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David Doyle
Dick Tubert
Bud Tardiff

ISN
44866

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proc. Human Resources Management

AID'S RENEWABLE ENERGY PROGRAM

IN MOROCCO

SCOPE AND HRM CAPABILITIES

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Gary Thomas
HRM

Georg Kelly
DOE - Synfuels

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AID'S RENEWABLE ENERGY PROGRAM IN MOROCCO

INTRODUCTION

HRM proposes to assist the Agency for International Development in establishing a renewable energy program in Morocco. This program will consist of several interrelated tasks and activities.

The program will be directed by a program manager based in HRM's Washington office. This individual will provide overall direction and support to the program and will also be the primary liaison with AID/Washington. The program manager will be assisted by a logistics coordinator also based in our Washington office.

A long term advisor will be selected and located in Morocco. This advisor will provide direct support to the Government of Morocco and the AID/Rabat mission in developing an alternative energy program. This individual will coordinate all program activities in Morocco and will provide direct liaison with the program manager in Washington.

The three assessments relating to a renewable energy center, mini-hydro, and solar irrigation for Morocco would be undertaken as tasks to be performed under the direction of the program manager. It is anticipated that some team members will perform multiple assignments in the accomplishment of the major tasks.

A work plan for the accomplishment of all three major tasks and the coordination of the team efforts will be developed before the team leaves for Morocco.

The program manager, assisted by HRM staff, will design and coordinate the participant training and will also provide for the necessary interfaces between the field team members and the

participants. HRM will handle all logistics and assignments for the participant training.

The long-term advisor will be nominated by HRM and approved by AID/Washington and AID/Rabat. Once approved, the advisor will be posted to Morocco for duty.

In addition to the major tasks outlined above, HRM will provide backstopping and assistance throughout the project. This will consist of the provision of quick response to specific requests for energy-related assistance and information.

SCOPE AND HRM CAPABILITIES

General

The following section covers both the scope, as we have interpreted it, and the professional manpower resource base from which HRM would draw to perform the work.

Our review of the program requirements leads us to suggest that central to the project is establishing a Renewable Energy Center, designed to fulfill the multiple demands of energy policy information, socio-economic management and technical assessment. The Center should act as a focal point for the rigorous exploration of candidate energy technologies to meet Morocco's energy needs. Hence, we envision a strong, long-term relationship between the Center and the mini-hydro, solar and training activities which are part of this renewable energy program with Morocco. A comprehensive cohesive plan for the Center should be developed that can be used for the specific programs addressed herein as well as other renewable energy programs.

Following an interpretation of each task and related subtasks we have identified several HRM employees, associates and consultants who have relevant experience within the category noted and who have indicated to us a willingness to join with HRM to perform the type of work contemplated by the tasks. Their resumes are available upon request.

Scope of Work

Conceptualized as two phases, the scope is divided into Phase I, Feasibility, Planning and Organization, and Phase II, Implementation. Each phase assumes cooperative endeavors with the Moroccans aimed at a joint approach. HRM will take full advantage of the work already accomplished in these areas both by the Moroccans as well as U.S. firms.

The general approach to the project is reflected by concern for the upmost utilization of each team member. Hence, we will endeavor to identify individuals with multiple capacities so as to address the functional qualifications as efficiently as practicable. Examples of such capabilities would include one individual to address the sociological and environmental functions, another to appraise the hydro and hydro-design features and needs. An architect engineer (A&E), a laboratory specialist, an economist and a solar technologist may wear the hats of an in-country rep or project manager in addition to their chosen discipline. It is our intent to combine those functional areas possible, in order to produce a team of six individuals. The efficient use of resources in terms of existing information and project manpower will aid in maintaining a high quality dollar for dollar product.

Phase I Feasibility, Planning and Organization

Task A. Renewable Energy Center and Laboratory

A conceptual design for the Center and laboratory accompanied by an initial listing of equipment requirements will be prepared. We understand that preliminary plans call for the facility to accomodate 30 professionals performing research, development, demonstrations, and analyses of renewable energy technologies. The Center would undertake materials research aimed at maximizing the use of indigenous materials in the manufacture of Moroccan built solar components (i.e., the use of ceramics and concrete as structural/insulation/collection or storage components).

The level of effort cannot be precisely determined because existing data has not been identified or evaluated. It is our estimation that this Task will require (12) person months, or the services of one architect engineer and one energy laboratory design expert.

More specifically, the subtasks relating to the Center and laboratory during Phase I are:

A1 Review Center and laboratory objectives, target goals and candidate programs and develop criteria and specifications for:

a. site selection (if necessary)

b. operations

c. design

A2 Prepare conceptual design of the building

A3 Identify laboratory equipment requirements

Task B. Mini-hydro Energy Option Assessment

Reference will be made to data already collected and analysed by AID and this work will be used to the extent possible. This and other available data and studies will be analysed. The identification of potential sites, with the co-selection of three sites for purpose of demonstration will follow the analysis of the relevant data. The Moroccan industrial base will be reviewed to determine indigenous capabilities for fabrication of components, as well as design, construction and maintenance of multiple mini-hydro systems, the target being to minimize the use of imported components, materials and labor. This Task will require (2) to (3) months to complete. The collective talents of a mini-hydro designer, hydrologist, economist, sociologist, and an environmental expert will be drawn upon to complete this Task.

Specifically, the subtasks are:

B1 Select three sites for the demonstration phase

B2 Collect and analyze all relevant data (technical, factual, site related, and water resource)

B3 Examine the sociological, developmental and environmental aspects of selected sites

B4 Select appropriate hydro designs for selected sites

B5 Review the Moroccan mini-hydro industrial base jointly

In performing these subtasks HRM will take the following considerations into account:

- For each of the designated hydro sites, determine what mean head and flow rate is for each month of the year and calculate the resulting potentially useable hydro-power output for each month.

- Determine whether or not projects are feasible based upon reasonable ease of acquisition of all necessary rights, including competing uses for the water, i.e., irrigation.

- Determine for each site whether or not water characteristics and land and water availability justifies further investigation and development of the project.

- For each positive determination, forecast power demand, including characterizations of present or potential power consumers.

- Prepare a demand forecast inclusive of projected load factors, daily and seasonal demand variations, and peaking characteristics.

- Prepare preliminary designs for hydro and distribution systems for each approved site, describing the basis of facility location design, type and size of major elements, e.g., type and heighth of dam; design allowances for special local conditions, availability of materials for construction.

- Prepare an estimate of the capital cost of the solar project, specific to each site, in U.S. dollars and local currency.

- If back-up diesel generation has been determined and there is a necessity to supplement hydro generation during dry

seasons, include investment cost of the back-up facility and associated distribution systems. (Imported equipment will be of U.S. source and origin.)

- Estimate the average annual cost of operating each of the hydro systems, including depreciation charges based on the estimated useful life of various project elements.

- Based upon the information presented and comparisons made, present definitive conclusions concerning the technical feasibility of each proposed hydro plant including the estimated discounted, 20 year, investment and operation; cost of the project. (Technical soundness will be assumed if the investment and operating cost of the project is as low as that of other alternatives, such as remote diesel generation or extension of electric power producing the same result.)

- Estimate the amount of energy generated by each plant to be sold during each of the ten years after starting.

- Analyze financial projections so as to determine whether or not anticipated revenues would provide an adequate return on the investments and would compensate operation and maintenance costs.

- Describe the total economic benefits of the project, including the economic value of the energy that will annually be generated, i.e., utilization of domestic labor, import substitution or reduction; foreign exchange earnings, stimulation of increased agricultural output, reduced emigration, benefits to consumers. (We will compare costs and benefits with those of technically feasible alternatives; i.e., (1) a remote diesel generation, (2) extension of the electrical power grid, and (3) other feasible technologies.)

- Investigate the sociological aspects of each proposed hydro site, including populative rates, agriculture, commerce, absorptive characteristics and community priorities for utiliz-

ation of the proposed power generation. (Hence definitive conclusions will be offered concerning the sociological soundness of the project for each site.)

- Investigate the environmental effects of the projects for each site and make definitive conclusions.

- Recommend methods and procedures for project execution including preparation of final desings and specifications, equipment procurement, contracting engineering supervision; project execution in bar chart format; related manpower requirements; availability of local construction and erection services and equipment; availability and quality of local construction materials; and any special project execution problems.

Task C. Solar Irrigation

All existing relevant data, including solar radiation, micro-climate and solar experience, will be collected and analyzed. Identification of potential water pumping and irrigation sites, in concert with applicable technologies will be utilized to select the appropriate solar designs. An appropriate number of sites and the corresponding technologies will be identified, consistent with environmental and sociological concerns.

This Task, inclusive of an interim report, will require two (2) months to complete. Individuals with solar engineering, hydrology, rural sociology and environmental talents are needed.

Specifically, the subtasks are:

C1 Collect and analyze existing relevant data (including solar radiation, micro-climate, and solar experience data)

C2 Identify potential water pumping/irrigation sites for solar demonstration

C3 Identify applicable technologies for these sites

C4 Evaluate the socio-economic and environmental impact of selected sites

In performing these subtasks HRM will take the following considerations into account:

- For each of the designated irrigation sites, determine what potential flow rate is for each month of the year and calculate the resulting potentially useable water supply for each month. State whether or not the water supply meets the minimum required to justify a solar pump installation. Based upon this hydro potential data and pumping requirements, describe potential and projected solar system characteristics. Project the firm or dependable and peaking solar power capacity, and the annual energy output.

- Present a definitive, written recommendation for each site as to whether or not water characteristics and land and water availability, as well as irrigation requirements, justify further investigation and development of the project.

- For each site, review and comment on present or potential irrigation consumers; project consumption patterns and prepare a demand forecast. (Describe projected load factors, daily and seasonal demand variations, and peaking characteristics.)

- Prepare preliminary designs for the solar pump station and distribution systems for each approved site. Describe the basis of facility location design, type and size of major elements, e.g., type and size of the solar pumps, required acquisition of land, design allowances for special local conditions; availability of materials for construction, etc.

- Prepare an estimate of the capital cost of the solar project, specific to each site, in U.S. dollars and local currency. (If back-up diesel generation has been determined to be required to supplement solar generation during the rainy seasons, its investment cost will be included. Include the cost of distribution systems. Imported equipment will be of U.S. source and origin.)

- Estimate the average annual cost of operating each of the solar systems, including depreciation charges based on the estimated useful life of various project elements.

- Based upon the information presented and comparisons made, present definitive conclusions concerning the technical feasibility of each proposed solar station over its useful lifetime. (Technical soundness will be assumed if the investment and operating cost of the project is as low as that of other alternatives that would produce the same result, e.g., remote diesel generation or extension of the electrical power grid.

- Estimate the amount of energy generated by each solar pump to be sold during each of the ten years after start-up and analyze financial projections to determine whether or not anticipated revenues would provide an adequate return on the investments and would compensate operation and maintenance costs.

- Describe the total economic benefits of the project, including the economic value of the energy that will annually be generated, utilization of domestic labor, import substitution or reduction, foreign exchange earnings, stimulation of increased agricultural output, reduced emigration, benefits to consumers, etc. Assign monetary values to benefits to the greatest practicable degree. Compare costs and benefits with those of technically feasible alternatives, i.e., (1) remote diesel generation, (2) extension of the electrical power grid, and (3) other feasible technologies.

- Investigate the sociological aspects of each proposed solar irrigation site, including agricultural aspects and community priorities for utilization of the proposed water supply and make a definitive conclusion concerning the social soundness of the project for each solar site.

- Investigate the environmental effects of the projects for each site and make definitive conclusions.

- Recommend methods and procedures for project execution, including: preparation of final designs and specifications, equipment procurement, contracting; engineering supervision; project execution schedule in bar chart format; related manpower requirements; availability of local construction and erection services and equipment; availability and quality of local construction materials; and any special project execution problems.

Task D. Training

Training and technology orientation opportunities will be provided for those Moroccans who will be managing the renewable energy program and the Center. The designated Director of the Center, and the key Moroccan hydro and solar personnel should be given priority. This activity should be initiated as soon as practicable. Since this entire effort is a 'counterpart' operation, it is important that the Moroccan personnel work closely with their U.S. counterparts, and become aware of the technology, administrative and management aspects as they apply to Tasks A, B, and C. The training and orientation will take place at various locations within the U.S. with some in Morocco.

Specifically, the subtasks are:

D1 Identify training and orientation requirements of the Project

D2 Select those Moroccans to be trained and identify their study programs

D3 Develop training and orientation program consistent with Project requirements

Task E. General Support

In addition to providing management, technical, economic and administrative backstopping of the assembled team, this Task is a general tasking area, with a quick response characteristic, thereby meeting a need to be responsive to the Moroccans on energy related inquiries which cannot be more categorically

delineated at this time. We will offer assistance to the Moroccans in such areas as bio-mass, sylviculture, energy storage, coal and technology, as well as other appropriate areas. No additional full-time people will be added to the project to support this task area. Each request can be handled by project people or other HRM staff, associates and consultants. Back-stopping personnel in Washington will however, be identified.

Specifically, the subtasks are:

E1 Quick Response Assistance

Provide quick response assistance to energy areas not covered in Tasks B-D. Viewed primarily as technical assistance, this area would require support from energy technologists specifically. The level of effort is estimated at at least four (4) person months.

E2 Follow-on Projects

Provide for support of the development of follow-on AID energy projects in Morocco, a combined task for both project management and energy technologists, with an estimated level of effort of one (1) person month.

POTENTIAL CANDIDATES

(HRM Staff, Associates and Consultants)

Project Manager

David W. Doyle	M.S. Engineering; alternate energy systems, foreign service, fluent French.
Frederick March	M.S. Civil Engineering; biomass in urban centers-Egypt; wind and solar projects in developing countries; French speaking.
Edward Welles	M.A. Political Science; U.S. Embassy First Secretary-Morocco; extensive African experience, biomass commercialization, fluent French and some Arabic.

In-Country Representative

T. D. Nainan	Ph.D. Physics; energy policy, Mali, solar engineer, fluent French.
DH R Carlo La Porta	M.A. International Economics; solar, conservation, energy alternatives, fluent French.
David D. Johnson	B.A. Economics; Indonesia, Thailand, Upper Volta, reforestation, agriculture, fluent French.
Braddish Johnson	B.A. Political Science; solar systems, extensive African experience, Algeria, Madagascar, fluent French.
David P. DeSelm	M.S. Architecture; solar, conservation, urban planning, Morocco, fluent French and Arabic.
Robert Williams	B.A. Economics; solar entrepreneur, Morocco; fluent French, some Arabic.

Solar/Conservation Building Designer

William Graff	M.A. Architecture; solar architect work in Nigeria, Libya, Iraq; some French and Arabic.
Fred Dubin	M.S. Architecture, B.S.Mechanical Engineering; active and passive solar designs, designed SERI headquarters; Egypt, Nigeria, Kenya, Bahrain, Turkey, Oman.

Solar/Conservation Building Designer (continued)

Pierre Bricteux	M.S. Architecture; renewable energy designs of industrial plants, building, extensive African experience, fluent French, (Belgian citizen).
David P. DeSelm	M.S. Architecture; building-solar/conservation, Morocco experience, fluent French and Arabic.
Salim Naji-Hussain	M.S. Architecture; solar architect/engineer, extensive Near East experience, fluent French and Arabic (applied for U.S. citizenship).

Energy Laboratory Design

Charles S. Chen	Ph.D. Mechanical Engineering; solar engineer, solar heating and cooling lab design.
David Christensen	B.S. Mechanical Engineering; established Johnson Environmental and Energy Center at University of Alabama.

Development Specialist (Morocco)

Creighton Peet	Ph.D. Anthropology; Peace Corps-Nepal, fluent French.
Edward Welles	M.A. Political Science; U.S. Embassy First Secretary-Morocco; extensive African experience, biomass commercialization, fluent French and some Arabic.
Stephanie Krebs	Ph.D. Anthropology; Southeast Asia, Africa, fluent French.
Judith L. Katz	M.A. Law and Diplomacy; energy economics, Egypt, Lebanon, fluent French.
Jean-Marc Bisson	M.S. Economics; negotiated trade agreements with Algeria, Tunisia, Morocco, Iraq, Saudi Arabia, Cuba, Brazil; feasibility study-hydroelectric project; economic development plan-Niger, fluent French.
John P. Mason	Ph.D. Anthropology and African Studies; social development and planning for Libya, Egypt, fluent French and Arabic.

Energy Economist

Diane Gulbinowicz	Ph.D. Political Science; socio-economic energy demand assessments of India, Philippines, Taiwan, South Korea, Bangladesh; UN, U.S. solar strategy; fluent French.
Philip Palmedo EDI	Ph.D. Engineering; energy economic assessment Egypt, Peru, Jordan, Brazil, India, Mexico, Thailand; fluent French.
Arthur F. Mehr	Ph.D. Resource Economics; socio-economic effects of energy developments in small communities.

Environment

Robert C. Feuer	Ph.D. Entomology and Biology; baseline surveys, population studies, environmental impact studies; Saudi Arabia, Yemen; speaks French.
Martin S. Tanzer	Ph.D. Environmental Science and Affairs; water quality, water resources management, air pollution, hydro electric environmental assessments; Saudi Arabia, Nigeria, Egypt, Cuba, Pakistan.

Energy Technologists

Kenneth M. Stern	M.B.A., B.E. Chemical Engineering; conservation, industrial processes, energy/supply demand; country assessments-Egypt, Peru, Venezuela.
Lee Schipper LBL	Ph.D. Physics (candidate), M.S. Physics; energy alternatives, Kenya; fluent French.
Mamadou Watt	Ph.D. Fluid Mechanics; energy assessments, energy projects with developing countries, Mali, Senegal, Mexico; fluent French.
Philip Palmedo EDI	Ph.D. Physics; comprehensive overall energy assessments, Egypt, Peru, Thailand, Brazil, Jordan; fluent French.
Walter Hausz	M.S. Electrical Engineering; solar heating and cooling, conservation, hydrogen, ocean thermal, photovoltaic, wind, energy storage.
George Szego	Ph.D. Chemical Engineering; R&D, design engineering, solar thermal, hydro, biomass, photovoltaic, conservation; some French.

Hydrologists

George C. Taylor, Jr.	B.S. Geology and Chemistry; ground water investigations, Central America, Chile, Haiti, Thailand, India, Burma, Jordan, Argentina, Brazil, Chad, Upper Volta, Kenya; speaks French, Spanish.
(NFN) Qutub	Ph.D. Hydrology; Near East hydrology, Morocco, fluent Arabic and some French.

Hydro Power Design and Transmission

Harry Kramer	M.B.A., B.S. Mechanical Engineering; electric distribution throughout Venezuela, fluent French.

Solar System Designers/Engineers

David W. Doyle	B.S./M.S. Civil Engineering; practical designs of solar systems; fluent French.
Erich Farber	Ph.D. Mechanical Engineering; solar H&C and photovoltaic system designs; Morocco, India, Phillipines, Peru.
Charles S. Chen	Ph.D. Mechanical Engineering; multiple solar device system designs.

Biomass

Charles S. Chen	Ph.D. Mechanical Engineering; gasohol processes.
David O. Hall	Ph.D. Plant Physiology; biomass specialist, extensive African experience, fluent French, (U.K. citizen).
Walter S. Dreifuss	B.S. Chemical Engineering; development of fuels and chemical feedstock from sugar crops, corn, wood; ethanol production; speaks French.
Eliseo O. Mariani	B.S. Engineering; eucalyptus energy farms, wood waste energy conversion systems-Argentina, Algeria, Australia, Brazil, New Guinea, New Zealand, Spain, Saudi Arabia, Timor, Mexico, Guatemala, Italy.
Charles Vail	M.S. Environmental Biology (candidate), B.S. Botany; terrestrial ecology, biomass resource inventory, energy plantation concept originator.

Silviculture

Eliseo Mariani	B.S. Engineering; eucalyptus tree development for energy applications- Spain, Algeria, Saudi Arabia, Italy.
Bruce Learned	M.S. Forestry; tree farms; Tunisia, Morocco; fluent French.

Training and Orientation

Mulchand S. Rathod	Ph.D. Mechanical Engineering; Professor, State University of New York, Binghamton, HVAC, energy conservation, pumps.
Franklin J. Ahimaz	Ph.D. Engineering Mechanics; hydraulics, hydropower curriculum, Cornell University.
David Christensen	B.S. Mechanical Engineering; senior research associate, established Johnson Environmental and Energy Center at University of Alabama.
Erich Farber	Ph.D. Mechanical Engineering; Professor, University of Florida, renewable energy lab and curriculum (AID sponsored).
Harry T. Whitehouse	Ph.D. Mechanical Engineering; Assistant Professor Stamford University; energy conversion, solar energy.
T. Daniel Nainan	Ph.D. Physics; Senior Scientist; lectures in French (i.e., in Mali), solar engineer.
Arpad von Lazar	Ph.D. International Policy; Full professor-Fletcher School, Nigeria, Venezuela, Mexico, Kuwait, Chile and others, fluent French.