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U.S. INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

PROJECT PAPER

TUNISIA

ENERGY PLANNING

PROJECT # 664-0326

GRANT

1981

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

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7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 81 B. Quarter 4 C. Final FY 81

8. COSTS ($000 OR EQUIVALENT $1 = TD .500)

A. FUNDING SOURCE	FIRST FY 81 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	1300		1300	1300		1300
(Grant)	(1300)	( )	(1300)	(1300)	( )	(1300)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country		1600	1600		1600	1600
Other Donor(s)						
TOTALS	1300	1600	2900	1300	1600	2900

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ST	740	878				1300		1300	
(2)									
(3)									
(4)									
TOTALS						1300		1300	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 950

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code	RDEV	TECH
B. Amount	500	800

13. PROJECT PURPOSE (maximum 480 characters)

The purpose of this project is to make available accurate information on energy supply and demand options, to train Tunisian professionals to collect and interpret such information, to develop policy options for consideration by the Government, and to provide access to related American research.

14. SCHEDULED EVALUATIONS

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16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment.)

17. APPROVED BY

Signature: Martin V. Dagata

Title: Martin V. Dagata, Director, USAID/Tunis

Date Signed: MM 08 DD 1 YY 81

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PROJECT PAPER

ENERGY PLANNING PROJECT

664-0326

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I. SUMMARY AND BACKGROUND

A. Summary

1. The Problem

Economic development in Tunisia has brought about rapidly increasing demand for energy and it is expected that Tunisia will become a net importer of energy sometime in the mid to late 1980's. This in turn will strain Tunisia's balance of payments as an increasing share of export earnings go to pay for oil rather than for the importation of capital investment goods. As with many other developing countries already in this situation, rates of economic growth will diminish and indebtedness will rise, and as the economy becomes more and more dependent on net importation of oil at world prices, energy subsidies will create an increasing strain on the government budget, or, to the extent that subsidies are eliminated, place an inordinate burden on the poor as the price of energy for basic needs rises sharply.

Responding to this situation, the Government of Tunisia (GOT) recognizes the need for a comprehensive energy policy that addresses all aspects of the problem: Pricing of energy, the introduction of renewable energy supply technologies, energy conservation, etc. However, at present the GOT is limited in its ability to develop such policies by: data on energy end-use that is so fragmentary and unreliable that the impact of potential energy policies cannot be effectively gauged; a lack of data on the cost and performance of renewable energy technologies under Tunisian conditions, thus making it extremely difficult to assess the degree to which such technologies should be promoted; an insufficient cadre of professionals capable of quantifying and analysing alternative energy policy options for consideration by government policy makers; a lack of access to current developments in energy technology and related fields; and a lack of exposure of Tunisian professionals to new analytical and planning methods.

2. The Project

The GOT has begun to develop a cadre of professional analysts for energy planning and has begun the development of the necessary data. The GOT has asked AID for help in completing its energy planning capability and this project, which is a Tunisian effort aided by an AID funded contractor, is designed to alleviate the problems described above. It consists of the following elements:

(i) A comprehensive program of national energy planning leading to the evaluations of costs and benefits of a broad range of energy policy alternatives;

(ii) The development of comparative cost-effectiveness data on applications of renewable energy technologies, to include field testing of certain technologies with detailed assessment of their cost-effectiveness and market potential;

(iii) The collection and analysis of primary data on patterns of energy consumption in the household, commercial and institutional sectors;

(iv) The creation of an energy library as a means for continuing acquisition of current energy technology research and analytical methods from the U.S. and elsewhere; and

(v) A program of training Tunisian planning professionals, consisting of both programs for selected individuals in the United States and on-the-job training in Tunisia as a major aspect of elements (i) - (iv).

At the end of the project Tunisia will have a cadre of professionals in the Energy Task Force of the Ministry of National Economy (MNE) and elsewhere within the GOT trained and experienced in the collection and analysis of energy data and in the development of policy alternatives, who will continue the development of energy policy options on an on-going basis. An energy reference library will be stocked with appropriate English language journals and reference works to keep the energy planning staff abreast of current developments. Quantitative end-use data for the household, commercial and institutional sectors will be available and will have been integrated with data collected as part of other sector projects to allow a comprehensive picture of energy utilization in the entire economy. Several renewable energy technologies will have been tested in the field and the ground work will have been laid for development of an indigenous industry manufacturing most of the requisite renewable energy devices. The Energy Task Force will have completed a comprehensive assessment of energy policy options, using the data from the comparative analysis of renewable energy technology applications, the field demonstrations, and the end-use consumption data on the household, agriculture and transport sectors.

B. Background

The project will complement or incorporate a number of projects and programs already underway or completed, several with AID assistance.

1. The Existing GOT Energy Program

Most of the energy planning currently done in Tunisia falls into very narrow (and traditional) institutional lines. For electricity and for gas and petroleum product supply it is done by the Tunisian Gas and Electricity Company (STEG) and by the Tunisian National Petroleum Corporation (ETAP), respectively (both of which fall under the Ministry of National Economy) and as an incidental part of macro-economic and budgetary planning by the Ministry of Plan and Finance.

The first major comprehensive study of the Tunisian energy situation as a whole was undertaken by Gordian Associates (London) under contract to ETAP. This work included a national energy-economic planning model, various data studies, and a report on energy tarification. It is recognized, however, that the value of the effort remains somewhat limited due to the absence of many key items of data on current energy consumption and on renewable energy technology options.

The Prime Minister has designated the Ministry of National Economy (MNE) as responsible for the development of policy recommendations for energy, and MNE has established an Energy Task Force (ETF) under the direction of the Special Assistant for Energy to conduct during the next two years a detailed analysis of energy supply potential, consumption patterns and conservation potential as a basis for the formulation of policy options and program recommendations concerning energy pricing, regulatory and educational programs and investment in energy facilities. The ETF has at the moment three full-time professionals, plus part-time participation of the staff members of STEG and ETAP who worked on the Gordian study. The MNE intends to use this task force, augmented with additional full-time staff (as identified in later sections of this paper) to conduct and implement the proposed assistance and to act as a focal point and conduit for dissemination of information developed through the project to the potential users within the GOT and the private sector.

2. AID Involvement in Tunisian Energy Programs

AID has already begun to assist the GOT in developing the data and skills necessary for energy planning. Under the Renewable Energy Project (664-0325) USAID is assisting the GOT to develop cost-effectiveness and cultural acceptance data on a group of renewable energy technologies applicable in the setting of a remote agricultural village. The focus of this project is on the feasibility of a photovoltaic system serving as the basis for electrification of a remote village (not connected to the grid). Small remote photovoltaic systems, windmills for water pumping, small scale solar water and space heating systems and greenhouses with passive thermal storage and improved insulation will also be field tested.

Through the centrally funded Energy Policy and Planning Project (936-5703) AID is assisting the GOT in joint efforts to collect primary data and to analyze patterns of energy consumption in the industrial, transport and agricultural sectors. These studies focus on the training of Tunisian professional staff and on establishing a continuing process for periodic collection and analysis of energy consumption data. They will be integrated with the three similar sector studies included in the proposed assistance in order to assure comprehensive coverage of all consumption sectors, the use of compatible assumptions, and the avoidance of duplication of effort and statistical double counting and/or gaps. Under the centrally funded Conventional Energy Training Program (936-9907) discussions are currently underway with the GOT to send several participants to the U.S. for academic or applied training. This should be for long and medium term training with the fields of study selected by the GOT and AID to focus on development of energy planning capability. Several Tunisians have also been sent to the Alternative Energy Technology Program at the University of Florida, and to the Energy Management Training Program at the State University of New York at Stony Brook also under the Energy Policy and Planning Project. AID expects to continue to nominate candidates to these courses at the rate of two participants per year.

Under the ongoing Science and Technology Project (664-0300), a subproject has been devoted to training for staff members of ETAP. In addition to technical short and medium term training supplied, one participant is currently enrolled at an American university in a degree program in the use of modelling techniques for energy planning.

All of the above committed and proposed assistance projects provide elements of the complex of skills and data needed to carry out national energy planning. The assistance proposed here has grown out of an examination of the existing and anticipated elements, and a careful assessment of the gaps that must still be filled by the GOT in order to develop a comprehensive energy planning capability.

Through the various projects described above, the U.S. program of assistance to Tunisia will assist the GOT in developing such a capability. The GOT has responded positively and efficiently to program efforts to date, and has cooperated with AID in designing this program of proposed assistance to fill the remaining gaps so as to give the GOT a self-sustaining and effective energy planning capability and process.

3. Relationship to the AID Program Statement and Host Country Priorities

The FY 1980 Program Statement for Tunisia (published 1/79) states that the assistance program is designed to help Tunisia provide basic human needs for the poor, to achieve primary development plan goals of higher standards of living, food self-sufficiency, full employment and social stability and to build a relationship between Tunisia and the United States that will continue to benefit both countries after termination of concessional assistance. In particular the SPS points out that assistance should be managed in ways that help mature middle-income countries to build professional and institutional linkages that will survive the assistance projects that create them.

To the degree that effective energy planning is able to control or slow the increase in the cost of energy at the macro-economic level (which means reducing the level of oil imports to levels lower than would otherwise be the case) it facilitates all aspects of development insofar as the concomitant foreign exchange benefit can be applied to capital investments. At the level of the energy consumer, since energy is a basic good for which a price increase has its most severe impact on the poor, any avoided price increase disproportionately benefits the poor and thereby directly contributes to AID and GOT goals of providing basic human needs for the poor.

The project is specifically designed to transfer analytical skills to the institutions involved in the various facets of comprehensive energy planning such that a cadre of professionals

so developed can continue to provide the GOT with effective planning capability. This transfer is to occur by a number of training mechanisms, including U.S. training, on-the-job training in Tunisia and the establishment of professional and institutional relations which will allow Tunisian energy researchers and planners continued access to U.S. technology developments and research data.

In regard to host country priorities, planning for adequate energy supply at minimum cost, and for the most efficient use of energy, is at the core of the GOT development planning efforts, particularly as the current situation of net oil exports is likely to change to one of net imports within the next 5-7 years. It is one of the highest priorities of the GOT.

II. PROJECT DESCRIPTION

A. Goal, Purpose and Assumptions

1. Goal

The goal of the project is the development of a capability within the Tunisian Government for energy planning.

2. Purpose

The purpose of this project is to make available accurate information on energy supply and demand options: to train Tunisian professionals to collect and interpret such information, to develop policy options for consideration by the Government and to provide access to related American research.

3. Key Assumptions

The key assumptions linking purpose and goal are as follows:

(i) That the Energy Task Force established within the Ministry of National Economy will form the basis for an enlarged energy analysis and planning activity in Tunisia.

(ii) That complementary programs will continue, which, when combined with the present project, will provide the basis for a comprehensive and continuing energy planning activity.

(iii) That energy demand data collection and renewable energy technology field testing projects will continue as a permanent feature of the GOT energy planning program.

(iv) That energy policy options, once having been defined and evaluated through the program of analysis that is the focus of this project, will in fact be considered by the GOT and that appropriate actions will be taken.

B. Technical Interventions

1. Technical Components

The project will consist of five technical elements, as follows:

Element 1: General Planning Assistance

This project element involves assisting the Energy Task Force established within the Ministry of National Economy under the Special Assistant for Energy in the analysis of energy policy option. Options to be considered include changes in the pricing of energy products, energy conservation, the introduction of renewable energy supply options, incentives for private sector investments in certain technologies or conservation actions, Government investment programs, and so forth. As part of the process by which policy options are to be formulated, a broad range of applications of renewable energy technologies will be evaluated for cost, effectiveness and market potential in Tunisia, certain renewable energy technologies will be field tested, and information will be developed with respect to energy end-use consumption in several economic sectors. These requirements are identified as separate project elements, below. As an aspect of this element comparative cost-effectiveness data will be developed for conventional energy applications to allow comparison of all energy options for each application.

Element 2: Renewable energy technology assessment and field testing

This project element involves the ongoing assessment of renewable technologies for application in Tunisia, to include field testing of certain technologies. Already selected for testing are solar hot water heating for institutional application

(hotels, schools, hospitals, etc.) and wind electric conversion systems (WECS). As the assessment proceeds additional technologies will also be selected for field testing. The focus will be on technologies already commercially available and which have potential for manufacture in Tunisia. U.S. products are to be used in limited quantities only where local manufacture is not practicable. The solar collector panels, for example, are to be manufactured in Tunisia where prototypes have already been built. The field test projects will provide data for continuing assessment of applications of renewable energy technologies and are closely linked to project element 3 that will provide the end use energy consumption data necessary to assess the potential market and to define the parameters of possible technology application. Annex C contains a preliminary assessment of renewable energy technologies in Tunisia which justifies the two technologies already selected for field demonstration.

Element 3: Collection and Analysis of End-Use Consumption Data in the Institutional, Commercial and Household Sectors.

This project element is designed to complement data collection efforts already underway in the industrial, agricultural and transportation sectors. The actual data collection will be the responsibility of the GOT through the Tunisian National Statistics Institute (INS). INS personnel have participated in the development of the project, will have a continuing participation throughout the project, and will be expected to continue in the future, through regularly scheduled national surveys, to collect energy use data for the use of national energy planners. AID will provide technical assistance to this element through the resident energy planner, through the short-term assistance of technicians experienced in energy planning and in primary energy data collection in developing countries, and through the medium-term services of a survey specialist, to be hired under on AID funded host-country personal services contract, who will also serve a coordinating function for the three sector surveys on behalf of the GOT. It should be noted that the essence of the assistance to be provided is not the collection of data itself, but some assistance in how to collect the data and most importantly, identification of what items of data are most useful to collect. This involves specification in advance of how a particular data item can be used in the general energy planning process.

Project elements 2 and 3 are thus closely related. The ongoing analysis of renewable energy options requires not only data from field tests (to identify cost under local conditions)

but also the data from appropriate end-use sectors to identify the extent of the potential market for a particular technology application. These interrelationships are discussed more fully in Annex B.

The critical skill deficiency in Tunisia is not the ability to mount data collection efforts in the field. INS has considerable experience in surveys of all kinds, including surveys of household expenditures that are directly related to the proposed energy surveys. Rather, the needed new skills that the proposed project will provide are planning skills such as the ability to construct an analytical framework relevant to the particular country situation, the ability to identify critical data needs and to identify priorities for investigations (which may be field tests to establish local costs or particular items of end-use consumption), the ability to subsequently utilize the collected data for purposes of policy option identification and evaluation, and the ability to interrelate different issues within the framework of overall energy planning.

An assessment of the practicality of a particular renewable energy technology depends not only on the installed cost of the technology (established by engineering estimate and by field tests) and the scope of potential market (established by consumption survey), but also on the energy pricing policy in effect. Private sector cost-effectiveness of solar hot water heating, for example, is unlikely to be established in the face of continuing heavy subsidy to domestic fuel oil. Hence the promotion of such technologies, assuming economic feasibility as based on shadow prices of imported petroleum that is displaced, necessarily requires some intervention in the energy price structure (either by tax subsidy to the intended user or by elimination of the existing subsidy to all users, or both), which in turn requires knowledge of the appropriate income and price elasticities of demand. Thus the consumption surveys must be designed in such a way not only to establish how much energy for hot water is presently used in a particular sector, but also how such consumption varies with income and price. Price elasticities cannot generally be estimated with any great precision from cross-sectional surveys and it is difficult enough even from pooled time-series and cross-section data. The survey must therefore be designed in such a way to identify the likely response of particular user classes to price increases. For example, investment in solar heating at a hotel following elimination of the implied fuel oil subsidy is likely only if neither fuel switching nor conservation

measures are available. Thus the consumption survey should establish, in addition to the quantity and manner of use of hot water in a hotel, the efficiency of the boiler and access to alternative fuels.

The collection and analysis of end-use data for the commercial, institutional and household sectors therefore relates to a number of different aspects of the planning process and provides information necessary to analyse a variety of different policy interventions, including pricing, investment programs, conservation and others.

Element 4: Technical Library

Establishment of an energy library will provide energy planners and analysts with access to current developments in energy technologies, analytical methods and the world energy situation. The technical assistance portion of the project element will, in addition to choosing and procuring the documents and journals, focus on establishing institutional contacts, providing training in procurement procedures through which the library will continue to receive and acquire the latest data in the energy field, and providing training in library procedures to ensure effectiveness of the library's utilization by GOT energy planning staff.

The focus of the library will be on periodicals, with a minor portion of the acquisition funds earmarked for purchase of reference books. Several types of periodicals are to be distinguished. First are the newsletter type publications, exemplified by the Solar Energy Intelligence Report, and certain monthly newsletters focussed broadly on renewable energy or on some special topic such as biomass. Second are scientific journals, typically published monthly or quarterly, exemplified by Energy Systems and Policy or Energy. Third are technical journals, commonly published monthly, such as Solar Engineering. Fourth are irregularly published documents, such as OECD, U.N., IEA and World Bank publications (exemplified by the World Bank Staff Working Paper series or U.N. World Energy Statistics, published annually). Finally are the monthly abstracts in various fields published by the National Technical Information Service (NTIS) or the DOE Energy Abstracts published through Oak Ridge National Laboratory.

Element 5: Institutional Development Through Staff Training in Energy Analysis and Planning.

In addition to on-the-job training components of the previously enumerated project elements, this project element is directed toward developing the institutional capability of the GOT to do energy planning and energy policy formulation by in-service training of GOT personnel in the United States, and by a series of seminars offered in Tunisia concerned with certain special aspects of the project.

The training in the United States will be given to approximately six GOT personnel, drawn from the Energy Task Force of the MNE as well as from the other agencies involved in the project (STEG, INS, Ministry of Agriculture, Ministry of Transport, etc.) The training is to be offered in facilities in the United States actively engaged in energy research and planning, such as the National Laboratories of the U.S. Department of Energy and certain university centers. The participants will focus on the acquisition of analytical techniques and current U.S. approaches to energy research and management by working with American technicians and planners on actual problems. The training problems will be defined in the context of the overall project and will deal with specific topics such as evaluation of the wind potential or solar pond resource in Tunisia by working with specialists in these areas at the Solar Energy Research Institute (SERI), or refining the Gordian study supply-demand balances for Tunisia by using the new energy end-use data from the consumption surveys together with the computer models available at Brookhaven National Laboratory.

The training carried out in Tunisia will take the form of a series of seminars keyed to the activities and data output of elements of this and other AID projects and offered by experts in the employ of the contractor. These seminars may range from very practical topics offered to technicians involved in the manufacture, installation and monitoring of the field test equipment, to seminars focussed on specific analytical and/or planning skills that may be adopted by the GOT energy planning staff.

All of the U.S. training and the Tunisian seminars will be designed to upgrade existing skills and will involve GOT staff who are already involved in energy analysis and planning. The Tunisian seminars may be from a few days to two weeks in length, depending on the particular topic, and U.S. training sessions will last from one to four months. The Tunisian

seminars will be given in French, while participants chosen for U.S. training must demonstrate adequate knowledge of English.

2. Project Implementation

The project is to be implemented by the Ministry of National Economy, through the Energy Task Force under the Special Assistant (Chargé de Mission) for Energy.

a) General Energy Planning

The general energy planning and analysis function, leading to the formulation and evaluation of specific energy policy options, will be conducted by the Energy Task Force. The contractor's resident energy planner, assisted by short-term experts, will participate in this analysis. The GOT will provide the resident advisor with office space in the offices of the Energy Task Force in order to ensure day-to-day contact with pertinent GOT staff. The analytical framework to be used for this planning and analysis function is sketched out in Annex B. It should be noted that the technology field tests and end-use data collection surveys discussed separately below are closely related to the overall planning function and will be integrated therewith.

b) Renewable Energy Technology Assessment and Field Testing

The assessment of renewable energy technologies will be conducted by the ETF with the assistance of the contractor's resident energy planner. This continuing analytical evaluation of technology options will indicate certain data needs, either with respect to the cost and performance of specific technologies under Tunisian conditions, or with respect to the effectiveness and market potential of certain applications. Once a technology has been selected for field testing, the GOT will decide which agency will be responsible for implementing the actual field tests. For the WECS and solar hot water field tests the GOT has already identified STEG as the lead agency. An individual within that agency will be designated for each test as project manager, responsible for all aspects of the project. He will be advised by the contractor's renewable energy specialist, who will have had prior experience in field tests of such technologies and who will assist the Tunisian manager in such matters as procurement of U.S. equipment and arranging for

U.S. specialists to advise in certain technical matters such as instrumentation and monitoring equipment. The results of the field tests will be made available to the ETF for further analysis and assessment, leading eventually to recommendations by the ETF as to the degree to which GOT should take further actions to support the introduction of certain renewable energy applications. Annex D contains detailed descriptions of the two field tests already selected, including more detailed elaborations of inputs, schedules, resource requirements and manpower requirements.

c) Collection and Analysis of End-Use Consumption Data in the Commercial, Institutional and Household Sectors.

The responsibility for implementation of this project element rests primarily on the GOT. Initially, the necessary analysis of possible energy options and policies will be done by the ETF with the assistance of the contractor's resident energy planner. As this process identifies specific data elements necessary to develop specific policy options, responsibility for collecting the data will fall on INS, whose manager in charge of the field survey teams will be assisted by contractor provided short-term consultants who have special expertise in the design and execution of energy consumption surveys. The actual data collection as part of this project will be in two phases. First is a pilot survey, conducted early in the project (May 1982) and designed to provide some first order data points for the ongoing energy planning analysis as well as to test the survey instrument itself. Experience in similar efforts in other countries suggests a pilot sample size of approximately 300 households, stratified by income grouping and region, plus some 20-50 commercial and institutional samples, identified for this project with a view to providing input to the renewable energy field tests. The second aspect is a full survey, scheduled for January 1983 which would typically provide five to ten times the pilot survey coverage It must be recognized, however, that one of the objectives of the pilot survey is to establish the dimensions of necessary statistical coverage.

INS, aided by the National Computer Center (CNI) will provide the staff for the surveys and also for verification, keypunching and initial statistical tabulations, using INS and CNI facilities. Further analysis in terms of evaluation of energy options, determination of income elasticities, updating supply-demand balances, etc. will be the responsibility of the ETF, again

with the assistance of the contractor's resident energy planner. The objective of this project element is not so much the collection of data for its own sake, though such data is needed for analysis elsewhere in the project, as it is to teach an analytical approach to determining data needs and to assist in establishing an ongoing data collection process to serve future energy planning needs.

d) Energy Library

The principal purpose of establishing the energy library is to provide the energy planning staff of the GOT with current information. It therefore follows that the energy library should fall under the jurisdiction of the Ministry of National Economy (MNE) and be physically located in the already existing library of either STEG or ETAP. A minimum half-time English-speaking and reading librarian will be responsible for maintaining the circulation lists for periodicals, maintaining subscriptions and contacts with institutions in other countries, and providing related services to library users, including cataloging and sign-out procedures. Access to the library will be open to the staff of the MNE and its agencies (STEG, ETAP, etc.), as well as to the energy planning staff of other government agencies and to the university and research community.

The contractor will be expected to provide the short-term services of a library specialist who will assist the Tunisian librarian in the procurement of U.S. publications, in acquisition procedures, and in establishing contacts with counterpart institutions in the U.S. and elsewhere (international organizations, etc.).

e) Training

The short-term seminars in Tunisia will in most cases be offered by the short-term consultants during their visits to Tunisia, at locations to be provided by the GOT. The specific material to be offered in each instance will be agreed upon between the GOT and the resident energy planner prior to the instructor's arrival, so that they may have sufficient time for preparation of lectures and instructional materials. These seminars will be given in French. The organization of the U.S. training will be the responsiblity of the contractor. Once the general scope of a particular training course has been defined in collaboration with the GOT, the contractor will design a travel schedule and negotiate with the corresponding

host institution the parameters of the training program to be carried out in the U.S. It should be noted that experience indicates that for such training to be effective a considerable amount of time must be set aside by American counterparts, which in turn mandates that the host institution be reimbursed for staff time. The project budget makes allowance for the cost of 6 person-months of professional staff time for such participation by host institution personnel.

Experience with similar training projects elsewhere also suggests the need for a very focussed work program centered on some specific problem assigned to the trainee for completion during his U.S. visit.

3. Project Inputs

The total cost of this project is U.S. $2.9 millions. Of this total, U.S. $1.3 million will be funded by AID with the balance (equivalent to $1.6 million) contributed in Tunisian Dinars by the GOT. AID financed inputs will include technical assistance, training and commodities. The GOT will provide its input in kind through staff salaries, logistical support and commodities.

a) U.S. Inputs

(i) Technical Assistance

A large portion of the U.S. inputs will be as technical assistance provided through a host country contract to a U.S. contractor (firm, university center, or a consortium of such institutions). These services will include two long-term advisors, one an energy planner and chief of party and the other a specialist in renewable energy technology field tests. Also to be provided are the services of a number of short-term consultants providing expert services and a certain amount of home office staff support. The precise duties and expected qualifications of both resident advisors and certain of the short-term consultants are set forth in Annex A, part H (Request for Technical Proposal, Terms of Reference for Scope of Work). Technical assistance will also be provided through the medium-term services of a survey specialist, to be hired under an AID funded host-country personal services contract, who will also serve a coordinating function for the three sector surveys on behalf of the GOT. The principal function of all advisors is to assist the Tunisian Energy Task Force, as well as other agencies and individuals the GOT may identify as the project proceeds, in developing data and skills through on-the-job training.

(ii) Training

On-the-job training is an essential component of the project, and indeed the major function of the resident advisors to be supplied by the contractor is to work closely with GOT staff to transfer analytical skills. The short-term consultants will also be expected to participate in the training aspects of the project by giving training seminars in Tunisia in selected topics related to the project.

In addition, the project provides for U.S. training to be designed and arranged by the AID funded contractor for six GOT staff members. This will take the form of programs of study at stitutions in the forefront of energy policy and ergy technology research (Universities, National Laboratories the U.S. Dept. of Energy, etc.).

iii) Commodities

he project will provide for the cost of certain commodities ot available in Tunisia, particularly some of the monitoring and instrumentation required for the renewable energy field demonstrations and some technology components (such as the small wind electric conversion systems now commercially available in the U.S.) which could be manufactured in Tunisia but which could not be available in the project time frame. The cost of components of systems that can be manufactured now in Tunisia, such as the solar collectors and storage tanks for the solar hot water heating systems, will be assumed by the GOT. The project will also pay for the cost of acquisition of periodicals and other library materials not available in Tunisia. All commodities will be procured by the GOT with the advice and assistance of the AID funded contractor.

b) Government of Tunisia Inputs

As noted in the summary, the Government of Tunisia will contribute approximately 55% of the total value of this project. The GOT will pay for various staff, logistic support and certain commodities.

(i) Staff

The GOT will pay for all Tunisian staff involved in the project, including the staff of the Energy Task Force assigned to the project, staff from other agencies and ministries assigned to the project (e.g. from STEG and others involved in the field demonstrations, and the costs of INS staff involved in the field surveys for collection of energy end-use data).

(ii) Logistical Support

The GOT will pay for all logistical support required by the project, including office space for the contractor's resident advisors and associated bilingual secretarial services, translation services, local transportation, the sites for the field tests, and the logistical support for the field surveys (printing of questionnaires, computer time for data analysis, etc.).

(iii) Commodities

The GOT will pay for the local costs of manufacture and installation of the renewable energy systems to be field tested under this project. Only those components not available in Tunisia will be imported from the United States and paid for by the project. The GOT will also pay for any incidental supplies necessary for the establishment of the energy library (i.e. costs other than the actual acquisition cost of overseas journals and publications, such as shelving, cataloging materials, etc.).

c) Summary of Inputs

(i) United States Contribution	(U.S. Dollars)
Technical Assistance	964,000
Training	66,000
Commodities	197,000
Contingency and Inflation	73,000
TOTAL	1,300,000
(ii) Tunisian Contribution	(U.S. Dollar Equivalent)
Staff Salaries	470,000
Logistical Support	164,000
Commodities	700,000
Contingency and Inflation	266,000
TOTAL	1,600,000
(iii) Project Total	U.S. $ 2,900,000

III PROJECT ANALYSIS

A. Social Analysis

1. Identification of Beneficiaries

Because the project is designed to develop Tunisian capability to effectively plan for the production and consumption of energy, one must distinguish between short term and long term beneficiaries. In the short term, the immediate beneficiaries will be the Tunisian personnel trained, including those in firms in both the private and public sector trained in particular aspects of renewable energy technology manufacture and installation, and the limited number of villages and institutions chosen for testing of the renewable energy technologies. Over the long term, however, the more effective energy planning capability that is expected as a results of the project will allow the GOT to hold average energy supply costs, and the concommitant foreign exchange burden to levels below what they would have been in the absence of the project. Energy price increases have a generally regressive impact, adversely affecting disproportionately the rural poor who depend on energy inputs for agricultural productivity, transportation and cooking needs. Therefore, the benefits derived from improved energy planning, leading to a use of indigenous renewable resources or to improved energy utilization patterns, will disproportionately benefit the poor majority.

The demonstration of improved wood stoves, however, is expected to be of more direct impact to the rural poor in that the improved efficiency of such stoves will lessen the consumption of firewooed and reduce collecting time and hence contribute significantly to the control of desertification, which primarily impacts agricultural productivity of the rural poor.

2. Social Impact

Since the ultimate objective of the GOT in the project is to make technical or economic interventions, substituting one technology for another or one pricing policy for another, specific social impact will be a function of the specific policy actions and technologies proposed for introduction. It should be noted that the GOT will include Tunisian sociologists in the project committees (see Administrative Analysis) to ensure full consideration of social and cultural issues.

With respect to the renewable technologies anticipated for field testing, grid connected wind electric systems (WECS) or solar hot water heating for institutional application simply displace central station electric generation or fossil fueled boilers and are not expected to raise any issues of cultural acceptance. In terms of institutional applications such as hospitals and schools, any revenue gain as a result of cost-effective implementation of the renewable energy technologies would accrue to the public sector budgets involved and can therefore be assumed to be of general social benefit.

From the macroeconomic perspective, the principal impact of any significant penetration of renewable energy technologies is the foreign exchange benefit, which all other things being equal, will allow importation of additional capital investment goods in place of oil. Hence the distribution of benefits of the penetration of renewable energy technologies, at the macroeconomic level, is likely to correspond to the distribution of benefits of the development plan as a whole.

At the microeconomic level, the development of a Tunisian industry to manufacture solar collectors is likely to create significant employment opportunities in urban or semi-urban locations, particularly for skilled and semi-skilled technicians involved in collector assembly. Moreover, multiplier effects may provide significant benefits to other sectors of the economy (such as building contractors, plumbing firms and pump and equipment manufacturers). The creation of such an industry falls into the general category of import substitution strategies for economic development and can therefore be expected to have wide social benefit.

The successful testing and demonstration of some of the renewable technologies does raise certain issues of social impact. Improvement of efficiency in domestic stoves implies lower fuelwood consumption and therefore may have the positive impact of impeding desertification. However, the need to collect less firewood implies that less time is devoted by the rural household to fuelwood gathering activities, offering the potential of changing lifestyle. To the degree that such change is not desirable, the cultural acceptibility of such stoves may rest on the demonstration that the potential benefits outweigh the social impact.

Wind electric conversion systems (WECS) may raise social impact issues in those applications that are not connected to the grid. These applications are very similar, in terms of potential social impact, to the ones being studied under the related AID project on Renewable Energy (664-0325), a project specifically focussed on the cultural acceptability of renewable technologies in remote agricultural villages.

Tunisia is in the forefront of developing countries in terms of demonstrating expansion of opportunities for women in all fields. Currently, women occupy responsible positions in a number of ministries and are among the professional staff working on energy research and planning. This project will work toward enhancing the opportunity for women to participate in these and related efforts by encouraging their selection among planning units developed and the participants chosen for U.S. and Tunisian training.

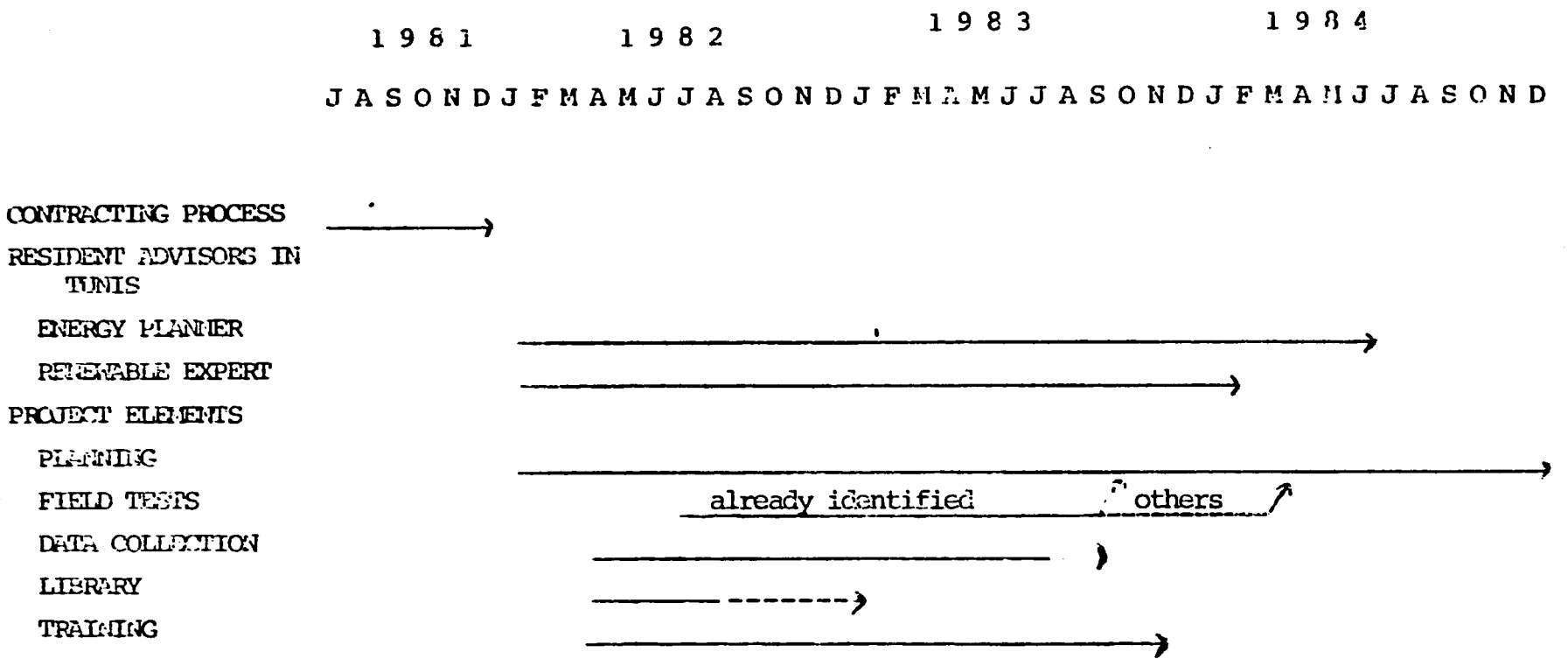
B. Implementation Plan

Table 2 sets forth the general timetable for the project. The detailed timetables for the three field test projects already selected are presented in Annex D.

Table 2: Project Schedule

August	1981	Project paper submitted
August	1981	Project paper approved
August	1981	Project agreement signed
September	1981	RFTP issued
November	1981	Proposals received
January	1982	Contract signed
March	1982	Contract resident advisors arrive in Tunis
April	1982	Analysis of renewable energy technologies begins
May	1982	First short-term consultants arrive for planning of field demonstrations
May	1982	GOT issues purchase orders for U.S. equipment for field tests
May	1982	Pilot study of domestic energy consumption commences
July	1982	First participant leaves for U.S. training
August	1982	U.S. equipment for field tests arrives in Tunisia
September	1982	U.S. equipment installed for field testing
October	1982	First locally manufactured renewable energy equipment is installed
November	1982	First renewable technology field tests operational
November	1982	Evaluation of pilot survey results complete and design of full survey started
January	1983	Full domestic consumption survey started
January	1983	First project evaluation
April	1983	Additional renewable energy supply options identified for field testing
June	1983	Energy consumption surveys completed, analysis begins
December	1983	Training completed
March	1984	Analysis of renewable energy options completed
June	1984	Second and final project evaluation
September	1984	Final follow-up by contractor on field tests and energy planning process
December	1984	Project complete.

PROJECT SCHEDULE



C. Administrative Analysis

The project will be implemented by the Ministry of National Economy, with responsibility for implementation given to the Special Assistant for Energy. Contracts will be placed by the GOT with a) an American firm or institution (or a consortium of such entities) to provide most of the necessary assistance, b) several American suppliers for the necessary equipment for field testing of renewable energy techniques, and c) an individual for skilled personal services in support of the surveys in the three energy use sectors.

1. Interministerial Coordination

The GOT recognizes the necessity for cooperation among the many entities involved in the project. While many of the key entities involved, such as the ETF, STEG and ETAP fall under the jurisdiction of the Ministry of National Economy (MNE), it is anticipated that other ministries and agencies will be involved, such as INS, CNI, the Ministry of Agriculture, the Ministry of Plan and Finance, the Ministry of Habitat, and others. An overall project coordination committee will be formed to be chaired by the Special Assistant for Energy and to include representation from the Ministries of Agriculture and Habitat, INS, STEG, CNI, the Office of Energy (the line organization within MNE), and others potentially involved in the project. The purpose of this committee will be to ensure overall project coordination and a broad perspective to project decisions. In addition, it is expected that for each major component of the project (e.g. such as the field tests for a particular technology) a small committee will be formed to make functional decisions and oversee progress. These committees are described in more detail below, under project coordination.

2. Project Coordination

An AID funded project is already underway for the collection of energy and end-use data in the industrial, agricultural and transportation sectors. The proposed project will collect data in the household, institutional and commercial sectors. Potential issues of overlap and completeness, and resolution of any issues concerning sectoral demarcation (e.g. between agricultural energy use and rural household energy use) will be the responsibility of a survey specialist to be provided by the GOT. This specialist will work for the GOT and will coordinate closely with the contractor's energy planner and with the INS personnel who will actually collect the data to ensure complete statistical and sectoral coverage and to focus data collection on the needs of the planning analysis.

Funds will be provided in this project for the acquisition of such services by the GOT through a host-country personal services contract. However, the survey specialist will be employed only 40% of full time under this project. The balance of the specialist's time will be employed under a similar host-country contract funded by AID under the existing Study of Energy-Use in the Industrial, Agricultural and Transport Sectors. The specialist will be expected to coordinate on behalf of the GOT across the six end-use sectors encompassed by this project and the existing energy end-use study in order to assure consistency of assumptions and methodology and to avoid gaps or double counting in coverage.

It is anticipated that a committee will be established to oversee the individual project elements. For the end-use data collection activities, the committee will include a member of the ETF, the survey specialist, a Tunisian sociologist, and the INS manager in charge of field work. Assistance will be provided by the contractor's resident energy planner and an expert consultant with experience in energy field surveys in other developing countries. This committee will be chaired by the ETF member. It may also be appropriate for members from other agencies to participate in this committee. For example, as the survey will require the collection of data at hotels, the assistance and cooperation of the National Tunisian Tourism Office (ONTT) will be required and their participation in the committee would be helpful. The importance of a clear link between data collection requirements and the specific issues of planning analysis to which the data will make a contribution bears repeating here. It cannot be expected that entities such as ONTT will provide assistance unless one can explain precisely the need for the data items and how the results of the analysis to be conducted with the data will answer specific questions related to energy policy. It is here that the contractor is expected to play a key role.

With respect to the field tests, it is expected that STEG will be responsible for the field testing of the solar hot water system and the wind electric systems. The contractor's resident renewable energy expert will assist the STEG individual identified by the GOT as the responsible project manager. In the case of field testing at institutions, a representative from the cognizant Tunisian ministry or agency will also be brought into the planning and execution of the project. For each field test or group of test projects, as appropriate, a small project committee chaired by either the project manager of the implementing agency or the ETF representative would be established. The contractor's resident renewable energy advisor and the special short-term consultants will assist such committees in the design, construction and monitoring decisions necessary for successful field testing.

Finally, oversight for the continuing energy planning and analysis work will be provided by a committee that will include representatives from the ETF, the Office of Energy, STEG and ETAP, and will be assisted by the contractor's resident energy planner and expert consultants.

3. Continuing Institutional Capability

As noted previously, the responsibility for the formulation of energy policy options has been assigned to the Special Assistant for Energy by the Minister of National Economy and a special Energy Task Force provides the requisite professional staff assistance. The GOT recognizes the need to expand the current staffing of the ETF for the project objectives to be successfully accomplished. It is expected that the proposed project will contribute to the ultimate institutionalization of the ETF by assisting in the development of its professional cadre through the various technical assistance and training components. The ultimate effectiveness of the ETF will depend on the degree to which it can fulfill its mission to develop a full range of proposed national energy policies and programs. Indeed, the proposed project is designed explicitly to equip the ETF to make constructive energy policy recommendations, an objective discussed further in the Evaluation Plan (part F, below).

D. Economic Analysis

The principal project activity is the collection of data needed by the GOT to make informed decisions about energy conservation, pricing policy and the substitution of renewable energy sources for non-renewable ones. The other major activity is training in how to utilize such data for effective decision-making. The economic value of the data gathered and the training given therefore depends on the decisions ultimately taken as a result of the new knowledge and skills the decision-makers have gained as a partial or total result of this activity.
This value cannot be estimated in advance with any great accuracy, insofar as the data needed to make such estimates are precisely the ones to be collected by the proposed study, and any sophisticated analysis would be quite spurious in its precision.

However, some simple order-of-magnitude calculations do suggest the potential cost-effectiveness of the proposed project. Consider, for example, the consumption of petroleum products in Tunisia, which currently amounts to some 2 million tons[1] or 16 million barrels per year. Since

[1] Using the 1975 Gordian study estimate of 10% p.a. growth from 1975-1980, and the 1975 consumption estimate of 1.3 million tons petroleum equivalent.

Tunisia is expected to become a net oil importer by the mid 1980's, it follows that at the margin, and ignoring secondary effects, a saving of as little as 0.1% of petroleum products by the introduction of locally manufactured renewable technologies would result in an annual saving of $5,600,000 (in 1981 dollars assuming $35/bbl). This implies a rate of return to the project with respect to foreign exchange of 193%.

The reasonableness of this computation can be illustrated in other ways. If, for example, we assume a target rate of return for project justification of 15%, what is the level of penetration of renewable technologies that would be required? The amount of petroleum products to be displaced, Δ, is given by the relationship

$$\Delta \left[\frac{\text{bbls}}{\text{yr}}\right] \quad 35 \left[\frac{\$}{\text{bbl}}\right] = 0.15 \left[\frac{\text{rate of}}{\text{return}}\right] \cdot 2.9 \times 10^{6} \left[\frac{\text{project}}{\text{cost}}\right]$$

from which Δ solves to 12430 barrels/yr. Assume, for purposes of discussion, that the renewable technologies are applied only to displace fossil fuels for hot water heat at hotels. 1980 data collected by Gordian Associates for the Tunis Hilton suggests a total annual consumption of fuel oil heating of 4000 bbls/yr. If we assume that 6/10 of this might be displaced by solar heat, then it follows that if the project results in only six hotels adopting solar water heating, each so supplying 60% of its total heating needs, the 15% rate of return criterion will have been met.[1]

It is recognized that such calculations are not rigorous, since they ignore secondary effects (e.g. imports of copper pipe and other non-locally available components in the solar equipment) as well as GOT project costs. However, even if all these effects result in an order of magnitude error, the level of technology adaptation required in the wake of the project is still seen to be small and likely to be reasonable as a justification for the project.

[1] Note that from the perspective of the government, the user costs of the technology itself need not be considered. It is a perfectly reasonable evaluation perspective to consider on the one hand the direct government expenditures involved in the demonstration (i.e the USAID plus GOT costs), and on the other the balance of payments impact to the country as a whole.

E. Financial Analysis and Plan

The AID funded portion of the project budget is as follows:

	U.S. Dollars
RENEWABLE TECHNOLOGY FIELD TESTS	
1. Technical assistance	
Resident advisor (1)	230,000
Short-term consultants for solar water heating, domestic stoves and wind electric (2), (31 person-months)	244,000
Short-term consultants in other technologies (3) (10 person-months)	80,000
	554,000
2. Hardware (see Annex D for details) (5)	
Solar water heating (6)	66,000
Wind electric	81,000
Domestic stoves	10,000
	157,000
GENERAL PLANNING ASSISTANCE	
Resident Advisor (7)	206,000
Short-term Consultants (2), (5 person-months)	39,000
	245,000
TRAINING	
Subsistence, etc. (8)	30,000
U.S. host institution costs (9)	36,000
	66,000
LIBRARY	
Acquisition (10)	27,000
Short-term consultant (2), (2 person-months)	13,000
	40,000
COLLECTION OF ENERGY END-USE DATA	
Coordinator (11)	20,000
Resident advisor (7)	106,000
Short-term consultants (2) (2 person-months)	39,000
	165,000
CONTINGENCIES AND INFLATION	73,000
TOTAL	1,300,000

The key assumptions and supporting details are as follows. (Paragraphs are keyed to the budget table by superscripted numbers).

1. Resident Advisor: Renewable Energy Specialist.

This assumes a two year residence in Tunis at $115,000 per professional person-year, including all contractor's overhead, fees, fringes, and allowances. If the contractor is a university it is possible that the cost per professional person-year may be somewhat less.

2. Short-Term Consultants.

The assumptions include reimbursement at a rate of $192/day for the professional fee, figured at 22 days per month, plus 30 days of per diem per month at $75/day. In addition, a 20% overhead has been added to reimburse the consultant's home office for consultant selection, insurance, travel arrangements, etc., to total of $7800 per professional man-month. It is expected that all such consultants would in fact be reimbursed at the maximum rate since individuals with the requisite experience and qualifications would be expected to have private sector consulting rates well in excess of the maximum.

It should be noted that the short-term consultant assistance appearing under this category is keyed to the detailed analyses of manpower needs presented in Annex D. The only exception is the requirement for a solar system designer, which skill is expected to be provided by the resident advisor and augmented by only a few person-weeks of additional short-term assistance.

3. Consultants for Other Renewable Energy Technologies.

This category includes the cost of consultants for technologies other than the ones for which detailed project descriptions have been developed in this paper. The precise timing and mix of such consultant assistance will be determined as the project proceeds.

4. Contingencies and Inflation and Home Office Backstop.

For each project element the calculation has made some allowance for predictable contingencies and inflation. This category allows for unanticipated inflation, and as one major contingency, allows for possible costs for backup from the home office of the contractor. While it is not expected that

any work will be conducted in the contractor's home office, certain administrative items not normally part of overhead will be incurred. For example, under training, the contractor's home office will need to make contractual arrangements with the host institutions in the United States to ensure participation and reimbursement of host institution staff, and such efforts may require reimbursement beyond the normal contractor overhead and administrative rate.

5. Renewable Technology Field Test Hardware.

The detailed itemizations of estimated hardware requirements are presented in Annex D.

6. Hardware Contingencies and Inflation.

No allowance is made here for contingencies or inflation because the detailed itemizations presented in Annex D are by intention already conservative. In particular, it is expected that some of the equipment assumed herein to be imported from the United States, such as certain pumps and valves, will in fact be available locally and these costs will therefore be assumed by the GOT.

7. Resident Advisor: Energy Planner.

The energy planner is assumed to be resident in Tunis for some 30 months at a fully burdened rate of $125,000 per year. Two thirds of his time is included under the heading "General Planning Assistance" and the remainder is under "Collection of Energy End-Use Data".

8. Short-Term Training.

Short-term training of Tunisians in the United States is budgeted at $2500 per person-month, consistent with prior USAID/Tunis experience for short-term training costs of this type. Travel to the United States from Tunisia and return will be paid by the GOT.

9. U.S. Host Institution Costs.

$6000 per man-month is a typical billing rate at Department of Energy Laboratories for the type of analyst who might typically be assigned to work in close collaboration with the Tunisian participants.

10. Library Acquisitions.

The assumptions underlying the acquisition budget are as follows: 7 newsletter-type publications at $300 per year, 30 scientific and technical journals at $60 per year, 30 subscriptions to abstract services, irregular publications and statistical handbooks at $60 per year, 70 reports through NTIS or research centers at $30 per item, and purchase of 30 textbooks at $40 per item. It is assumed that three years of such subscriptions and yearbook or other annual acquisitions will be funded by the project.

11. Survey Specialist

It is assumed that this project will contribute $20,000 to the salary of a survey specialist hired under a personal services contract directly by the GOT. This will cover 40% of that individual's time for 20 months. The remaining 60% of the specialist's time will be funded from the A.I.D. funded Study of Energy Use in the Industrial, Agricultural and Transportation Sectors.

The GOT funded portion of the project budget is as follows:

	Tunisian Dinars	
SALARIES - MNE		
Management, 8 p.m.[1] @ 1000/mo.	8,000	
Professional Staff, 72 p.m. @ 900/mo.	64,800	
Secretarial, 36 p.m. @ 300/mo.	10,800	
		83,600
PROFESSIONAL SUPPORT-OTHER AGENCIES		
STEG 54 p.m. @ 800/mo.	43,200	
36 p.m. @ 600/mo.	21,600	
CRGR 9 p.m. @ 800/mo.	7,200	
SIAME 36 p.m. @ 800/mo.	28,800	
INS 10 p.m. @ 800/mo.	8,000	
30 p.m. @ 300/mo.	9,000	
CNEI 12 p.m. @ 800/mo.	9,600	
Other 30 p.m. @ 800/mo.	24,000	
		151,400
OFFICE SPACE AND FURNISHINGS		
36 mo. @ TD 750/mo.	27,000	
Office furniture	3,000	
		30,000
TRANSPORTATION - LOCAL		
2 vehicles @ 10,000 x .7 amortization	14,000	
Gasoline and maintenance	10,000	
Air and train tickets	2,000	
200 days perdiem @ 20/day	4,000	
		30,000
INTERNATIONAL TRAVEL		
6 round trips Tunisia-USA @ 800	4,800	
360 days perdiem @ 20/day	7,200	
		12,000

[1] "p.m. = person-month of services - Cost includes all fringe benefits and overhead.

MISCELLANEOUS DIRECT COSTS

Computer time	5,000	
Translation services	3,000	
Communications and miscellaneous	2,000	
		10,000

EQUIPMENT AND CONSTRUCTION FOR RENEWABLE ENERGY FIELD TESTS

Hot water systems	270,000	
Wind electric systems	70,000	
Domestic stoves	10,000	
		350,000
Sub-Total		667,000
INFLATION AND CONTINGENCIES @ 20%		133,000
PROJECT TOTAL	TD	800,000

at TD 1.0 = U.S. $2.0, the GOT contribution equals US $1,600,000

F. Evaluation Plan

Two evaluations are proposed, one 16 months after project initiation (contract award) and the other near the end of the project. The mid-term and final evaluations will be undertaken collaboratively by representatives from the GOT and USAID, and AID costs will be financed within the proposed project. The evaluations will take place concurrently with program implementation and will not cause delay or hiatus in on-going project activities.

1. Evaluation Criteria

The success of the project can be established by examining its principal dimensions:

(i) The progress of the field tests and data collection activities: Are the systems in place? Does the monitoring equipment function reliably? Have the expected response rates to consumption surveys been realized? Note that these types of questions relate to the procedures involved, rather than to the demonstration of cost-effectiveness. Indeed, it should not be expected that all of the field tests will result in a subsequent finding of cost-effectiveness. The evaluation criterion to be applied here focusses only on whether or not the test was properly conducted and accurate data was collected.

(ii) The efficacy of technical assistance: Since the major thrust of the involvement of the U.S. contractor is the provision of special expertise not locally available in Tunisia, a second dimension of project success conserns the effectiveness of the contractor's resident advisors and the effectiveness of the contractor's short-term consultants. Typical questions under this heading include: Has the skill-mix originally offered by the contractor actually been provided. How effective has the contractor been in responding to problems that have arisen in the course of the project. Has the proposed comparative analysis of energy options been carried out? And what evidence is there that skills and expertise have in fact been transferred to the GOT energy planning staff?

(iii) The substantive progress toward GOT energy planning objectives: To what extent have the demonstrations of renewable energy technologies and the on-going analysis of renewable supply options resulted in the formulation of specific decision options for presentation by the Energy Task Force (ETF)? Recognising that ultimate project success, in the form of the GOT acting upon such recommendations, may well extend beyond the project schedule, it will be sufficient to establish as part of the project evaluation (and the final evaluation in particular) that the ETF is successfully meeting its defined objective of analyzing and quantifying energy policy options for consideration by other levels of Government for actual decision, that the library is available, and that institutional contacts have been established for future flow of expertise and documents.

2. Timing of Evaluations

The first project evaluation is scheduled for January 1983. At this point two of the three pre-selected field tests of renewable energy technologies will have been fully operational for several months so that the problems encountered in equipment manufacture, procurement and installation can be assessed. The pilot survey of energy consumption data will also have been completed and the data will have been analyzed. The evaluation team will have the opportunity to comment on the plan for conduct of the full survey that will commence soon after the first project evaluation. The library will be operating and several participants will have returned from training in the U.S.

The first project evaluation is therefore scheduled in such a way that substantive results should be evident for all four of the project elements, yet there will still be sufficient opportunity for any necessary mid-course corrections needed by the project.

The second project evaluation is scheduled for June 1984. At this point extensive operational experience will have been gained in the field tests and preliminary analysis of the performance and costs will be complete. Coupled with data on end-use consumption, the evaluation team should have available the results of a complete first analysis of the cost-effectiveness and potential market application of the

technologies in question, as well as an analysis of other technologies to be selected for field demonstration. The overall effectiveness of the technical assistance and training elements of the project can thus be fully gauged at this point.

G. Environmental Evaluation

The only element of the proposed assistance with any potential negative impact upon the environment is the field testing of renewable energy technologies.

Of the three technologies pre-selected for field tests, improved domestic stoves, small to medium wind electric systems and institutional solar hot water heating, none has any significant environmental impact. By improving efficiency of biomass combustion the improved domestic stoves will help reduce demand for firewood and thereby aid the campaign against desertification. The other two technologies, by virtue of their displacement of fossil fuel (fuel oil in the case of solar water heaters and partially oil-based electricity generation in the case of the WECS) will have a positive environmental impact in that pollution emissions associated with electric generation (particularly SO_2, NO_x and particulates) and with oil refining and combustion will be reduced. Indeed, to the extent that the technologies are successfully tested and applied even on a modest scale, significant environmental benefits can be expected, particularly in the urban environments.

Other candidates for possible field testing have not yet been selected, but none of the technologies viewed as probable by the initial assessment of renewable energy technologies (see Annex C) is expected to cause significant environmental impact, either from field testing or from possible subsequent commercialization in Tunisia. In most cases application of the technology displaces either fossil-fuel generated electricity (the electric system in Tunis has only very small hydroelectric capacity, which, because of favorable economics, would continue to be dispatched into the grid regardless of any electric load displacement caused by renewables) or a petroleum product, almost all of which is refined locally at the Bizerte refinery. In some cases the application may displace natural gas in which case there is no significant environmental gain, nor is there a loss.

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ANNEX A

REQUEST FOR TECHNICAL PROPOSAL

SUPPLY OF TECHNICAL SERVICES

A Contract with the
Government of Tunisia

Funded by the Agency for
International Development.

REQUEST FOR TECHNICAL PROPOSAL

TUNISIA

Subject: Request for Technical Proposal to Supply Services for an Energy Planning Project.

Gentlemen:

The Government of Tunisia ("Government") acting through the Ministry of National Economy ("MNE") is seeking proposals from U.S. firms, non-profit institutions and/or consortia of such entities to provide the services described in this request. This request is issued pursuant to a grant made to the Government by the Agency for International Development ("AID"). Negotiations will be conducted in accordance with applicable Government and AID regulations. Based on the response to this solicitation, the Government contemplates entering into a cost-reimbursement contract for the services described herein. Price shall not be included in the technical proposal.

The request consists of the following parts:

I. Project Description and Scope of Work
II. Selection Criteria
III. Instructions to Offerors

This RFTP in no way obligates the Government to award a contract, nor does the Government assume any responsibility to pay any cost incurred in the preparation and submission of the proposal.

If you decide to submit a proposal, an original and five copies in French plus a copy in English of such proposal must be received by the MNE no later than , 1981.

Please address proposals to: Mr Kamel Rekik,
Ministère de l'Economie Nationale
Place de la Kasbah
Tunis, Tunisia.

I. Project Description and Scope of Work

A. Objectives

The Government wishes to plan for development of the most cost-effective mix of renewable, non-conventional and conventional energy sources, but lacks much of the data which would allow planners to assess cost-effectiveness of renewable energy technologies under local conditions or the relative merits of a wide range of energy policy and program options. Moreover, the Government lacks adequate personnel skilled in the formulation and analysis of energy supply and consumption data needs, the use of such data for integrated energy planning, and the formulation of energy policy and programs. This proposed assistance is addressed to alleviating these problems by the provision of technical assistance, training, and the procurement of certain commodities, focussed in such a way as to assist the Government in developing a broad range of energy supply and demand data and a cadre of professionals equipped to conduct energy planning and analysis on a continuing basis.

In particular, and in order to complement certain aspects of data collection and institutional development already underway, certain specific requirements are to be satisfied by the project:

1) The Development of a general energy planning capability which will allow the formulation of policy options with supporting data for consideration by the Government.
2) The evaluation of the cost and effectiveness of renewable energy supply technologies under Tunisian conditions particularly small-scale technologies already proven elsewhere from an engineering standpoint.
3) The collection of accurate data on the patterns of energy consumption in the household, institutional and commercial sectors, and the training of personnel in the ongoing definition of data needs and in the acquisition, evaluation and analysis of such data.
4) Providing the Government access to energy related documents, journals and research published abroad, and the necessary institutional contacts which will facilitate a continuing flow of data and continued access to ongoing energy technological and policy developments.

5) The professional development of a cadre of energy planning personnel within the Government through the development of skills necessary for the ongoing general assessment of energy supply and applications, with special focus on renewable energy technologies, as well as on integrated multi-sector planning.

B. Background

AID is financing a host-country contract with a U.S. firm or institution or a consortium of such to provide technical assistance, training and commodity procurement to help attain the objectives of this project. This project is one of several currently planned or underway in Tunisia under AID sponsorship.

The Energy Policy Planning Project (936-5703) is assisting the Government in the collection and analysis of energy consumption data in the industrial, transport and agricultural sectors. The Renewable Energy Project (664-0325) is currently assisting the Government in the assessment of a group of renewable technologies in the setting of a remote agricultural village. Other AID projects are focussed on the academic training of energy specialists and on more general aspects of technology transfer.

C. The Project

The project consists of three major and two minor elements, which, when integrated with other elements currently in place or underway, will lay the groundwork for an effective planning capability in Tunisia. It must be stressed that the responsibility for the project elements themselves lies with the Goverment. The role of the contractor is to assist the Government in the successful execution of the project by making available to the Government expertise and certain commodities currently unavailable in Tunisia. The project consists of the following elements:

1) General Planning Assistance

This project element involves assisting the Energy Task Force, established within the Ministry of National Economy under the Special Assistant for Energy, in the analysis of energy policy options. Options to be considered include changes in the pricing of energy products, conservation, the introduction of renewable energy supply options, incentives for private sector investments in certain technologies or conservation actions, Government investment programs, and so forth. As part of the process by which policy options are to be formulated and evaluated, certain technologies, particularly renewable energy technologies, may be field tested. Information may also need to be developped with respect to end use consumption. These two requirements are identified as separate project elements below.

2) Renewable Energy Technology Field Testing and Assessment

This project element involves the assessment of renewable technologies for application in Tunisia, to include field tests of certain technologies. Already selected for testing are solar hot water heating for institutional application (hotels, schools, hospitals), wind electric conversion systems (WECS) and wood stove improvements. Others may be selected as the project proceeds, based on comparative analysis. The focus is on technologies already commercially available and with potential for predominantly local manufacture. Imported products are to be used only where they are a small percentage of system cost or where local manufacture in Tunisia is not practicable in time for field tests. The solar collector panels, for example, will be manufactured in Tunisia. The field tests are application oriented and will provide data for continuing assessment of such renewable energy technologies. They are thereby closely related to project element 3, that will collect data on energy end-use.

3) Collection of Energy End-Use Data in the Household, Commercial and Institutional Sectors.

This project element consists of field surveys of energy consumption in urban and rural households and in the commercial and institutional sectors. The household sector will receive the most emphasis. The field collection of data will be carried out by the Government through the Tunisian National Statistical Institute (INS) which has trained survey staff available for this project. The role of the contractor is to assist the Government in the definition of data needs and in the subsequent integration of the data collected into the energy planning process in order to provide the Government with expertise not currently available in Tunisia related to the design and evaluation of field energy end-use consumption surveys.

The two minor elements are as follows:

4) Energy Library

This project element involves the establishment of an energy library designed to provide Tunisian energy planners with direct access to current developments in energy technology and the world energy situation. The contractor will assist in the procurement of subscriptions to appropriate journals and publications, the establishment of contacts with other institutions, and the providing of training in procurement and library management procedures to ensure continuing access to current energy data by the Government energy planning staff.

It is anticipated that the focus of the library will be on periodicals, statistical reports and current information (newsletters, etc.), rather than on textbooks, and that it will be housed in an agency of the MNE for ready access by the Government energy planning staff.

5) Training

This project element is designed to complement other forms of training already in place through AID programs (short courses and academic programs), and will provide for training of Government energy planning staff in the U.S. through special programs of study at appropriate institutions (national laboratories, university centers, etc.). It is expected that six individuals will be selected for an average of two person-months each of training in the U.S. The contractor will design and arrange for such training, which will focus on practical energy policy analysis problems.

D. Scope of Technical Services

1) General

The contractor will assist the Ministry of National Economy (MNE), through the Special Assistant for Energy, with technical assistance, training, and commodity specifications and assistance to the Government in procurement. It is anticipated that the work will begin not later than January 1982 and be completed by December 1984.

2) Specific

a. Site Selection

The sites to be selected by the Government for the field tests of renewable energy technologies will account for the availability of wind or solar resources, the type of system, the cost of the system, the presence of an appropriately matched application, the acceptability of the system to potential users, and the applicability and market potential for similar systems. One of the wind sites will be separately chosen in order to gain technical experience with electric grid interconnection problems. The contractor will assist the Government in this site selection process.

b. Advisory Services

The contractor will be responsible for assisting the Government in the implementation of energy end-use surveys in the household, institutional and commercial sectors; the design, implementation and evaluation of renewable energy technologies, and the establishment of an energy library. The project will require a team of two long-term contract advisors, stationed in Tunis, to work with Government counterparts. The chief of party will be an energy planner, who will be concerned with all aspects of national energy planning. The second resident advisor will be a project manager concerned with the field demonstrations of renewable technologies, and who will have broad experience in manufacture and testing of renewable energy technologies and particular expertise in solar hot water heater system design.

The long-term advisors must have capability in French at the FSI R-3, S-3 level, as tested by the Foreign Service Institute of the U.S. Department of State or by an equivalent test or method acceptable to the GOT.

The long-term advisors will be complemented by short-term consultants. While the precise timing and mix of short-term expertise is flexible, and will be left to the contractor and the Government to develop via mutual agreement, certain qualifications have already been identified, as detailed under item "h", below. These consultants will address specific technical aspects of the project, including specialized training, the procurement of equipment and library materiels, and participation in the evaluation of policy options, including interventions in the areas of conservation, the efficiency of energy utilization, renewable and conventional energy supplies, pricing, etc.

c. Training

Training is an important element of the project and has the objective of developing within the Government a cadre capable of energy planning in general and the collection of end-use data and the assessment of supply options, including renewable energy sources in particular. Emphasis will be placed on on-the-job training in Tunisia, in which Government staff will work closely with U.S. technicians in the conduct of energy data collection and analysis, field testing of renewable energy technologies, the creation of an energy library, and comparative analysis of supply options and applications. Training seminars, covering special topics, will be held in Tunisia by the contractor.

The contractor will also assist the Government in the selection of Government employees for training in the U.S. and in the development of courses of study and placement in appropriate U.S. institutions (national laboratories, university research centers, etc.). The focus of such training will be on renewable energy technology assessment, on energy planning and on energy policy formulation. the exposure of the Government energy planning cadre to planning and assessment practices in the U.S.

d. Commodity Procurement

The contractor will also be responsible for the selection and for assistance to the Government in importation of certain commodities required for project implementation. The source and origin of these commodities will be U.S. or code 941 (Developing Countries). Included among these commodities will be instrumentation and monitoring equipment for the field tests of renewable energy technologies and the library aquisitions.

e. Supervision

The Ministry of National Economy, acting for the Government, will supervise the activities of the contractor and coordinate the involvement of other entities, such as the Institut National de Statistique (INS) and the Société Tunisienne d'Electricité et de Gaz (STEG) in the implementation of the project.

f. Logistical Support

The Government will provide administrative and logistical support for the project including offfice space, secretarial support, local transport. copying, translating and communications.

g. Contract Technical Services

The contractor will provide staffing adequate to meet the objectives of the project. Present estimates of contractor team composition are as follows:

	Person-months
(1) Long-term	
Energy Planner and Analyst.....	30
Renewable Energy Technology Project Manager	24

(2) Short-term

	Person-months
Energy Planning Specialists.....	5
Survey Specialists	4
Instrumentation Specialist.....	2
Librarian	2
Wind Electric Conversion Systems Engineer	8
Solar Collector Manufacturing Specialist	2
Wind Resource Specialist	3
Solar System Engineer	2
Wood Stove Experts	10
Market Research Specialist.....	6
Other	10

h. Terms of the Scope of Work

(1) General Conditions

Although great emphasis will be placed on the qualifications and experience of both resident advisors and short-term consultants proposed for the project, potential bidders must demonstrate an awareness of national energy planning problems and procedures in the context of a developing economy. In particular, bidders are expected to demonstrate previous experience in the integration of field tests and end-use survey data into the overall planning process. Bidders will be expected to describe such an analytical framework as a ten to twenty page Annex to their technical proposal.

(2) Resident Advisors

(a) Energy Planner

The proposed individual must have at least 5 years of experience in energy planning in developing countries. Included in this experience must be the assessment of renewable energy technologies, participation in primary energy end-use data collection (preferably in the household sector), and the demonstrated ability to train host-country nationals in planning and assessment procedures. The minimum academic qualification is a Masters degree in some numerate discipline such as planning, economics or engineering, with a Ph.D. qualification preferred.

The responsibilities of this advisor wil include the following:

i. As chief of party responsibility for planning, coordination and implementation of all parts of the project assigned to the contractor.
ii. Assisting Government staff in the identification of data needs for the energy end-use surveys.
iii. Conducting ongoing comparative assessments of renewable energy technologies with a view to selection of additional technologies or field testing.
iv. Assisting Government counterparts in the selection of sites for the technology field tests.
v. Assisting in the evaluation of survey data and field demonstration results for the formulation of policy recommendations.
vi. Coordinating and supervising all other contractor staff.

b. Renewable Energy Technology Project Manager

The proposed individual must have at least 5 years of experience in the project management of renewable energy field tests from conceptualization and design through installation, operation and evaluation. In particular he/she must have experience in the design of solar hot water heating systems. At least one year of such experience should have been in a non-English speaking developing country. The minimum academic qualification is a Masters of Science in a technical area (preferably engineering) and familiarity with project planning and scheduling techniques is desirable. Teaching experience in a technical environment (e.g. training of technicians at the community college level or involvement in extension service programs) is also desirable.

The responsibilities of this advisor will include:

i. Assisting the Government in the conceptualization, site selection, design installation, operation and evaluation of the renewable energy technology field tests.
ii. Scheduling and coordinating the activities of the contractor's expert consultants and technicians required for various aspects of the field tests.
iii. Selection and assistance to the Government in procurement of commodities to be purchased in the U.S. (monitoring equipment, wind electric operation, etc., and other equipment not available in Tunisia).
iv. Working with the energy planner and Government energy staff in the ongoing assessment of renewable energy options.

(c) Short-term Specialists

While the bidders are free to propose any particular consultant skill mix they feel is appropriate to the tasks at hand, the following needs have already been identified:

i. Survey Specialist

The survey specialist will assist the Government in the design and pilot field testing of the survey questionnaires and will become a member of a committee established by MNE to oversee the surveys that will also include a Tunisian sociologist and a Government coordinator who will coordinate the surveys undertaken as part of this project with surveys of other sectors otherwise funded. It is essential that the contractor provide an expert with professional experience in rural and urban energy field surveys in developing countries. This specialist will also assist in the training of the Tunisian field enumerators and provide assistance with the evaluation and analysis of the collected data.

ii. Instrumentation Specialist

The resident advisor will require the assistance of a consultant versed in the details of evaluation, procurement and field installation of monitoring equipment for both the measurement of the solar resources and the performance of the system itself. He/she should have documented experience of such work in other field test projects and in the design of simple, effective, and reliable monitoring systems.

iii. Librarian

The library specialist will assist his/her Government counterpart in establishing the energy library. In particular, he/she will provide on-the-job training in procedures for document and periodical acquisition in the U.S, establish contacts between the energy library and U.S. document producing/distributing institutions and develop the procedures to assure effective utilization of the energy library (such as effective circulation, cataloging and ordering procedures). This specialist must show experience in the establishment and operation of an energy library for some comparable energy planning and/or research entity.

iv. Wind Electric Conversion Systems (WECS) Engineer

The design and installation of the WECS will require the services of an experienced wind engineer. Prior experience with the design and installation of small and medium WECS, maximum 50kw, is a prerequisite. A Masters of Science in engineering or science is desirable, and the qualification statement for this individual should list the details of the installations with which he/she has worked.

v. Solar Collector Manufacturing Specialist

A specialist in the field of operations management or industrial engineering, familiar with the practical aspects of the manufacture of solar hot water heater collectors will be needed on a continuing intermittent basis in order to establish local manufacturing capability in Tunisia. Actual factory experience with (a) solar collector manufacture and (b) manufacturing or assembly operations in a developing country is required.

vi. Wind Resource Specialist

The wind resource specialist will be responsible for providing expertise to the ongoing assessment of the wind resource in Tunisia. Familiarity with wind prospecting techniques, as well as conventional climatological and meteorological skills, is mandatory. This specialist will assist in site selection and field monitoring. A Masters of Science in an appropriate science is required, and details of the specific wind-related work experience must be provided.

vii. Solar System Engineer

The design and installation of the solar water heating systems will require an experienced solar engineer to assist the resident advisor. Prior experience in the design, specification and installation of solar hot water systems of an institutional scale (hotels, schools, etc.) is required, and a listoof the actual demonstration and/or commercial systems designed by the proposed individual should be included. A graduate degree in engineering is desirable, but emphasis is on practical experience.

viii. Market Research Specialist

The market research specialist will provide recommendations for (a) the types of data that should be collected in the household and institutional sectors, (b) important issues for consideration in site selection (particularly in regard to replicability), and (c) assessing the contribution that renewable energy technologies can make in Tunisia. A Masters degree in business, with a major in market research, is required. French language capability and a familiarity with recent work on methodologies for forecasting market penetration of new technologies must also be demonstrated.

ix. Wood Stove Experts

One or more experts versed in the design of wood (or animal waste) stoves will be required to assist in the wood stove field tests. These experts will be expected to have previous experience in designing more efficient stoves for rural applications in developing countries (preferably in areas currently threatened by desertification) and in the manufacture of such devices using locally available materials and skills.

(3) Participationof Manufacturing Companies

Although bidders should feel free to include companies manufacturing solar equipment and WECS in their consortiums as a means of obtaining the necessary expertise, it must be stressed that the size and general specifications of the equipment to be installed in Tunisia has not yet been decided. Potential bidders are therefore cautioned about including companies that manufacture only limited ranges of equipment. In any event, the procurement of the systems and ancillary monitoring equipment, etc. will be the subject of separate RFP's issued by the Government after some of the technical assistance to be supplied by this project has been rendered.

II. Selection Criteria

1. General Instructions

Since great stress is being placed on the qualifications and experience of the resident advisors and of the short term consultants, resumés must be prepared in such a way as to enable the proposal evaluation committee to make precise determinations. In particular, resumés must be specific, avoiding generalities and stock phrases often encountered in company brochures. Academic style resumés, even if lengthy, are preferred over brief one-pagers. The ideal resumé will include a chronological experience record, describing projects worked on, and the details of duties and responsibilities. For resident advisors, even 10 pages would not be deemed excessive. Resumés for expert consultants should provide explicit lists of other consultancies, and the projects/ installations they have worked on. Publications thought to be relevant should be listed.

Another area of importance in the evaluation is the demonstration of an understanding of national energy planning; this demonstration is to be submitted in the form of an Annex to the proposal, 10-20 pages in length. This should be written in the style of a technical publication for submission to a journal, entitled "The Energy Planning Process in Developing Countries: An Analytical Framework". Bidders are expected to show how they would integrate the various elements of energy planning -- analytical models, data collections, field tests, etc. into a process that leads to the formulation of specific policy recommendations to the Ministerial level, and that might include portfolios of pricing actions, Government investments programs, regulatory initiatives and so on.

2. Numerical Evaluation

The evaluation will be based on a point scoring system of 100 points.
The individual weights are as follows:

A. Qualifications and Experience of Resident Advisors:

i. Energy Planner:	15
ii. Renewable Technology Expert (expected to have qualifications and experience in solar hot water heater system design):	15

B. Qualifications and experience of short-term advisors:

i. General energy planning:	10
ii. Energy Data and Survey Experts:	15
iii. Renewable Technology Experts:	15

C. Understanding of National Energy Planning, as demonstrated by the Annex described above:	20

D. Corporate experience in National Energy Planning:

This is to be demonstrated by a list of country planning studies undertaken by the offeror (and his subcontractors, if any), with a brief description of the scope of work and the client. In the case of AID contracts, offerors should list the Ministries and agencies with whom they worked in developing countries, and include the name of an official (non-AID) who can be contacted for a reference. 10

100

ANNEX B

THE ANALYTICAL FRAMEWORK

1. Background

This annex has two functions. First, it elaborates a general framework for energy analysis and planning in a developing country such as Tunisia, emphasizing the relationships between the different components of the planning and policy-making function, some of which are elements of this project and some of which, such as the collection of industrial, agricultural and transportation sector demands, are elements of other projects.

The second purpose of the annex is to demonstrate, at least on a first order of magnitude basis, that there are reasonable grounds for believing that solar hot water heating for hotel application is cost-effective. Obviously, given the lack of data at this point, one would require simply that based on conservative assumptions a positive rate of return might be indicated. To be able to differentiate between rates of return on an investment in solar hot water heating versus other potential energy and non-energy investments in the hotel or tourism sector is at this point neither possible nor necessary.

2. The Analytical Framework

While a great deal of attention has been devoted in the recent energy planning literature to individual aspects of energy planning in developing countries or to general, macro-level analysis,[1] very little attention has been devoted to the methodology of integrated energy planning that ties together primary data collection, field testing, analysis, formulation of policy options, allocation of budget resources and impact analysis.[2]

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[1] For example, there have been a number of recent papers on the topic of integrating macro-economic models with energy systems models, or on specific aspects such as energy surveys (e.g. National Academy of Science. "Energy Survey Methodologies for Developing Countries": 1980), or on specific problems (e.g. J.W. Howe and F. Gulick, "Fuelwoods and Other Renewable Energies in Africa: A Progress Report on the Problem and the Response", Overseas Development Council, Washington D.C., March 1980).

[2] In developed countries one would add research and development activities to this list. Indeed, one of the failures of energy planning in the developed countries (and in the U.S. in particular) has been the lack of attention given to the coherent integration of the components of energy planning.

Certainly other analytical approaches are possible and what is offered here is not presented as being definitive. However, it exemplifies the type of discussion that will be expected of potential bidders in their proposals.

Perhaps the aspect of energy planning that has received least attention is the process by which general policy recommendations can be translated into specific portfolios of government and private sector actions. It is, for example, very easy to identify conservation in the industrial sector, or the use of solar resources for hot water heaters, or even the need to adjust price structure for petroleum products, as the general directions of policy. It is far more difficult to identify portfolios of specific projects, such as what investments need to be made, exactly how much should prices be adjusted, and precisely what design of solar hot water heater should be used in precisely what application.

Figure 1 sets forth the general dimensions of the planning process. One should differentiate in particular between macro analysis which is focussed on supply/demand balance at the national scale, and micro-analysis which is focussed on detailed engineering and economic calculations for small groups of technology/application pairs. At the macro level one is interested above all in macroeconomic impacts of energy strategies: the investment requirements, the level of oil imports and foreign exchange, etc. At the micro level one is interested in rates of return and revenue requirements, in the applicability of the technology to local conditions, and so forth. Obviously the two levels of analysis are interrelated, the one feeding back to the other in an iterative process. Through data collection efforts and field demonstrations (and in developed countries through research and development efforts) the precision of the analysis improves to the point at which policy options, each associated with a specific set of macro and microeconomic impacts, can be selected.[3]

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[3] Macro and micro economic impacts are used in their broadest sense here to include social, manpower and environmental criteria as well as the more narrowly focussed economic criteria such as investment feasibility and requirements, rate of return, etc.

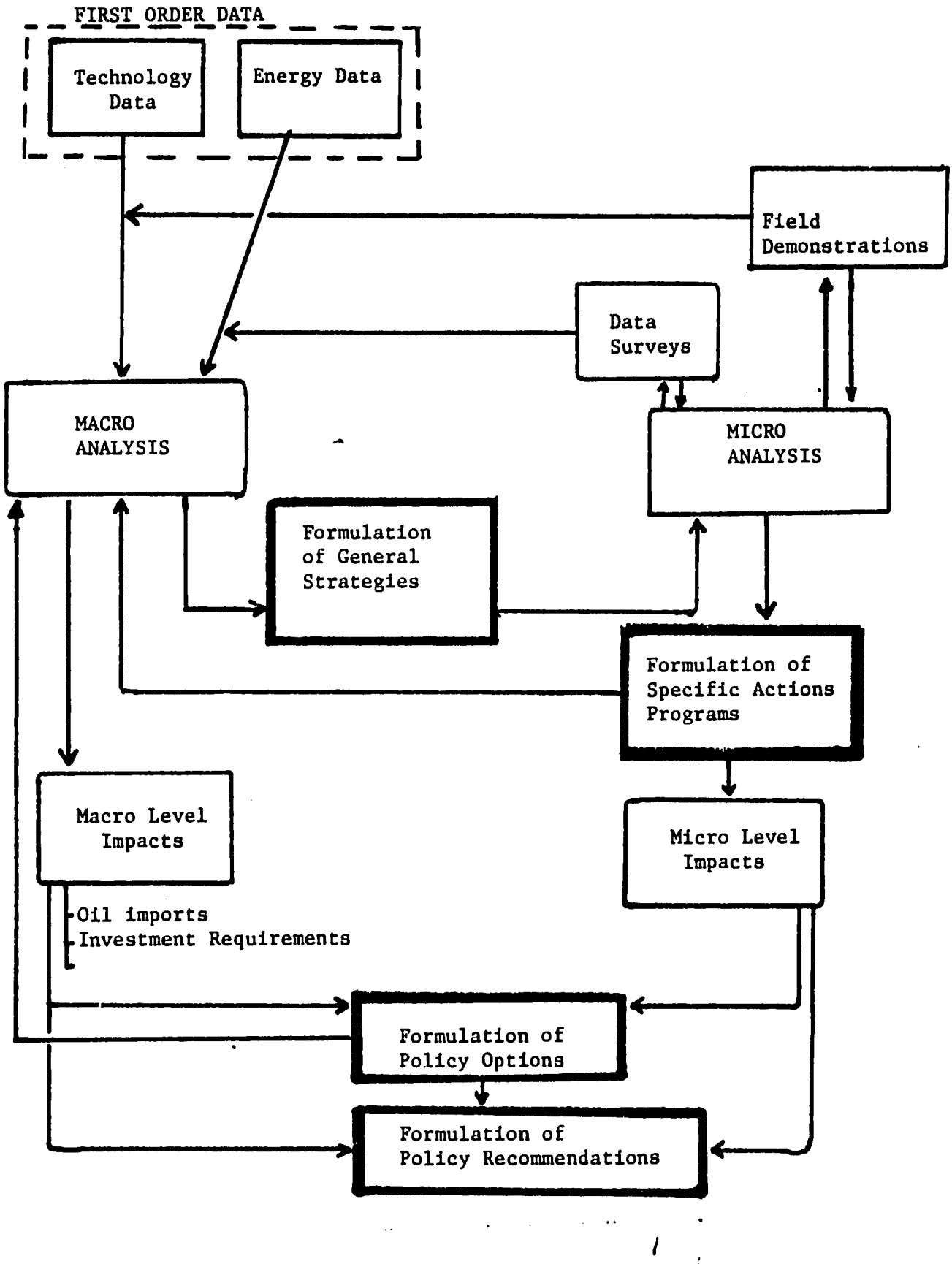

Figure 1: A FRAMEWORK FOR ENERGY PLANNING

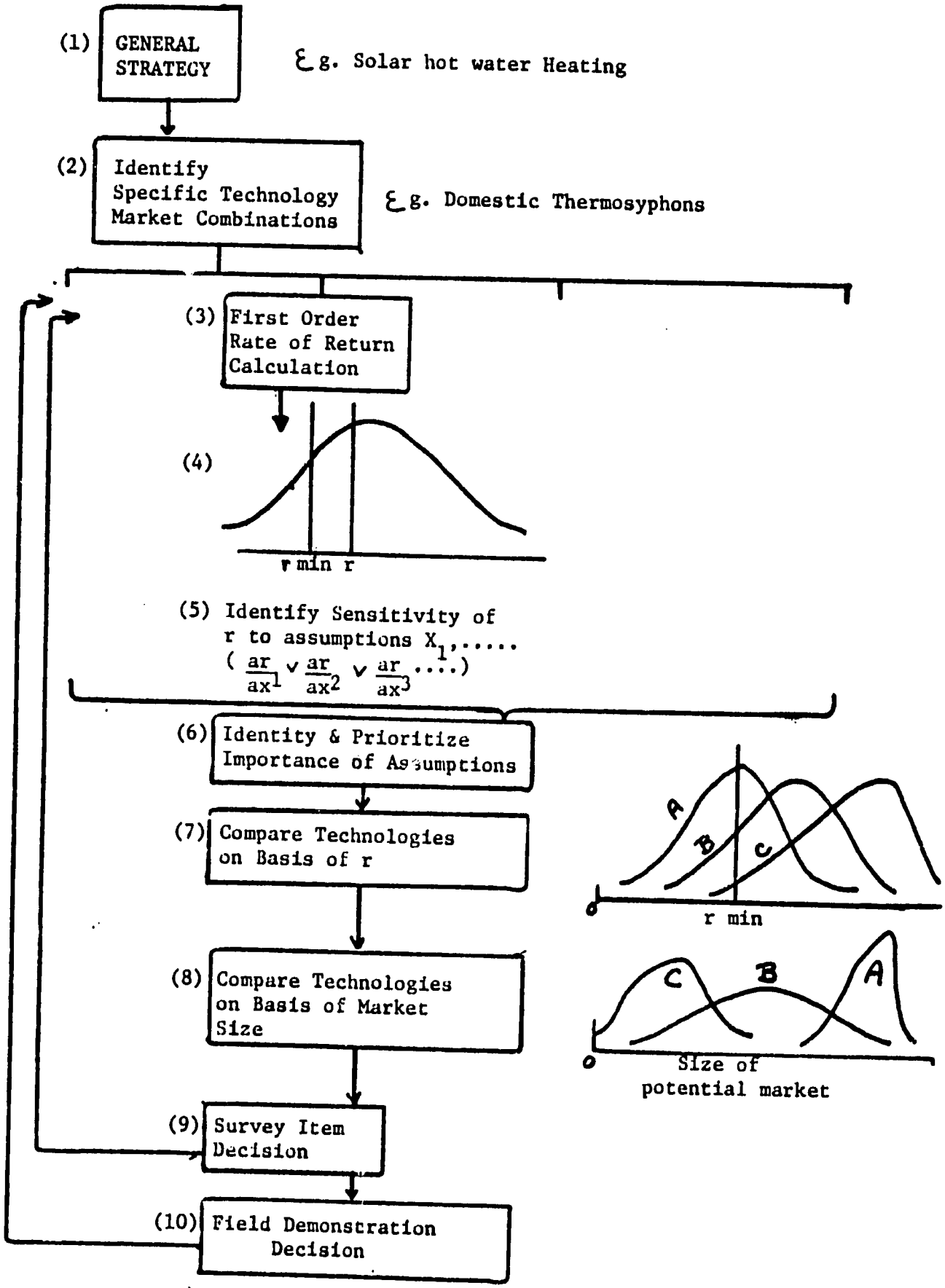

Figure 2: MICROANALYSIS: THE GENERAL FRAMEWORK

Figure 2 elaborates the microeconomic analysis. The fundamental notion here is that of uncertainty. No parameter is ever known with complete certainty. The point of the analysis, therefore, is to reduce the variability of an initial rate of return calculation (step 3) to the point at which the probability of an unsound investment decision, as it might be imposed by a potential lending institution, is recuced to acceptible levels. Having once made the initial calculation, the next step is to identify the sensitivity of the calculation to input assumptions. Alternative portfolios of technologies can then be compared on the basis of rate of return (step 7) and on the basis of the size of the potential market application (step 8), which in turn allows decisions to be made as to which technologies should be tested in the field and which items of data should be collected through field surveys.

The most important point here is that data should not be collected just for the sake of collecting data, since that would require that one collect all data, for which sufficient resources are hardly ever available. The essence of the analytical approach is the prioritization of alternatives such that scarce resources available to the planning entity (in this case the limited resources of the AID and GOT contributions) are utilized to best effect. Moreover, the relationship between analysis and data collection is the key contribution of the AID funded contractor, given that the problem is not the ability to collect the data itself as much as the ability to identify what items of data are needed to improve planning decisions.

Figure 3 sketches the process in a more specific way. Assume for illustrative purposes that only two parameters determine the rate of return for solar heaters in luxury hotel applications the installed cost per sq. ft. of collector (which requires field testing to determine it precisely for Tunisian conditions) and the per-guest consumption of hot water. (Obviously in practice, total consumption is insufficient one would need a breakdown between kitchen, laundry and guest use in order to size storage, solar collectors, and piping needs.) The problem is essentially a stochastic one wherein no number is known with certainty. The analytical objective is to reduce the uncertainty of the calculation to the point at which the probability of making an unsound investment decision is reduced to reasonable limits. If the minimum rate of return required is r min, then one would require that the probability of a rate of return less than r min. be kept to some level, P.

$C_1 \pm g_1$ (e.g. collector cost)

$D_1 \pm h_1$ (e.g. gal/guest/day)

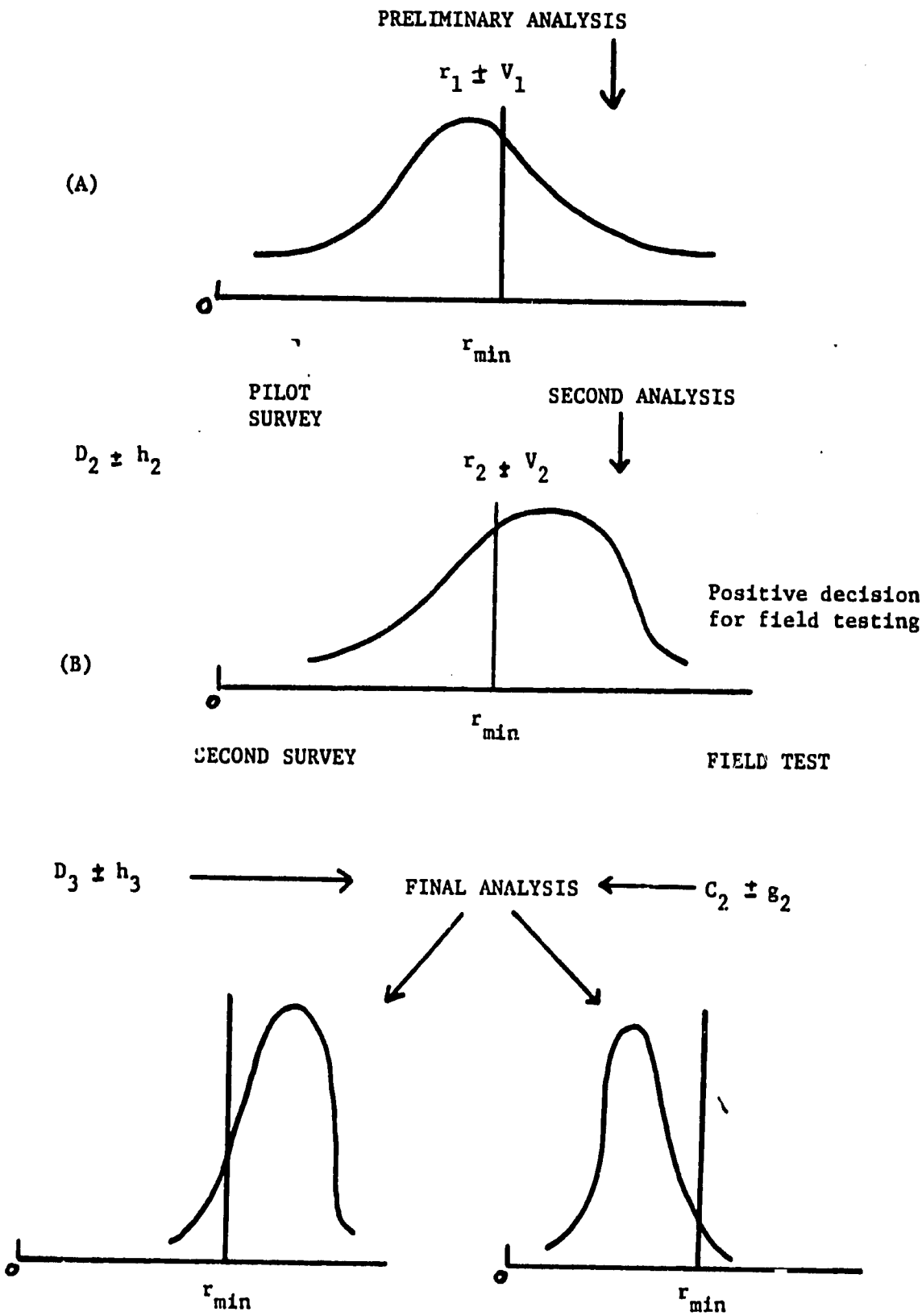

FIGURE 3: FIELD TESTING AND SURVEY DECISIONS

Return then to Figure 3. Initially we compute a first estimate of rate of return, r_1, with variance V_1, based on first estimates of collector cost $C_1 \pm g_1$ and per capita consumption $D_1 \pm h_1$. Suppose r_1 plots as shown on curve (A) of Figure 3. Such a result would indicate that rates of return would be expected to be positive, but only under few conditions exceed r_{min}. However, it would be reasonable to include per capita consumption in the pilot end-use survey to get better estimates and to narrow the range of uncertainty before a decision for field testing is made. The pilot survey result would yield a second estimate, almost certainly of lower variance than the initial estimate (which was probably made on the basis of extrapolations from other countries). Thus, a reanalysis might yield the result indicated on curve (B). At this point a field test would be indicated, as well as a further reduction of variance by inclusion of the per capita consumption item in the full end-use survey. The desired end-result is depicted on curve (C).

3. A Sample Calculation

The calculations presented here are purely for illustrative purposes and were made without benefit of programmable calculator or computer programs for calculating discounted cash-flow rates of return, as will be expected of the contractor. Nor were the calculations made with the benefit of other reference materials, expected to be supplied by the contractor. Nevertheless, the order of magnitude computation does suggest a positive rate of return and a reasonable expectation of financial feasibility. The contractor would also be expected to develop full calculations of uncertainty ranges, again omitted here for simplicity.

(i) Fuel Savings Due to Solar Hot Water Heating

Assumption: 60% of fuel oil used by HILTON-TUNIS replaced by solar heater.

Savings compute to:

$$576{,}000 \cdot 0.6 \cdot .85 \cdot 1/1000 \cdot 8 \cdot 35 \doteq 82{,}253$$

$$\frac{\text{liters}}{\text{Yr}} \quad \frac{\text{Kg}}{\text{liters}} \quad \frac{\text{Tep}}{\text{kg}} \quad \frac{\text{bbl}}{\text{Tep}} \quad \frac{\$}{\text{bbl}} \quad \frac{\$}{\text{Yr}}$$

(ii) Hot Water Consumption

The writer has no information available on actual hot water consumption at the HILTON. However, if we assume that feed water is heated by approximately $100^{\circ F}$ and that the boiler has an efficiency of 65%, then daily water consumption, x, in the hotel is given by

$$x \cdot 100 \cdot 8.4 \cdot 1 \cdot 1/.65 \cdot 1/6\text{X}10^6 \cdot 1/8 \cdot 10^3 \cdot 1/.85 = 576{,}000 \cdot 0.6 \cdot 1/3$$

$$\frac{\text{gal}}{\text{day}} \quad {}^{\circ}\text{F} \quad \frac{\text{lb}}{\text{gal}} \quad \frac{\text{Btu}}{{}^{\circ}\text{F.lb}} \quad \frac{\text{Btu}}{\text{Btu}} \quad \frac{\text{bbl}}{\text{Btu}} \quad \frac{\text{Tep}}{\text{bbl}} \quad \frac{\text{kg}}{\text{Tep}} \quad \frac{1}{\text{kg}} \quad \frac{1}{\text{Yr}} \quad \frac{\text{Yr}}{\text{day}}$$

from which x computes to 29,900 gallons.

(iii) Cost of Solar Collectors

Typical U.S. dimensions are on the order of 40 sq. ft. per 100 gallons per day, at about $ 40/sq. ft. installed. Hence, the collector cost is

$$29{,}900 \cdot 1/100 \cdot 1{,}600 = \$478{,}400$$

$$\frac{\text{gal}}{\text{day}} \quad \frac{100\ \text{gal}}{\text{gal}} \quad \frac{\$ \cdot \text{day}}{100\ \text{gal}} \quad \$$$

(iv) Rate of Return on Investment

Rate of return on investment, r, is given by

$$r = \frac{\text{Fuel savings per year - Operating \& Maintenance Cost}}{\text{Capital Investment}}$$

If operating and maintenance costs are 1% of initial cost, then

$$r = \frac{82,253 - 4784}{478,400} = 16.2\%$$

ANNEX C

PRELIMINARY RENEWABLE ENERGY ASSESSMENT IN TUNISIA

1. INTRODUCTION

Annex C consists of three parts: a) a discussion of a Preliminary Renewable Energy* Assessment which serves as an illustrative example of an analytic methodology for choosing renewable energy systems for field testing, b) brief summaries of a number of plant and renewable energy technology field visits, and c) recommendations for the proposed field tests. Detailed descriptions of the field tests themselves, including budgets and schedules, are contained in Annex D.

a) Preliminary Renewable Energy Assessment in Tunisia

The assessment methodology used is shown in the flow chart in Figure 1. In the limited time available for the preliminary renewable energy assessment it has not been possible to even acquire the data that is required for a complete assessment, let alone initiate a quantitative analysis. The results shown below are illustrative of the logic involved but are dependent on experienced judgment and not on the data and analysis that will be possible with the implementation of the proposed project.

The sources of information used in the assessment include published reports and working papers provided by and discussions with the Government of Tunisia, Ministry of National Economy (GOT -MNE) energy planning team and USAID/Tunis, and other meetings and field visits described in part b) of this Annex.

Any country or regional assessment must take account of the following features:

a) the sectors, applications and associated markets for renewable energy products, b) the infrastructural capabilities

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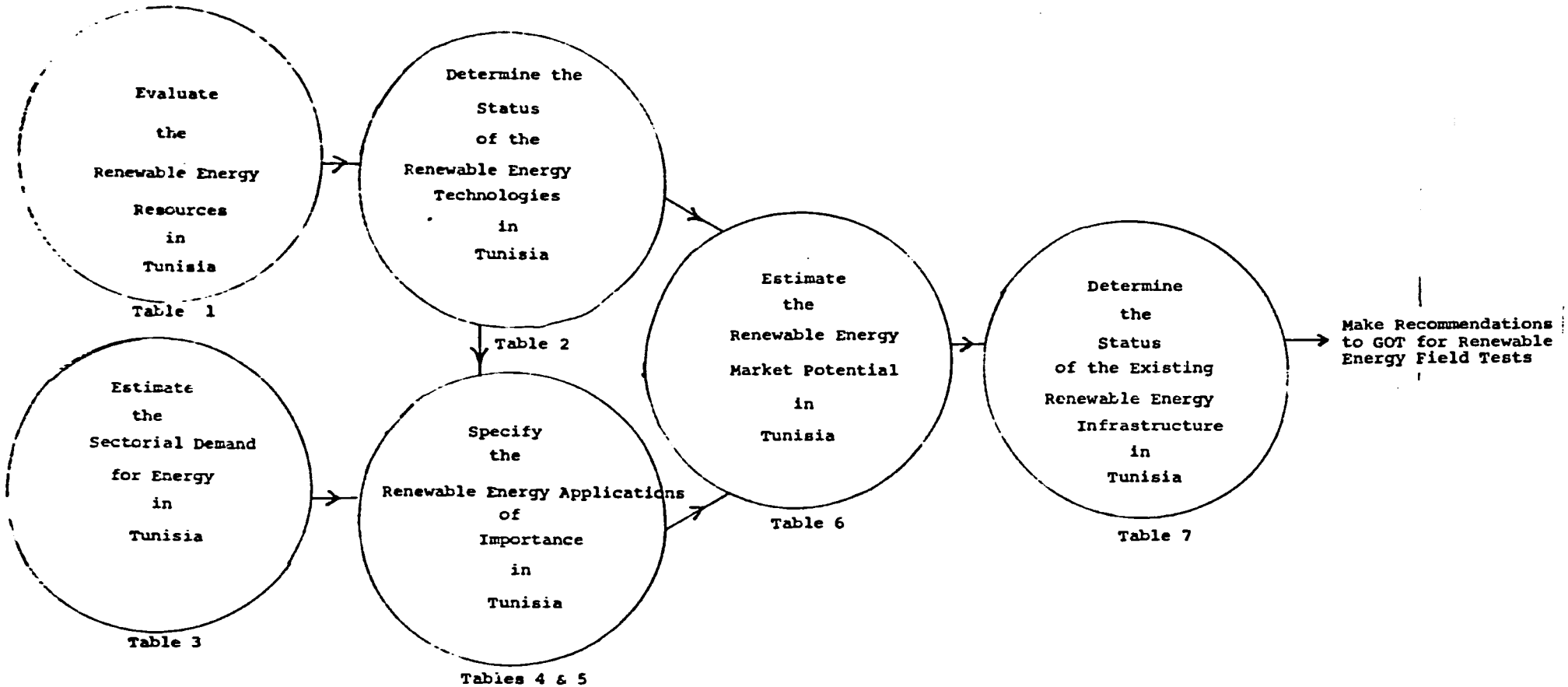
*Renewable energy includes all energy resources which directly or indirectly are dependent on energy from the sun. It includes solar energy itself, the wind's energy due to differential heating of the earth's surface, the growth of living matter, such as forests or agricultural products and hydropower because the hydrologic cycle is driven by the sun. Geothermal energy is not dependent on the sun's energy, but is included here. Certain subtleties in the definition of renewable energy exclude petroleum, coal, or other fossil fuel resources, because of their infinitesimal rates of formation, but include wind energy even though part of its energy is due to the earth's rotation.

RENEWABLE ENERGY ASSESSMENT METHODOLOGY FOR TUNISIA

FIGURE 1



to deliver such products, including manufacturing, installation, service and marketing*, c) the renewable energy resources available and d) the renewable energy technologies themselves and their corresponding products.

In the case of this preliminary assessment there are a number of criteria which were specified by GOT - MNE which played an important role in this assessment:

1) Only commercially available technologies are included, and

2) Only applications for which renewable energy technologies appear to be possibly cost effective are considered relevant.

The first criterion is designed for assessing the impact that existing renewable energy technologies can have in Tunisia. There are uncertainties enough in the market development of existing technologies to warrant, for a preliminary assessment, that the consideration of technologies in the R&D stage be deferred for the future. The second criterion is designed to focus the field tests on those applications that have the greatest near term potential for contributing to energy supply based on their potentially favorable comparative economic advantage relative to alternative sources of supply.

The objective of the preliminary assessment is to provide a judgmental basis for the choice of field tests to be included in the Project Paper. Additional recommendations for possible future field tests are also included for completeness.

The first step was to evaluate the renewable energy resources in Tunisia. Table 1 is a summary of findings. Comments on each resource follow. A 5 point scale has been used for the assessment with 5 the most favorable, 1 the least favorable, and though based on the available data the ratings are highly judgmental.

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*Additional factors such as financing and organization are not included in this assessment. In general financing and organization are company information that may be considered proprietary.

TABLE 1

RENEWABLE ENERGY RESOURCES IN TUNISIA

RESOURCE	PARAMETER	SCALE
Solar Energy	2700 ⟶ 3600 hours of sun each year from Northwest to South Tunisia 148,264 calories/cm^2-year (Tunis); 177.717 calories/cm^2-yr (Kairouan)[1]	4.5
Wind Energy	Gafsa, average speed varies 1.84m/sec(1978) to 2.57m/sec (1976), highest 15m/sec (April 1974) Kaiouran, average annual is 2.93m/sec, highest is 38m/sec (August 1975)[1] (Site specific resource)	3
Biomass:		
Forest Products	466,000 tons potential annual yield (1978)[2] (difficulty of collection) 2,000,000 tons of fuel wood consumed each year[2] (problem of desertification)	3
Agricultural Residues	2,600,000 tons of cereal straw per year[2] 156,000 tons of olive processing residues per year[2] 40,000 tons of grape residues[2] (residues often have alternative uses or are difficult to collect)	2
Livestock Wastes	9,000,000 tons of organic wastes per year[2] (in practice hard to collect) 120,000 tons of chicken droppings per year[3]	2
Urban Wastes	90,000 tons per year (Tunis only)[2]	3
Hydro Potential:	Existing hydro capacity 29MW from 3 small hydro plants; 25MW from Sidi Salem when completed[4]	1
Low-Head Hydro	unknown	
Pumped Storage Sites	Proposed 300MW Kasseb facility	
Mediteranean-Sebkhet Moknine	Sebkhet is within 10 km from Mediteranean and is 20 m below sea level.	
Chotts	Surface areas, chemistry, water depth by season needs to be obtained	4
Geothermal Resources	Potentially significant resource in three areas, no surface steam, some hot water locations	3

1 Institut National de la Meteorologie, S/D de la Meteorologie Economique

2 Gordian Final Report, ETAP (1981)

3 M. Brini, INRAT

4 Tunisia - Renewable Energy, Working Paper

Solar energy was given a 4.5 because of the variation across Tunisia from good to excellent. Available insolation and weather data should be adequate for designing solar flat plate collector systems for domestic, commercial, and institutional water and space heating and for low temperature industrial process heat. Little data was available on cloud cover, and none on the direct vs. diffuse component of insolation that would be relevant for solar concentrating collector work. Degree-day data was also not available.

Wind energy was given a rating of 3. Data reviewed had low annual average wind speeds (below 3m/sec) although the Sahelian coastal zone is considered a good wind regime. It would be useful to have much more data and to have wind speed and energy distribution curves. Wind technology installations require good site measurements as wind power varies with wind speed cubed.

The biomass resource ratings varied from 2 to 3. In general, the issue of using biomass for energy depends on two critical considerations: 1) biomass is a valuable commodity for food or raw material and often even the residues are of economic value for alternative uses (olive processing wastes as animal feed, for example) or for maintaining soil nutrients, etc. and 2) the biomass may be very difficult to collect (such as straw from cereal harvesting or manures from range stock).

Forest products were given a 3 because of the significance of fuelwood usage and the problem of desertification. See also Table 3.

Hydro resources were given a 1 because of the limited hydropotential in Tunisia. This does not mean that there are no suitable mini or micro hydro sites or other potentially useful hydro projects, such as the Mediterrean - Sebkhet Moknine Canal.

The chotts were rated a 4. Potentially these may represent a significant energy resource, but only if there is sufficient water. Data on the size of the resource, geology and chemistry of each chott and the water level during the year are required in order to make more than this preliminary observation.

The geothermal resource was rated a 3, however, because at present there is only experimental drilling.

In this preliminary renewable energy assessment short cuts have been taken in order to proceed as expedititiously as possible. The energy planning and analysis work undertaken under the proposed project itself will be able to use primary and secondary data collection not possible here. In the remaining parts of this assessment concentration has been placed on solar energy, wind energy, biomass, and chotts.

Table 2 presents information on the stage of development for most renewable energy technologies on both a world-wide scale and in Tunisia. Combining the priority renewable energy resources from Table 1 with the GOT-MNE criteria leads to a subset of renewable energy technologies for further analysis. These technologies are:

SOLAR ENERGY

Thermosiphon Solar Water Heaters
Passive Solar Design
Solar Collectors (Flat Plate) Pumped Water and Space Heating

WIND ENERGY

Mechanical Pumping
Small (6KW) Wind Electric Turbines

BIOMASS

Domestic Stoves

Although potentially promising, solar ponds using chotts, is still in the development stage and is not as obviously relevant to this program. The recommendation is made, however, that resource estimation and solar pond experimentation be undertaken in Tunisia. Similar recommendations are made for better resource estimates for both research in alcohol production from agricultural wastes and methane production from manures.

Available data on the sectorial demand for energy is shown in Table 3. Outstanding features of the data are that the predominent use of non-commercial energy (fuel wood) in the domestic sector and that the largest users of electricity are in the industrial, domestic, and tourism sectors. These are therefore the priority sectors for further assessment because a) the magnitude of fuel wood consumption coupled with problems of

TABLE 2

RENEWABLE ENERGY TECHNOLOGIES IN TUNISIA

RENEWABLE ENERGY TECHNOLOGIES GROUPED BY RESOURCE	MOST ADVANCED STAGE IN ANY COUNTRY	CURRENT STAGE IN TUNISIA
Solar Energy		
Thermosiphon Water Heaters	Commercial - Mature	Commercial - Initial
Passive Solar Design	Commercial - Mature	Commercial - Mature[1]
Solar Collectors for General (non-thermosiphon) Applications	Commercial - Maturing	Development[2]
Absorption Air Conditibning	Development	No current work
Photovoltaic Technology	Development - Commercial	Research - Field Tests
Thermal Electric	Development	Research
Wind Energy		
Water pumps	Commercial - Mature	Commercial - Initial
Electric Generators		
Small $\leqslant$ 6 KW	Commercial - Maturing	Demonstration
Medium $\leqslant$ 50 KW	Development	No current work
Large $\geqslant$ 50 KW	Research and Development	No current work
Biomass		
Combustion:		
Domestic stoves - wood or animal waste	Commercial - Mature	Commercial - Mature
Wood Electric Generator	Commercial - Mature	No current work
Wood Chipping Technology	Commercial - Maturing	No current work
Motor fuels from residues (Alcohol Production)	Commercial - Maturing	No current work
Methane Productions from wastes	Commercial - Mature	No current work
Hydro Resources		
Micro Hydro	Commercial - Mature	Feasibility Studies
Chotts		
Salt Ponds	Development	No current work
Geothermal Resources		
Electricity Production	Commercial - Mature	No current work
Heating	Commercial - Mature	No current work

1 Tunisian building practices already incorporate some passive design techniques. Many new techniques and materials could be added

2 Present activity concentrates on use of collectors for thermosiphon systems only

TABLE 3

SECTORIAL DEMAND FOR ENERGY IN TUNISIA in 1975*

(10^3 tons petroleum equivalent**)

	ELECTRICITY#	PETROLEUM	GAS	SOLID FUELS	NON-COMMERCIAL	TOTAL
DOMESTIC	18.0	164.2	4.9	------	586.5	773.6
TOURISM	6.6	23	0.9	------	------	30.5
AGRICULTURE	2.7	131.0	---	------	------	133.6
INDUSTRY	56.5	375.2	16.7	98.0	133.0	668.7
COMMERCE	3.9	26.7	2.2	-----	-----	32.8
TRANSPORT	1.9	394.5	----	-----	-----	396.4
OTHERS	8.4	85.5	----	-----	-----	93.9

* Gordian Final Report, ETAP (1981)

** 1 ton petroleum equivalent (TPE) = 10^7 kilocalories

Electricity at the point of end-use is converted at 860 kilocalories per kWh, not the approximately 2580 kilocalories of fossil fuel used per kWh at the power plant.

desertification indicates a major sector for potential renewable energy technologies (in this case, it will be an example of energy conservation, not fuel substitution); and b) electricity use in countries with fossil fuel steam boilers generally presents favorable comparative economics for some renewable energy technologies. We exclude the industrial sector from further analysis here because of the difficulty of identifying specific applications and their corresponding markets. The industrial sector, itself, represents an extremely complex energy use structure and requires a detailed examination of industrial processes. The work of Tunnah et al should be extremely useful in this regard. This short-cut should not be construed to imply that there may not be low temperature process heat requirements in specific industries and at specific sites for which solar technologies may be cost-effective now.

Table 4 presents energy prices in 1978 and the economic competitiveness of domestic solar water heating in that year as determined by ETAP.

As oil was selling on the world market at $ 10 per barrel in 1978, this table is only illustrative of the relative competetiveness of solar hot water systems against varying fuel prices. It is important for future work to reexamine this issue using today's energy and solar system prices.

Table 5 presents the results of matching the priority renewable energy resources and technologies with the priority sectors and specific applications. The evaluation of the cost-competitiveness of the renewable energy technologies is based on experienced judgment rather than on quantitative analysis. The evaluation leads to the following applications of renewable energy technology:

SOLAR ENERGY
- Thermosiphon Solar Water Heaters - domestic water heating
- Solar Collectors - domestic water heating
- Solar Collectors - commercial and institutional water heating

WIND ENERGY
- Mechanical Pumping - rural domestic potable water
  - rural agriculture:
    - Livestock water
    - crop irrigation

TABLE 4

ENERGY PRICES

	1978	Domestic Solar Water Heating Economic Competitiveness in 1978
DOMESTIC FUEL OIL	41 TD*/Ton	very unfavorable
LIQUIFIED PETROLEUM GAS	124.2 TD/Ton	unfavorable
ELECTRICITY:		
Domestic Water Heating	14 Millimes/kWh	unfavorable
Domestic Lighting	41 Millimes/kWh	marginal

*TD = Tunisian Dinar

Source: "Les Perspectives d'utilisation de l'énergie solaire en Tunisie - Le Chauffage Domestique", ETAP (October 1978).

TABLE 5

RENEWABLE TECHNOLOGIES AND APPLICATIONS - SUITABILITY AND COMPETITIVENESS

RENEWABLE ENERGY TECHNOLOGY Grouped by Resource	APPLICATION AND SECTOR	TECHNICAL SUITABILITY	ECONOMIC COMPETITIVENESS* vs. Fossil-Fired ELECTRICITY	vs. OIL or GAS
SOLAR ENERGY				
Thermosiphon Solar Water Heaters	Domestic Water Heating Single Family Low Density	5	5	3
Solar Collectors (various systems)	Domestic Water & Space Heating	5	4	2
	Commercial Water & Space Heating	5	5	3
	Institutional Water & Space Heating	5	5	3
	Industrial Low Temperature Process Heat	4	4	2
WIND ENERGY				
Wind Pumping	Rural Domestic Potable Water Pumping	5	5 (from Diesel)	4
	Agricultural Water Pumping Livestock water Crop irrigation	5	5 (from Diesel)	4
Wind Electric Generation	Same as Above	5	-4 (from Diesel)	3
	Rural Electrification	4	5 (from Diesel or Batteries)	Not Applicable
BIOMASS				
Wood and Agricultural Waste Combustion	Rural Domestic Heating and Cooking	5	Not Applicable	5

* Based on general observations of World Market Factors

Wind Electric Turbines - electricity for remote installations, isolated villages, islands, isolated farms, and small commercial or industrial sites.

BIOMASS

Domestic stoves - rural domestic heating and cooking

Passive solar design has been omitted from the above table only because of the complexity of assessment for each project; type of project, building material, design consideration, etc. It is considered, however, to be extremely important. Traditional building practices currently in disuse in Tunisia demonstrate many effective examples of passive solar design.

Solar Space Heating has been deemphasized in this preliminary assessment because of the comparatively low load factors. However, more detailed data and analysis should be undertaken for this application.

Table 6 presents data on the size of the domestic market for solar water heating. A further segmentation of the market must be made in order to judge what are the most likely market segments (e.g. single family, low and high density housing units, or by income class or geographical region). Field tests associated with the most likely market segments, assuming there are no current examples of the technology, are the ones most likely to have a maximum impact. Similar market data is required for other sectors and applications.

Table 7 concerns the current renewable energy infrastructure which is assessed for the priority technologies and applications. The status of R & D efforts, marketing, manufacture and installation and service is evaluated on the basis of a review of the literature, discussions and plant and site visits. Details of the plant and site visits are included in Part b) below.

In Part a) of this Annex a renewable energy assessment methodology (Figure 1) has been presented. In addition, using available published materials, discussions with members of the Energy Planning Group of the Ministry of National Economy and plant and site visits, a preliminary renewable energy assessment was made, illustrative of the process to be followed in future energy planning activities.

TABLE 6

RENEWABLE ENERGY MARKETS
(projected as of 1978)

	NUMBER OF HOUSING UNITS	MARKET POTENTIAL
DOMESTIC		
CURRENT Housing with:		
Electricity for Water Heating	32,000	Most Favorable
Town Gas for Water Heating	10,000	Favorable
Domestic Fuel Oil for Water Heating	85,000	Least Favorable
FUTURE Housing (1978-1986) with:		
Bath, but without hot water	61,500	Unfavorable
Bath and hot water	106,000	Most Favorable

Source: "Les Perspectives D'Utilisation de L'Energie Solaire en Tunisie - Le Chauffage Domestique", ETAP (October 1978).

TABLE 7

STATUS OF THE EXISTING RENEWABLE ENERGY INFRASTRUCTURE IN TUNISIA[1]

	DEVELOPMENT	MARKETING	MANUFACTURING CAPACITY	INSTALLATION And SERVICE
SOLAR ENERGY				
Thermosiphon Solar Water Heaters[2]	4	2	2	2
Solar Collectors[2]	4	2	2	2
WIND ENERGY				
Wind Mechanical Pumping[3]	4	2	2	3
Wind Electric Generation[3]	2	1	1	2
BIOMASS				
Wood and Agricultural Waste Combustion	1	1	5	Not Applicable

1 The scale runs from 1 to 5, with 5 corresponding to the most developed status and 1 to the least developed.

2 Based on discussions, review of reports and plant visits to COGELEC (Megrine) and SIAME (Grombalia), 7/7/81

3 Based on discussions and visits to ASDEAR in Tunis (A. Chabbi), 7/3/81, and ASDEAR in Hammamet, 7/7/81

In a step-by-step process, the preliminary assessment evaluated for Tunisia:

- The Renewable Energy Resources.....(Table 1)
- The Renewable Energy Technologies.....(Table 2)
- The Sectorial Demand For Energy.....(Table 3)
- Energy Prices.....(Table 4)
- Renewable Energy Technologies and Their Matching to Applications.....(Table 5)
- The Market for Renewable Energy Technologies....(Table 6)
- The Renewable Energy Infrastructure of Development Marketing, Manufacturing, Installation and Service.....(Table 7)

As a product of this assessment, a priority list of renewable energy technologies and applications for field testing was generated. In addition, recommendations for renewable resource estimation and renewable energy development were also made. The recommendations for the specific field tests, included in this project paper, are presented in Part c).

b) Plant and Renewable Energy Technology Field Visits

The data collection process used in this preliminary renewable energy assessment included discussions with the MNE Energy Planning Group, meetings with Tunisian specialists directly involved with renewable energy, several visits to facilities used for manufacturing renewable energy equipment, and a field visit to a wind pumping installation, currently in progress.

Meetings were held with Mr. Ahmed Marrakchi, Director of the National School of Engineers in Tunis (ENIT), with Mr. Mokdad Maksoudi, head of the New Energy Project at the Tunisian National Gas and Electric Company (STEG), and Mr. Abdelhafidh Chabbi, Director of the Association for Rural Animation and Development (ASDEAR).

Their observation have been included in the preliminary renewable energy assessment, part a) above.

The plant visits to the Industrial Electrical Equipment and Materials Company (SIAME), in Grombalia, the Electrical Enterprises Corporation (COGELEC), in Megrine and ASDEAR in Hammamet, and the visit to wind installations near Nabeul are discussed here because of their direct relationship to the field tests proposed in this Project Paper.

VISIT TO SIAME and Mr. Marzouk Abbès, Head of Maintenance Service in Grombalia

The facility is located in the industrial zone of Grombalia. A couple of solar collectors with thermosiphon storage tanks were exhibited in front of the building. One of them was a small model, and the other a full-size working proto-type. The collector itself is about two square meters with the long axis of the collector horizontal. The insulation used on the piping had an exposed aluminum surface wrapped around the piping. There were about 150 people working at the plant at the time of the visit. However, they are involved in making mechanical and electrical devices for STEG . Most of what was seen involved the manufacture of electric meters. The plastic casings are injection molded at the plant.

There are separate rooms for assembly and testing. The plant was quite busy. The facility for the collector assembly was in another building in the wharehouse area with one small room apparently being used for assembly and parts storage. The room itself was adequate for proto-type assembly. The insulation material used in the solar collectors is cork. These are single glazed collectors with black painted absorber panels.

VISIT TO COGELEC and Mr. Roger Meuchien, Director of the Mégrine Factory

The facility includes a very large manufacturing space, roughly of the order of 3,000 to 4,000 square feet. There is a large amount of metal forming machinery that was being used to produce cable trays for buildings. They have made prototype absorber plates for SIAME under sub-contract, and an absorber plate was available for inspection. It consists of two copper headers spaced about two meters apart with a series of connecting copper tubes with copper fins attached. The headers themselves were about 3/4 of an inch in diameter and the piping was about half an inch. The fins themselves were about two meters long and approximately five inches in width. The fins were mechanically bent around the pipes and were not bonded together. Mr. Meuchien commented upon that himself, indicating that one of the possibilities was to have soldered them. The work going on the day we visited was all in connection with the forming of the cable trays. COGELEC had recently made the absorber plates for a solar energy fair in Sfax, that was held at the end of June, 1981.

V..IT TO ASDEAR and Mr. Abdelhafidh Chabbi, Director of ASDEAR in Hammamet

The wind machine facility is located on a farm in Hammamet. The group consists of an ASDEAR Tunis-based project leader, a machinist experienced particularly with wind mechanical pumps (he put up his own in 1961), and three apprentices. The wind machine design itself is a multi-bladed type developed by the "Technische Hochschule Twente" in the Netherlands. The machine is 16 bladed and of novel design. The group is quite enthusiastic and committed. A field visit was made to a site on a farm near Nabeul where one of their wind machines is being installed. The machinist and his crew of three apprentices busied themselves in climbing up the tower, which they had erected, in order to attach the connecting rods from the wind machine to the well. There is currently an electric pump in the well. ASDEAR is starting another wind machine center in Kairouan.

c) Recommendations for Renewable Energy Field Tests

As a result of the preliminary renewable energy assessment described in Part a), a number of priority renewable energy technologies and applications were identified as follows:

SOLAR ENERGY

Thermosiphon Solar Water Heaters - domestic water heating
Solar Collectors - domestic water heating
Solar Collectors - commercial and institutional water heating

WIND ENERGY

Mechanical Pumping - rural domestic potable water
- rural agriculture:
- livestock water
- crop irrigation

Wind Electric Turbines - electricity for remote installations, isolated villages, islands, or isolated farms, and small commercial or industrial sites.

BIOMASS

Domestic Stoves - rural domestic heating and cooking

Two of the field test projects, solar water heating for institutions, and wind electric applications, were chosen explicitly by the Energy Planning Group and represent a significant and appropriate extension of existing Tunisian renewable energy experience. An organization's commitment is as important as rational analysis to the success of field tests, and the proposed projects are supported by both. A similar conclusion holds for domestic stoves because of the importance of more efficient fuel wood utilization and the continuing problem of desertification.

Domestic water heating has not been recommended for field testing under this project because of available Tunisian experience with this application. At present, however, there is a need for both updated analysis of domestic solar water heating's cost competitiveness and for market research. Wind mechanical pumping, too, has not been recommended for field testing because of Tunisia's historical experience with this application and because current efforts by ASDEAR make it of lower priority. However, both domestic solar hot water heating and wind water pumping require a combination of capital for manufacturing capacity and an active government information or extension program in order to get them into widespread use.

ANNEX D

RENEWABLE ENERGY DEMONSTRATION PROJECTS

SOLAR WATER HEATING PROJECT

OBJECTIVES

1. To assess the potential contribution that solar water heating in institutions (hotels, hospitals, etc.) could make in Tunisia.

2. To obtain field data on costs and performance of, and on energy savings from solar water heating in hotels, hospitals, and other institutions necessary for energy planning.

PROJECT SUMMARY

This project is designed to evaluate the cost-effectiveness of solar water heating for institutional buildings, such as hotels, hospitals and schools. It is intended to the fullest extent possible to use current Tunisian solar collector designs and manufacturing capability. The project, for its first year alone, extends current Tunisian collector manufacturing plans for 1982 by a factor of three. It is likely that the most cost-effective potential applications will be at sites where electricity is being used for water heating. Three solar water heating systems will be designed, installed, and monitored in the first year (Phase I) and an additional three in the second year (Phase II).

PROJECT ELEMENTS

1. Assist the Ministry of National Economy (MNE) in the selection of potential installations.

   Ten hotels, hospitals, or other institutions, will be provisionally selected for the installation of solar water heating systems. This selection will be based on:

   a) their use of electricity for water heating and potential economic savings;

   b) their location in an area with good insolation-- free of excessive cloudiness, fog, etc.;

   c) the representativeness of the potential installations.

2. Visits to potential installations.

The potential installations will be visited by American experts together with Tunisian project staff. The suitability of each potential installation will be assessed in terms of siting, possibility of retrofit,probability of success, etc.

3. Assist MNE in the final selection of sites.
The final three sites for Phase I, probably one hotel, one hospital, and one school, will be chosen. Commitment of the site-owners or managers, representativeness of the installation, etc. will be taken into account in the final selection.

4. Provide technical assistance for the evaluation of the current SIAME solar collector design and its suitability for institutional applications. Make recommendations to the MNE based on the evaluation.

5. Assist MNE in the design of the solar water heating systems. Different designs, such as multi-unit thermosiphon systems as well as circulating systems with pumps, will be designed by MNE staff with the assistance of the contractor. Detailed specifications will be drawn up and components ordered. Wherever possible, Tunisian components will be used. The specifications will include all monitoring equipment and instrumentation.

6. Provide technical assistance for increasing the solar collector manufacturing capability required for this project.

7. Assist MNE in the installation of the solar water heating systems. The contractor will provide technical support for the installations.

8. Assist MNE in the monitoring of the solar system performance, water heating load, and site insolation and weather (if necessary).

9. Assist MNE in the analysis of the results of the project, including technical, economic, and market related factors. Make recommendations for the site-selection process in the second year.

SECOND YEAR

10-18 The same project elements as in the First Year are repeated, for an additional three sites, incorporating the experience of the first year.

THIRD YEAR

19 Provide continued technical assistance for both the solar collector design and manufacturing processes

20 Assist MNE in the monitoring and analysis of the project.

SOLAR WATER HEATING PROJECT

I. MANPOWER (WEEKS)

FIRST YEAR - PHASE I (First 3 Systems)	Contractor				GOT
	SSD*	MR*	IS*	OMS*	
1. Preliminary Site Selection	2	2			8
2. Preliminary Site Visits	3				6
3. Final Selection of 3 sites	1				3
4. Technical Assistance - Solar Collector Design	4				
5. Design of 3 Solar Systems	12		2		36
6. Technical Assistance - Solar Collector Manufacturing				8	
7. Installation of 3 Solar Systems	12				48
8. Monitoring			2		16
9. Analysis of Results	2	2			24
TOTAL (weeks)	52				141

* SSD= Solar System Designer/Engineer
MR = Market Researcher
IS = Instrumentation Specialist
OMS= Operations Management Specialist

SOLAR WATER HEATING PROJECT (cont.)

SECOND YEAR - PHASE II (Second 3 Systems)	Contractor				GOT
	SSD*	MR*	IS*	OMS*	
10. Preliminary Site Selection					
11. Preliminary Site Visits					
12. Final Selection of 3 sites					
13. Technical Assistance - Solar Collector Design					
14. Design of 3 Solar Systems					
15. Technical Assistance - Solar Collector Manufacturing					
16. Installation of 3 Solar Systems					
17. Monitoring					
18. Analysis of Results					
TOTAL (weeks)	34				102**

** Assuming approximately 1/3 time is saved on site visits, and installation, due to experience.

THIRD YEAR	Contractor	GOT
19. Continued Technical Assisstance for Solar Design and Manufacture	6	-
20. Continued Monitoring and Analysis, including Market Research	4	36
TOTAL (weeks)	10	36

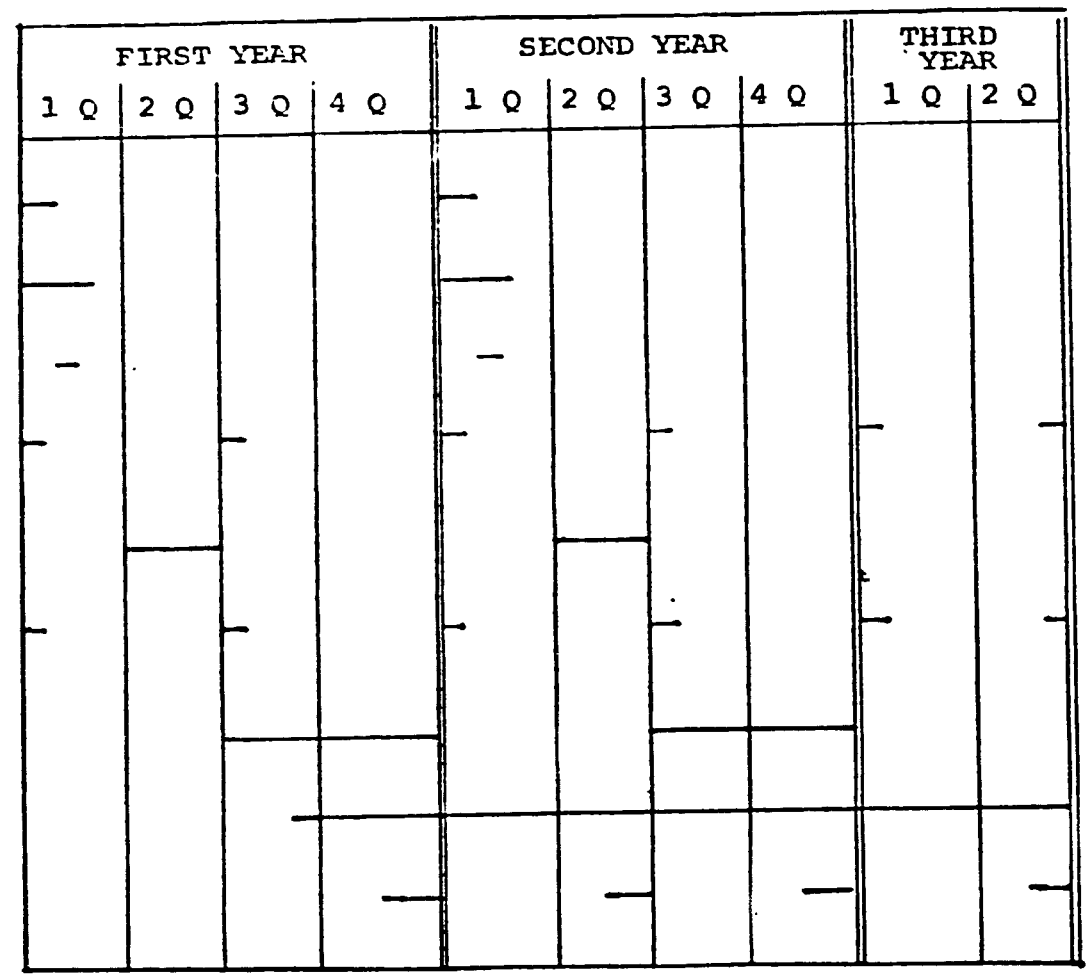
SOLAR WATER HEATING PROJECT

II. HARDWARE

			Contractor	GOT
CONTROL SYSTEMS	6 @ US $ 5,000		US $ 30,000	---
MEASURING SYSTEMS	6 @ US $ 9,000		US $ 27,000	✓
CIRCULATION PUMPS VALVES	6 @ US $ 3,000		US $ 9,000	✓
COLLECTORS	$1200m^2$		---	✓
MOUNTING RACKS			---	✓
PIPING			---	✓
FOUNDATIONS			---	✓
TANKS			---	✓
		TOTAL US $	66,000	

SOLAR WATER HEATING PROJECT

III. SCHEDULE



1. Preliminary Site Selection
2. Preliminary Site Visits
3. Final Selection
4. Technical Assistance - Solar Collector Design
5. Design of Solar Systems
6. Technical Assistance - Solar Collector Manufacturing
7. Installation of Solar Systems
8. Monitoring
9. Analysis of Results

WIND ELECTRIC PROJECT

OBJECTIVES

1. To assess the potential contribution the Wind Electric Conversion Systems (WECS) could make in Tunisia.

2. To obtain field data for costs and performance of and energy savings from WECS, as required for energy planning.

3. To examine the technical and operational problems associated with WECS interconnection to the electric grid.

PROJECT SUMMARY

This project is designed to support the on-going wind energy assessment by providing the field-related data necessary to analyze the potential WECS contribution in Tunisia. Commercially available small ($\leq$ 6kW) wind electric turbines will be installed at four sites chosen as potentially cost-effective. The sites will be chosen for their representativeness and it is likely that these sites will be rural, non-grid-connected villages or isolated farms. Islands too, may be candidate sites. Such sites with either diesel generated electricity or battery supplied electricity have been in other countries the most potentially cost-effective sites. It is anticipated that the WECS systems for these four sites will consist of a) one very small WECS (a few hundred Watts) for battery charging for a clinic or village TV, b) two small WECS (3 to 6 kW) for rural electrification, water pumping, etc. (one of which will be installed with battery storage, the other of which will act in a fuel saver mode, connected to a small diesel generator), and c) a medium (25 kW to 40 kW) wind electric turbine to be interconnected to the electric grid. This machine may supply part of a large village load and will be used to examine directly the technical issues involved with interconnection to the grid.

PROJECT ELEMENTS

1. Review available wind-speed and duration data and make recommendations to the MNE on data requirements and their measurement for the on-going wind energy asessment.

2. Assist MNE in identifying preliminary sites, which will be chosen for their wind potential, representativeness of the

potential application, and for their potential cost-effectiveness. Ten preliminary sites will be selected.

3. Assist MNE in the field measurement of wind-speed and duration at the preliminary sites. Three months of wind measurements should be taken and correlations with the closest airport or other data sources should be examined in order to estimate annual wind energy potential.

4. Assist MNE in the analysis of the correlations at each site between the preliminary site wind measurements and the closest airport or other wind data sources.

5. Assist MNE in its performance of socio-economic and market research for the preliminary sites. This will include determining electric loads at the site (size and timing), availability of local assistance, acceptability of new technologies, etc.

6. Assist MNE in the final selection of sites. Actual field sites will require a matching of the wind resources to load requirements and to the commercial availability of an appropriate machine.

7. Assist MNE in WECS system design, final specifications and ordering. It is not intended that the contractor alone design the wind systems and specify components, but that he assist the MNE in the process so that a team of Tunisian wind electric engineers can be developed. System design will seek maximum similarity to systems possible with local manufacture.

8. Assist MNE in the installation of the WECS. The contractor will provide an experienced WECS installer to work with MNE in the installations.

9. Assist in monitoring WECS performance at the sites. The contractor will provide technical assistance and be available on an on-call basis; however, the monitoring itself will be done by MNE. Continuing socio-economic and market research will also be performed.

10. Assist MNE in analyzing results from the projects on WECS costs, performance, savings, attitudes of users, etc. Make recommendations on local manufacture of WECS equipment.

WIND ELECTRIC PROJECT

I. MANPOWER (WEEKS)

FIRST YEAR

	Contractor				GOT
	WD*	IS/WRS*	WI*	MR*	
1. Wind Energy Review	2				8
2. Preliminary Site Identification				2	4
3. Short-term Wind Measurements		16			48
4. Analysis of Correlations		4			16
5. Socio-economic and Market Research				4	10
6. Final Selection	2				8
7. WECS System Design	8				30
8. WECS Installation			12		38
9. WECS Monitoring		4			16
10. Analysis of Results	2			2	16
TOTALS (WEEKS)	58				194

*WD = Wind System Designer/Engineer

*IS/WRS = Instrumentation Specialist/ Wind Resource Specialist

*WI = Wind System Installers

*MR = Market Researcher.

WIND ELECTRIC PROJECT (cont.)

SECOND YEAR	Contractor	GOT
11. Complete Installations	4	16
12. Continued Monitoring and Analysis, including Market Research	4	12
13. Technical Assistance - WECS Design and Manufacturing	4	-
TOTALS (weeks)	12	28

THIRD YEAR	Contractor	GOT
14. Continued Monitoring and Analysis, including Market Research	4	12
15. Technical Assistance - WECS Design and Manufacturing	4	--
TOTALS (weeks)	8	12

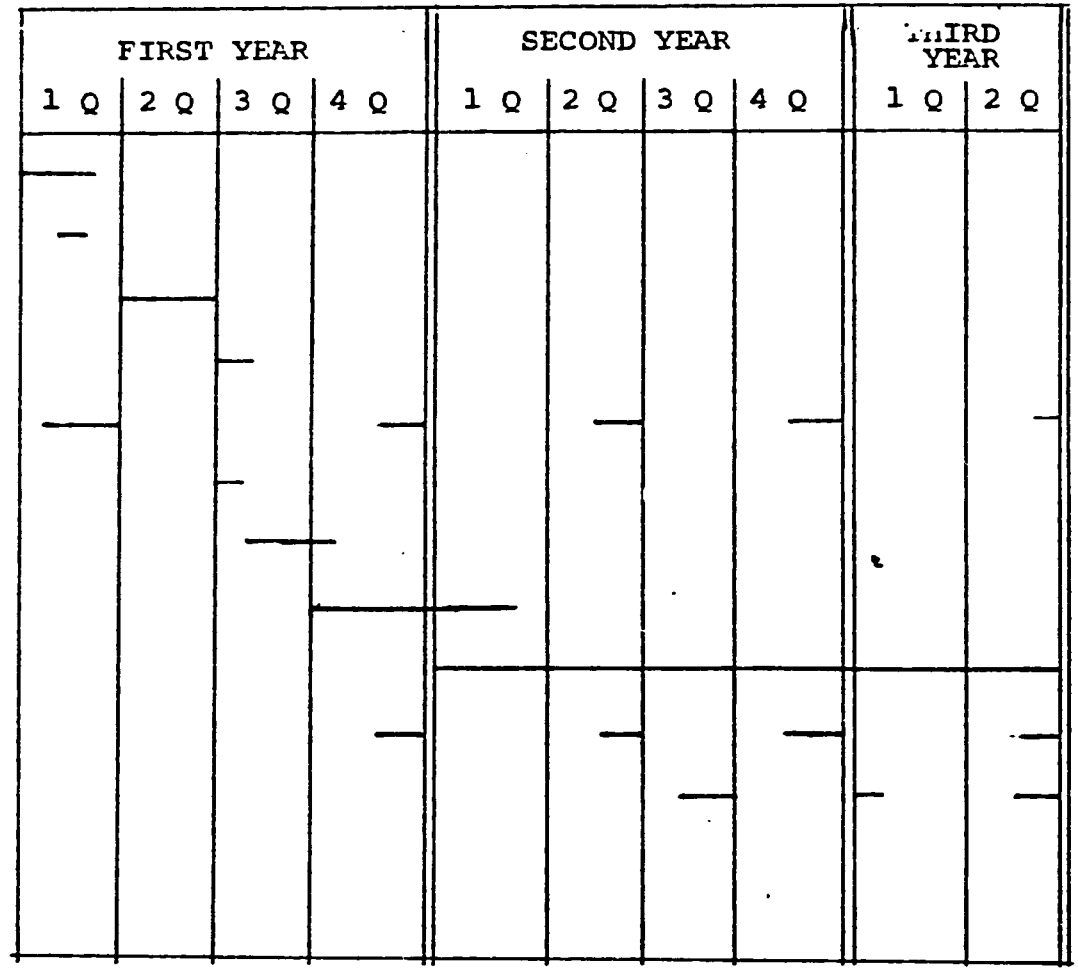
WIND ELECTRIC PROJECT

II. HARDWARE

	USAID	GOT
1 Very Small WECS (< 1 kW)	US $ 2,000	-
2 Small WECS (≤ 6 kW)	8,000	-
1 Medium WECS (25 - 40 kW)	30,000	-
1 Battery Pack	3,000	-
10 Preliminary Site Instrumentation Packages	10,000	-
4 Monitoring and Recording Instrument Packages	28,000	-
14 Towers	—	✓
4 Foundations	—	✓
Cables and Wiring	—	✓
TOTAL	US $ 81,000	

WIND ELECTRIC PROJECT

III. SCHEDULE



DOMESTIC STOVE PROJECT

OBJECTIVES

1. To assess the potential contribution that more efficient wood and agricultural waste stoves could make in Tunisia.

2. To obtain the actual field data for costs and performance of and energy savings from more efficient domestic stoves as required for energy planning.

PROJECT SUMMARY

A field test project will be undertaken to assist MNE in the assessment of the fuel wood and agricultural waste use by regions in Tunisia and to develop the data on cost and performance of and energy savings from more efficient domestic stoves as useful for energy planning purposes. Non-commercial fuel wood use in the domestic sector has been estimated to be the largest sectorial demand in the Tunisian energy system. Technical assistance will be provided on the design and manufacture of more efficient wood and agricultural waste stoves, consistent with regional fuel gathering practices and local stove manufacture capability.

PROJECT ELEMENTS

1. Assist MNE in the questionnaire and sampling design for the collection of data on regional wood and waste burning practices, including a) types of wood or other plant materials used, b) wood gathering practices, c) types of stoves used, and d) sources of stove supply. This activity will be integrated with the survey of domestic energy use to be carried out under another aspect of the proposed project.

2. Assist MNE in the analysis of the data and make recommendations by region as to more efficient domestic stove designs and other activities that could lead to more efficient utilization of fuel wood and agricultural wastes.

3. Provide technical assistance to MNE and its designated organizations in the manufacture of more efficient domestic stoves, consistent with regional fuel gathering practices and local manufacture capability. This technical assistance will be provided over the life of the contract, starting in the last quarter of the First Year. Models recommended will be manufactured locally and installed in field tests to be monitored over the life of the project.

WOOD STOVE PROJECT

I. MANPOWER (WEEKS).

FIRST YEAR

	Contractor	GOT
1. Data Collection	4	8xR*
2. Analysis and Recommendations	4	12
3. Technical Assistance - Domestic stove Manufacture	8	
TOTAL (weeks)	16	12+8R+F**

* R is the number of regions with different fuel gathering practices, ~~wood~~ stove designs, etc.

** F is the time-commitment of GOT field agents.

SECOND YEAR

	Contractor	GOT
4. Technical Assistance - Domestic stove manufacture	5	-

THIRD YEAR

	Contractor	GOT
5. Technical Assistance - Domestic stove manufacture	5	-

DOMESTIC STOVE PROJECT

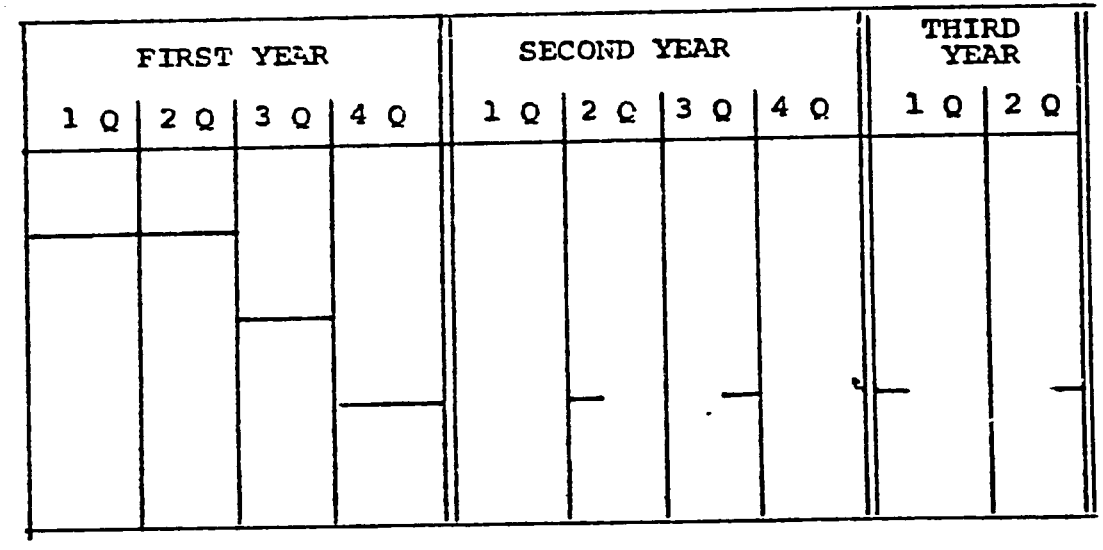
II. HARDWARE

	USAID	GOT
Measuring Instruments for Fuel Efficiency and combustion By-Products @ US $ 1,000 a set	$ 10,000*	-

* Assuming there are 10 regions identified

DOMESTIC STOVE PROJECT

III. SCHEDULE



1. Data Collection
2. Analysis and Recommendations
3. Technical Assistance

ANNEX E

LOGICAL FRAMEWORK

Narrative Summary	Indicators	Puppose to Goal Assumptions
Goal: Effective sectoral and inter-sectoral planning for supply and consumption of enrgy.	1. Establishment of a central energy planning institution or authority and an energy planning unit or authority within each Ministry or appropriate sub-ministerial administrative unit, staffed by a cadre of professionals trained and experienced in energy analysis and planning, both broad spectrum and sector specialists. 2. Ongoing production on a regular basis of detailed and accurate data on current and projected energy demand and on current and potential supply of energy. 3. Establishment and enforcement of national energy pricing and regulatory policies conducive of energy conservation, of distribution of energy for optimal economic growth and public welfare, and of private sector investment in energy supply. 4. National educational programs for energy conservation implemented. 5. Investment decisions made to implement most cost-effective energy technologies and applications	1. GOT supports development of sectoral and inter-sectoral energy planning institutions or units. 2. GOT continues to support research on energy demand and supply options and on the socio-economic impacts of energy pricing and regulatory options. 3. GOT is active in the regulation of energy supply and distribution, in the promotion of energy conservation and in investment in the development of energy supply.

Narrative Summary	Indicators	Ouput to Purpose Assumptions
Purpose: To make available to national planners and decision makers accurate information on energy demand patterns and supply options, interpreted by trained Tunisian professionals with the ability to effectively produce and utilize such information and with access to American institutions and professionals.	1. Energy demand and supply data available on a current basis. 2. Analysis carried out effectively on energy policy and regulatory options. 3. Data collection, analysis and energy planning carried out in each of the major energy consuming sectors and at an intersectoral planning level by personnel trained in data collection and in analytical methods. 4. Energy library accessible and continuing to acquire documents on a regular basis	1. Personnel trained continue to work in the energy sector. 2. GOT makes adequate resources available to staff energy analytical units and to continue to update energy data on a regular basis. 3. GOT continues to fund acquisition of data from abroad through the energy library.

Outputs	Indicators	Input to Output Assumptions
1. Personnel trained and experienced in collection and analysis of energy supply and demand data, in planning for energy supply, and in the development and analysis of policy and regulatory options. 2. Accurate and detailed data on energy consumption in the household, institutional and commercial sectors and on renewable energy supply options. 3. Energy library augmented within the Ministry of National Economy with an adequate selection of documents and periodicals for planning and policy formulation purposes.	1.a. Generalists and sector specialists returned from short term specialized training and orientation in the U.S. in energy analysis and planning. 1.b. GOT personnel trained on-the-job in data collection and analysis in the household, commercial and institutional energy consumption sectors continue to collect and analyze data. 2.a. Studies completed and current data available on patterns of energy use, price elasticity of demand, and potential for energy	1. A suitable American firm or institution is available to contract for implementation of the project within time and budgetary constraints. 2. GOT negotiates and administers a contract with an American firm or institution to implement the project. 3. GOT provides adequate personnel, material and administrative support to all studies and to field demonstration projects. 4. GOT provides appropriate personnel from within each energy consumption sector and from the central energy planning unit for on-the-job training in the U.S.

Indicators	Input to Ouput Assumptions
Consumption in the household, commercial and institutional sectors.	5. GOT funds adequate physical facility and staff for operation of the energy library within the Ministry of National Economy or STEG.
2.b. Short term studies completed on cost of, applicability of and supply potential from renewable energy technologies.	
2.c. Field demonstrations mounted of renewable energy supply technologies with monitoring data collected and analyzed for cost and performance.	
2.d. Analysis completed of feasibility of local manufacture of renewable energy technologies and assistance given in product and production process design for selected technologies.	
2.e. Detailed and accurate data available, on a comparative basis, of cost, performance and externalities of all feasible energy technologies, particularly including renewable energy.	
3. Energy library set up and accessible, with an established proceedure for continuing acquisition.	

Ibputs: Total U.S. Contribution: US $ 1,300,000, consisting of contract technical services, short term training in the U.S., equipment for field testing and demonstration, and library materials.

Total GOT contribution: US $ 1,600,000.00 consisting of counterpart personnel for on-the-job training through participation in studies and analysis; major field survey for primary data collecteon, local manufacture or purchase and installation and maintenance of equipment for field tests and demonstrations of renewable energy technologies, international travel for U.S. training, and continued general support and document acquisition for the energy library.

ANNEX F

LETTER OF REQUEST

FROM THE GOVERNMENT

OF TUNISIA

PUBLIQUE TUNISIENNE

MINISTERE
L'ECONOMIE NATIONALE

CAB/ N° KR/SF. 12 67

Rec'd CDHC 3/19/81

664-0326

Tunis, le 17 MARS 1981

DIR	INFO
DIR ✓	
PLR	
ADM	
PROG ✓	
TNG	
PRC	
CONT ✓	
HRN	
S&T ✓	
F&A	
RD	
FFP	
RLA ✓	
KHUDO	
F.C.	
[illegible]	
FOL	
ECON ✓	

A L'attention de Monsieur Richard STEVENSON
US - AID
Avenue de la Liberté

TUNIS
(TUNISIE)

S&T 4/1 [illegible]

included in PID for 664-0326

OBJET : Assistance US-AID
Energies renouvelables
Phase II.

Messieurs,

Nous avons l'honneur de vous confirmer l'intérêt du Ministère de l'Economie Nationale quant à la poursuite de la coopération avec l'US-AID dans le domaine énergétique.

Dans le cadre d'une 2ème phase concernant les énergies renouvelables, nous souhaiterions bénéficier de votre assistance sur les questions suivantes :

1.- Réalisation d'un nombre suffisant de projets de démonstration solaires et éoliens, en vraie grandeur : l'objectif serait d'une part d'amorcer l'introduction d'énergies renouvelables dans des secteurs où elles peuvent être rapidement opérationnelles au plan technique et profitables au plan économique; et d'autre part d'identifier et de tester les possibilités d'intégration des nouvelles technologies dans l'industrie tunisienne. De tels projets pourraient inclure :

a) des équipements solaires de chauffage d'eau (sanitaire, piscine, etc...) dans des établissements collectifs (hôtels, hôpitaux, lycées);

b) des installations éoliennes en vue de la production d'électricité dans des points géographiquement dispersés et non raccordés au réseau STEG.

Dans les deux cas a) et b) ces opérations permettraient, si la démonstration en question s'avère assez concluante pour mériter d'être généralisée à l'échelle industrielle, d'établir le cadre nécessaire pour promouvoir efficacement telle ou telle application auprès du grand public, qu'il s'agisse des aspects techniques (formation de personnel, encouragement à la création d'entreprises de fabrication, d'installation, d'entretien), commerciaux (prix, financement) règlementaire (incitation, contrôle, fiscalité), etc...

./.

La participation de l'US-AID à cette action pourrait consister à financer l'expertise nécessaire à l'étude et la conception de ces différentes réalisations, ainsi que les avis et conseils à l'industrie locale en phase d'apprentissage, à différents niveaux (fabrication, contrôle de qualité, installation, entretien), de même que l'approvisionnement des équipements qui ne pourraient pas être produits localement dans un délai compatible avec la durée de l'expérience.

2. Le développement du cadre institutionnel national, en vue de renforcer un noyau national de planification et de formulation de politiques énergétiques qui reflètent les données réelles du secteur (nationales et internationales).

La contribution de l'US-AID concernerait ici le financement de stages et séminaires destinés à spécialiser et perfectionner des cadres tunisiens dans ce domaine, notamment par des échanges aussi poussés que possible avec des équipes homologues traitant de problèmes similaires aux USA.

Veuillez agréer, Messieurs, avec tous nos remerciements, l'expression de nos sentiments distingués.-

Kemal REKIK

Chargé de Mission auprès du Ministre
de l'Economie Nationale

ANNEX G

PROJECT IDENTIFICATION DOCUMENT

GUIDANCE CABLE FROM

NEAR EAST ADVISORY COMMITTEE

ACTION: AID-8
INFO: AMB DCM
ECON CHRON/12

DEPARTMENT OF STATE

TELEGRAM

R 200544Z MAY 81
FM SECSTATE WASHDC
TO AMEMBASSY TUNIS 4882
BT
UNCLAS STATE 130943

AIDAC

05818

E.O. 12065: N/A

TAGS:

SUBJECT: PID FOR TUNISIA ENERGY PLANNING PROJECT (0326)
NEAC

1. THE NEAC REVIEWED AND APPROVED SUBJECT PID ON 1 MAY 1981. THE COMMITTEE WAS PLEASED WITH THE OVERALL CLARITY AND CONCISENESS OF THE PID. THE MISSION IS AUTHORIZED TO APPROVE THE PP WITHIN THE NEAC GENERAL GUIDANCE DISCUSSED BELOW:

2. THE NEAC FELT THAT, WHILE ALL PROPOSED PROJECT ELEMENTS ARE DESIRABLE, AID FUNDING LIMITATIONS REQUIRE THAT MISSION SEEK TO FOCUS AID ASSISTANCE, WHILE POTENTIALLY ACTING AS CATALYST FOR OTHER DONOR PARTICIPATION. IN THIS CONNECTION TH ARE A NUMBER OF OPTIONS FOR USAID INVOLVEMENT. NEAC EXPRESSED VIEW THAT IF AID WERE TO BE THE ONLY DONOR, WE SHOULD FOCUS ON THE PLANNING AND TRAINING COMPONENTS, TO IMPROVE GOT ENERGY POLICY/PLANNING CAPABILITY. THIS APPROACH APPEARS MOST DESIRABLE IN VIEW OF PHASE-OUT STRATEGY AND ALLOCATION TO DATE OF APPROXIMATELY DOLS. 600,000 IN AID FUNDS IN SUPPORT OF THIS EFFORT. NEAC ASSUMED THAT OTHER DONORS, PARTICULARLY THE WORLD BANK, WOULD BE MORE EASILY ATTRACTED IF APPROACHED FOR DISCRETE PROJECT ELEMENT, E.G., RENEWABLES DEMONSTRATION COMPONENT.

IF, HOWEVER, OTHER DONOR(S) PREFERRED TO FINANCE PLANNING AND TRAINING ELEMENT, WE WOULD NOT BE AVERSE TO AID'S PICKING UP THE RENEWABLES DEMONSTRATION COMPONENT. IF, AS APPEARS MOST LIKELY, NO OTHER DONOR IS FOUND BUT THE GOT IS PREPARED TO COVER THE REMAINING COST OF THE ENTIRE PROJECT, IT MAY BE APPROPRIATE FOR AID AND THE GOT TO EACH ASSUME COMPLETE FINANCIAL RESPONSIBILITY FOR DISTINCT COMPONENTS. THEREFORE, WE WOULD NOT NECESSARILY EXPECT THAT THE DIVISION OF RESPONSIBILITY BE ON THE BASIS OF FOREIGN EXCHANGE OR LOCAL CURRENCY REQUIREMENTS, BUT RATHER WHATEVER ARRANGEMENT IS MOST LOGICAL AND BENEFICIAL TO BOTH PARTIES, E.G., AID COULD HAVE COMPLETE FINANCIAL RESPONSIBILITY FOR THE PLANNING SEGMENT AND THE GOT COULD FINANCE BOTH FX

ACTION	INFO
DIR	
PER	
EDU	
PROG	
TRC	
PRC	
CONT	
HPN	
S&T	
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RLA	
RHUDO	
P.C.	
EXB/ADMIN	
POL	
DISCO	

AND LOCAL COST FOR RENEWABLES.

3. IN PREPARING PP, MISSION MAY WISH TO EXPAND OR CONTRACT TREATMENT OF VARIOUS ELEMENTS DEPENDING UPON DEGREE OF OTHER DONOR OR GOT INVOLVEMENT ANTICIPATED. NEAC BELIEVED MARKETING TO POTENTIAL DONORS COULD BE STRENGTHENED IF EACH COMPONENT IS COSTED SEPARATELY AND INCLUDES TERMS OF REFERENCE FOR ITS SCOPE OF WORK. THIS IS, HOWEVER, MISSION DECISION DEPENDING ON ARRANGEMENTS IDENTIFIED DURING PP DESIGN.

4. OTHER ISSUES WHICH SHOULD BE ADDRESSED IN THE PP ARE AS FOLLOWS:

A. THE MISSION SHOULD CONSIDER THE NEED FOR A LONG-TERM FIELD COORDINATOR FOR THE PLANNING SUB-PROJECT. SUCH A COORDINATOR, PROVIDED BY THE CONTRACTOR, SELECTED ON A COMPETITIVE BASIS, WOULD FACILITATE EFFECTIVE IMPLEMENTATION OF THE PROJECT.

B. THE PP SHOULD IDENTIFY THE TARGET GROUPS FOR THE PLANNING AND TRAINING PORTIONS OF THE PROJECT AND IDENTIFY HOW THESE ACTIVITIES AFFECT THE ENERGY PLANNING INSTITUTIONALIZATION PROCESS AND DECISION MAKING WITHIN THE GOT. AS INDICATED ABOVE, WE BELIEVE TRAINING SHOULD FOCUS ON IMPROVING GOT POLICY/PLANNING CAPABILITY (AS OPPOSED TO TECHNICAL TRAINING). THIS WOULD EQUIP TRAINEES TO DEAL WITH QUESTIONS OF, INTER ALIA, ENERGY PRICE ELASTICITY, OVERALL SUBSIDY QUESTION AND ISSUES OF ALLOCATION OF SCARCE RESOURCES IN THE ENERGY FIELD.

C. WHAT IS THE ADAPTATION POTENTIAL OF RENEWABLE ENERGY TECHNOLOGIES IN TUNISIA GIVEN THE PRESENT ENERGY SUBSIDIES? WHAT CHANGES MUST BE MADE IN THE SUBSIDY

STRUCTURE BEFORE RENEWABLES ARE FINANCIALLY ACCEPTABLE? THE MISSION SHOULD CONSIDER OBTAINING ASSURANCES OF THESE CHANGES BEFORE OBLIGATING FUNDS FOR RENEWABLES DEMONSTRATIONS.

D. THE MISSION SHOULD RE-EXAMINE THE IMPLEMENTATION PLAN PROPOSED IN THE PID DURING THE PP DEVELOPMENT. IT APPEARS TO BE OVERLY AMBITIOUS.

5. IF THE MISSION HAS OTHER VIEWS THAN THOSE EXPRESSED ABOVE, AID/W WOULD ENCOURAGE A CABLE EXCHANGE BEFORE PP PREPARATION. HAIG

BT
#0943

ANNEX H

ISSUES PAPER

A number of issues were raised by the Near East Advisory Committee (NEAC) in a cable approving and commenting on the Project Identification Document (PID). The issues and their responses, as developed in the Project Paper (PP), are as follows:

Issue A: While all proposed project elements are desirable, the Mission should consider focusing assistance on a reduced number of elements while acting as a catalyst to induce other donors to participate in those elements not funded through this project.

Response: The Mission has been unable to induce other donors to fund on a grant basis any of the proposed elements of this project. Due to the funding limitation the contribution to an energy library has been radically reduced from the level originally proposed and is now proposed as a limited contribution to make English language technical and policy journals and a small number of basic reference works available through an existing staff library within the Ministry of National Economy.

Similarly the AID contribution to the collection and analysis of energy end-use data in the domestic, commercial and institutional sectors is significantly reduced to an advisory technical assistance capacity. The GOT is expected to carry the full manpower burden for collection and analysis, based on the experience gained through the preceding studies of energy use in the industrial, agricultural and transport sectors as carried out under the centrally funded Energy Policy and Planning Project(936-5703).

With the above modifications of two of the five project elements, the Mission believes that all elements of the project as proposed in the PP can be carried out effectively within the available budget, and that deletion of any current project element would leave a critical gap in the future GOT capability to carry out energy planning and effective policy formulation.

Issue B: The Mission should consider the need for a long-term field coordinator for the planning sub-project.

Response: The Mission agrees with the need for such a long-term advisor and has provided for such , as described in the PP on pg. 13, item 2.a), General Energy Planning and on pg. 16, item 3.a) (i), U.S. Inputs, Technical Assistance.

Issue C: The PP should identify the target groups for the planning and training portions of the project and identify how these activities affect the energy planning institutionalization process and decision making within the GOT.

Response: The proposed project focuses both U.S. training and on-the-job training on improving GOT capability in energy planning and policy formulation. Therefore the principal efforts of the resident advisor energy planner and of much of the short-term technical advisors is directed toward those GOT professional staff members who will in the future be called upon to develop energy program and policy options for decision at the ministerial level. The skills developed through this effort will significantly facilitate decision making in that there will be a cadre of professionals in the Ministry of National Economy and elsewhere within the GOT trained and experienced in the collection and analysis of energy data and in the development of policy and program alternatives based on hard data analysis (see the PP, page 3, item 2, The Project).

As for institutionalization of the energy planning process, it is expected that the project will lead to the eventual institutionalization of the Energy Task Force, under the Special Assistant for Energy to the Minister of National Economy, as an energy planning and policy formulation body. The ultimate role of this group will depend on its effectiveness over the life of this project in developing a full range of rational and soundly based energy policy and program options for consideration by the policy makers of the GOT (see the PP, pg. 26, item 3., Continuing Institutional Capability).

Issue D: What is the adaptation potential of renewable energy technologies in Tunisia given the present energy subsidies? What changes must be made in the subsidy structure before renewables are financially acceptable?

Response: The GOT recognizes that the current schedule of energy subsidies is not economically acceptable but it lacks the data on patterns of energy end-use necessary to effectively predict the economic impacts of changing these subsidies (see pg. 2, item A. 1, The Problem).

A major objective of this project will be to develop the data and the skills necessary to formulate energy pricing policies which will reduce those subsidies with minimal impact on the economy. There is no question but, that the GOT intends to reduce the subsidies as much as economic and social impact will allow. It is not feasible, however, to require a certain level of subsidy reduction as a condition precedent of this project as the data is still lacking which will allow policy makers to determine what level and rate of reduction is feasible (see the PP, pg. 26, item D. Economic Analysis).

Concerning the cost effectiveness of renewable energy technologies given existing energy subsidies, the analysis upon which selection of technologies for field testing will be based, will take into account probable future subsidy levels, as the analysis upon which subsidy policy recommendations will be based progresses over the course of the project (see PP, ANNEX B: Analytical Framework).

Concerning the three technologies already chosen for field testing, one is more efficient combustion designs for domestic stoves which is a conservation rather than a substitution issue whose cost effectiveness is largely independent of energy subsidies unless the subsidies were to be increased. The next, wind electric systems, appear on the basis of preliminary analysis to be cost-competetive for remote applications with electric grid extension at current electricity prices (which are not subsidized) and are probably cost-effective in a fuel saver mode integrated with the grid even at current subsidized fuel prices. Solar hot water heating for institutions is estimated to be cost-competitive with electric hot water heating at current electricity prices and would be competitive with hot water heating by fuel oil at world market fuel prices. A major objective of the field tests is to determine the local costs of manufacture and operation in order to be able to compute the market price of fuel oil at which the renewable energy technology can penetrate a significant market. It is clear from the level of contribution that the GOT intends to invest in such field tests that they are seriously considering implementing energy pricing policies which will cause this and other renewable energy technologies to become cost-effective choices (see PP, pg. 26, item D, Economic Analysis; ANNEX B: Analytical Framework; and ANNEX C: Preliminary Renewable Energy Assessment in Tunisia).

Issue E: The Mission should reexamine the implementation plan proposed in the PID during the PP development.

Response: The implementation plan, in particular the project implementation schedule, has been reexamined and has been found to be unduely optimistic in its estimation of the time frames in which certain functions, notably contracting and fielding of personnel by the contractor, can be accomplished. A new and more conservative schedule is presented on pg. 22 of the PP.

Other issues have been raised within the Mission concerning the proposed project. The issues and their responses, as developed in the PP, are as follows:

Issue F: No permanent organization is being established within the GOT to be given permanent responsibility to do energy planning and to gather primary data on energy use and supply on a regular basis. How can AID be certain that the resources invested in this project will not be wasted?

Response: Decision making authority for energy pricing and the regulation and exploitation of energy in Tunisia is institutionalized in the Cabinet and among several top decision makers in the GOT, covering several ministries. AID has repeatedly discussed with high level GOT officials the possibility of using this project to establish an energy planning and research institute or to formalize these functions in some other manner so that the provision of research data and planning expertise is assured to top level decision makers on a continuing basis. The GOT has responded by creating an Energy Task Force within the Ministry of National Economy but has cited political problems of the location and domain of such an institute in declining to further institutionalize the process at this time.

It is the judgement of the AID Mission that the best existing potential for ultimate formalization of the energy planning and policy making process lies within the Ministry of National Economy and particularly with the Energy Task Force, and that the best way in which this project can help this group to grow into a more permanent institution is by helping them to produce useful policy option results during the life of this project.

If this evolution does not occur and the Energy Task Force is dissolved after the end of this project, the GOT will still have gained a cadre of trained and experienced energy planners who will either coalesce in another institutional framework or contribute their skills within the several ministries concerned with energy planning, and the data which has been developed will be a substantial contribution to Tunisian development which will generate returns from the first round of energy policy formulation which will more than justify the cost of the project (see PP, pg. 26, item 3, Continuing Institutional Capability, and item D, Economic Analysis).

Issue F: Has the Mission considered recommending to the GOT that they sole-source all or the energy end-use study portion of this project to Ferguson Bryan Assoc. Inc. which is currently carrying ou Study of Energy End-Use in the Industrial, Agricult and Transport Sectors?

Response: The issue has been discussed and concerning sole sourcing of the whole project the possible advantages of economics of scale of personnel and of dealing with a firm which is already present and possesses familiarity with the Tunisian energy setting and some of the organizations to be involved is seen as outweighed by the fact that the energy end-use data collection effort is only a small portion of the larger scope of the project and the firm in question is not known to possess sufficient experience or internal expertise in the other project elements to justify a sole source award.

Award of only the energy end-use study portion of the project on a sole source basis is not feasible because the resident advisor energy planner, judged essential to the project (see Issue B above) is projected to spend a minor but significant portion of his/her time supervising the three energy end-use sector studies. There is not sufficient funds available to allow this long term advisor to be funded wholly by the other project elements and still allow sufficient budget for a contractor to effectively implement a stand alone energy end-use study.

The question of coordination across all six energy end-use sectors which would be accomplished by sole sourcing the project element to Ferguson Bryan Assoc. Inc. is being otherwise accomplished through a host-country personal services contract for a survey specialist who will assure such coordination on behalf of the GOT.

ANNEX I

JUSTIFICATION FOR SECTION 612(b) DETERMINATION:

Recommendation to Purchase Tunisian Dinars with U.S. Dollars

Over the life of the project approximately $1.7 million will be used to support local currency expenditures that the Tunisian government and a U.S. contractor will make for specific items in support of this project. Dollar funds will be used in association with GOT disbursement of Tunisian dinars for the costs of travel, per diem, and shipment of household effects of project consultants, related project support costs such as secretarial and interpreting services, special costs associated with training, in-country seminars and workshops and related miscellaneous costs. The U.S. contractor will purchase with U.S. dollars provided by the project in accordance with procedures prescribed by A.I.D. The contractor will be responsible for expenditures which will be made in accordance with the agreements reached between USAID and the GOT in the project agreement.

One reason for using dollar funds in conjunction with Tunisian dinar costs is that this represents an additional real resource to the Tunisian economy and supports efforts by the Tunisian government to implement new initiatives. Although Tunisia is a near-excess foreign currency country, the amount of U.S.-owned local currency available to A.I.D. is restricted to that which is not allocated for other priority purposes. Accordingly, availability of excess local currency at any point in time can not be predicted. Approximately half of the local currency costs to be financed by A.I.D. under the project are for personnel collaborating under the project.

The Tunisian contribution to this project, $1.6 million equivalent in local currency, is evidence of their support of and interest in this innovative activity.

Given the above considerations and the fact that the Energy Planning Project is fully consistent with the congressional mandate of the Foreign Assistance Act, we have concluded certain local currency project costs should be dollar funded.

ANNEX J: STATUTORY CHECK LIST

Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual funding 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 PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. Continuing Resolution Unnumbered; FAA Sec. 634A; Sec. 653(b).

   (a) Describe how authorizing and appropriations Committees 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)? (a) Congressional Presentation; (b) Yes.

2. FAA Sec. 611(a) (1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, 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? None required.

4. FAA Sec. 611(b); Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973? Not Applicable.

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? Not Applicable.

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. This is a small project which builds on a current A.I.D. - funded project.

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; and (c) encourage development and use of cooperatives, and 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 is aimed at increasing knowledge about energy use and as such will improve technical efficiency of Tunisian economy.

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). Project should indirectly increase U.S. participation in Tunisian energy sector.

9. FAA Sec. 612(b), 636(h); Continuing Resolution Sec. 508. 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 in lieu of dollars. GOT is contributing local currency. 612(b) determination being made to spend U.S. dollars.

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? U.S. owns near-excess Tunisian Dinars. These will not be spent in this project.

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. Continuing Resolution Sec. 522. 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? Not Applicable.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). 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 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? Project designed to assist Tunisia's self-help efforts in energy.

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 (a) extent to which activity is specifically designed to increase productivity and income of rural poor; 103A if for agricultural research, full account shall be taken of the needs of small farmers, and extensive use of field testing to adapt basic research to local conditions shall be made; (b) extent to which assistance is used in coordination with programs carried out under Sec. 104 to help improve nutrition of the people of developing countries through encouragement of increased production of crops with greater nutritional value, improvement of planning, research, and education with respect to nutrition, particularly with reference to improvement and expanded use of indigenously produced foodstuffs; and the undertaking of pilot or demonstration of programs explicitly addressing the problem of malnutrition of poor and vulnerable people; and (c) extent to which activity increases national food security by improving food policies and management and by strengthening national food reserves, with particular concern for the needs of the poor, through measures encouraging domestic production, building national food reserves, expanding available storage facilities, reducing post harvest food losses, and improving food distribution.

(2) [104] for population planning under sec. 104(b) or health under sec. 104(c); if so, (i) 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.

(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; and (ii) extent to which assistance provides advanced education and training of people in developing countries in such disciplines as are required for planning and implementation of public and private development activities.

(4) [106] ISDCA of 1980, Sec. 304 for energy, private voluntary organizations, and selected development activities; if so, extent to which activity is:
(i) (a) concerned with data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production:
(b) facilitative of geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploration for potential oil, natural gas, and coal reserves; and (c) a cooperative program in energy production and conservation through research and development and use of small scale, decentralized, renewable energy sources for rural areas; subsection (a) is mostly at issue for this project.

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

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

(iv) reconstruction after natural or manmade disaster;

(v) for special development problems, 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? (relatively smaller, cost-saving, labor using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor.)

d. <u>FAA Sec. 110(a).</u> 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)? Yes.

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to 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 processes essential to self-government. Use of Project designed to strengthen Tunisia's capacity to manage its energy.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of 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, at a reasonable rate of interest. Not Applicable.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, 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? Not Applicable.

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102? Not Applicable.

b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities? Not Applicable.

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed? Yes.

2. FAA Sec. 604(a). Will all procurement 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 commodities be insured in the United States against marine risk with a company or companies authorized to do a marine insurance business in the U.S.? Does not so discriminate.

4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). 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? (Exception where commodity financed could not be reasonably procured in U.S.) Not Applicable.

5. FAA Sec. 603. Is the shipping excluded from 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?

6. FAA Sec. 621. If technical assistance is financed, to the fullest extent practicable will such assistance, goods and professional and other services be furnished from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs? Yes.

7. 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. carriers will be utilized to the extent such service is available? Yes.

8. Continuing Resolution Sec. 505. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States? It will, if used.

B. Construction

1. FAA Sec. 601(d). If 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 interests? Not Applicable.

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 Applicable.

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million? Not Applicable.

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? Not Applicable.

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international orgnaization, does Controller General have audit rights? Not Applicable.

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? Yes.

4. Continuing Resolution Sec. 514 If participants will be trained in the United States with funds obligated in FY 1981, has it been determined either (a) that such participants will be selected otherwise than by their home governments, or (b) that at least 20% of the FY 1981 fiscal year's funds appropriated for participant training will be for participants selected otherwise than by their home governments? Yes.

5. Will arrangements preclude use of financing:

a. FAA Sec. 104(f). To pay for performance of abortions as a method of family planning or to, motivate or coerce persons to practice abortions; to pay for performance of involuntary sterilization as a method of family planning, 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 provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes.

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

e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained. Yes.

f. Continuing Resolution Sec. 504. To pay pensions, annuities retirement pay, or adjusted service compensation for military personnel? Yes.

g. Continuing Resolution Sec. 506. To pay U.N. assessments, arrearages or dues. Yes.

h. Continuing Resolution Sec. 507. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multilateral organizations for lending.) Yes.

i. Continuing Resolution Sec. 509. To finance the export of nuclear equipment fuel, or technology or to train foreign nationals in nuclear fields? Yes.

j. Continuing Resolution Sec. 510. Will assistance be provided for the purpose of aiding 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? Such assistance is precluded.

k. Continuing Resolution Sec. 516. To be used for publicity or propaganda purposes within U.S. not authorized by Congress? Yes.

ANNEX K

PROJECT COMMITTEES

1. Project Committee

USAID/Tunis Project Committee:

Mr. Richard Stevenson, Science and Technology Officer, Chairman

Ms. Saida Zouiten, Assistant Science and Technology Officer

Mr. William Kaschak, Assistant Program Officer

Mr. Steven Carlson, Regional Legal Advisor

Mr. Said Ben Chouika, Controller (Acting)

Mr. Salah Mahjoub, Assistant Food and Agriculture Officer

Ms. Greta Cherchad, Training Officer

2. Also participating in the design of the project were:

Dr. Peter Meier, Brookhaven National Laboratory

Dr. Lance Heiko, Independent Renewable Energy Consultant

Mr. Kemel Rekik, Special Assistant for Energy, MNE

Mr. Ali Ben Ahmed, ETF, MNE

Mr. Mokhtar Rezgui, ETF, MNE

Mr. Nouri Amar, ETF, MNE

Mr. Mokhdad Maksoudi, STEG, MNE

Mr. Ahmed Ounalli, STEG, MNE

3. Director's Development Assistance Committee

Mr. Martin Dagata, Director, Chairperson

Mr. David Leibson, Assistant Director, Office of Housing (RHUDO/Tunis)

Mr. Edmund Auchter, Program Officer

Mr. Said Ben Chouikha, Controller (Acting)

Mr. John Fliginger, Agriculture Development Officer

Ms. Dorothy Young, General Development Officer

Mr. Buddy Dodson, Food for Peace Officer

Mr. Richard Stevenson, Science and Technology Officer

Ms. Dale Gibb, Health and Family Planning Development Officer

Mr. Anthony Wallace, Economic and Commercial Counsellor, US Embassy/Tunis

Mr. Robert E. Miller, Public Affairs Officer, USICA/Tunis

Mr. Charles Graham, Director, Peace Corps

Mr. Steven Carlson, Regional Legal Advisor

Mr. Robert Parker, Country Director, Catholic Relief Services Tunisia

Mr. Leonard Coppold, Country Director, CARE MEDICO/Tunisia.