind power supply, 24 hours operation. Daily pumping capacity at discharge rate 5 liters per sec = 432 m^3/day. Daily operation - supplies daily use and 50% of storage

OPERATION FOR POTABLE WATER SYSTEM AT PK 8 ROUTE d'AHFIR SITE

EQUIPMENT	METHOD OF OPERATION
Wind Turbine Generator	Automatically starts or stops at cut in or cut out wind speeds.
Lifting Pumps	With the automatic control device provided, the motor can be operated as long as the wind turbine generator is in operation. The motor is variable speed and regulates pump output according to the output of the wind generator.
Distribution Pumps	The motor is a regular 3-phase type with a special starting device to minimize the starting current. Manually controlled. It can be connected to the system when the wind speed exceeds 6.0 meters per second. If it is necessary to operate at a lower wind speed, the motor can only be operated when the lifting pump is shut down.

LIST OF EQUIPMENT FOR RABT TEHTANI SITE AT OUJDA

ITEM	TECHNICAL INFORMATION	CAPACITY
Wind Turbine Generator	10 kW wind generator at 9.1 m/sec Cut in speed of 2.7 m/sec Cut out speed of 23 m/sec	10 kW peak 3.1 kW average at nearby site
Photovoltaic	125 Volts (Batteries are commonly installed)	1 kW
Batteries	62 cells, 2.1 Volts per cell in series	400 Ampere Hours
Pump	Head = 50 meters Discharge = 2 liters per sec	2.7 hp (2.0 kW)
Pump Motor	125 Volt d.c. permanent magnet	3.4 hp (2.5 kW)
Lighting	For pump house use 2 - 40 watt lights	80 watts

LOAD FORECAST FOR RABT TEHTANI SITE AT OUJDA

TIME FRAME	LOAD
Present Condition	• 8 hours per day operation • Discharge = 2 liters per sec • Total water consumed = 57.6 m^3/day Storage tank 40 m^3
Future Load	• Normal Conditions • Total Water Consumption 7.2 m^3/hour 57.6 m^3/day • Calm wind day and cloudy day. • Total water consumption 40 m^3 (Limited by the capacity of storage tank) • Total Power Load Normal conditions Water pumped 57.6 + 40 = 97.6 m^3/day Electric Power consumed 34 kWh/day • Calm wind day or cloudy day. Water pumped - 40 m^3 Energy consumed = 14 kWh/day

ANNEX 17

Site Descriptions - Small Hydro

Part 1 : Tabant-Ait Imi

Description : Tabant-Ait Imi is in the Bou Guemez valley on the northern slope of the central High Atlas, at an altitude of 1860 meters and about 74 km south of the provincial capital of Azilal. The rich, well-watered valley supports widespread and intensive agriculture which provides the basic ingredients for a very prosperous local economy combining agriculture with the regionally more traditional pastoralism. The valley is four hours'drive by dirt road from Azilal, over a pass closed by snows at least for two months each year. The total population of the Ait Bou Guemez valley is about 10,000 spread among 25 villages and hamlets. Tabant-Ait Imi consists of 3 separate hamlets in 182 households totalling 1,117 people. It is the primary administrative center of the valley. The caid's office is located there, as well as a primary school, a souk, a post and telephone office, a dispensary and a local office of the Forest Service.

About 3,000 ha of land are irrigated in the valley by irrigation canals gravity fed from hillside springs and the river. Principal irrigated crops are potatoes and forage and corn for animal feed. Potatoes are raised as a commercial crop and sold during harvest. Walnuts and apples are another important source of cash income. The souk at Tabant is the principal market valley and one of the most important souks in the central High Atlas.

Animal and human power are used for agricultural and pastoral tasks. Water power is used for cereals grinding in small mills. There are no diesel installations and few motor vehicles in the area. Domestic uses of energy include those typical for the Atlas. Wood and charcoal are used mainly for cooking and heating. Butagas is used for lighting and cooking, and candles and kerosene are used for lighting. There is no electricity now being generated in the valley and there are no reports of any past attempts to generate electricity.

Two 50 kilowatt electric generation units will be installed at an estimated total cost of $ 222,000 ($ 67,000 for equipment and $ 155,000 for civil works.)

Water : The rivers in the vicinity of the site are spring fed. The proposed water source for power generation is a spring which discharges into a small tributary above the village of Ait Imi. There is sufficient water for power generation the year round.

Socio economic Factors : The project to electrify Tabant-Ait Imi is considered sociologically acceptable. No negative impacts are foreseen as a consequence of the project. There is no indication that an inequitable financial burden will be placed upon the users of the project.

The local economy is sufficient to absorb the costs of electrification and even support modest investments in electrical applications which should expand the economic base.

CTmain found that Tabant Ait Imi offered a combination of socio-economic and ecological conditions which make it an attractive site for the small-hydro electrification project. The valley as a whole has a solid economic base which includes cash income. There is high interest and strong support for the project among a broad cross-section of area residents, government officials and local leaders. There is considerable movement in and out of the valley making it accessible and open to innovative outside influences which could lead to commercial as well as domestic applications of electricity. Agricultural extension agents make regular visits to the valley and merchants from urban areas regularly come to purchase potatoes. The road to Azilal provides fairly reliable access for 10 months of the year. There should thus be few obstacles to carrying out studies to monitor the effects of electrification and to necessary repairs and maintenance operations for the physical plant and transmission lines. Tabant will serve an important role as a demonstration project having potential replicability within the valley and in broadly similar settings in other remote areas. Tabant is typical of at least 6 other possible sites for small hydro installations in the Ait Bou Guemez valley and many more sharing a similar economic and cultural base and depending on spring water sources through the High Atlas and Middle Atlas Mountains. Tabant's resource base offers a range of ecnonomic possibilities that might be realized through the use of electricity. Development possibilities are foreseen especially for the agricultural sector and a modest tourist industry.

Possibilities for agricultural applications include potato storage, cereal grain processing and irrigation water pumping. Small scale commercial applications are expected to occur based on existing resources and needs. Refrigeration for meat is an immediate application. A repair shop with an arc welder and power tools for woodworking operations, including furniture making are further applications. A small tourist industry might be developed to take advantage of the lush valley setting in summer and skiing in winter.

The provincial government intends to carry out an integrated development program including road construction, agricultural and forestry activities and tourism development all of which will benefit from the introduction of electricity. The program is now being reviewed for inclusion in the 1981-85 Five Year Plan.

Present GOM plans call for the generating and transmission facilities, once installed, to be under the supervision of the Ministry of Interior through local authorities. A trained technician from ONE will be permanently resident at the site and responsibilities will also include collecting customer revenues. ONE will provide any additional special technical assistance as needed. Institutional arrangements planned for operating, maintaining and administering the facility are the responsability of the local collectivity - the caid'office. The local community will not be required to provide the

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technical expertise necessary and no difficulties are foreseen in adapting to the planned institutional structure.

A local extension office of the Ministry of Agriculture will be established at Tabant in 1981. This office will be able to provide advice in introducing new and improved production techniques and agricultural processing. Improved water and land management techniques and the expansion of irrigation through electrically operated pumps can help expand and improve agricultural production and thus contribute to the broader economic base of the valley.

Electricity will improve the health of the community through provision of refrigeration, sterilization, lighting and hot water to the health care clinic. It will also provide a small amount of power for commercial and small scale business activities ; power for a grist mill, lighting for shops and refrigeration for foods. The improvement in education through lighting, TV and radio will also be felt. Lastly a higher standard of personal confort and more recreation activities will be promoted. The broad range of potential benefits and the positive local view toward electricity indicates that there is strong community interest in the project and a willingness to participate.

When weighed against anticipated benefits of project development, the reasonably foreseeable environment impacts are not considered cause of significant environmental harm.

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Part 2 : Msemrir

Description : At an altitude of 2000 m., Msemrir is on the southern slope of the central High Atlas Mountains in Ouarzazate Province. It consists of villages totalling 200 households with 1.200 inhabitants. Msemrir is a commune center, includes a primary school, a dispensary, a commune court, an office of the Forest Service and a souk. Electricity is now being generated by a diesel engine from 6 pm to 11 pm to light the administrative center, streets and 50 private houses. The diesel generator is not reliable and has an history of breakdowns every 2 to 3 months.

The local economy reflects the long standing prominence of traditional pastoralism and the growing importance of agriculture and contributions from migrants. Intensive irrigated agriculture is practised. The amount of land now under irrigation is estimated as 200 hectares for Msemrir center and 150 hectares for the commune. Local officials estimate that there are an additional 50 hectares in Msemrir center and 200-400 ha in the commune overall which could be brought under irrigation with pumping. Agricultural production consists of wheat, barley, walnuts, potatoes and apples.

Present energy sources include electricity as well as the traditional human and animal power. When available, electricity is used for home, administrative and domestic lighting and for television and radios. Domestic uses of energy are typical. Wood and charcoal are used primarily for cooking and heating, butagas for lighting and cooking, and candles and kerosene for lighting. There are 5 diesel powered grist mills in the commune ; two of these are in the center of Msemrir, and all are privately owned. At least one householder in the commune has installed his own small gasoline engine to pump well water for domestic, animal and irrigation purposes.

Water :Water availability could present a problem if the river were the only source. During the summer dry season river flow is reduced substantially. CTMain suggested that possibly improved water management techniques in conjunction with pumping could make more efficient use of what river water is available and that several springs in the general area might also be used for irrigation water pumping. The smaller hydro installation recommended by Grower, however, places less demand on available water than does the installation recommended by CTM, and a USAID engineering review concluded that with proper design power can be provided reliably throughout the year without conflicting with other water uses.

The land to be used for the unit and the canals is collective land under State control, and questions of expropriation or compensation do not therefore arise. There is an abondance of water in relation to crop demands. The project will not in any way interfere with irrigation.

Socioeconomic Factors : Msemrir offers a combination of socioeconomic conditions which should make it a good pilot site for the research, demonstration and replicability and economic development goals for the

small hydro program. Investments in commercial or industrial applications for electricity are expected to accompany the project. Msemrir has an economic base which includes cash income and a portion of this is expected to be available for investment.

There is a high interest and strong support for the project amon area residents, government officials and local leaders. Msemrir is now served by a small diesel generator which, when working, meets only a fraction of the potential load. The demand for additional power is clear. The 1981-85 development plans for the area proposed by the provincial government include several commercial and industrial projects which would add to the load. Symbols of locally available capital to make commercial investments are visible in new house construction and reflect the remittances of migrants. There are also reports that migrants have significant amounts of capital to invest in new business once elctricity becomes more available.

The fairly good condition of the road allows for relatively easy year round access.

The resource base at Msemrir offers good options for development, especially when considered in conjunction with government proposals included in the 1981-85 Five Year Plan. Opportunities are foreseen for agricultural and pastoral applications of electricity and in a range of small scale commercial and service industries, including tourism.

Present marketing channels include the local souk and souks at nearby major towns along the main highway.

The settlement pattern at Msemrir makes electrification very practicable. All 5 douars are compact settlements and within a 1 to 1,5 km radius of each other and the site for the proposed power plant.

Electricity will improve the health of the community through provision of refrigeration, sterilization, lighting and hot water to the health care clinic. It will also provide s small amount of power for commercial and small scale business activities ; power for a grist mill, lighting for shops and refrigeration for foods. The improvement in education through lighting, TV and radio will also be felt. Lastly a higher standard of personal comfort and more recreation activities will be promoted. The broad range of potential benefits and the positive local view toward electricity indicates that there is strong community interest in the project and a willingness to participate.

Various agencies of the GOM plan to undertake development activities in the Msemrir area, particularly in agriculture and small agriculture-related industry. Efforts will be made to coordinate these activities for optimum use of available electricity through the local and provincial authorities. The Ministry of Agriculture plans to establish an extension center in Msemrir later in 1981. Its major responsabilities will be irrigation pumping and expanding and improving agricultural production and livestock management practices. The potential impact

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of this type of technical assistance can be considerable. Irrigation pumping can have a major role in improving water management on land now irrigated and in expanding the land under intensive cultivation.

Emigrant workers - those who have left the area to work in urban areas in Morocco and Europe and repatriate their earnings - are a likely source of cash for investments, market outlets, business management skills and technological innovation. Efforts will be made to encourage their active participation in the development of the area.

Present plans call for the generating and transmission facilities to be under the supervision of the Ministry of the Interior. A ONE trained technician will be permanently resident at the site and responsabilities will probably also include collecting customer revenues. ONE will provide any additional special technical assistance as needed.

Institutional arrangements planned for operating, maintaining and administering the facility already have their basic foundation in the caid's office. The local community will not be required to provide the technical expertise needed and no difficulties are foreseen in adapting to the planned institutional structure.

The proposed project will not require relocation of any housing or other existing structures and is not expected to have any negative impact on downstream users of water. When weighed against anticipated benefits of project development, the reasonably forseeable impacts are not considered to cause any significant environmental harm.

Part 3 : Arhbalou-n-Kerdouss

Description : Arhbalou-n-Kerdouss is at an altitude of 1600 m. on the southern slope of the central High Atlas Mountains in Errachidia Province. The site is 51 km and about 2 hours by dirt road from the main highway and is accessible throughout most of the year. It consists of 3 settlements about 3/4 Km apart in a short broad upland valley. The population is about 1,000 people in 178 households.

Arhbalou is the commune center and the seat of a newly established caid's office. Public services include a primary school, a post and telegraph office, a dispensary, administrative-center, and a newly built agricultural extension center. This center will provide agricultural advisory services to local farmers and may assume some of the responsability of regulating the delivery of irrigation water. Potable water is obtained from wells and from the spring feeding the irrigation system. There is no local souk and no electricity. The local economy is based on pastoralism and agriculture, with support from remittances from emigrants.

Rain fed cereal culture is practiced as well as intensive irrigated agriculture. Principal crops are corn, barley, alfa and vegetables. Little wheat is raised. An estimated 186 hectares of commune land are now irrigated and 40 hectares more, could be irrigated. The size of irrigated holdings varies considerably by family, but an average holding of 1/2 ha per family is probably accurate. Cash income is derived from the sale of livestock and some of its by-products (raw wool, hides) and remittances from family members who have emigrated.

Patterns of energy sources and use are typical. Wood and charcoal are used for cooking and heating, butagas for cooking and lighting and candles and kerosene for lighting. There are 7 privately owned diesel grist mills for grinding barley and corn in the commune. There is no local use of hydropower.

A generation capacity of 250 kilowatts will be installed at a total cost of $ 446,000 ($ 386,000 for equipemnt and $ 60,000 for civil works).

Socioeconomic Factors : Arhbalou-n-Kerdouss offers a combination of socioeconomic conditions which should make it a good pilot site for the research, demonstration and replicability and economic development goals of the small hydro program. Investments in commercial or industrial applications for electricity are expected to accompany the project. Arhbalou-n-Kerdouss has an economic base which includes cash income and a portion of this is expected to be available for investment. Local interest and support are strong and

the project is seen as providing the only viable possibility for electrification within the near future. Potential uses for the power foreseen by local officials include the usual lighting and recreational applications (TV and radio), and the commercial applications of irrigation water pumping corn and barley grinding, lighting for local shops, and possibly fig drying and olive oil pressing plants. In addition, it is reported that a summer camp for children will be established in the valley by the government.

Access to modern technology is primarily via migration and visits to larger towns and cities by local residents. Migration is an important source of exposure to modern technology and helps chape local attitudes toward technological innovation. The newly constructed agricultural extension center will also be an important avenue of access to innovation when it begins operations.

Access to the site for project monitoring, demonstration and maintenance and operations purposes should not present any major difficulties.

The existing agricultural and resource base offers some possibilities for small applications of electricity which would help to broaden the local economic base. Other small scale application are seen for local service businesses such as welding and vehicle repair.

Marketing channels for Arhbalou-n-Kerdouss now exist with the nearby large towns and good roads provide access to provincial capitals and the large commercial centers.

Water : The spring which will provide the source of water for the hydro facility is also the source for the extensive irrigation system serving the three valley communities. Engineering plans call for placement of the powerhouse at the foot of the slope below Arhbalou-n-Kerdouss village.

There are no detailed hydrologic data for the site. However, preliminary estimates suggest that there could be occasions when the power plant might not be able to generate power 24 hours per day if water is required for Arhbalou.

Power reductions would be only occasional and are not seen as serious enough to jeopardize capital investments in electrical applications.

The present water calendar management system seems to be functioning well and is an indication of the local abilities to organize and manage effectively.

A socioeconomic study of Arhbalou-n-Kerdouss in December 1980 recommended that water use for electricity generation be carefully planned so as not to interfere with its use for irrigation, particularly in the summer; and that the local authorities review with the population the project plans to assure them that installation of the pilot unit will not conflict with irrigation.

The small hydro installation will not only not conflict with irrigation needs, but will help satisfy them. The unit as designed will provide for using a portion of the electricity generated to pump part of the water which has passed through the turbine back up to top of the irrigation network for re-use. This will allow irrigation of a larger area than has so far been possible with simple gravity irrigation.

Questions of responsability for financing, installation, management, repair and maintenance of the small hydro facilities appropriate GOM authorities : (Ministry of Interior, are now being reviewed by the/Ministry of Energy and Mines and the Office National de l'Electricité). Clear assignment of responsabilities for these matters and a firm commitment to carry them out will be conditions precedent for AID procurement of any small hydro equipment for this project.

Before construction begins at the site, the proposed pilot installation design will be reviewed with the local authorities and beneficiary population at a public meeting so that the advantages, disadvantages, water and land requirements, and the extent of local responsabilities for the installation can be fully aired. The pilot unit will not be installed without full local acceptance.

Present plans reportedly call for the generating and transmission facilities to be under the supervision of the Ministry of the Interior. an ONE trained technician will be permanently resident at the site and their responsabilities will probably also include collecting customer revenues. ONE is supposed to provide any qdditional special technical assistance as needed.

The institutional arrangements planned for operating, maintaining and administering the facility already have their basic foundation present with the caid's office. The local community will not be required to provide the technical expertise necessary and no difficulties are foreseen in adapting the planned institutional structure.

Widening the present canal from the intake will take a small amount of irrigated land, but careful planning should avoid unnecessary destruction of valuable land. Construction of the rest of the canal structures, storage tank, powerhouse and tailrace will also require a minimal amount of land taking. However, this land is not used for agricultural or residential purposes. The project is not expected to disturb any present housing.

To date, there is no evidence of critical habitat, rare or endangered species occurring within the vicinity of the Arhbalou-n-Kerdouss site. The Ministry of Water and Forests will provide comment in this area once the precise location and the extent of development are known.

When weighed against anticipated benefits of project development, the reasonably foreseeable impacts are not considered cause of significant environmental harm.

ANNEX 18

PORTABLE PHOTOVOLTAIC PUMPS

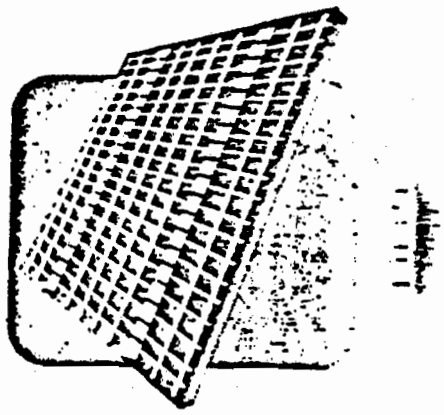
The attached description is provided by one of a number of firms manufacturing portable photovoltaic pumps. It produces a 250 watt unit which pumps 40 gallons per minute at 15 feet - enough to yield 60-80 cubic meters per day and irrigate 1-4 hectares, depending on the crop, soil and climate. The cost, now at about $6000, is projected to drop significantly during the next five years.

Generating electricity directly from sunlight

A new day is dawning in which electricity will be as abundant as sunshine. Sunlight striking photovoltaic (p.v.) cells causes current to flow and power to be generated.

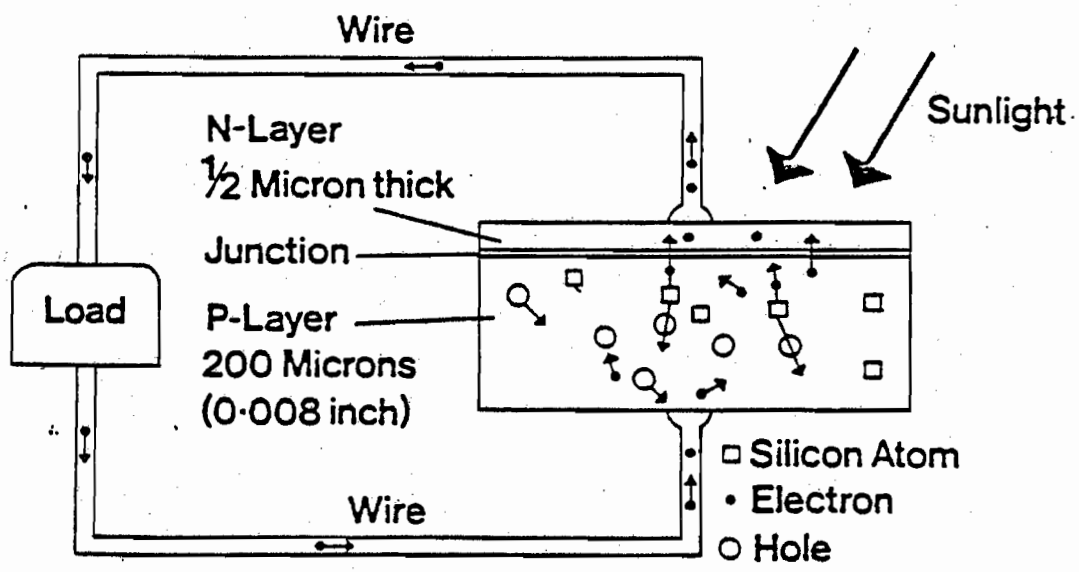
Photovoltaic systems differ from other forms of power generation in that the efficiency does not depend on system size. Because there are no "efficiencies of scale" in photovoltaics, this has become the most suitable source for small, widely distributed, power requirements.

This new approach to power generation has, in the past, been expensive. Through careful market analysis and imaginative engineering Solar Electric International has identified and developed applications that are economic now.



How does a solar cell work?

The basic concept is simple. A solar cell is made of two very thin layers of semiconductor material normally silicon. These are mixed with other materials to give one layer a negative electrical bias (n-bias, an excess of electrons), and the other layer a positive bias (p-bias, a deficiency of electrons). Terminals of an external circuit are attached to the front and back of the cell. Sunlight reaches the junction between the two layers in the form of photons of energy and knocks electrons across the junction. This leads to a current which can be drawn through the external circuit to return to the other side of the junction. If a load, such as a d.c. electrical motor, or a light bulb is placed in the circuit, it will be operated by the current. Thus sunlight is directly converted into electricity. This should not be confused with a thermal process, and no heat transfer is involved.



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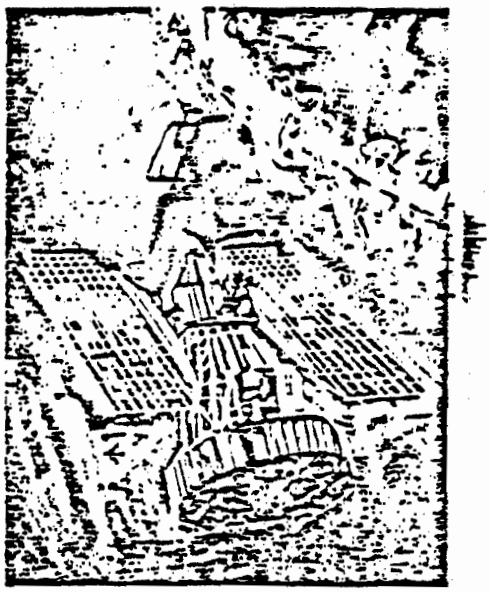
Photovoltaic power applications

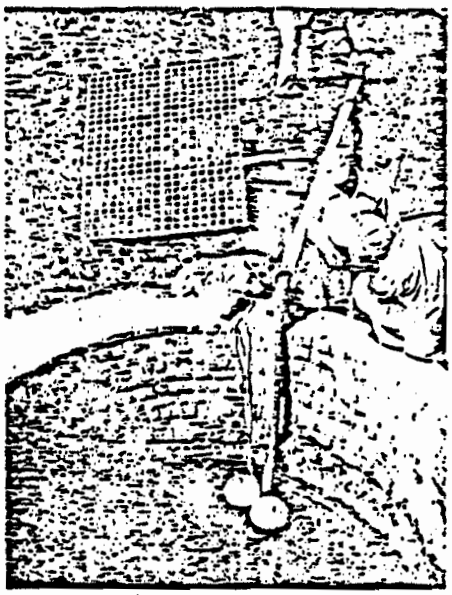
Past



Solar electric power systems were developed in the early 1960's to provide on-board electrical power for satellites and spacecraft. In outer space, they have functioned superbly, far from any possibility of maintenance, year after year.

In the early 1970's photovoltaics started to "come down to earth". As lower cost manufacturing techniques were developed, a small number of applications were recognized as being the first of man's earthly needs which could be economically served by solar energy. These applications, typified by microwave repeater stations and offshore navigational buoys, were all at remote locations requiring strictly limited quantities of energy.

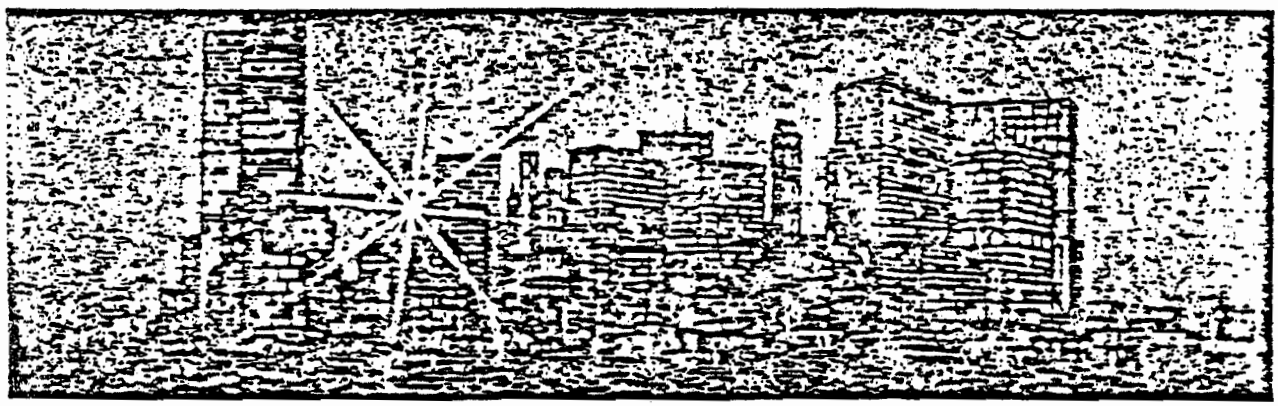
Present



As fossil fuel costs continue to rise and photovoltaic costs to fall, solar electric power is rapidly becoming economic for a far wider range of applications. Amongst the most promising of these are water pumping systems, remote lighting and power packs for the needs of non-electrified villages. Solar Electric International has available, or under development, a considerable number of devices ranging from micro-irrigation systems and battery chargers, through refrigerators and educational TV sets, to handheld agricultural implements such as crop sprayers and weeders.

Future

In the future, as the costs continue to decrease, the use of photovoltaics will become justified for large-scale electrical generation. However, for the 1980's, the guiding principle of solar electricity will continue to be "Small is Sensible"!



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Solar Electric International

- ★ World leader in photovoltaic powered water pumping technology
- ★ Unmatched capacity in photovoltaic system design and engineering
- ★ Wide experience in international development and installations

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IN TECHNOLOGY SIMPLICITY IS

Solar Electric International

SEI-250 Portable Sun Pump

CONCEPT

Over 50 million of the world's poorest farm families exist on less than 50 million hectares (125 million acres) in the fertile alluvial valleys, deltas and coastal plains of the Third World. Most of these areas experience extended dry seasons during which cropping is impossible without irrigation; but adequate irrigation is frequently either unavailable or beyond the financial means of a small farmer.

The SEI-250 Sun Pump is a solar-powered water pumping system which can dramatically alter the irrigation options open to these farmers. The unit has been specifically designed to supply irrigation water to farms of 1 to 4 ha., depending on lift and cropping pattern, where conventional methods are inappropriate or becoming prohibitively expensive.

DESCRIPTION

The lightweight, portable Sun Pump is a self-contained system comprising a 250-watt photovoltaic array, a pumpset, a Maximum Power Controller (MPC) and a mounting frame. The entire unit can be easily moved from house to field or from one water source to another; its simple operation and low maintenance make it particularly well suited for use in rural areas and in other places not served by an electric grid. The MPC is an electronic device which matches the pumpset load to the power available from the solar array under varying conditions of insolation (sunshine). This raises the efficiency and maximizes the yield of the system, ensures good start-up capability and, within a broad range, varies the speed of the pump to maximize output when either insolation or lift conditions diverge from the base values for which the equipment was designed.

The Sun Pump available today is optimized to yield 2.5 liters/second at a lift of 4.5 meters (40 gpm at 15 ft.) Solar Electric International pumps with larger yields and lower/higher lifts are being developed and will be available in the near future.

OPERATION AND MAINTENANCE

The SEI-250 Sun Pump is quiet, safe and simple to operate. The user merely places it in the proper south-facing direction in the morning, lowers the pumpset and switches the unit on. If he does not intend to move the Sun Pump daily he leaves the switch on; the unit will automatically turn on and off as the sun rises and sets.

Routine maintenance involves occasional water rinsing to remove any accumulated dust or dirt. The array should have a trouble-free lifetime of 15 years, while the pumpset should last 7 - 8 years.

FEATURES AND SPECIFICATIONS

ARRAY

Rugged, high-reliability, easily maintained
Outer surface protected by tempered glass which provides high transmittance
Peak power: 250 Watts*
Open circuit voltage: 125 Volts*
Short circuit current: 2.5 Amps*

FRAME

Sturdy frame supports the array, allows proper orientation to the sun and facilitates transportation of unit.

PUMPSET

Submersible, high efficiency variable voltage/variable speed
Nominal operation 3000 RPM at 60 Volts DC
Brushless, permanent magnet design eliminates need to unseal motor for periodic maintenance
Vertical axis, single-stage centrifugal pump close-coupled to motor
High impact plastic impeller and casing
Integral flotation device
Optimized for high-flow, low-head canal and open well conditions

MAXIMUM POWER CONTROLLER

Safe operation to 325 Watts
Output limits: 5 Amps, 75 Volts
Electronically matches pumpset load to available array power under all conditions, using pulsewidth modulated downconverter with integrated circuit logic.

PERFORMANCE

Head / Discharge*	Meters			Feet		
	2	4	6	6	12	18
Liters/sec.	3.5	2.75	1.5			
M^3/hr.	12.6	9.9	5.4			
US Gal./min.				60	48	26
Ac-in/hr.				.14	.11	.06

* Under typical field conditions (95 Mw/cm² insolation; 30°C ambient temperature).

SOLAR ELECTRIC INTERNATIONAL

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SOLAR ELECTRIC INTERNATIONAL

SCHEDULE OF CURRENT AND INDICATIVE FUTURE PRICES* FOR SEI SUN PUMPS

SEI-250	Year					
	1980/81	1981/82	1982/83	1983/84	1984/85	1985/86
No. of Units	(U.S. Dollars)					
1-10	$5,250	$3,950	$2,650	$2,150	$1,650	$1,250
11-20	4,750	3,600	2,650	2,150	1,650	1,250
21-50	4,250	3,250	2,650	2,150	1,650	1,250
51-100	3,750	3,000	2,500	2,150	1,650	1,250
101-200	3,450	2,750	2,300	1,900	1,650	1,250
201-500		2,650	2,200	1,825	1,450	1,125
501-1000			2,150	1,750	1,300	1,025
1001-2000				1,650	1,275	950
2001-5000					1,250	925
5001-10,000						900

SEI-500						
1-10	$7,000	$5,500	$4,000	$3,000	$2,350	$1,850
11-20	6,500	5,100	4,000	3,000	2,350	1,850
21-50	6,000	4,750	4,000	3,000	2,350	1,850
51-100	5,500	4,500	3,750	3,000	2,350	1,850
101-200	5,200	4,250	3,550	2,775	2,350	1,850
201-500		4,150	3,450	2,700	2,150	1,725
501-1000			3,400	2,625	2,000	1,625
1001-2000				2,550	1,900	1,550
2001-5000					1,850	1,500
5001-10,000						1,475

*1980 $ ex-factory

April, 1980

ANNEX 19

MOROCCO: ECONOMICAL AND SOCIAL DATA

U.S. OVERSEAS LOANS AND GRANTS – OBLIGATIONS AND LOAN AUTHORIZATIONS
(U.S. Fiscal Years – Millions of Dollars)

COUNTRY MOROCCO

PROGRAM	FOREIGN ASSISTANCE ACT PERIOD					TOTAL LOANS AND GRANTS 1946-70	REPAYMENTS AND INTEREST 1946-70	TOTAL LESS REPAYMENTS AND INTEREST 1946-70
	1970	TQ	1971	1972	1973			
I. ECONOMIC ASSISTANCE – TOTAL	45.1	4.0	26.8	36.2	27.2	980.2	290.2	690.0
Loans	24.8	-	8.4	8.8	9.7	515.2	290.2	225.0
Grants	20.3	4.0	18.6	27.4	17.5	465.0	-	465.0
a. A.I.D. and Predecessor Agencies	14.3	0.5	2.1	10.0	4.1	391.9	213.4	178.5
Loans	13.0	-	-	-	-	341.5	213.4	128.1
Grants	1.3	0.5	2.1	10.0	4.1	50.4	-	50.4
(Economic Support Fund)	-	-	-	-	-	71.1		
b. Food for Peace (PL 480)	29.0	2.8	23.1	24.5	20.9	566.9	76.8	490.1
Loans	11.8	-	8.4	8.8	9.7	173.7	76.8	96.9
Grants	17.2	2.8	15.1	15.7	11.2	393.2	-	393.2
Title I - Total Sales Agreements	11.8	-	8.4	8.8	9.7	173.7	76.8	96.9
Repayable in U.S. Dollars - Loans	11.8	-	8.4	8.8	9.7	122.5	42.7	79.8
Payable in Foreign Currency - Planned for Country Use	-	-	-	-	-	51.2	34.1	17.1
Title II - Total Grants	17.2	2.8	15.1	15.7	11.2	393.2	-	393.2
Emerg. Relief, Econ. Develop. & World Food Program	0.7	-	-	-	-	185.5	-	185.5
Voluntary Relief Agencies	16.5	2.8	15.1	15.7	11.2	207.7	-	207.7
c. Other Economic Assistance	1.8	0.7	1.6	1.7	2.2	21.4	-	21.4
Loans	-	-	-	-	-	-	-	-
Grants	1.8	0.7	1.6	1.7	2.2	21.4	-	21.4
Peace Corps	1.8	0.7	1.6	1.7	2.2	21.4	-	21.4
Other	-	-	-	-	-	-	-	-
II. MILITARY ASSISTANCE – TOTAL	30.9	0.2	30.0	44.2	46.1	290.3	94.9	195.4
Credits or Loans	30.0	-	30.0	43.0	45.0	234.4	94.9	139.5
Grants	0.9	0.2	0.6	1.2	1.1	55.9	-	55.9
a. MAP Grants	-	0.2	-	-	-	29.6	-	29.6
b. Credit Financing - FMS	30.0	-	30.0	43.0	45.0	234.4	94.9	139.5
c. Military Assistance Service-Funded (MASF) Grants	0.9	-	0.6	1.2	1.1	14.4	-	14.4
d. Transfers from Excess Stocks	-	-	-	-	-	11.9	-	11.9
e. Other Grants	-	-	-	-	-	-	-	-
III. TOTAL ECONOMIC AND MILITARY ASSISTANCE	76.0	4.2	57.6	80.4	73.3	1270.5	385.1	885.4
Loans	54.8	-	38.8	51.8	54.7	749.6	385.1	364.5
Grants	21.2	4.2	19.0	28.6	18.6	520.9	-	520.9
Other U.S. Government Loans and Grants								
a. Export-Import Bank Loans	5.5	0.4	24.1	-	7.8	178.2	155.6	22.6
b. All Other Loans	31.4	-	11.1	-	7.8	88.8	55.6	33.2
	23.1	0.4	13.0	-	-	69.4	100.0	10.6-

* LESS THAN $500,000

TQ – TRANSITIONAL QUARTER (7/1/76 – 9/30/76)

ECONOMIC PROGRAMS OF ALL DONORS
(Millions of Dollars)

A. ASSISTANCE FROM INTERNATIONAL AGENCIES – COMMITMENTS

	FY 1970	FY 1970	FY 1960	FY 1946-70
TOTAL	90.0	430.4	193.5	1633.9
IBRD	83.1	407.0	146.0	1421.9
IFC	1.2	19.2	16.5	44.0
IDA	0.0	0.0	0.0	50.0
IDB	0.0	0.0	0.0	0.0
ADB	0.0	0.0	0.0	0.0
AFDB	5.0	0.0	0.0	26.0
UNDP	0.7	5.9	5.0	51.9
OTHER-UN	0.0	2.3	0.0	13.3
EEC	0.0	0.0	26.0	26.0

B. BILATERAL OFFICIAL DEVELOPMENT ASSISTANCE

1. D.A.C. COUNTRIES (Gross Disbursements)

Donor	CY 1970	CY 1970	CY 1960-70
TOTAL	194.5	195.4	1494.1
U.S.	27.0	26.0	339.0
FRANCE	106.0	98.2	729.2
GERMANY	38.7	49.4	268.1
BELGIUM	14.3	15.6	77.6
CANADA	4.6	1.5	40.7
ITALY	1.8	2.1	31.7
OTHER	1.3	2.6	7.8

2. O.P.E.C. COUNTRIES (Gross Disbursements)

	CY 1970	CY 1970	CY 1973-70
TOTAL	34.3	20.5	289.9

C. LOANS AND GRANTS EXTENDED BY COMMUNIST COUNTRIES

	CY 1970	CY 1970	CY 1964-70
TOTAL	2,089	-	2,320
USSR	2,000	-	2,100
EASTERN EUROPE	89	-	170
CHINA	-	-	55

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ECONOMIC AND SOCIAL DATA

COUNTRY: MOROCCO

BASIC DATA

TOTAL POPULATION.. (THOUSANDS,MID 1980) 19,954

PER CAPITA GNP..... (DOLLARS,1978) 670

AVERAGE ANNUAL PER CAPITA REAL GNP GROWTH RATE.. (1960-78) 2.5%

AVERAGE ANNUAL RATE OF INFLATION (1960-70) 2.2% (1970-78) 7.1%

NATIONAL INCOME RECEIVED BY LOW 20% OF POPULATION.. (1970) 4.0%

LIFE EXPECTANCY AT BIRTH, IN YEARS

(1978)	TOTAL 55.4	MALE 53.8	FEMALE 57.0	
(1968)	TOTAL 50.4	MALE 49.0	FEMALE 51.8	

ADULT LITERACY RATE

(1971)	TOTAL 21%	MALE 34%	FEMALE 10%
(1960)	TOTAL 14%	MALE 22%	FEMALE 6%

AGRICULTURE

AVERAGE ANNUAL PER CAPITA AGRICULTURAL PRODUCTION GROWTH RATE (1970-1979) -2.8%

AGRICULTURAL PRODUCTION AS % OF GDP..... (1978) 18%

POPULATION DENSITY / SQ MI OF AGRICULTURAL LAND (1980) 255

LAND OWNED: (1973) BY TOP 10% 49.0% BY LOWEST 10% 1.0%

MAJOR CROP(S)

				ARABLE LAND	YEAR
SUBSISTENCE:	WHEAT	BARLEY		57%	(1979)
CASH:	WHEAT	ORANGES	SUGAR BEETS	29%	(1979)

MAJOR AGRICULTURAL EXPORTS:(1979) ORANGES TOMATOES

MAJOR AGRICULTURAL IMPORTS:(1979) WHEAT VEG. OIL SUGAR

PROPORTION OF LABOR FORCE IN AGRICULTURE..... (1978) 53%

CENTRAL GOVERNMENT FINANCES

TOTAL DOMESTIC REVENUES ($ MILLIONS, U.S.)
(1976) 1,997 (77) 2,588 (78) 2,806

TOTAL EXPENDITURES ($ MILLIONS, U.S.)
(1976) 3,867 (77) 4,692 (78) 4,092

DEFICIT(-) OR SURPLUS ($ MILLIONS, U.S.)
(1976) -1,870 (77) -2,104 (78) -1,286

DEFENSE EXPENDITURES,
AS % OF TOTAL EXPENDITURES.. (1976) 8.5% (77) 9.9% (78) 11.5%
AS % OF GNP..... (1976) 3.2% (77) 4.0% (78) 3.7%

OFFICIAL INTERNATIONAL RESERVES, GROSS HOLDINGS END OF PERIOD,
($MILLIONS, U.S.) (1977) 531 (78) 649 (79) 590
EQUIVALENT TO 2.0 MONTHS OF IMPORTS (1979)

FOREIGN TRADE

MAJOR EXPORTS... (1978) PHOSPHATES

EXPORTS TO U.S.
($ MILLIONS, US, FOB) (1977) 25 (1978) 43 (1979) 43
AS % OF TOTAL EXPORTS (1977) 2% (1978) 3% (1979) 2%

MAJOR IMPORTS... (1978) MACHINERY FOODSTUFFS OIL PRODUCTS

IMPORTS FROM U.S.
($ MILLIONS, US, CIF) (1977) 202 (1978) 249 (1979) 242
AS % OF TOTAL IMPORTS (1977) 6% (1978) 8% (1979) 7%

TRADE BALANCE($ MILLIONS, U.S.)(1977) -1,697(78) -1,462(79) -1,809

MAIN TRADING PARTNERS: FRANCE SPAIN ITALY

EXTERNAL PUBLIC DEBT AS % OF GNP (1978) 40.1%

SERVICE PAYMENTS ON EXTERNAL PUBLIC DEBT,
($ MILLIONS, U.S.)..... (1978) 548
AS % OF EXPORT EARNINGS (DEBT SERVICE RATIO).... (1978) 18.7%

SOCIAL DATA

POPULATION GROWTH RATE.....(1969-79) 2.9%

POPULATION IN URBAN AREAS..... (1969) 32% (1974) 38%

TOTAL BIRTHS PER 1,000 POPULATION..... (1979) 45

MARRIED WOMEN AGED 15-44 YRS. USING CONTRACEPTION... (1974) 7%

POPULATION (1978) IN AGE GROUP:
(0-14YRS) 46.5% (15-64YRS) 50.1% (65+ YRS) 3.4%

INFANT DEATHS DURING FIRST YEAR OF LIFE / 1000 INFANTS (1972) 133

PEOPLE PER PHYSICIAN..... (1976) 11,101

MAJOR CAUSES OF
DISEASE (1975)MEASLES EYE DISEASES
DEATH.. (1971)MEASLES RESPIRATORY GASTROINTESTINAL

PER CAPITA CALORIE SUPPLY AS A % OF REQUIREMENTS.... (1977) 105%

POPULATION WITH REASONABLE ACCESS TO SAFE WATER SUPPLY(1975) 55%

TOTAL SCHOOL ENROLLMENT AS % OF POPULATION IN AGE GROUP:

PRIMARY.....	(1977) TOTAL 66.0%	MALE 86.0%	FEMALE 50.0%	
SECONDARY.....	(1976) TOTAL 17.0%	MALE 21.0%	FEMALE 12.0%	
POST SECONDARY ..	(1977) TOTAL 4.2%	MALE 6.4%	FEMALE 1.8%	

ENERGY PRODUCTION AS % OF CONSUMPTION..... (1978) 19%

AGENCY FOR INTERNATIONAL DEVELOPMENT

ADVICE OF PROGRAM CHANGE

Country : Morocco

Project Title : Renewable Energy Development

Project Number : 608-0159

Data Base Reference : Near East Programs, p. 41

Appropriation Category : Agriculture, Rural Development and Nutrition

Life-of-Project Funding : $6,700,000

Intended FY 1981 Obligation : $1,500,000

This is to advise that AID plans to obligate $1,500,000 in FY 1981, Agriculture, Rural Development and Nutrition (ARDN) grant funds for this project as shown in the Data Base, rather than $1,300,000 in Selected Development Activities (SDA) funds as shown in the FY 1981 Congressional Presentation. In addition, the planned life-of-project cost is now $ 6,700,000, $1,700,000 higher than the $5,000,000 shown in the FY 81 CP and Data Base.

As a result of an Agency decision made after the preparation of the FY 81 CP increasingly to fund energy activities from ARDN funds when the activities were aimed at rural areas, hereinafter all funding for this project will be from Section 103. The planned funding increases for FY 1981 and for the life-of-project are based on feasibility studies and final project design cost estimates which were not completed when the Data Base was prepared.

Attachment: Revised Activity Data Sheet

The attached notifications were sent to the Hill on July 7, 1981. Obligation may be incurred on July 22, 1981.

PROGRAM: MOROCCO

ACTIVITY DATA SHEET

TITLE	FUNDING SOURCE (1) Agriculture, Rural Dev. & Nutrition (2) Selected Development Activities	PROPOSED OBLIGATION (In Thousands of dollars) FY 81 1,500	LIFE OF PROJECT (Auth.) 6,700
NUMBER 608-0159 GRANT [X] LOAN [ ] NEW [ ] CONTINUING [X]	PRIOR REFERENCE Advice of Program Change dated 1/29/80	INITIAL OBLIGATION FY 80 / ESTIMATED FINAL OBLIGATION FY 84	ESTIMATED COMPLETION DATE OF PROJECT FY 86

Purpose: To create and institutionalize an applied research and demonstration capability in renewable energy development which will contribute to national energy policy and planning.

Background: Morocco is one of a number of countries whose economic development is threatened by increasing energy costs. A.I.D. energy teams visited Morocco in 1978 and 1979 to analyze the Moroccan energy situation and examine opportunities for renewable energy activities. The teams recommended that a Center for Renewable Energy Development be established under the aegis of the Ministry of Energy and Mines (MEM).

Project Description: The project began early in 1980 with further survey and design work. Now that feasibility studies have been completed, technical assistance will be provided to (1) develop the Center. (2) train Moroccan staff in Morocco, the United States and third countries; and (3) design and carry out a renewable energy research and development program under Center sponsorship. A.I.D. will also finance the procurement of U.S. source technical and scientific equipment for the Center and for the pilot projects and demonstration projects.

Relation of Project to A.I.D. Country Strategy: One of the major elements of A.I.D.'s strategy in Morocco is to assist the Government of Morocco to integrate renewable energy development into national energy planning, and make renewable sources available to groups lacking access to conventional energy.

Beneficiaries: The immediate beneficiaries of the project will be Center staff receiving training, and the target groups of the pilot projects selected. Over time this project will help reduce dependence on high-cost fossil fuels, permit the continued expansion of energy supply essential to economic growth and help improve the quality of rural life by increasing agricultural productivity and agro-employment opportunities, and reducing environmental destruction.

Host Country and Other Donors: The Government of Morocco is providing staff and land and will construct facilities for the Center for Renewable Energy Development in Marrakech as well as for the pilot and demonstration projects. Estimated Government of Morocco contributions will exceed $5,000,000 during the life of project. No other donors are directly associated with this project.

Major Outputs	All Years
Center for Renewable Energy Development established	1
Small remote hydroelectric generation pilot projects established	3
Solar, wind and biomass pilot projects installed and functioning	10
Moroccan staff trained for Center	40

A.I.D. - Financed Inputs	($ thousands) Life of Project
Personnel (long-term 8 p.y.)	940
(short term 100 p.m.)	1,060
Training (long-term 24 p.y.)	810
(short-term 120 p.m.)	475
Commodities (such as laboratory and hydro-power generation equipment, small photo-voltaic pumping and refrigeration units, and wind-powered-electric pumping units)	2,455
Small projects fund	320
Other costs (preparatory studies, evaluation, etc.)	640
TOTAL	6,700

U.S. FINANCING (In thousands of dollars)	Obligations	Expenditures	Unliquidated
Through September 30, 1979	--	--	-
Estimated Fiscal Year 1980	600	1	
Estimated through September 30, 1980	600	1	599
		Future Year Obligations	Estimated Total Cost
Proposed Fiscal Year 1981	1,500	4,600	6,700

PRINCIPAL CONTRACTORS OR AGENCIES

To Be Selected

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Department of State

OUTGOING TELEGRAM 20-3

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ORIGIN AID-35

ORIGIN OFFICE NETC-04
INFO NEPD-04 AANE-01 NEDP-02 CH6-01 NENA-03 PPCE-01 PDPR-01
PPPB-03 GC-01 PPEA-01 GCFL-01 GCNE-01 STA-10 IDCA-01
PPIA-01 FM-02 AADS-01 C-01 CMGT-02 CNE-02 CPP-01 CPS-02
CSE-02 CTR-02 DSEY-01 CH8-01 DOE-01 OPIC-10 /064 A4 823

INFO OCT-00 /035 R

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TAGS:

SUBJECT: PP FOR MOROCCO RENEWABLE ENERGY DEVELOPMENT II (608-0159)

1. THE NEAC REVIEWED AND APPROVED SUBJECT PP ON JUNE 4, 1981. THE COMMITTEE WAS PLEASED WITH THE OVERALL CLARITY OF THE PP AND COMMENDS THE MISSION ON AN EXCELLENT PROJECT PAPER.

2. THE NEAC OVERALL PERCEPTION IS THAT THE PROJECT REQUIRES A LARGE NUMBER OF SEPARATE AND LABOR INTENSIVE MISSION ACTIONS WHICH WILL UNDOUBTEDLY INCREASE MISSION'S AND AID/W WORKLOAD. THE COMMITTEE RECOMMENDS THAT THE PROJECT DESIGN BE REVIEWED WITH THE GOAL OF DECREASING THE NUMBER OF DIRECT MISSION INTERVENTIONS. SOME OF THE SUGGESTIONS AND RECOMMENDATIONS WHICH FOLLOW ARE ATTEMPTS TO ACHIEVE THIS GOAL.

3. IN THE PILOT PROJECT FUND, SUB-ALLOCATION OF FUNDS SHOULD HAVE MISSION DIRECTOR'S APPROVAL. THESE PROJECTS SHOULD, HOWEVER, BE PACKAGED BY APPLICATIONS OR TECHNOLOGIES IN ORDER TO ASSURE THAT THEY ARE REASONABLY INTEGRATED AND COORDINATED, AND TO REDUCE THE NUMBER OF MISSION REVIEWS TO A MINIMUM.

4. IN THE SMALL PROJECT FUND THE MISSION SHOULD NOT BECOME INVOLVED IN INDIVIDUAL FUNDING DECISIONS. SELECTION OF PROJECTS SHOULD BE GOM RESPONSIBILITY WITH ACTIVE ROLE FOR US CONTRACTOR RATHER THAN THE PASSIVE ROLE ENVISIONED BY THE SUGGESTION THAT THE US CONTRACTOR BE GIVEN VETO POWER OVER PROPOSALS. ROLE PLAYED BY US CONTRACTOR WOULD DIMINISH AS CDER CAPABILITY GROWS. THE GOM IN CONSULTATION WITH THE CONTRACTOR SHOULD BE REQUIRED TO PROVIDE THE MISSION WITH A QUARTERLY REPORT ON PROJECT

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FUNDING AND PROGRESS ON THE ACTIVITIES UNDER THE SMALL PROJECT FUND. CRITERIA FOR USE OF FUNDS SHOULD BE MUTUALLY AGREED UPON AND MISSION SUPERVISION EXERCISED BY REGULAR, NOT LESS THAN QUARTERLY, POST APPROVAL REVIEW OF FUNDING DECISIONS WITH RIGHTS TO DISASSOCIATE US FUNDS FROM ANY ACTIVITY NOT CONSISTENT WITH AGREED CRITERIA.

5. SELECTION CRITERIA GUIDELINES NEED TO BE DEVELOPED FOR BOTH PROJECT FUNDS, BUT PARTICULARLY FOR THE SMALL PROJECT FUND AS ITS USES ARE RELATIVELY LESS DEFINED IN PP. THE US CONTRACTOR WITH ASSISTANCE FROM CDER STAFF SHOULD DEVELOP THE CRITERIA ALONG WITH THE ADMINISTRATIVE PROCEDURES FOR MANAGING THE FUNDS. GENERAL GUIDELINES FOR DEVELOPMENT OF THESE CRITERIA SHOULD BE PROVIDED IN AN ANNEX OF THE PP. THESE GUIDELINES SHOULD BE BASED ON THE NORMAL AID PROJECT CRITERIA INVOLVING ECONOMIC, SOCIAL, ADMINISTRATIVE, TECHNICAL, AND BUDGETARY FEASIBILITY AS WELL AS ADEQUACY OF A DATA COLLECTION SYSTEM TO INSURE ANTICIPATED RESULTS. A CP SHOULD BE ADDED REQUIRING MISSION'S CONCURRENCE IN THE CONTRACTOR/CDER DEVELOPMENT CRITERIA AND PROCEDURES.

6. IN ACCORDANCE WITH GENERAL GUIDELINES, PARA 2 ABOVE, THE US CONTRACTOR SHOULD BE RESPONSIBLE FOR ALL PROJECT COMMODITY PROCUREMENT EXCEPT IN THOSE CRITICAL CASES WHERE EQUIPMENT DELAYS WILL SIGNIFICANTLY EFFECT THE IMPLEMENTATION AND OVERALL SUCCESS OF THE SUB-PROJECT. THE COMMITTEE IS IN AGREEMENT WITH THE MISSION ON THEIR PROCUREMENT OF THE SMALL HYDRO EQUIPMENT AND OTHER CENTER EQUIPMENT AND MATERIALS REQUIRED WITHIN THE FIRST SIX MONTHS OF THE CONTRACTOR'S ARRIVAL. DECISIONS ON OTHER EARLY PROCUREMENT SHOULD BE MADE ON A CASE BY CASE BASIS IN LIGHT OF THE URGENCY OF NEED AND MISSION PROCUREMENT OFFICE WORKLOAD.

7. ANOTHER NEAC CONCERN WAS THE FLEXIBILITY OF THE CONTRACT AND ALLOCATION OF GRANT FUNDS BETWEEN THE VARIOUS PROJECT COMPONENTS. THE NEAC SUGGESTS MISSION KEEP AS MUCH FLEXIBILITY AS POSSIBLE DURING IMPLEMENTATION. THEREFORE, THE NEAC RECOMMENDS THAT THE INITIAL TA CONTRACT BE LIMITED TO TWO YEARS AND THAT FUTURE TA NEEDS BE ASSESSED AS CONDITIONS EVOLVE. THE PROJECT DESIGN SHOULD ALSO ALLOW FOR FUNDING SHIFTS BETWEEN PROJECT COMPONENTS IF AND AS NECESSARY.

8. ADDITIONAL ITEMS THAT REQUIRE ELABORATION AND DEVELOPMENT FOR THE FINAL DRAFT OF THE PP ARE:

A. THE COMMODITY PROCUREMENT SCHEDULE ANNEX NEEDS TO BE EXPANDED WITH DETAILS ON EACH COMPONENT OF THE PROJECT GIVEN NEAC RECOMMENDATIONS, PARA 6.

B. THE STATUTORY CHECKLIST, ANNEX 12, NEEDS TO BE UPDATED SINCE AT PRESENT IT IS AN ADDITION TO THE PHASE 1 PP AND THE CHECKLIST HAS CHANGED SINCE THE PHASE 1 CHECKLIST WAS DEVELOPED.

C. THE EVALUATION PLAN (PAGES 71-72) NEEDS TO BE EXPANDED AND DEVELOPED FURTHER. THERE IS SOME CONFUSION IN THE PLAN BETWEEN MEASURING PURPOSE LEVEL ACHIEVEMENT (I.E. ESTABLISHMENT OF AN EFFICIENT AND RELEVANT CENTER) AND MEASURING MOROCCAN ENERGY NEEDS AND DEVELOPMENT. IT IS ALSO NOT CLEAR IF THE CENTER EVALUATION WILL INCLUDE AN EVALUATION OF PILOT PROJECT ACTIVITIES. CONCLUSION OF NEAC WAS THAT EVALUATION SHOULD FOCUS ON INSTITUTIONAL CAPACITY ISSUES.

D. THE PP NEEDS A SUMMARY FUNDING TABLE IN THE PROJECT DESCRIPTION WHICH SHOWS THE VARIOUS SUB-PROJECTS, THEIR

FUNDING COMPONENTS, AND WHETHER AID OR GOM-FUNDED.

E. THE MISSION SHOULD DELETE THE GENERAL WAIVER FOR EUROPEAN OBSERVATION VISITS AND USE A CASE BY CASE WAIVER. THE BLANKET WAIVER MAY ENCOURAGE RENEWABLE ENERGY VISITS TO EUROPE, RATHER THAN TO U.S.

F. AN ANNEX NEEDS TO BE INCLUDED FOR THE TWO PROJECT FUNDS' CRITERIA GUIDELINES SUGGESTED, PARA 5 ABOVE.

G. AN ADDITIONAL CP SHOULD BE ADDED FOR MISSION'S CONCURRENCE ON THE SMALL PROJECT FUND AND THE PILOT PROJECT FUND SELECTION CRITERIA AND ADMINISTRATIVE PROCEDURES DEVELOPED BY THE CENTER WITH ASSISTANCE FROM US CONTRACTOR.

H. CONSIDERATION SHOULD BE GIVEN TO CREATING AN ADMINISTRATIVE MECHANISM WITHIN THE CENTER TO FOCUS ON TECHNOLOGY APPLICATIONS. THIS GROUP WOULD CONSIST OF ENERGY SPECIALIST RESPONSIBLE FOR CONSERVATION AND VARIOUS SECTOR APPLICATIONS SUCH AS RURAL AND AGRICULTURAL, INDUSTRIAL, COMMERCIAL/INSTITUTIONAL, AND DOMESTIC. ONCE SECTOR ENERGY PROBLEMS HAVE BEEN IDENTIFIED, THIS APPLICATIONS GROUP WOULD WORK WITH THE TECHNOLOGY SPECIALIST IN PROJECT DESIGN AND DEVELOPMENT. THIS SUGGESTION REFLECTS CONCERN THAT THE CDER AS PRESENTLY CONFIGURED DOES NOT HAVE A PLAN FOR A MULTI-DISCIPLINARY APPROACH TO DETERMINING APPROPRIATE TECHNOLOGIES GIVEN A SPECIFIC PROBLEM. THIS GROUP SHOULD BE CREATED WITHIN THE PROPOSED STAFFING;LEVEL OF CDER.

I. PP, P. 20, INDICATES EARLY TRAINING WILL BE SHORT-TERM TECHNICAL TRAINING FOR ENGINEERS. LONG-TERM TRAINING PLAN, P. 20-21, INDICATES THAT ALTHOUGH ACADEMIC PROGRAMS MAY INCLUDE EXPOSURE TO NON-TECHNICAL SUBJECTS, ALL PARTICIPANTS WILL BE ENROLLED FOR MS DEGREES. NEAC CONSIDERED IT ESSENTIAL THAT BOTH EARLY SHORT-TERM AND LONG-TERM ACADEMIC TRAINING PLANS AND SCHEDULE PROVIDE CENTER WITH A BALANCED MIX OF PROFESSIONAL SKILLS, NOT SIMPLE - HIGHLY TECHNICAL EXPERTISE. WHAT IS THE TRAINING PLAN FOR NON-TECHNICAL STAFF SHOWN, P. 19, FIGURE 2, AS PART OF OPERATIONS RESEARCH AND PLANNING UNIT?

J. THE NEAC ALSO SUGGESTED CP REQUIRING THE CENTER TO DEVELOP A TIME PHASED RECRUITMENT AND STAFFING PLAN WHICH WOULD ENCOURAGE THE CDER TO INCREASE ITS STAFFING ASAP AND TO PROGRESSIVELY TAKE ON MORE RESPONSIBILITY FOR THE IMPLEMENTATION OF THIS PROJECT. ONE APPROACH IS TO ENCOURAGE MORE ON THE JOB TRAINING (PROVIDED, IN PART, BY US CONTRACTOR) FOR CDER STAFF INSTEAD OF THE TREND TO EMPLOY PERSONNEL ONLY AFTER COMPLETION OF A TRAINING PROGRAM. SUGGEST THAT TRAINING OF STAFF BE CARRIED OUT AS EARLY AS FEASIBLE IN ORDER TO HAVE CDER ASSUME MAJOR RESPONSIBILITY FOR PROJECT PRIOR TO TIME PROJECTED IN PP.

9. AID/W WITH PARTICIPATION AND CONCURRENCE OF MARK WARD USAID/RABAT, IS;REVISING PP TO RESPOND TO ALL OF THE ABOVE POINTS. CN IS IN PROCESS. UPON USAID CABLE CONCURRENCE ON PP CHANGES AND EXPIRATION OF CN WAITING PERIOD, REVISED PP WILL BE PRESENTED TO AA/NE FOR AUTHORIZATION. STOESSEL

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