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EVALUATION REPORT
USAID/Morocco
Renewable Energy Project

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USAID/Morocco Renewable Energy Project

by

Sheladia Associates, Incorporated

October 14, 1983

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FOREWORD

The Evaluation Team consisted of Terence J. Hart, current resident renewable energy advisor to the Laboratoire de l'Energie Solaire in Mali; Dr. Kennell J. Touryan, former Deputy Director of the Solar Energy Research Institute (SERI); and James W. Howe, former International Division Manager of SERI. After meetings in Washington, D.C. with Mr. Fakihani of CDER, several officers of the Near East Bureau of the Agency for International Development, and staff members of Research Triangle Institute and A. T. Kearney Co., Inc., the Team assembled in Rabat, Morocco on Sunday, September 18, 1983 (Mr. Hart arrived the following day from Mali).

As Monday, September 19 was a Moroccan holiday, meetings were held with staff of USAID/Rabat and a US consulting firm, Development Sciences, Inc. (DSI). The Evaluation Team travelled with USAID representatives to Marrakech on Tuesday, September 20, and the primary analysis of CDER facilities, organizational structure, and program plans continued through the following Sunday. The Team then worked in Rabat and Casablanca with the Ministry of Mines and Energy and the Ministry of Finance through Tuesday, September 27. There was a short meeting with the USAID Director and representatives of CDER and RTI, which was reconvened on Thursday, to present preliminary findings and recommendations. The report was then assembled in rough draft and copies given to USAID, CDER, RTI, and each member of the Evaluation Team. The Team members have since consulted by phone and reviewed two revisions of the draft report. We now take pleasure in submitting this final report.

The Team acknowledges with gratitude the unfailing cooperation it received from CDER, in particular, Mr. Fakihani and Mr. M'Zabi, from RTI, including Mssrs. Himy, Fabre, and Minis and from USAID, including Director Chase, Deputy Director Petroquin, Gary Bricker, Stacy Rhodes, and Dianne Tsitsos who, together with Helga Tahiri and Cindy Wilcox served as liaison to the Team. The generous support provided by these individuals made it possible for us to complete our work on schedule. We also acknowledge the invaluable advice and counsel given to us by James Bever of AID/W.

James W. Howe, Chief of Party
October 24, 1983

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SECTION ONE: SUMMARY OF RECOMMENDATIONS

The various issues that the evaluation team has addressed have led to a series of recommendations that are detailed in Section Three of this report to USAID. To further focus on these recommendations, a summary follows in the same sequence as that appearing in Section Three.

Recommendations Requiring Action Primarily by CDER/RTI

1. Organizational Structure of CDER

A long term staffing pattern plan, which is an RTI responsibility, and is scheduled for inclusion in the strategic plan, should be published by the end of 1983 in order to provide a clearer basis for long term organizational planning.

2. Staffing of CDER

An improved salary structure should be authorized for CDER, to enable CDER to recruit and hold highly qualified engineers and technicians for its staff.

Technical and scientific collaboration between the CDER staff and Moroccan universities and technical institutes should be sought out and actively cultivated.

3. Short Term Training

High priority should be assigned to specialized intensive training for new CDER staff, both in the classroom and in field test settings. A detailed plan for this training should be included in the 1984 operating plan.

4. RTI Long Term Development Program

CDER should proceed to order necessary laboratory and workshop equipment at once, rather than wait until its new building is under construction. Additional interim rental space may be necessary so that the equipment can be put into operation.

It would be advisable to plan for an additional one year extension of the RTI consultant to CDER (to October 1986).

5. Provision for Special Technical Assistance

First priority should be given to provision of RTI technical assistance in Morocco, involving CDER staff in actual task performance. Where US-based effort is deemed essential, CDER technical staff should travel to the US to participate in the project work.

6. Short Term Consultants

It would be valuable if RTI could provide for short term consultancies by one or more of the handful of people in the world who have participated in the development of a renewable energy center from inception to relative maturity.

7. CDER Use of RTI Staff

The counsel of RTI should be available to CDER for any of its renewable energy activities, without favoring work financed by the US over that financed from other sources.

8. RTI Compliance with AID Procurement Regulations

RTI should introduce the use of microcomputers, develop software and train CDER personnel in computerized inventory techniques, to include equipment acquisitions made with funding from sources other than AID.

9. Selection of Pilot Projects

The six pilot projects under study, excluding the microhydro projects, should be carefully re-evaluated in light of their potential for penetration of the Moroccan national markets.

In order to improve the procedures for selection of pilot projects, CDER should develop a national research and development plan using existing and improved base-line data on renewable energy resources, energy needs, population distribution and composition and Moroccan energy policy alternatives.

urban emphasis

CDER should include the urban residential, commercial and industrial sectors in its long term renewable energy planning in addition to the emphasis it has placed on the rural sector.

10. Small Projects Funds

Small project grants should be made to substantial businesses rather than to individual users, in order to enhance the diffusion of successful renewable energy technologies.

Recommendations Requiring Actions Primarily by USAID

1. Project Continuation

The contract with RTI should be renewed for the next 12 month period.

2. Communications

Communications between USAID and CDER/RTI need to be improved by such actions as (a) more frequent visits by USAID to CDER and its installations, (b) visits by CDER/RTI to USAID whenever they are in Rabat, (c) phone calls in lieu of telexes or letters (which often miscommunicate) and (d) CDER/RTI should send USAID copies of any written materials that will inform USAID about the project. In this connection USAID should make clear to CDER/RTI the extent of responsibility of the USAID staff member assigned full time to the project and that this person should be the most frequently used point of contact.

3. Project Extension

The project termination date should be extended to October 1, 1987 and the RTI contract termination to October 1, 1986.

4. Procurement

Responsibility for the remaining items scheduled to be procured by USAID should be transferred to RTI. The RTI equipment line item budget should be increased by $150,000.

5. Small Projects Fund

Three USAID rules on the Small Project Fund should be revised in order (a) to permit the Moroccan private sector to procure materials and equipment, (b) to count the $435,000 in matching grants provided by the private entrepreneurs as part of the GOM contribution and (c) to revise the project agreement to more clearly delineate the circumstances under which grants might later by disallowed by AID.

6. Extension of Renewable Energy to Other USAID Projects

USAID should review its other projects (i.e. in agriculture, housing and health) to determine whether they could benefit from the introduction of renewable energy technologies to provide or conserve energy used by these projects. If this proves successful, the GOM may also wish to review its governmentally sponsored activities that need energy.

SECTION TWO: EXECUTIVE SUMMARY

The most salient impression made upon the Evaluation Team was that the Morocco Renewable Energy Research Project is an unusually promising one. It appears to have all of the elements for success, and is a project of the type that AID managers and programmers always hope to find. It deserves enthusiastic USAID support. Our reasons for this strong conclusion follow:

- Renewable energy in Morocco has a promising future. Although much work remains to be done to quantify this conclusion with precision, it is clear (a) that Morocco has an abundance of renewable energy resources, (b) that it is often found in forms and places where it matches urgent needs for energy and (c) that a range of technologies already exist, and more are on the way that can convert the raw energy into usable energy.

- The Goverment of Morocco (GOM) appears to give strong backing to the Renewable Energy Development Center (CDER). The 1983 budget has been approved without a cut in a year when the overall Ministry of Mines (MEM) program was cut 40%. CDER has also been given parastatal status--the first for any organization outside Rabat and Casablanca. Our conversations with officials of the Ministry of Finance and the Ministry of Energy and Mines left us with no doubts that both Ministries are committed to vigorously pursuing renewable energy, and will give CDER the support it needs to do so. Two MEM officials declared that even if USAID should discontinue this project, the GOM would continue to support CDER.

- The GOM has appointed a dedicated, energetic and knowledgeable individual to be Director of CDER.

- The support staff for the Director also contains several impressive officers.

- The US contractor supporting CDER has fielded an excellent resident staff and given it solid, competent project management and qualified short term experts.

- In the nine months since the contract field personnel arrived (less one month "out" for Ramadan), this project has made more rapid progress than any we have seen.

Our approach to writing this evaluation report has been to follow the very thoughtful outline of the USAID Terms of Reference which are more relevant to the Moroccan situation than the more general Performance Evaluation Summary supplied to us by AID/W. This Executive Summary follows the order of topics given in the Terms of Reference.

In response to the first topic, the institutional progress of CDER, each member of the evaluation team was surprised that so much had been done

in so little time. We contrast it with the pace of work elsewhere in the Third World and, based on our own intimate experience, with the agonizing growth pains of the US national Solar Energy Research Institute. CDER's staff, physical facilities (and the new ones soon to be under construction), logistical support, and staff training programs all speak well for the future success of this institution.

The team was also very impressed with the role and functioning of RTI. We do not think it is realistic that CDER can become independent of RTI support by October 1, 1985, as presently planned. Our experience and observations suggest that a one year extension is needed.

Under the pressure of CDER's urgent need to accomplish work before CDER staff was on board to learn by helping do it, some work has progressed without as strong a training element as each of the parties involved in the project would have preferred. In the future all are agreed that a repetition of this practice should be resisted as much as circumstances will permit.

The RTI resident staff and short term experts are well equipped to provide the needed technical training. We believe it would be valuable for RTI to supply short term consultancies by one or more of the world's handful of people who have been involved with institution building assistance and operations of renewable energy centers.

The relationship between CDER and RTI is healthy and has a good spirit of cooperation that supports and teaches but at the same time is mindful of the perils of encouraging dependence. We have criticized the working rule under which CDER uses RTI chiefly on US-financed projects. We fear that such a working agreement may foster the very dependency (i.e., on prolonged U.S. funding) that all parties seek to avoid.

We have also disagreed with delaying the procurement of research equipment until the new building is closer to completion. The time remaining in the project (even extended to 1987) is too short to lose the valuable training and research of the type that requires such equipment.

The Team finds the Pilot Project Fund to be the main vehicle through which CDER can develop institutional muscle and through which Morocco can learn which renewable energy technologies are best suited for application to the country's energy needs. Newcomers to the subject of Third World renewable energy are unfailingly surprised to learn that each nation must retest equipment that has already been tested elsewhere in the world. This is unfortunately necessary due to the lack of sufficient hard data about the performance of renewable energy technologies in a growing variety of configurations in the various and site-specific sociological, meteorological and economic circumstances as well as the comparative performance of solar and renewable versus conventional and depletable energy technologies. Consequently, CDER must experiment with various technology configurations in order to advise Moroccan decision makers, both private and governmental, where to invest the Nation's money in renewable energy.

The two objectives of training CDER staff and helping them develop the data that Morocco needs (or, more precisely, the combined objective of training CDER to obtain the needed information) constitute the most persuasive justifications for the Pilot Project Fund. Given that, we find that the projects selected and their designs are partly suited to these objectives although in Section Three we offer recommendations for improvements of the project selection and design components. Morocco should have a comprehensive national plan for testing and adapting renewable energy technologies. The selection and design of all future projects (including a review of those now being intensively studied) should ensure that they conform to that plan, that they be designed to train as well as to learn, and that the technologies selected be those which promise to have a national impact. Applications in the urban and modern sectors should not be neglected.

The Evaluation Team was concerned that the Small Projects Fund, if applied predominately to small energy users, would consume an inordinate amount of CDER staff time and do very little to diffuse renewable energy technology throughout the private sector. Accordingly, we suggest that fewer and larger grants be made chiefly to substantial businesses either to encourage them to produce renewable energy technologies, (or produce them better or cheaper), market them more effectively, or to encourage the commercial sector (e.g. canneries or textile factories) to use such technologies. The grantee is asked to assume the heavy burden of risking his own funds on a technology that, by definition, has not yet been accepted in the marketplace. This, one could argue, is too heavy a burden to ask an individual user without ample resources to accept. The goal should be to make grants to businesses which, if the technology is successful, stand to gain a substantial amount (and in the process will help diffuse the technology) and if the technology fails, can afford to absorb the loss.

We believe that the Small Projects Fund can help to diffuse renewable energy technologies in Morocco, but there are three matters in the management of the Fund that are at issue between USAID and CDER/RTI, any one of which could be fatal to the Fund if left unresolved. We recommend proposed solutions in Section Three, Chapter IV, Part A. In each case, our recommendations involve changes in the current USAID position.

SECTION THREE: THE ISSUES

CHAPTER I - THE INSTITUTIONAL DEVELOPMENT OF CDER

A. ORGANIZATIONAL STRUCTURE

CDER has a legal decree and regulatory charter (August, 1982) authorizing its formal existence and defining its operatonal and financial status within the GOM. The Director, Mr. Fakihani, has received formal notification of his appointment. CDER is a parastatal organization with a large degree of autonomy and has a separate budget, a charter to perform renewable energy activities nationwide, continued sponsorship by the Ministry of Energy and Mines, and the right to utilize its own revenues. It is negotiating freedom from government pay scale regulations.

The CDER budget (equipment and operations) for 1983 is approved at the ministerial level (August, 1983) and operational funding is in the process of transfer into CDER. The equipment component of this budget, which includes funds for construction of the new laboratory facility, is contained in the five year financial plan of the GOM which will be available before the end of 1983. The budget proposed for 1983 was not amended despite a 40% average cut in the GOM national energy budget. It provides for support of the following personnel:

3 - management
8 - engineering
6 - technician
8 - secretarial/logistical

The budget for 1984 will be submitted to the GOM in October 1983. Approval is anticipated by January 15, 1984, according to officials of the Ministry of Mines and Energy (MEM). The proposed staffing pattern reflects an increase of 33 technical personnel, and 18 logistical/administrative personnel.

Assuming the approval of this budget, CDER will have funds to satisfy 90% of its project recruitment needs by the end of 1984.

CDER plans to set up a series of regional centers where concentrations of pilot projects or resource assessments occur (see Chapter III). These regional centers will be responsible for system installations, performance monitoring, socio-economic and social acceptability surveys, and site wind and solar resource data acquisition. Staff of the regional centers, who initially will be located near the pilot projects, will include Peace Corps Volunteers having minimum qualifications at the engineering technician level. Other regional center staff will be drawn from private sector personnel involved in, or recruited for, pilot or small project responsibilities. CDER staff will be used only when a supervisory role or specialized engineering expertise is required. Thus the demand on Marrakech-based staff for regional operations will be minimized.

CDER forsees a staff size of up to 85 within the life of the project, and eventual increase to 100, although detailed planning beyond 1984 is not yet available (to be included in the RTI-prepared strategic plan) and

no budgetary commitments can therefore be made by the GOM. The technical assistance component (RTI) of the project, which furnishes 2 long-term resident technical advisors and short term assistance to CDER, has now been effectively integrated into the organizational structure.

CDER is the first decentralized government organization with nationwide activities to be physically situated outside Rabat or Casablanca. Additionally, a proposal has been submitted to the GOM which would provide sufficient flexibility within the staff recruitment procedures and payscale regulations for CDER to offer employment opportunities competitive with those of the private sector.

In summary, since the official establishment of CDER in August, 1982 and the arrival of the RTI technical advisory group in December, 1982, remarkable progress has been made towards establishing a well managed and administered body with a capacity to expand sufficiently within the time frame of the project to achieve the goals defined. The CDER Director, Mr. Fakihani, and his managerial and administrative colleagues, Mr. M'Zabi and Mr. Ghozlani, have played key roles in the establishment of this effective core organization.

It is recommended that CDER develop a long-term staffing pattern as soon as possible, thus providing a clearer basis for long term organizational planning. This should include staffing elements necessary to administer and implement the Small Projects Fund and Pilot Projects Fund, a provision for the increasing quantity of applied research that will become necessary within the organization as it develops, and, above all, provision of the capacity for CDER to take advantage of its financial autonomy and its ability to market its growing expertise. RTI has informed us that this recommendation is foreseen in the draft Strategy Plan which is expected to be issued by the end of December 1983.

B. STAFF

The present staff of CDER consists of a Director (Mr. Fakihani), a Secretary General (Mr. M'Zabi), a Finance Director (Mr. Ghozlani) and his two aides, four engineers, six technicians, and eight support personnel. Neither the CDER management nor the technical staff had any experience in solar energy technologies prior to the creation of the Center. All relevant experience in renewable energy technologies has been gained by the CDER staff through exposure to internal short-course training, observational and technical visits to the US and other countries, and on-the-job training.

Although CDER has made unusually rapid progress towards institutional growth, the shortcomings and problems associated with the development of CDER as an institution can be directly traced to the lack of specialized experience in renewable technologies among the CDER staff. The short term training programs of the past, and those planned for the future (see Section I-C), are therefore of paramount importance to CDER's success as a bona fide renewable energy research and development institution.

Before January 1984, CDER plans to add four more French-trained engineers who will undergo more comprehensive training in renewable technologies than their forerunners, both on-the-job and in the classroom.

Two other staff interactions within the context of the training program at CDER have helped maintain the viability of the center. The first has been the availability of qualified resident RTI advisors as well as short term advisors (see Section II-C). The second has been the close association of the CDER staff with the Faculte de Sciences and Ecole des Mines at Marrakech. Other fruitful relationships exist between the CDER staff and several well qualified faculty members at the Faculte de Sciences at Mohammed V University in Rabat, and Meteo Nationale de Casablanca.

It is recommended that relations between CDER and Moroccan Universities be strengthened and formalized in order to provide: (1) a pool of qualified graduates for future employment at CDER; (2) collaboration with several nationally recognized faculties; and (3) provide a smooth transition from university research to renewable technology development and application, which is the mandate of CDER.

The improved salary structure identified in Section I-A above will help CDER to attract qualified technical staff and therefore operate independently of RTI assistance by late 1986. (See discussion under II-A. We believe that the pace of recruitment to date warrants hope that the recruitment plan will be fulfilled on schedule by the end of the project.

C. FACILITIES

CDER established temporary operational headquarters in March 1982. RTI was provided with approximately 20% of the space available immediately upon the arrival of the long term resident advisors in December, 1982.

The total surface area utilized within the temporary facility to house RTI and CDER administrative and technical staff is approximately 300 square meters. This includes an area of 30 square meters which was designed to equip a temporary biomass laboratory. Room for further expansion exists. Informal arrangements have been made with the Ecole des Mines and Faculte de Sciences to perform laboratory testing and analyses as needed. CDER has taken frequent advantage of this arrangement.

The present space leased by CDER is far from ideal. The building was originally constructed for use as apartments, is labyrinthian and divided between several different floors within 2 separate buildings. At this point in the stage of development of CDER, no great hardships are evident. This problem will present itself in a more acute form when the technical activities and personnel within CDER increase. CDER advises that the option to move into a more adequate temporary facility exists if there are further delays in the construction of the permanent structure, or if increases in the staffing pattern justify the investment.

A 20 hectare tract of land situated 15 kilometers from Marrakech is available to CDER for field testing of hardware and biomass experimentation.

Tenders for the construction of the third design version of the new CDER facility have been received. The tenders reflected cost estimates higher than anticipated and almost matched the total funding available to CDER for equipment and operation within 1983. CDER requested a construction budget increase, which was refused. Consequently, it was decided to decrease the size and complexity of the proposed permanent facility so that it could be constructed within the budgetary limits.

The current design version (third) provides the following approximate usable surface area:

Function	Sq. Meters
-- Administrative Management	1,300
-- Technical Staff	1,200
-- Laboratory	1,000
-- Workshop	450
-- Library	500
Subtotal (Enclosed work space)	4,450
-- Testing Area	2,000
-- Lodging	1,250

The approach utilized by CDER to resolve the temporary impasse created by budgetary limitations and elevated construction costs appears logical and should provide an adequate facility within a reasonable time frame which will permit the growth and increased technical capability needed to meet the project goals.

An architectural consortium is currently performing a redesign study which retains the essential components (laboratories, workshop and administration) and the energy-efficient features of earlier designs, but eliminates lodging for personnel and landscaping. It is anticipated the study will be completed by the end of 1983. Invitations to bid on revised architectural design will then be prepared, tendered, and reviewed, and a contract awarded. A detailed plan defining the construction schedule will be prepared by the architect. No estimates for the date of groundbreaking are available.

The new architectural design could reduce the available working space by 20% compared to the original design, and will eliminate provision for lodging. Regardless of modifications, the revised structure will be totally adequate to house projected CDER personnel and equipment for the project even if extensions are granted. Provision also exists for expansion as needs arise and funds become available. The total site area available for contiguous building and outdoor test facilities is approximately 4.2 hectares.

D. Logistical Support

Current Level and Quality of Staff

CDER currently has the following logistical support staff:

1 Chauffeur
3 Secretaries
2 General Clerical and Messengers
1 Administrative Assistant
1 Accountant
1 'Agent Comptable' from the Ministry of Finance (part time)

With the exception of the 'Agent Comptable', these staff members are supervised by Mr. Ghouzlani, the Director of Finance.

Our opinion is that this staff is adequate to provide the support currently needed. As the activities of CDER increase it will be necessary to expand this staff. The organization chart calls for three sections -- personnel, accounting and general services.

Transportation

CDER has four automobiles; they have been assigned as one each for the Director, the Secretary General and the Administrative and Financial Director, and one for technical staff. However, all vehicles are generally made available to all staff as needed. Additional cars and chauffeurs could be put to good use in the near future as staff expands and as project activities proliferate. CDER's plan to establish Regional Centers to monitor its work in various parts of Morocco will probably require CDER to supply several additional vehicles including pickup trucks.

Translation

RTI provides all of its documents to CDER in French, and CDER communicates with USAID in French. Hence CDER has very little need for translation services. In cases where a number of USAID and/or AID/W staff are involved, USAID reviews could be expedited if written materials were presented in English. RTI/M reports that it is not involved to any appreciable extent in assisting CDER with translations.

Accounting

CDER has one full-time accountant and the part time service of an accountant from the Ministere des Finances to monitor the Moroccan portion of the project funds. Accounting for the US portion of project funds is done by RTI. It is worth noting that both the CDER accountant and the Ministry of Finance

accountant would like to learn USAID accounting procedures, possibly by participating in one of the AID short-term accounting courses given several times a year.

E. SHORT TERM TRAINING

In view of the lack of experience of the CDER staff in renewable technologies, short term training has been, and will continue to be a critical component in CDER's progress towards successful institutionalization.

The following short term training programs have been instituted at CDER:

- English language training for the technical staff at the Marrakech American Language Center;
- Structured short courses by RTI advisors. To date courses have been given in biomass (anaerobic digestion, combustion theory), solar thermal conversion (design of solar water heating system), energy economics, and energy planning;
- On-the-job training of CDER staff by the RTI resident and short term advisors.

From September 1981 to December 1981, five CDER engineers were given special training in renewable energy technologies at the University of Florida in Gainesville, Florida. This was followed by observational visits to various US research and demonstration centers specializing in renewable energy activities. Four of the five engineers successfully completed the course, and three are still at CDER today. The Florida training was only marginally successful. It did not take into proper consideration the individual needs of the trainees and lacked sufficient hands-on experiential training for the five CDER staff.

Plans are underway for an improved training program. These plans should include:

- More appropriate locations for training the new CDER staff, such as New Mexico State University, Sandia Laboratories in New Mexico, the Solar Energy Research Institute in Colorado, the University of Arizona, and Arizona State University.
- Courses that are tailored to the specific needs of the new CDER staff. RTI could design these courses in coordination with other AID-funded training projects in the US. For example, a short course in PV pumping installation, design and monitoring could draw participants from other AID funded projects, thus increasing the cost effectiveness of the training program.
- Provision for each trainee to complete an experimental project during his/her training in one of the above institutes.

- A careful selection between intensive specialized training for the technical staff and full-fledged Master's degree programs.

- Better language preparation for trainees prior to sending them on training tours to the US.

- Regular rotation of new technical staff among the various departments within CDER, for broad exposure to all aspects of renewable energy technologies.

- Visits to demonstration or pilot projects of other organizations and other international aid programs for comparative system study and further training. Examples are: O.N.E. microhydro projects, wind farms, the Italian projects on rural electrification, and irrigation and desalination projects using photovoltaic technology.

It is recommended that a high priority be assigned to the above outlined training programs for the CDER staff in order to maintain and improve their proficiency in all aspects of renewable technologies.

CHAPTER II: THE ROLE OF RTI

A. RTI LONG TERM DEVELOPMENT PROGRAM

The RTI three year plan was last revised on July 21, 1982. RTI is currently proposing a revision that will add one more year to the life of the project and their contract. There have been many revisions in the original 3 year plan, and a very recent (September 13, 1983) "Strategic Plan for CDER" (in draft). We believe the latter, although still not complete, best represents the thinking of RTI with respect to CDER's development and accordingly the comments in this section are based on that document plus interviews with RTI personnel.

The RTI program for CDER consists of three parts:

First, CDER should develop into a strong institution. This includes the ability to plan, a good organizational structure, a well defined and conceived program of activities, qualified staff with clear assignments, a vigorous training program, constructive linkages with other government agencies, and clear operating policies and procedures.

Second, CDER should develop renewable energy technologies applicable to Moroccan needs. This requires that primary renewable energy resources be identified and quantified; the various needs for energy in Morocco be measured; technologies to convert renewable energy resources to meet Moroccan needs be identified, adapted, tested and evaluated; programs to commercialize such technologies be conducted; and finally one or more models be developed to help evaluate the applicability of various technologies to the various Moroccan needs, and that CDER staff be able to use these models.

Third, CDER should be able to facilitate the transfer of technology to Morocco and the diffusion of such technology within the country. This includes a library, public education through universities and other public interest groups, operation of the Small Projects Fund, and creation of working relationships with the private sector.

This constitutes a logical and sound basis for strengthening CDER. If future GOM support is as strong as that in 1983, and if the progress made in the past year by CDER and RTI continues, it is a viable plan, but not feasible in the two years remaining in the life of the project. The experience of the Evaluation Team in the Third World suggests that perhaps four years will be required to achieve these targets (three years for the RTI contract), even though CDER is progressing more rapidly than any other comparable institution in Africa of which we are aware.

We believe that CDER should not wait until its building is under construction to order the equipment it needs but should proceed to do so at once. If the equipment arrives before the building is ready,

it can be placed in leased or borrowed space and used to train CDER staff. The problem of later transferring it to the CDER building is not significant enough to lose this valuable training time. Other renewable energy centers have done creditable work in rented quarters (e.g. SERI in the United States). If this is done, one might foresee a schedule as follows:

Year end 10/1/84:	Building started, most equipment received and installed, and staff training under way.
Year end 10/1/85:	Building complete, equipment permanently installed.
Year end 10/1/86	Operational experience in the permanent setting; gradual withdrawal of US contractor, to be completed by year end.

Although human experience warns us that in the building of institutions one should think in decades rather than in years, and that one should expect delays, the extraordinary pace of progress in the case of CDER suggests that withdrawal of the US contractor by October 1, 1985 is a possibility. However, we would feel more comfortable if the US contractor were to provide support for another year to extend through October 1, 1986.

B. PROVISION OF SPECIAL TECHNICAL ASSISTANCE (i.e. ALL TECHNICAL ASSISTANCE EXCEPT RESIDENT ADVISORS)

The contract states that a total of "at least 60 months of short term advisors for technical assistance and up to 24 months of short term advisors for technical training" would be provided in Morocco over the three year contract period. An additional 43.5 person-months of technical and administrative support would be provided in the United States. The contract estimates this effort would be spread equally across the three years: 28 months in Morocco plus 14.5 in the US equaling 42.5 total special technical assistance (T.A.) per year. Although actual experience has resulted in modifications to these numbers, an important point for comparison is the relationship envisioned in the contract between TA provided in the US and that provided in Morocco. Overall this relationship was estimated at 2 for Morocco to 1 for the US apart from the resident advisor time.

An examination of the Labor/Task Summary for the period October 1982 through August 1983 shows a total of approximately 35 person-months of special technical assistance has been provided in the US and Morocco (figures for September are not yet available). Although this total appears behind schedule on TA delivered under the three year contract, in actuality, the 35 months were provided over a much shorter period the full first year. First there was a three month start-up period before the resident advisors were actually fielded, plus a short

(about one month) time before they were prepared to receive short-term advisors. Added to these factors was the month of Ramadan, when work schedules change significantly. Consequently, the 35 person month total delivered over a period of eight months rather than twelve months actually represents a faster rate of delivery than that planned for the first year in the contract.

During this first year, more special technical assistance was provided in the US than in Morocco. However, as noted above, the contract calls for almost twice the amount of special TA to be provided in Morocco as in the US. Only 13.7 person months of technical and management support were provided in Morocco versus 25 person months in the US.

One reason for this apparent shift of work to the US was that limited CDER technical staff during its start up year meant a limited capacity to absorb in-country technical assistance. Another reason was the pressure on CDER to accomplish certain technical tasks quickly. While CDER was in the process of acquiring more staff, this urgent work had to be undertaken in the US.

Of greater significance to the Evaluation Team, however, is the second year effort planned. CDER technical staff will be augmented by the beginning of 1984, thus increasing the ability of CDER to utilize more technical assistance delivered in Morocco.

The second year draft budget indicates significant increases over the first year in special technical assistance to be provided in Morocco. However, the total technical work planned for Morocco is still slightly less than that planned to take place in the US, according to the chart "Niveau d'effort par activite." A more refined analysis of this projected activity is being undertaken between USAID and CDER, however, since these total figures alone may be misleading. The Evaluation Team is satisfied that second year planning has increased the emphasis on Moroccan-based TA and considers such an emphasis to be of great importance.

With respect to the future we have several observations. Whenever pressure to produce work exceeds the ability of CDER staff to be trained by participating in the work, one has two alternatives:

(1) postpone some activities until more staff are on-board while increasing training activities for the CDER technicians already there; and

(2) complete planned activities in the US.

The former route recognizes the importance of institution building, with the significance of the various technical activities resting on their potential for training CDER staff. The latter approach focuses on completion of technical tasks per se and has virtually no training value for CDER. The selection of the second alternative would lose

sight of what the Team believes to be the most important project objective: CDER's organizational development. Even if some technical tasks cannot realistically be put off until more staff are hired, the benefits of having as much technical work as possible done at CDER outweigh the drawbacks. Research methods and organization of research and technical work could, at a minimum, be observed by CDER personnel, and the short-term advisers could increase their direct experience with CDER's problems and prospects, enriching their future project involvement.

A further consideration is that performing so much of the technical work in the US might take away the immediacy of the need to augment the CDER staff and could contribute to a perception of the project as being focused on RTI rather than CDER.

Accordingly, the Evaluation Team recommends the following order of priority for deciding where technical tasks will be performed:

- o Priority One: Technical assistance in Morocco involving CDER staff in actual task performance;
- o Priority Two: Where US-based effort is deemed essential, CDER technical staff travel to US to participate in technical work;
- o Priority Three: As a last resort, technical support tasks performed in the US by US contractor/consultants without direct CDER staff participation.

C. SUITABILITY OF RTI STAFF

RTI provides staff support to CDER through their offices in North Carolina and on-site in Marrakech. Hal Minis, together with his administrative support, provides management and technical review services to CDER from the US. His experience and training in energy systems planning and rural development, participation in the Peace Corps program and fluency in the French language make him well qualified as Project Director for RTI.

The two resident staff have strong technical backgrounds, extensive energy planning experience in developed and industrialized countries, and strong language skills. Mr. Himy's Moroccan background provides him with a unique balance between a "native Moroccan" and US perspective. Mr. Fabre's technical skills have been indispensable in providing guidance and direction to the CDER technical staff. In fact, the absence of technical managers at CDER may create a dependence by the CDER staff on Mr. Fabre, by default, that if not rectified soon (by mid-1984) could complicate the RTI phase-out process.

The Evaluation Team did not have an opportunity to meet the RTI short-term staff and consultants. However, based on personal knowledge of their abilities and reviewing the vitae, we conclude that the present RTI advisory team (and those planned for 1984) represent a spectrum of competence that ranges from adequate to very good. They can provide the needed training to the CDER staff, help design and operate the pilot projects, initiate small project fund activities and contribute to the long term planning of the center.

The RTI team members, however, have not had direct experience in the building of a complete energy center, such as CDER, from inception to institutionalization. Although few in number, individuals with such experience do exist. We recommend that a short term consultancy of one or more such persons be made available to CDER.

D. CDER USE OF RTI STAFF

1. For Non-US Projects

We understand that CDER has agreed that in using RTI staff it will give first priority to US-financed projects. We believe this arrangement deserves further thought. The basic purpose of the project is the development of CDER's institutional capability. A key part of that development is the ability to attract and efficiently use funds from a variety of sources. If it is good for RTI to help CDER use US funds wisely, it is even better to help them use non-US funds wisely, for that is an essential part of the process of becoming independent of US support. We recommend therefore that the counsel of RTI be available to CDER for any of its renewable energy work, without favoring work financed by the US over that financed from other sources.

2. For Administrative Duties Versus Programmatic Development

No abnormal demand is imposed on RTI to perform administrative chores for CDER. RTI enjoys a flexible yet firm understanding with CDER regarding their respective responsibilities for administrative chores.

In the early days of RTI's present, CDER was without transportation for personnel. RTI cooperated with CDER, providing transport only when there was direct participation within the specific activity by RTI. CDER has acquired four vehicles and is now totally independent in this respect.

Initially, CDER was also obliged, due to work load and limited secretarial support, to request typing services from RTI. RTI was not able to oblige. Growth of CDER administrative and logistical support capacity now extends to include details such as providing their own telex operator for telex transmission and provision of their own paper supply for the photocopier. This demonstrates total independence from RTI in this respect, leaving RTI free to concentrate upon programmatic development.

E. RTI COMPLIANCE WITH AID PROCUREMENT REGULATIONS

No violations of procurement procedures on the part of RTI are evident. Considerable effort does however need to be invested in many aspects of procurement.

Of principle concern is the lack of clear definition of what major commodities will be purchased and when. The preliminary list of needed commodities identified by C.T. Main and annexed to the Project Paper is considered by RTI to be indicative only. Equipment procured by USAID and RTI for the project until September, 1983 is minimal. CDER provided a list of required equipment to USAID for action in October, 1982 and USAID requested this be reviewed with RTI advisors upon their arrival in December, 1982. It has recently become evident that some of these items have not yet been ordered. The RTI budget for its first year of contractual services contained zero allowance for procurement. RTI has budgeted $1,949,774 for procurement for the duration of the three year contract.

RTI indicated that very limited procurement will take place in the second year of the contract because the permanent CDER facility will not be completed. The Evaluation Team strongly recommends that RTI not delay procurement to coincide with completion of the new facility, but identify and arrange major procurement needs immediately. At the request of CDER and USAID, one Team member, Mr. Terence Hart, spent a few days working on a procurement proposal which is included as Part Three of this evaluation report.

Temporary laboratory and workshop premises can be leased, equipment installed, and the extremely important research, practical training, and monitoring components of the project set into operation, thus providing for the growing capacity and needs of CDER on a timely basis.

Failure to launch this portion of RTI's responsibilities will impose severe restraints on CDER's ability to become largely independent of the need for technical assistance within the life of the project. By the same token, CDER will need to ensure that appropriate space is available to properly house the equipment when it arrives.

RTI is advised to explore container shipment from the US, thus minimizing loss, damage, customs clearance procedures and, of greatest importance, cost.

As part of the procurement program, RTI should introduce microcomputers, adapt software, and train CDER personnel in computerized inventory techniques, to include procurement with funds from sources other than AID. RTI reports that this is being planned.

CHAPTER THREE: PILOT PROJECT FUND

A&B. Background and Technical Appropriateness

Pilot project selection and design are critical to the success of this project, which in turn, is measured by the ability of the selected technologies to penetrate the market.

The purpose of the USAID Renewable Energy Project is to provide CDER with the experience necessary to build its institutional capability in order to achieve its long term assignment of effective market penetration of renewable energy technologies. The Pilot Project Fund is the chief medium through which CDER can gain the experience to reach this goal.

A review of the nine pilot projects currently being undertaken or under study indicates that more than half of them are not well adapted to the goal of market penetration. In view of this, the Evaluation Team recommends the following criteria which should govern the selection and design of pilot projects.

1. The technology should match those renewable energy resources that are in plentiful supply in Morocco.

2. There should be a large potential market for the technology or for the energy it will produce.

3. The technology should be potentially economically competitive with current and alternative energy technologies.

4. The engineering design should arrange proven technology components into a combination that most effectively matches the resources available to the potential demand.

5. The project should be designed to generate and retrieve precise information about the technology's performance in terms of the first four criteria (i.e. resources, demand, cost competitiveness and physical effectiveness) as well as information about the social acceptability of the technology and the ability of the users to organize themselves to manage and maintain it.

6. The project should be designed so as to be a representative sample of a technology combination that can be widely applied within a national research plan for renewable energy (see discussion below).

The end result of following these selection criteria is to help renewable energy technologies penetrate the Moroccan economy--in short to have a national impact on the mainstream of development in Morocco.

Following these selection criteria would, in our view, result in a substantial number of applications in the industrial, business, and urban residential sectors as well as in the rural sector of Morocco.

If we now apply the above criteria to the nine pilot projects selected, only the three microhydro installations and the PV water pumping project planned for Crafa comply. The remaining five proposed pilot projects require serious review and redefinition in order to meet the criteria proposed by the Evaluation Team.

Two of the five projects do, however, in their present or slightly modified forms have considerable potential utility in terms of training CDER in applied research.

These two projects are discussed below.

1. Ch'bani Digester

This family-sized anaerobic digester is a particularly good example of one of the three well known design options available. What must be considered prior to construction is the relative costs of the options. Costs depend primarily on local labor and expertise, raw material availability, and environmental conditions (in particular mean ambient air and ground temperatures).

The CDER/RTI design study has provided adequate justification for construction of this particular model, which will demonstrate the technology at a household level and provide a valuable hands-on training experience to CDER personnel.

In question is the potential of this family sized technology to provide an attractive competitive energy option to the typical user. Extensive use and long term field testing of variants of this digester design (about 700,000 examples throughout the Indian continent) shows that users are generally not convinced the initial investment of time, labor, and cash plus the daily effort essential for any family level digester is justified by the return. The evidence now indicates that once the promotion push from the government stops, utilization of the one-family village digesters stops. Hence, we believe that although the training of CDER staff from the Ch'bani digester amply justifies the small cost to CDER/USAID, future work in biomass should look beyond the single-family biodigester to other areas such as agro-industry sized digesters, conversion of agricultural residues such as olive seeds to useful energy, use of municipal waste, efficient stoves and boilers, improved charcoal production, etc.

2. School of Mines Marrakech - PV Pumping

The refurbished well at the School of Mines can provide at best a daily yield of 80 m^3/day which is not adequate to irrigate the 5 Ha School of Mines and Renewable Energy Center grounds. The proposed system is not representative of a typical village system in many respects. Thus, the only real criteria justifying use of this site for a pilot project lie with the proximity to the permanent CDER facility and its training and demonstration potential. These are important criteria.

However, this being the case, CDER should seriously consider acquiring a system which can offer far more as a training exercise than an "off the shelf" PV pump and can demonstrate far more broadly the potential applications of small PV installations.

The team recommends a design review which will emphasize these two features and also give consideration to the energy storage options, multiple uses (such as lighting, pumping, refrigeraton, and hybrid generation), and instantaneous and continuous monitoring methods.

C&D. MARKET PENETRATION AND DATA MONITORING

For renewable technolgies to effectively penetrate the market on a nationwide scale, an overall research plan for renewable energy in Morocco must be developed.

Such a plan would begin with baseline data drawn from a resource assessment of wind, solar, biomass, and hydro potentials. Geographic zones would then be identified each of which would be as similar as possible from the point of view of resources.

Next, zones of nationwide energy needs would be defined by identifying rural, urban, and industrial areas, determining population distribution, locating the presence of significant ethnic groups, and identifying GOM plans for conventional energy provision (i.e., the national electrical grid). By overlaying these sets of geographic zones of resources and needs, representative zones can be established in which a potential demand exists for each major technology type.

The third step in the planning process would be to determine the combination of systems needed to meet the total demand in any one zone. Only after this total has been determined can a pilot project sample be drawn from each zone. This sample must be large enough to yield statistically significant data which can be used to assess the accuracy of the earlier estimates, yet must be small enough to be affordable and manageable by CDER.

Pilot project selection based upon this approach would avoid further repitition of the many "demonstration" projects which the Evaluation Team has observed scattered through the developing nations with no clear understanding of their potential for replicability or potential to make a true impact on the provision of national energy supplies.

We recommend that CDER develop a national research plan for renewable energy technologies along the lines of the process described above. The $1.9 million USAID-financed portion of such a program would not, of course, when examined by itself, be a complete and balanced learning experience or research program, but it should be integrated into, and should provide the initial stimulus for developing such an overall Moroccan comprehensive research program. In the process, the most valuable kind of training will occur.

Additional factors which must also be taken into consideration in the process of selecting and designing pilot projects include the following:

1. Energy Production/Conservation

For renewable energy technologies to achieve greatest impact, one must consider not only the introduction of energy-producing technologies but also means of conserving energy. Energy-production and conservation need to be treated as an integrated effort, which is demonstrated in the classic example of fuel for domestic cooking. Technologies such as wind and PV pumping systems provide water for irrigation and by extension encourage reforestation, while improved wood stoves and charcoal production techniques can provide significant reductions in wood fuel consumption. Thus, fuel production is increased by one technology while fuel consumption is decreased by another. The introduction of both technologies of course has the greatest impact on the overall objective.

Any pilot project designed should contain the element of conservation as a parallel or integral activity along with technologies that produce energy in order to obtain best results.

2. Site Selection

Careful site selection is essential. Selection must, by definition, be representative of the nation to develop valid test results. Efforts to minimize pilot project site management, data acquisition and maintenance problems are also key factors which influence the final degree of utility of a site. Any pilot project (as long as it remains a representative case) benefits considerably if situated either close to the central controlling body (i.e. CDER) or if rapid easy access is guaranteed (i.e. regional centers).

3. Integrated Projects

AID and other donor organizations frequently use pilot projects to demonstrate, promote, or teach in fields other than energy, such as agriculture, health and education. Clearly it would be advantageous to build an appropriate energy component into such projects.

The Evaluation Team recommends that USAID review its current and planned projects and explore the possibilities of integrating CDER renewable energy pilot projects into other ongoing AID projects to expand the learning experience, and increase project efficiency. If this is successful the GOM may wish to undertake a similar effort with its own government sponsored projects.

4. Don't Neglect Urban and Industrial

CDER gives highest priority to rural applications and the Evaluation Team agrees that many--perhaps most--opportunities to apply renewable energy will occur in the rural areas, particularly in areas beyond the reach of the grids of modern conventional energy. However, one should be open to the possibility that many opportunities will also occur within the sectors of the Moroccan economy that are now served by modern, conventional (but increasingly expensive) depletable energy sources.

E. PLAN FOR ANALYZING PILOT PROJECT DATA

The analysis of quantitative data from pilot projects is straight forward and a large and growing body of experience exists for doing so. RTI staff plan to train CDER staff in the methods for such analysis including the development of computer assisted modelling. Given current and 1984 planned staffing, this appears feasible.

F. DISSEMINATION OF PILOT PROJECT RESULTS

No systematic dissemination plan yet exists. This is to be expected at this early stage of the project; however, extensive discussions on the dissemination problem have been held within RTI and with CDER. Dissemination is critical to the whole process of renewable energy diffusion. Such a plan should be in place by the time useful data begin to accumulate in any serious volume--perhaps in the latter half of 1984.

CHAPTER IV: THE SMALL PROJECTS FUND

A. CURRENT STATUS

A manual of "Objectives, Regulations, and Procedures" has been sent to USAID by CDER. USAID has raised further questions about financial arrangements, procurement procedures, selection criteria, priority for Moroccan citizens, the Moroccan contribution, and audit arrangements. CDER and its advisers are working on a response. It is not an auspicious moment for external evaluators to intervene. Nevertheless, we have several observations.

First, a means must be found for procurement to be done in the local marketplace by the grantee. The administrative burden of a small grants fund is enormous. If US procurement rules are to apply and procurement to be undertaken either by the US or Moroccan Government, the project will fail.

Second, if the GOM is required to make a governmental contribution (over and above the contribution made by the Moroccan grantees), the project would also apparently fail, since Morrocan rules do not permit their public funds to be used for grants to private individuals. We have been able to identify no cure for this potentially fatal problem unless USAID is willing to accept as the Moroccan contribution those funds put up by private Moroccans.

Third, the project agreement now provides for USAID to audit the individual grants to private persons and to demand a refund of the grant in the event the criteria specified in the project agreement are not followed. Such sweeping powers (although the Team is confident they would be administered responsibly) are potentially intimidating to the prospective grantee who, as we discuss further below, is being asked to carry considerable risks already. It could do serious damage to the Small Projects Fund. Accordingly, we recommend that the project agreement be amended to narrow the circumstances under which disallowances might occur, for example, in case of diversion of the funds to personal use.

B. EVALUATION OF CURRENT ISSUES

1. Selection Criteria

a. Preference for Moroccan Investors

USAID believes preference should be given to Moroccan investors while CDER, in accordance with the spirit of a new GOM law (see announcement "Encouragement Measures for Investment in Industry and Related Sectors") prefers to keep the grants neutral regarding nationality of investors.

Since the purpose of the Fund is to promote the use of renewable energy technology in Morocco through the private sector (which,

perforce, must include foreign, as well as domestic investors as it does in most countries) rather than to assist Moroccan investors per se, the Evaluation Team believes CDER's argument is persuasive.

b. Small vs Large Grants

The Fund of US$345,000 is available for grants ranging from US$500 to US$20,000. If grants averaged US$5,000, there would eventually be a portfolio of 70 projects to select (presumably from hundreds of applications, each of which would need a careful staff review with appropriate documentation for the Selection Committee) and to monitor. Bearing in mind that monitoring responsibilities must be taken seriously for small projects as well as for large ones, CDER is facing a workload that will require a substantial staff--perhaps 3 to 5 people. If the average grant were US$10,000, the project portfolio would be reduced to 35 (still a formidable load), and if the grants averaged US$20,000, the maximum, the portfolio would come to 17. The conclusion is that, other things being equal (which they often are not), it is much better to make large loans than small ones.

c. Individual Consumers vs Industrial Users and Producers of Renewable Energy Technologies

Some basic premises must be stated at the outset of this discussion:

1. The purpose of the Fund is to diffuse renewable energy technologies, not to benefit the grantee;

2. If properly designed, the grant will not be a windfall for the grantee (who must put up his/her own funds and deal with a technology untested in Morocco);

3. The present state-of-the-art of renewable energy does not permit CDER to assure the grantee that the technology will succeed physically, financially or socially.

From these premises flows the conclusion that one should not regard the grants as rewards to be distributed according to principles of social justice. Indeed, given the burdens and risks the grantee is asked to undertake, one could argue that it would be unfair to impose them on a small user. Thus, we believe it would be better to attempt to enlist the cooperation of investors who stand to make a substantial gain if the technology is successful and who can afford the loss if it is not.

Moreover, even if a series of grants to small users turned out to be successful in the sense that the technology was of great advantage to the end user, we doubt that much diffusion of the technology would result. The so-called "demonstration effect" has served as a justification for many projects financed by donor agencies throughout the world as well as by the US Department of Agriculture and many other gov-

ernmental agencies. The results have been spotty at best. It is clear, for example, that USDA projects demonstrating the advantages of high yielding varieties of corn did not have as much of an effect on diffusion as the marketing efforts of seed corn salesmen.

Thus, if diffusion is the goal, we believe it would be advisable to encourage manufacturers or distributors of renewable energy technology to produce (or distribute) new or improved equipment because, if the technology is successful, they have a large interest in diffusing it. Their interest coincides precisely with the purpose of the Fund. Alternatively, the Fund could be used to help a manufacturer who has a promising product to build a marketing effort. The aim in either case would be to help build an institution whose success depends on diffusion.

Still another alternative is to work with a private institution (such as a fish canner or a textile manufacturer) that could make use of a renewable energy technology such as solar generated industrial process heat. A grant of $20,000 might be too small to persuade them to make a big investment, but it is possible that it would be sufficient to encourage them to purchase (from a Moroccan flat plate manufacturer who might also be given a grant) a small solar hot water system in place of a conveniently fired boiler. CDER might also offer technical assistance to encourage such arrangements.

The above suggestions are not intended to be taken as serious project grant proposals; indeed our stay was too short to venture so far. Rather these are merely intended as illustrative of a general approach, namely that CDER should emphasize either manufacturers of renewable energy equipment or industrial users of such equipment in preference to individual or family users. Mr. Boudraa, Technical Director of Soco Charbo expressed considerable interest in the Small Projects Funds for Soco Charbo itself and suggested that it should be valuable in encouraging a number of other industries to diffuse renewable energy.

Other than the above comments, we believe the selection criteria now contemplated by RTI and CDER are valid.

2. Financial Operations

See discussion above under IV-A.

3. Procurement Issues

See discussion above under IV-A.

4. Publicity Program

No activity has been undertaken by CDER to publicize the program since that must await agreement with AID to launch the Fund. The RTI schedule of short-term advisors in Morocco during 1983 and 1984 pro-

vides for technical assistance to CDER in getting out notices to solicit applications for grants. The RTI short term advisor (McWilliams) will work with Mr. Ghoslani to develop these procedures.

5. CDER Access to Grantee Records

RTI reports that it is intended that the agreements with grantees will provide for CDER to have access to grantee records.

6. Monitoring Program

CDER and RTI now anticipate that one commercialization specialist will be responsible for all aspects of the Fund including monitoring of approved projects. We think this is unrealistic unless the number of Projects is held to a minimum [see Section 4B(1)(b)].

7. Information Dissemination Program

No systematic work has been done yet on a program for disseminating information about the results of the grant program. It is probably premature to spend much time on this until there is a better understanding of the nature of the grants to be made and until the results of those grants can be anticipated.

C. RELATIONSHIPS BETWEEN CDER AND PRIVATE COMPANIES

RTI and CDER report that a number of requests have been made for advice especially on the questions of installing solar hot water heaters as well as explorations of common goals with entrepreneurs with respect to biomass, photovoltaic generation of electricity, and wind electric and mechanical power. No advisory committees have yet been established to assist in this regard. At the present time, this would appear to be premature until the Fund is launched and CDER staffing and training levels are adequate. RTI is confident that the forthcoming survey of energy needs will point out areas in the commercial sector with which advantageous working relationships can be established.

SECTION FOUR: REFERENCES

A. LIST OF INTERVIEWS

Pre-Embarcation Evaluation Discussions

September 8 - Washington, D.C.

James Bever	AID/W
Mr. Fakihani	CDER
Mrs. Ford	AID/W
Mr. Zimmerman	AID/W
Al Himy	RTI
Hal Minis	RTI
William Stokes	RTI/ATK
Mr. McWilliams	RTI/ATK

September 15 - Washington, D.C.

James Bever	AID/W

September 16 - Washington, D.C.

James Bever	AID/W
Hal Minis	RTI
William Stokes	RTI/ATK

September 18-19, Rabat

Dianne Tsitsos	USAID (daily)
Rick Ernst	DSI Sept 18
Gary Bricker	USAID Sept 19

September 20-23, Marrakech

Mr. Fakihani	CDER	Director Generale	Daily
Mr. M'Zabi	CDER	Secretaire Generale	Daily
Mr. Alaoui	CDER	Chemist/Engineer	Sept 22
Mr. Benamar	CDER	Economist/Engineer	Sept 22
Mr. Benfdil	CDER	Agent Comptable	Sept 22
Mr. Al Himy	RTI	Chief of Party	Daily
Mr. M. Fabre	RTI	Assistant Chief of Party	Daily
Mr. El Jenati	RTI	Admin. Asst.	Sept 23
Ms. D. Tsitsos	USAID	Prgm. Asst/OTP	Daily
Ms. H. Tahiri	USAID	Admin. Asst.	Daily
Ms. C. Wilcox	USAID	AID Intern	Daily

September 24 - Marrakech

CDER Preliminary Evaluation Review

Mr. Fakihani	CDER
Mr. M'Zabi	CDER
Mr. Al Himy	RTI
Mr. M. Fabre	RTI
Ms. D. Tsitsos	USAID
Ms. C. Wilcox	USAID

September 25 - Marrakech

CDER and RTI Remarks on the Preliminary Evaluation Review

Mr. Fakihani	CDER
Mr. M'Zabi	CDER
Mr. Al Himy	RTI
Mr. M. Fabre	RTI
Ms. D. Tsitsos	USAID
Ms. C. Wilcox	USAID

September 26 - Casablanca

Sococharbo

Mr. Boudraa	Technical Director
Mr. Lahlou	Consultant

Office National d'Electricite

Mr. Ghorfi	Director of Micro-Hydro Projects

September 27 - Rabat

Ministry of Energy and Mines

Mr. Benchekroun	Directeur Adjoint
Mr. Barakad	

Ministry of Finance

Mr. Lazrak
Mr. Bayali

Meeting with Mission Director

Mr. Robert Chase	USAID	Mission Director
Ms. Dianne Tsitsos	USAID	Program Assistant/OTP
Mr. Jamal Akahloun	USAID	Program Specialist/OTI
Mr. Jay Smith	USAID	Economist
Mr. Hal Minis	RTI	Project Director
Mr. M'Zabi	CDER	Secretaire Generale

September 28 - Rabat

USAID Review Postponed until following day.

Harry Petroquin	USAID	Assistant Director

(Same as Previous Day except Director)

Stacey Rhodes	USAID	Program Officer

September 29 - Rabat

<u>USAID Review</u>

Mr. Robert Chase
Ms. Diane Tsitsos
Mr. Stacey Rhodes
Mr. Al Himy
Mr. Hal Minis
Mr. M'Zabi

(Section 4B)

DOCUMENTS REVIEWED (NOT APPENDED)

1. AID Project Paper, Project #608-0159. "Morocco Renewable Energy Development II," 1981.
2. USAID/GOM Program Agreement
3. RTI/CDER Contract and Scope of Work
4. RTI/CDER Strategic Plan
5. Year II Objectives, Activities, Short-Term Advisory Plan
6. Task Order Log
7. Project Organizational Chart
8. CDER Organizational Plan
9. Resumes of key staff (CDER and RTI)
10. Commercialization Specialist Profile
11. Observational Visit Program: Mr. Fakihani
12. CDER briefing paper; "Background Information on Renewable Energy Development in Morocco," September 8, 1983.
13. C.T. Main Study: Pilot, Wind, and Solar Projects.
14. Small Projects Fund: Objectives, Regulations, Procedures
15. Small Projects Fund status report memorandum, September 16, 1983
16. Technology Diffusion, Institutional Development Models, Pilot Project Selection.
17. CDER Laboratory and Facilities Design Proposal: SERI/CRS Group, Inc.
18. CDER Laboratory and Facilities Design Proposal: Moroccan Firm.
19. "A Plan for Solar and Wind Energy Resource Assessment in Morocco": SERI.
20. Solar and Wind Energy Resource Assessment memorandum and recommendations: SERI, January 20 1983.

DOCUMENTS REVIEWED (Not Appended)
(Continued)

21. Renewable Energy Demand Study

22. Quarterly Report No. 1

23. Quarterly Report No. 2.

24. Quarterly Report No. 3

25. Trip Reports (Nos. TR001 through TR011)

26. Amorphous Silicon PV Technology

27. Biomass Course No. 1.

28. Sidi Bounouar: Wind Generation Pilot Project

29. Ch'bani Digester

30. Equipment Log

31. CDER books and periodicals (partial list).

32. "Encouragement Measures for Investment in Industry and Selected Sectors."

33. Le Gisement Solaire Marocain

PART II - RENEWABLE ENERGY POTENTIAL FOR MOROCCO

The four types of renewable energy resources that exist in Morocco are microhydro, solar, wind, and biomass.

A. Microhydro Power

The initial C.T. Main study and reference sources within the "Office National d'Electricite" (ONE) have identified 200 sites within the remote rural parts of Morocco with the potential to technically and economically merit the installation of micro-hydro power plants, which would provide an installed generating capacity of approximately 30 MW. Seventy-three of these sites are considered to be immediately exploitable, priority sites. Although small and representing less than 3% of the total electrical generating capacity for Morocco, this power would serve significant parts of the remote mountainous rural population of Morocco for which power demand per capita is low (about 100W).

Morocco, although equipped with a national grid which supplies adequate power to the industrial and urban sectors, currently only provides electricity to 6% of the rural population. Some 854 rural communities are identified, of which 50 are electrified today. The ONE rural electrification program will supply power to an additional 254 communities within the framework of a World Bank project, still leaving 65% (8.3 million) of the population of rural Morocco outside of any immediate ONE planning program for electrification.

The three microhydro plants to be brought on line by the fall of 1985 will supply power to 3,500 people and will be adequate to measure the technical and economic potential of micro-hydro. Site surveys indicate that even if these plants are operational for only 35% of the year, power would be generated at prices competitive with diesel plants. The national grid is not an option in these locations.

ONE quotes the following approximate figures:

- Microhydro 1.5 DH/kWh with estimates for specific sites (i.e. Arhbalou -n- Kerdouss as low as 0.40 DH/kWh);
- Rural diesel plant - up to 5.5 DH/keWh
- National grid - 0.68 DH/kWh (Not an available option)

The issue of maintenance must of course be addressed. First, diesel generating plants are inherently less reliable than hydro, and system life between major overhauls is significantly shorter, hence the above numbers. Additionally, ONE has experience with the operation and maintenance of small hydro systems for many years (installations date back to the 1930's). Many of the plants are still operational today, some coupled into the national grid and demonstrating ONE's capacity to successfully maintain and operate this type of technology.

The microhydro technology thus demonstrates that no major constraints are likely to be encountered as further market penetration occurs. The technology has been used and proven, the economics are competitive, and the resource potential for expansion exists.

B. Solar Energy Conversion

There is abundant sunshine in Morocco and measured levels of insolation range from high to very high. According to a recent publication by members of the Faculte des Sciences of Rabat's solar energy laboratory* over two-thirds of Morocco has average annual insolation levels exceeding 5 kWh/m^2. Unfortunately, only two out of thirty meteorological stations in Morocco report global solar radiation data. The rest provide only qualitative information. This deficiency can be redressed if USAID supports the SERI plan (May 1983) for upgrading the 28 weathers station in Morocco to provide quantitative insolation data. The only limit to the utilization of solar energy for providing thermal and electric power in Morocco is the economic viability of the particular technology at hand. A technical and industrial infrastructure exists in Morocco, to effect the widespread utilization of solar thermal technologies.

At present, capital cost of photovoltaic (PV) power is $5000/kWe and bus bar costs run at 20¢/kWh. Near term forecasts for the development and commercialization of thin film PV cells such as amorphous silicon predict installed capital costs of $2,000/kWe by 1986 and bus bar costs of 10¢/kWh.

Similar predictions are being made for solar thermal industrial process heat utilization. Low cost, linear parabolic collectors could become commercially available at installed costs of $200/m^2 (full system costs), providing thermal energy at $5/MBTU or $5 Gigajoule (the present OPEC price for oil and gas).

In summary, solar technologies available today that are competitive with fossil fuels, or would be competitive by 1986 are:

1. Passive designs: heating and cooling;
2. Flat Plate Collector Technology: hot water/air for domestic consumption and/or industrial process heat use.
3. Linear Parabolic Troughs (1986) - hot water/air/steam for Industrial Industrial Process Heat (IPH) use.
4. PV Panels (1986) - electrical production for rural and urban applications; stand-alone or grid connected.

All four above technologies can be well matched with both rural and urban needs of Morocco. These include domestic space heating and cooling, domestic hot water utilization, process heat for industrial and dairy products; electricity for pumping, lighting refrigeration/cooling and grinding and/or electricity tied to the power grid. For stand-alone applications in electricity generation, storage of energy, primarily in banks of batteries, would add to the PV system cost. Unless low cost, light weight batteries become available by 1986, commercial viability of a PV-storage system may be realized around 1990.

*Le Gisement Solaire Marocain by J. Bahraoui-Buret, M.N. Bargach, M.L. Ben Kaddour, Maroc 1983

C. Wind Energy Conversion

The wind resource is also large in Morocco, but is geographically limited to five regions:

- Strait of Gibraltar Coast
- El Jadida - Cap Rhir Coast
- Tarfaya - Dakhla Coast
- Valleys with a general west-east orientation
- Crests and ridges in the Atlas mountains exposed to upper westerly flows.

Unfortunately, very limited wind data is available for these geographical sites. The wind resource assessment plan prepared by Battelle Pacific Northwest Laboratories for USAID (May 1983) if executed, would provide detailed quantitative information from 10-15 stations in Morocco. For example, based on available mean monthly and annual wind speeds in the above three coastal areas, several hundred megawatts of electric power can be generated by presently available, medium sized wind turbines, tied to the Moroccan power grid system.

More specifically, a medium sized, 200 kWe wind turbine can be installed today at a total capital cost of $2,000/kWe, with a bus bar energy cost of 10-12¢/kWhr. Groups of 10 such turbines can be installed on 5-7 Ha sites and tied to the existing power grid, for an aggregate power of 2 MW. Twenty such groupings could provide an additional 60 MW at 40% utilization per year.

In addition, a large number of small, 5-10 kWe, units could provide water pumping, grinding, and lighting for hundreds of rural communities. Small banks of batteries will be needed for storing energy during calm periods. An alternative system would involve coupling wind turbines in parallel to existing (or newly purchased) 5-10 kW diesel generators as backup units. A careful inventory study is needed to find the number of existing small wind turbines, their state of disrepair, and provide a plan for repairing, reutilizing and maintaining these units.

Finally, on locations where free salt is available at zero cost, with brackish water (i.e. desalination sites), 5-10 Hectare salt gradient solar ponds may be constructed for solar-electric power generation (200-500 kWe units), and/or used in a hybrid scheme with 100-200 kWe wind turbines. Wind and insolation data will be needed at the site before selecting such a hybrid design.

D. Biomass Energy Conversion

Biomass energy has been in use in Morocco for decades, primarily in the form of direct wood combustion and charcoal utilization. In fact, deforestation has been a serious problem in Morocco and unless reversed through a nationally planned reforestation program, could create serious economic and environmental problems for the country.

Of the four renewable resource estimates, biomass represents the least quantifiable resource. Wide estimates are available to date (from the

Moroccan Ministry of Agriculture) depending on various end use patterns. The Evaluation Team was told that a centrally (Washington, D.C.) funded US team will be visiting Morocco in late fall, 1983 to study in some detail the Moroccan biomass potential.

The Evaluation Team was able to glean the following qualitative information on biomass resource and utilization potential in Morocco.

Resource	Conversion	End-Use
Dung and Animal Manure	Anaerobic digestion	Methane for cooking, heating, running small engines (farms and villages).
Agricultural waste and wood	Direct combustion, charcoal production, or wood gasification	Cooking, heating-both residential and commercial scale
Halfa plants	Combustion	1-2 MW power plant*
Municipal Waste	Anaerobic digestion	Several MW power plant utilization

*We were told by CDER about a French study that gives this estimate for power production through Halfa combustion.

All above conversion schemes represent current technologies that are competitive with fossil fuels. The critical issue is the availability of the biomass resource itself and the energy expended in collecting the resource. There exists a definite collection radius, beyond which the fuel expanded to collect the biomass source would exceed the energy value of the fuel produced.

In addition to the above listed "present day" technologies, the strategic renewable energy plan for Morocco could include aquacultural resources for development in 1990 time frame such as giant kelp farms, grown along the Moroccan coastline for the production of chemicals and methane gas, and microalgae ponds for the product of oil at the rate of one barrel of oil/Ha/day.*

Lack of quantitative biomass resource information will make it impossible at this time to quantify the quad, kilowatt or kilojoule impact of biomass energy in Morocco

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*See article by K.M. Touryan "Solar Energy: When, Where, How?" Jour. of Energy, Vol. 6, No.4, July-August 1982.

PART III: PROPOSED PROCUREMENT PLAN FOR CDER FOR 1984

Primarily as a result of the problems that are almost inevitable if a procurement plan is not adopted which matches CDER growth with equipment need, and also because of concern expressed by USAID, the Evaluation Team examined the situation in some detail and prepared the following analysis.

Selection and procurement of equipment depends upon five factors:

1. The configuration of the pilot projects and technology areas for the duration of the project.

2. The applied research program necessary to

   a. support pilot project activities
   b. Develop CDER's institutional capacity

3. The workshop capacity required to support the factors above.

4. The staff available within CDER.

5. The facility to house workshop and laboratory equipment.

This section analyzes the above five key factors and identifies the most expeditious route to proceed with procurement.

1. Pilot Projects

Nine potential projects were cited during the project design phase, and five of these are now in various stages of realization. Studies to identify further projects which encourage market penetration of the technologies are incomplete, and awaiting results of resource and energy needs assessments. Final selection and procurement of equipment must await final selection of the Pilot Projects.

2. The applied research program hinges upon the pilot project selection. Consequently no long term research plan exists. A proposal for '84 only based upon discussions with RTI staff is provided in Attachment A.

3. An incomplete research plan makes it difficult to identify the machine shop facility necessary to support the pilot projects and research program. Based upon the proposal in Attachment A, the priority equipment needed to support '84 activities is shown in Lists D1 and D2.

4. The staff growth pattern within CDER is governed by the annual budget allotted to CDER, and availability of qualified staff. Discussions within CDER and RTI at the Ministry of Energy and Mines and Ministry of Finance indicate a probable growth pattern within '84 as shown in Attachment B.

5. The facility available to CDER must expand considerably prior to completion of the permanent facility targeted for mid-86. CDER management has explored various short term avenues open to them. A formal arrangement to use the School of Mines, workshops and laboratories, additional leased office and lab space, and possible leased or constructed temporary workshop space will provide the essential space for the personnel and equipment envisaged. Expected growth pattern of the facility is shown in Attachment B.

A laboratory and workshop procurement plan (Attachment C) is developed, which allows for the restraints identified in (1) through (5) above, but provides RTI/CDER with adequate support in hardware to ensure the project and the institutional building of CDER progress efficiently.

As shown in the Procurement Plan (Attachment C), procurement is divided into three principle areas for action.

1. First Priority Lab Equipment - (See List D1)

   - o Initiate purchasing procedure immediately
   - o Install in School of Mines 2nd trimester '84

2. Second Priority Lab Equipment - (See List D2)

   - o Identify detailed needs throughout '84
   - o Initiate procurement January '84
   - o Install in supplementary space mid-'85
   - o Transfer to CDER permanent site mid-'86

3. Workshop Equipment (See Workshop Equipment Guidelines--List D3)

   - o Initiate purchasing procedure immediately for

     - Low cost/low volume hand and power tools, for mechanical, electrical and carpentry and selected supplies and materials. Install in School of Mines workshop or temporary supplementary space, if available--3rd trimester '84.

     - High cost/high volume machine tools and heavy material supplies; prepare RFPs and place firm orders <u>only</u> when assurances of supplementary space, and/or formally agreed to space in School of Mines exists. Install end '85 or hold in storage for a period not to exceed six months if CDER permanent facility nearing completion.

<u>Recommendation</u>: RTI cost estimate FY'84 be increased by $150,000 (Line item 12 would be $350,000 rather than $200,000).

Attachment A

RTI PROPOSED APPLIED RESEARCH PROGRAM BY 84
Based on Fabre/Hart Discussion of October 1, 1983

BIOMASS:

- Set up Biomass lab - Space available, some equipment available
- Construct and set up monitoring program on fixed dome (Chinese type) digester
- Perform studies - stationary gasifier (in coordination with Energy and Mines)
- Biogas adaptations -- cooling, pumping, etc. (with Energy and Mines)

METEROLOGICAL:

- Calibration program -- National Meteo Systems
- Introduce full solar monitor into Marrakech Meteo.
- Follow program proposed with SERI resource plan to improve wind/solar resource data base.

SOLAR:

- Set up PV test facility for modules
- Experimentation in load matching and max power tracking
- Set up and monitor 300W PV pump
- Set up test facility for flat plate collectors
- Progress with pilot projects at Grafa and School of Mines
- Participate in NASA refrigeration field test program

WIND:

- Progress with pilot project--Sidi Bounouar
- Prepare multi-blade repair program for Morocco
- Prepare wind atlas for Morocco.

OTHER:

- Investigate other potential pilot projects

List D1

FIRST PRIORITY LABORATORY EQUIPMENT GUIDELINE

Monitor (Lab Level)

- Sensors (Transducers)

  - o TEMPERATURE

    - T/C Probes and Wire Type T. J. K.
    - Thermometers: Mercury in Glass, Bimetal Etc.
    - Pyrometer
    - Resistance Thermos

  - o PRESSURE

    - Static Probes) Visual/Electrical (Liquid & Gas
    - Differential)

  - o FLOW

    - Positive Displacement)
    - Ultrasonic) Visual/Electrical(Liquid & Gas
    - Paddle Wheel)

  - o MECHANICAL

    - Counters

  - o ELECTRICAL: I, V, P, Ø, AC/DC, etc.

  - o RESOURCE*

- Transmission and Signal Conditioning

  REF Junctions, Amplifier's

- Receivers, AC-DC Converters, information storage, accumulators, channel selectors, integrators, etc.

- Readout (Display) Devices--Multichannel Analog Recorders, Digital, etc.

- Calibration References

*NOTE: Solar and wind monitoring instrumentation not included since USAID has procurement responsibility.

List D1 Continued

FIRST PRIORITY LABORATORY EQUIPMENT GUIDELINE

- Plotters
- Extensive Spare Parts
- Volatile solids and Combustion Analyzers
- Weighing
  - o Precision
    - Greater than 5 Kg, 10 Kg and 20 Kg
    - Load Cells

Maintenance (Lab Level)

- Instrumentation maintenance sets (Handtools)
- Signal monitoring and generation instruments (Scope, power supply frequency generation, etc.)
- Large selection common electrical maintenance components (Resistors, caps, diodes, fittings, etc.)
- Electrical/electronic measuring instruments for lab level use, and field use) (multimeter, digital 3-1/2 and 4-1/2, analog, shunts, etc.)
- Cleaning materials
- Test bench for electrical/electronic components
- Stock glassware (chem)
- Resistance/cap, box, impedance bridge

Maintenance (Field Level)

- Pilot project service and troublshooting kit (One set per project)
- Regional center (Measuring instruments, portable, analog/digital for temperature, pressure, flow & electrical outputs

List D2

SECOND PRIORITY LABORATORY EQUIPMENT GUIDELINE

Lab Monitoring

- Data Logging
- RS232 Interface
- Microcomputer
- Software (Lab Level Research)
- Weighing
    - o Less than 100 Kg
    - o Load Cells
- Pressure Transducers
- Remote Hook-up Terminals, Intercom to field test area
- Software
    - o Social Impact Studies PPS
    - o Economic Impact Studies PPS
- Instrumentation to monitor selected technologies funded under small project.
- Bio-chemical Lab (Ref. Project Paper 5-9) [Selected items only]
- Bio-combustion Lab--Selected items

Field Monitoring

o Instantaneous

- Readout system for each PP System

o Cumulative

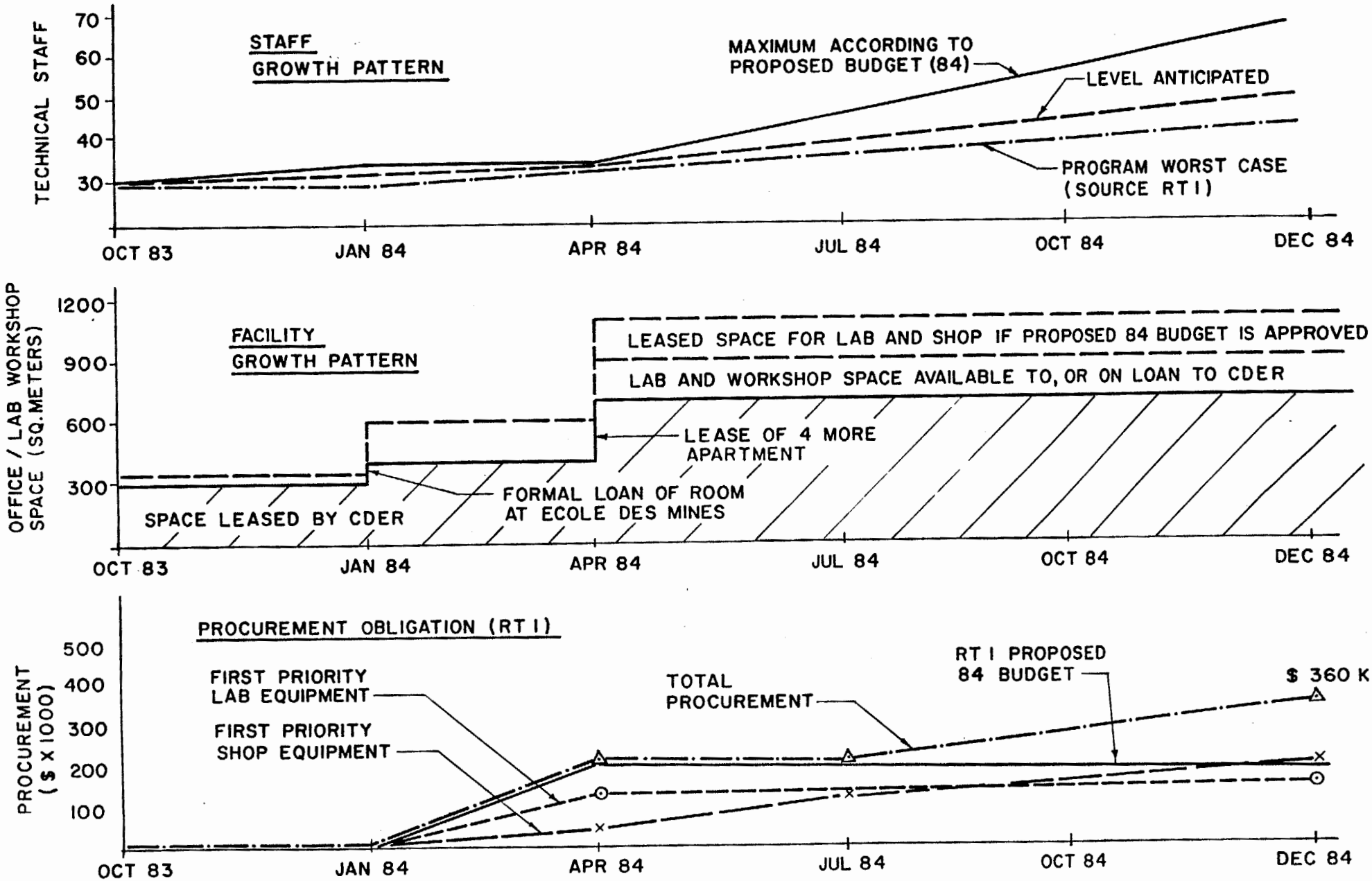
- Data Storage System for each PP

Solar Hardware

- General Materials Stock

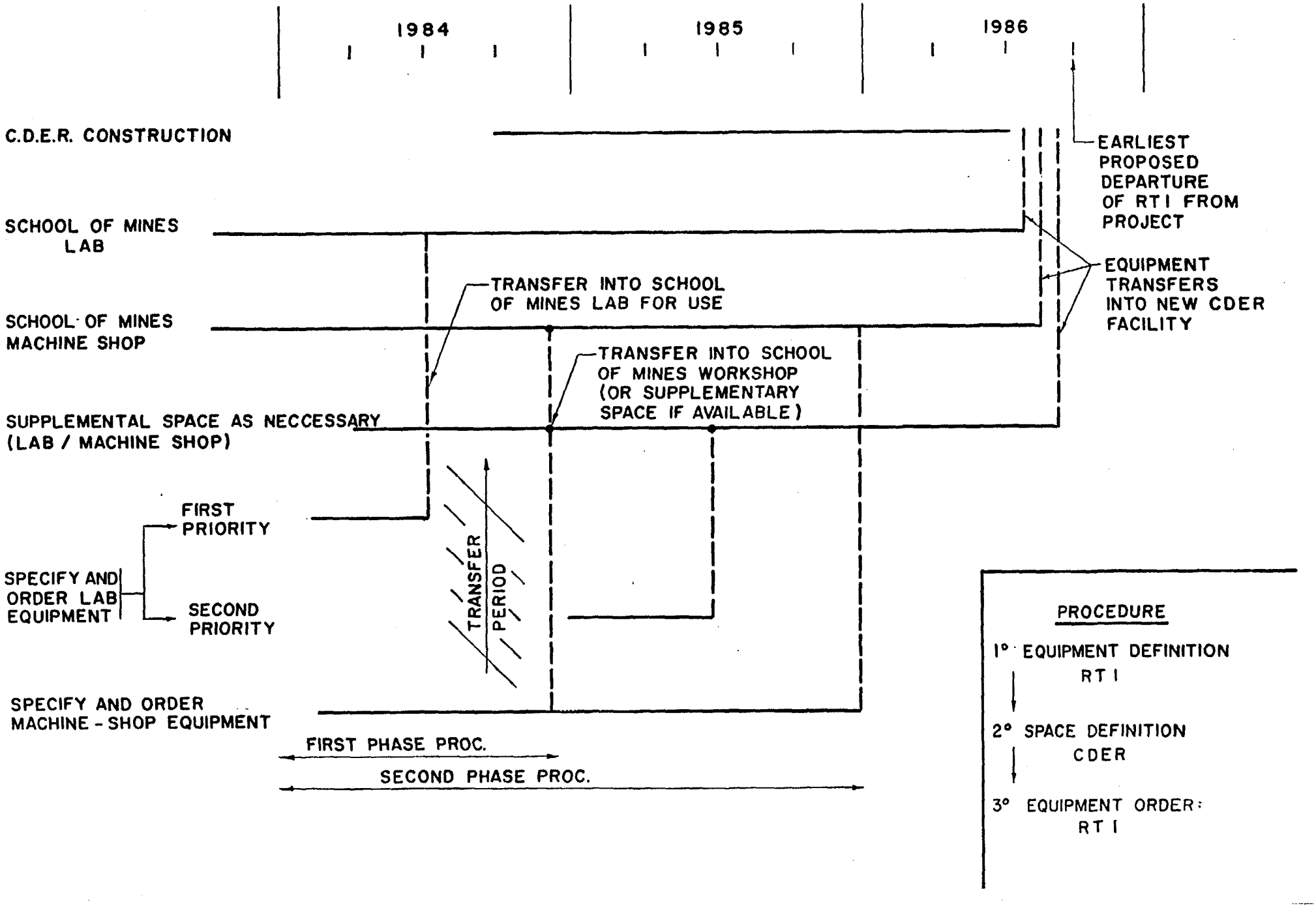
ATTACHMENT B

PHASING: C.D.E.R. STAFF – SPACE – PROCUREMENT 84



ATTACHMENT C

PROCUREMENT PLANNING



List D3

WORKSHOP EQUIPMENT GUIDELINES

Low Cost/Low Volume Hand and Power Tools and Supplies

- General mechanical engineering maintenance tool sets (US & metric) on rolling cabinets (Ref Snap-On + additional sets of frequently used tools)
- Plumbing tool set--complete for galvanized, copper, PVC
- Electrical maintenance tool set for domestic/industrial maintenance.
- Misc. electrical supplies and stock
- Misc. plumbing supplies and stock
- Electrical test bench (Shop type) with power supply DC/AC Ø 123 armature test I,V, P measure etc.
- Small Compressor
- Miscellaneous pneumatic fittings
- Retention devices - clamps, vises, etc.
- Extractor sets--mech/elec applications
- Measuring instruments metal/wood gauges, etc.
- Woodworking tool set - hand and power tools.
- Bench grinder and attachments
- Drill press--medium duty
- Safety Equipment
- Sheet metal working hand tools
- Manual shear
- Hydraulic press and attachments
- Welding equipment oxy/acetyline - spot - arc
- Riveting and percussion nailer

ESTIMATED VALUE: $50,000

High Cost/High Volume Machine Tools and Heavy Material Supply

- M/C tools, lathe, universal mill, surface grinder, HD, drill press, etc.
- Sheet metal m/c: Shear, rolls, notch, bender
- Heat treatment: forge, furnace
- Woodworking M/C: combination plane/table saw/router/ band saw, sander, drill press, etc.
- Welding: M.I.G, Argon
- Materials Stock not available on local market.

ESTIMATED VALUE: $300,000

PART IV: LIST OF APPENDED DOCUMENTS

NUMBER	TITLE
I	Dahir No. I-81-346 du II rejeb 1402 (6 Mai 1982) Portant promulgation de la loi No. 26-80 Relative au Centre de Developpement des Energies Renouvelables. (Law creating CDER)
II	Decret No. 2.80.504 Pris pour l'application de la loi No. 26.80 Relative au Centre de developpement des energies renouvaleable, promulguee par dahir No. 1.81.346 du 11 rejeb 1402 (6 Mai 1982) (Decree locating CDER at Marrakech and other actions)
III	Organigramme Du Mionistere de L'Energie et Des Mines
IV	Organigramme de Demarrage 1983, CDER
V	Research Triangle Institute Technical Assistance Project CDER - Marrakech Morocco
VI	Liste Du Personnel Actuel (23 Sept. 1983)
VII	Personnel A Recruter
VIII	Strategic Plan for CDER
IX	Newspaper Article from LeMatin, 27 September 1983
X	Excerpts from Kompass showing advertisements of renewable energy equipment and services. See Part I, Section Three, Chapter IV, item C, of the Evaluation Report.

Dahir n° I-81-346 du I rejeb 1402 (6 Mai 1982) portant promulgation de la Loi n° 26-80 relative au Centre de Développement des Energies Renouvelables.

Appendix I-1

LOUANGE A DIEU SEUL !

(Grand Sceau de Sa Majesté Hassan II)

Que l'on sache par les présentes - puisse Dieu en élever et en fortifier la teneur !

Que Notre Majesté Chérifienne,

Vu la Constitution, notamment son article 26,

A Décidé ce qui suit :

ARTICLE PREMIER - Est promulguée la loi n° 26-80 relative au Centre de Développement des Energies Renouvelables, adoptée par la Chambre des représentants le 21 ramadan 1401 (23 Juillet 1981) et dont la teneur suit :

Loi n° 26-80 relative au Centre de Développement des Energies Renouvelables

ART. I - Il est institué, sous la dénomination de Centre de Développement des Energies Renouvelables (CDER) un établissement public doté de la personnalité morale et de l'autonomie financière.

Le centre est soumis à la tutelle de l'Etat qui est assurée par l'intermédiaire du Ministère chargé de l'énergie. Cette tutelle a pour objet de faire respecter, par les organes compétents du centre, les dispositions de la présente loi, en particulier celles relatives aux missions qui lui sont imparties et, de manière générale, de veiller à l'application de la législation et de la réglementation concenant les établissements publics.

Il est également soumis au contrôle financier de l'Etat applicable aux établissements publics en vertu de la législation en vigueur.

ART. 2- On entend, au sens de la présente loi, par " énergies renouvelables " toutes les énergies qui se renouvellent naturellementn ou par l'intervention d'une action humaine, et notamment l'énergie solaire, l'énergie éolienne, l'énergie biomassique, l'énergie marine.

ART. 3 - Le Centre de Développement des Energies Renouvelables est chargé d'effectuer toutes études et recherches destinées à la promotion, au développement, à la production et à la commercialisation ainsi qu'à l'utilisation des énergies renouvelables.

A cet effet il peut, à la demande de l'Etat ou de sa propre initiative :

- mettre au point des procédés et des équipements pour l'utilisation efficiente des sources renouvelables d'énergie, par l'établissement et l'exécution de programmes d'études et de recherches scientifiques et techniques et techniques ainsi que par la réalisation de tous essais technologiques ;

- démontrer l'intérêt technique, économique et social de l'utilisation des énergies renouvelables par la création et l'aménagement d'installations dont le centre assure le fonctionnement ;

- assurer la formation technique du personnel spécialisé pour la recherche et l'utilisation des énergies renouvelables.

Il peut également réaliser, pour le compte de tiers, des études, des recherches et des travaux relevant de sa compétence.

ART. 4- Le centre est administré par un conseil d'administration qui peut comprendre, outre des représentants de l'Etat ou d'autres personnes morales de droit public, des représentants des producteurs, des utilisateurs et des consommateurs de l'énergie.

Le conseil peut déléguer une partie de ses pouvoirs à un comité de direction.

Le centre est géré par un directeur assisté d'un secrétaire général.

ART. 5 - Le conseil d'administration est investi de tous les pouvoirs et attributions nécessaires à l'administration du centre.

Le conseil d'administration délibère valablement lorsque la moitié, au moins de ses membres sont présents ou représentés, le cas échéant. Les décisions sont prises à la majorité des voix. En cas de partage égal des voix, celle du président est prépondérante.

ART. 6 - Le directeur détient tous les pouvoirs et attributions nécessaires à la gestion du centre.

Il exécute les décisions du conseil d'administration et, le cas échéant, du comité de direction.

Il peut recevoir délégation du conseil d'administration ou du comité de direction, pour le règlement d'affaires déterminées.

Il peut déléguer une partie de ses pouvoirs et attributions au personnel de direction du centre.

Le directeur peut déléguer, au secrétaire général, une partie de ses pouvoirs et attributions. En cas d'absence ou d'empêchement du directeur, le secrétaire général assure l'intérim de ce dernier.

.../...

ART. 7 - Le budget du centre comprend :

a - En recettes :

- Les subventions de l'Etat ;
- les produits et bénéfices provenant de ses opérations propres ;
- les avances remboursables du Trésor, d'organismes publics ou privés ainsi que les emprunts autorisés conformément à la réglementation en vigueur ;
- les dons, legs et produits divers ;
- toutes autres recettes, notamment parafiscales, qui peuvent lui être attribuées ultérieurement.

b - En dépenses :

- Les frais de fonctionnement et d'équipement du centre ;
- le remboursement des divers avances avances et emprunts ;
- les versements à l'Etat des bénéfices réalisés par le centre ;
- toutes autres dépenses qui peuvent lui être imposées.

ART. 8- Le Centre tient ses écritures et effectue ses opérations de recettes et de paiement selon les lois et usages de commerce.

ART. 9 - La présente loi prend application à compter de la date de sa publication au Bulletin officiel.

ART. 2 - Le présent dahir sera publié au Bulletin officiel.

Fait à Fès, le II rejeb I402
(6 Mai I982)

Pour contreseing :
le Premier ministre,
MAATI BOUABID.

/_) E C R E T
n° 2.80.504

pris pour l'application de la loi n° 26.80 relative au centre de développement des énergie renouvelables, promulguée par dahir n° 1.81.346 du 11 rejeb 1402 (6 mai 1982)

/E PREMIER MINISTRE,

VU la loi n° 26.80 relative au Centre de développement des énergies renouvelables promulguée par dahir n° 1.81.346 du 11 rejeb 1402 (6 mai 1982)

VU le dahir portant loi n° I.77.185 du 5 chaoual 1 (19 septembre 1977) relatif à la présidence de conseils d'administration des établissements pu nationaux et régionaux ;

Après examen par le Conseil des Ministres réuni le 16 rejeb 1401 (21 mai 1981) ;

D E C R E T E :

ARTICLE PREMIER.- Le siège du Centre de développement des énergies renouvelables est fixé à Marrakech.

Des annexes du Centre peuvent être ouvertes dans les différentes régions du Royaume.

ARTICLE 2.- La tutelle du Centre de développement des éne renouvelables est assurée par le Ministre chargé de l'Ene sous réserve des pouvoirs et attributions dévolus au Mini des Finances par les lois et règlements sur les établisse publics.

ARTICLE 3.- Le Conseil d'administration est présidé par l Premier Ministre ou par l'autorité gouvernementale délégu par lui à cet effet.

/...

Il comprend, en outre, les membres suivants :

- le Ministre chargé de l'Energie,
- le Ministre chargé des Finances,
- le Ministre de l'Intérieur,
- le Ministre chargé de l'Equipement,
- le Ministre chargé des Transports,
- le Ministre chargé du Plan,
- le Ministre chargé du Commerce et de l'Industrie,
- le Ministre chargé de l'Habitat,
- le Ministre chargé de l'Agriculture,
- le Directeur de l'Office national de l'électricité,
- le Directeur du bureau de recherches et de participations minières,
- le Directeur de la Société nationale des produits pétroliers.

Les autorités gouvernementales, membres du Conseil d'administration, ou, en cas d'empêchement, leur représentant.

Le Directeur de l'énergie et le Directeur du Centre assistent aux réunions avec voix consultative.

Le Directeur du Centre assure le secrétariat des réunions du Conseil d'administration.

Toute personne qualifiée peut être appelée par le président à y siéger à titre consultatif.

ARTICLE 4.- Le Conseil se réunit sur convocation de son Président aussi souvent que les besoins du Centre l'exigent et au moins deux fois par an :

a) avant le 31 mai de chaque année, pour arrêter les comptes de l'exercice écoulé ;

b) avant le 31 octobre de chaque année pour examiner et arrêter le budget du Centre et le programme prévisionnel de l'exercice suivant.

Conformément aux dispositions de l'art. 5 de la loi n° 26.80 susvisée, le Conseil délibère valablement lorsque sept au moins de ses membres sont présents ou représentés et prend ses décisions à la majorité des voix. En cas de partage égal des voix, celle du Président est prépondérante.

ARTICLE 5.- Le Conseil d'administration dispose de tous les pouvoirs nécessaires à l'administration du Centre.

A cette fin, notamment, il arrête les programmes des opérations scientifiques, techniques et financières du Centre, arrête le budget ainsi que les modalités du financement et les comptes de l'exercice écoulé et décide de l'affectation des résultats ; élabore le statut du personnel du Centre et le fait approuver dans les conditions prévues par la législation en vigueur pour le personnel des établissements publics ; approuve les programmes des travaux à réaliser pour le compte des tiers et à leur demande.

Les délibérations du Conseil d'administration sont constatées par des procès-verbaux, signés par le Président de séance et transcrits sur un registre spécial tenu au siège du Centre.

ARTICLE 6.- Lorsque le Conseil d'administration délègue conformément aux dispositions du 2ème alinéa de l'art. 4 de la loi n° 26.80 précitée, partie de ses pouvoirs à un comité de Direction, ce dernier est composé, se réunit et délibère dans les conditions suivantes :

Le Comité de direction est présidé par le directeur de l'énergie. Il comprend en outre :

- un représentant du Ministère des Finances,
- un représentant du Ministre chargé de la météorologie nationale,
- un représentant du Ministre chargé de l'Habitat,
- le directeur des mines,
- le directeur de la géologie,
- le chef de la division des produits pétroliers à la direction de l'énergie,
- le chef de la division du développement des ressources énergétiques à la direction de l'énergie,
- le chef de la division de l'électricité à la direction de l'énergie,

- le doyen de la faculté des sciences de Rabat,
- le directeur de l'Office national de l'électri ou son représentant,
- le directeur du bureau de recherches et de participations minières ou son représentant.

Toute personne qualifiée peut être appelée par le Président à y siéger à titre consultatif.

Le directeur du Centre assiste aux réunions du Comité de Direction avec voix consultative et en assure le Secrétaria

Le Comité de direction se réunit sur convocation de son Président aussi souvent que les besoins du Centre l'exigen et au moins une fois par trimestre.

Le Comité délibère valablement à la majorité des membres présents ou représentés dont le nombre ne peut être inférieur à six. En cas de partage égal des voix, celle du préside est prépondérante.

ARTICLE 7.- Le Directeur est nommé conformément à la réglementation en vigueur.

Le directeur peut, conformément aux dispositions du 3ème alinéa de l'art. 6 de la loi précitée n° 26.80 recevoir délégation du Conseil d'Administration ou du Comité de direction pour le règlement d'affaires déterminées.

Le directeur exécute les décisions du Conseil d'administration et, le cas échéant, celles du Comité de direction ; assure la gestion de l'ensemble des services du Centre et agit en son nom : accomplit ou autorise tous actes ou opérations relatifs à l'objet du Centre et le représente vis-à-vis de l'Etat, de toute administration publique ou privée et de tous tiers, fait tous actes conservatoires ; représente le Centre en justice mais ne peut intenter une action judiciaire qu'avec l'autorisation du Conseil d'Administration; nomme le personnel, dans le cadre des dispositions prévues par la réglementation en vigueur.

/...

En tant qu'ordonnateur, le Directeur engage les dépenses par acte, contrat ou marché, fait tenir la comptabilité des dépenses engagées, liquide et constate les dépenses et les recettes du Centre.

Le Directeur peut déléguer une partie de ses pouvoirs et de ses attributions conformément aux dispositions de l'art. 6 de la loi précitée n° 26.80.

ARTICLE 8.- Le Secrétaire Général assiste le Directeur et le remplace en cas d'absence ou d'empêchement. Il exerce les attributions et pouvoirs que lui délègue le Directeur.

ARTICLE 9.- Le personnel du Centre est composé d'agents recrutés par ses soins et de fonctionnaires détachés de l'Administration.

ARTICLE 10.- Le Centre tient ses écritures et effectue ses opérations de recettes et de paiement suivant les lois et usages du commerce.

ARTICLE 11.- Le Ministre de l'Energie et des mines et le Ministre des Finances sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret qui sera publié au bulletin officiel.

FAIT A_____, le_____

POUR CONTRESEING :

e Ministre de l'Energie et des Mines,

Signé :

Le Ministre de l'Energie et des Mines

Signé : Mousso SAADI

-/e Ministre des Finances,

Signé :

(C) ORGANIGRAMME DU MINISTERE DE L'ENERGIE ET DES MINES
(cf. DECRET DU 27 JUIN 1979 FIXANT L'ORGANISATION ET LES ATTRIBUTIONS DU MINISTERE DE L'ENERGIE ET DES MINES

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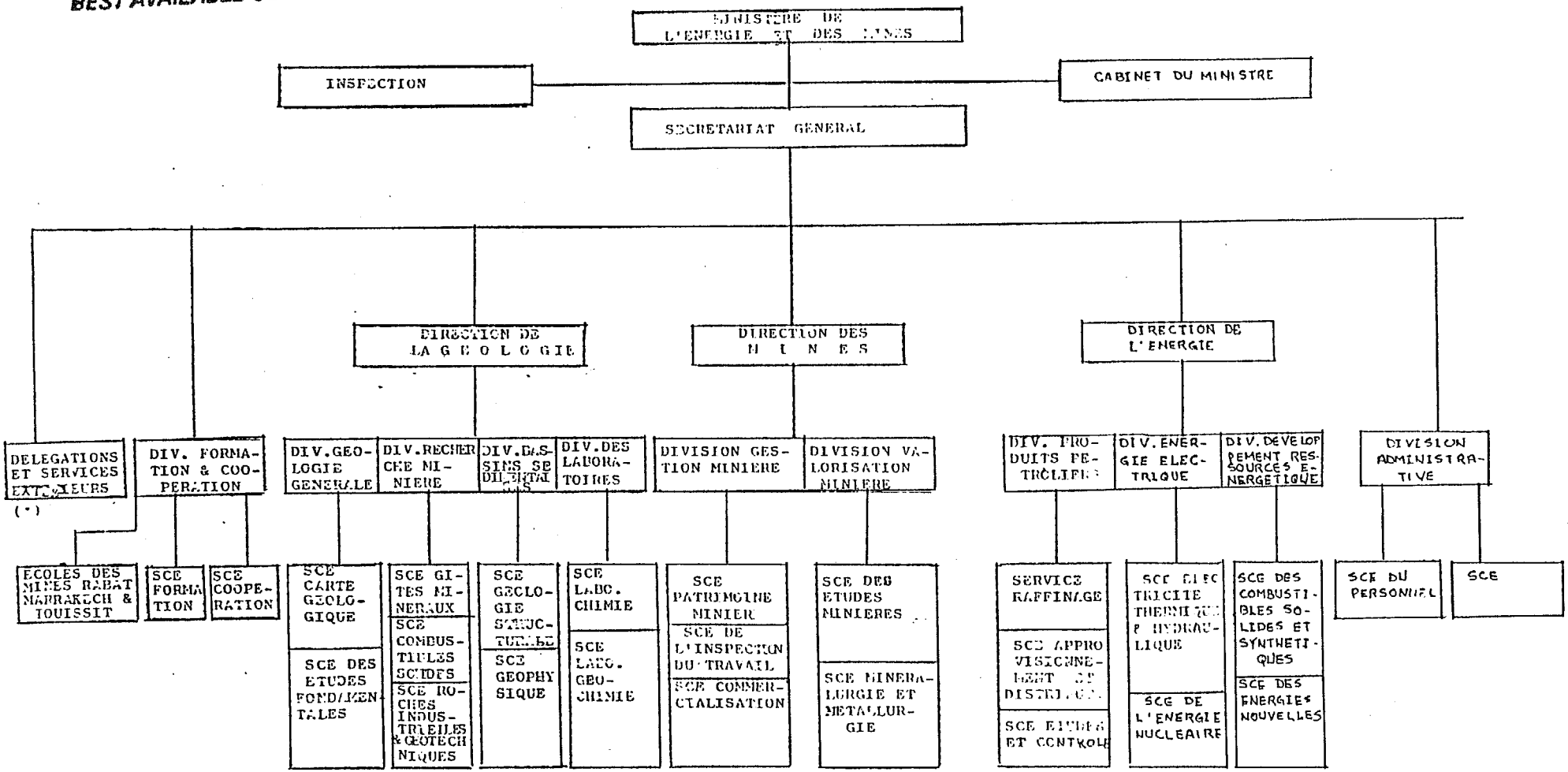

(*) NB :
- Délégations : OUJDA, RABAT, CASABLANCA, MARRAKECH, MEKNES, LAAYOUNE
- Services Extérieurs des Mines : OUJDA, BOUARFA, ERFI-ENZAR, TETOUAN, TANGER, MEKNES, KHENIFRA, ERRACHIDIA, CASABLANCA, MARRAKECH, AGADIR, OUARZAZATE.
- Services Extérieurs de la Géologie : OUJDA, EZZHIES, MIDELT, MARRAKECH, OUARZAZATE, AGADIR.

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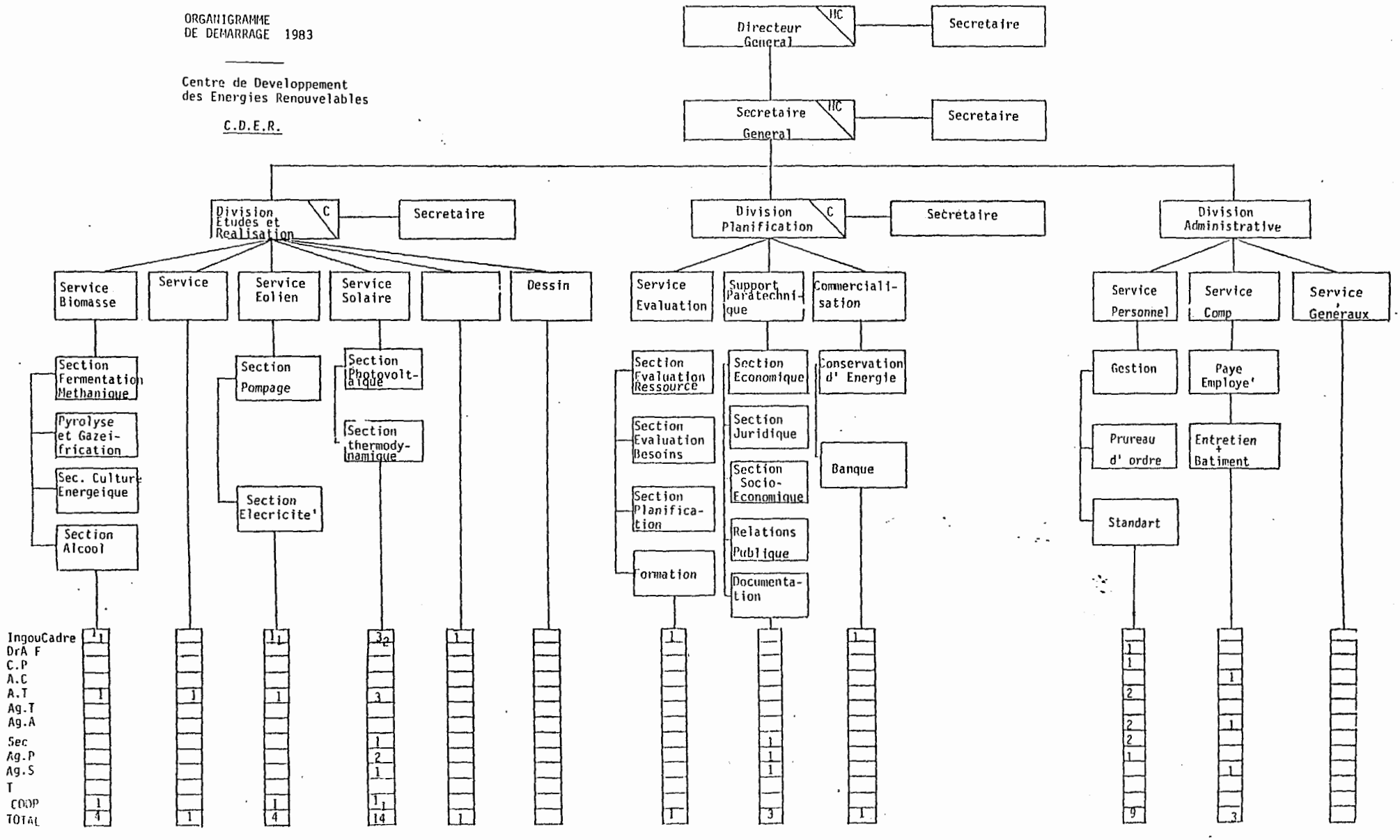
APPENDIX IV

ORGANIGRAMME
DE DEMARRAGE 1983

Centre de Developpement
des Energies Renouvelables

C.D.E.R.



Besoins par Service

CLASSIFICATION														
DIRECTEUR GENERAL	1													1
SECRETAIRE GENERAL	1													1
DIVISION ETUDES ET REALISATIONS														
SERVICE BIOMASSE		1 1				1							1	4
SERVICE MICROCENTRALES HYDROELECTRIQUES						1								1
SERVICE EOLIEN		1 1				1							1	4
SERVICE SOLAIRE		3 2				3			1	2	1		1 1	14
SERVICE ENERGIE MARINE ET GEOTHERMIQUE		1												1
SERVICE DESSIN														
DIVISION PLANIFICATION														
SERVICE EVALUATION		1												1
SERVICE SUPPORT PARATECHNIQUE									1	1	1			3
SERVICE COMMERCIALISATION		1												1
DIVISION ADMINISTRATIVE			1	1		2		2	2	1				9
SERVICE PERSONNEL														
SERVICE COMPTABILITE					1			1			1			3
SERVICES GENERAUX														
TOTAUX — PERMANENTS														43
TOTAUX — TEMPORAIRES														

N.B. Cet organigramme ne comprend pas les annexes du Centre qui pourraient etre creees dans certaines regions-

D.G.	1													1
S.G.	1													1
D.E.R.		6 4				6			1	2	1		2 2	24
D.P.		2							1	1	1			5
D.A.			1	1	1	2		3	2	1	1			12
TOTAL	2	12	1	1	1	8		3	4	4	3		4	43

Legende:

D.G: DIRECTEUR GENERAL

S.G: SECRETAIRE GENERAL

H.C: HORS CADRE

ING/C: INGENIEUR OU CADRE

Dr.A.F: DIRECTEUR ADMINISTRATIF ET FINANCIER

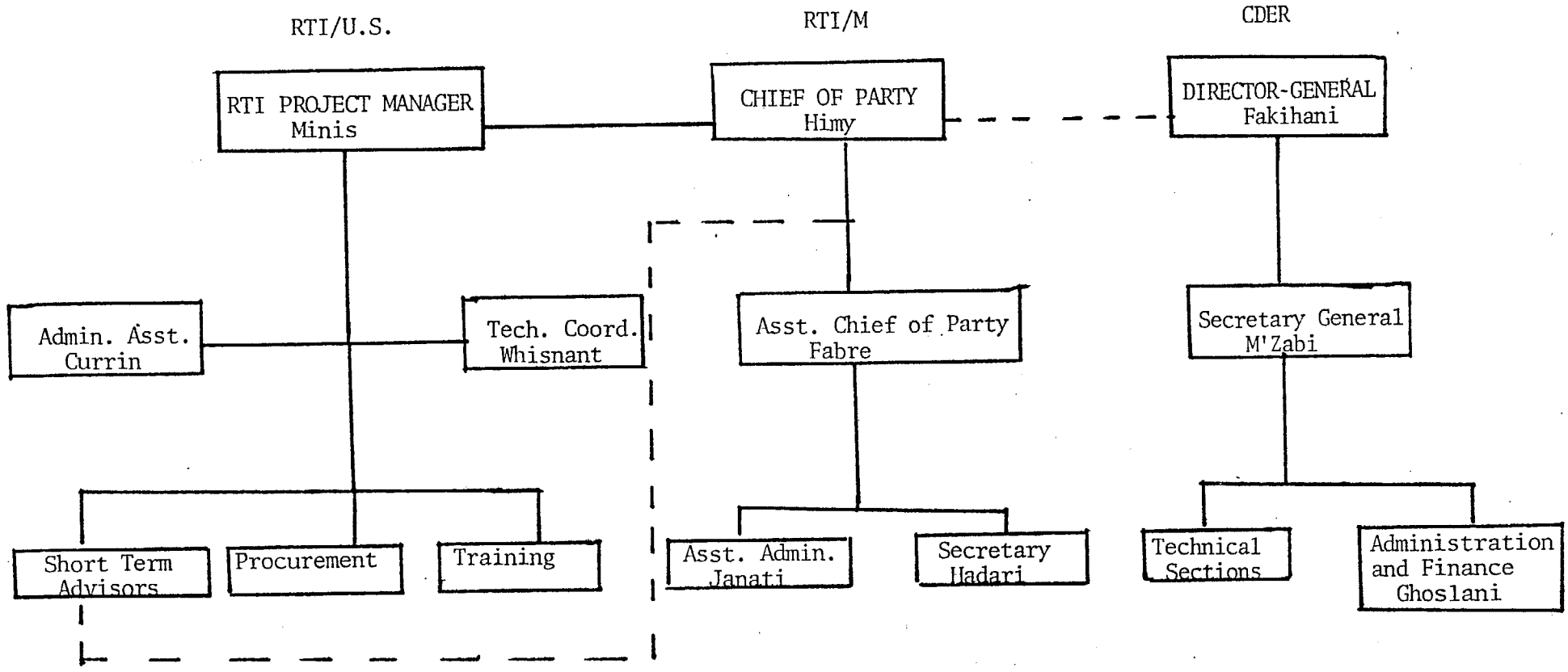
C.D: CHEF DU PERSONNEL

Ag.C: ANGENT COMTABLE

A.T: ADJOINT TECHNIQUE

Ag.T: AGENT TECHNIQUE

RESEARCH TRIANGLE INSTITUTE
TECHNICAL ASSISTANCE PROJECT
C. D. E. R. - MARRAKECH MOROCCO



LISTE DU PERSONNEL ACTUEL DU CDER AU 23/9/1983

NOMS ET PRENOMS	QUALIFICATION
Mr. FAKIHANI Abdelhag	Directeur General
Mr. M'ZABI Mohamed	Secretaire General
Mr. GHOZLANI Mohamed	Directeur
Mr. ALAOUI Mohamed	Administratif et Financier
Mr. BENTALHA Abderrazak	Ingenieur d'Etat
Mr. CHEBRI Abdellah	Ingenieur d'Etat
Mr. BENAMAR Mohamed	Ingenieur d'Application
Mr. SEMLALI Mohamed	Ingenieur d'Application
Mr. ACHARAI Abdelouahed	Comptable
Mr. BAKRI Mohamed	Adjoint Technique
Mr. BOUAM Mohamed	Adjoint Technique
Mr. AFFANI Fathallah	Adjoint Technique
Mr. NAYSSA Abdelmoula	Adjoint Technique
Melle MAGHOUSSI Ghita	Adjoint Technique
Melle KNIDIR Fatima	Adjoint Technique
Melle MISRAR Aicha	Adjoint Technique
Melle DOUNIA Halima	Secertaire
Melle QACIK Khadija	Secretaire
Mr. MECHROUKI Hassan	Chauffeur
Mr. KARI Mbarek	Agent de Service
Mr. TAGHZOUTI Abdelkader	Agent de Service

PERSONNEL A RECRUTER

FILIERE ADMINISTRATIVE	NOMBRE
Echelle 11	
—	
Echelle 10	
- Attaché de Diréction	1
- Administrateur Adjoint.....	3
- Documentaliste (D.G).....	1
Echellè 8	
- Rédacteur (Sc.G).....	1
- Secretaire de D (D.G).....	1
Echelle 7	
- Chefs de section (Cpté, Pers).....	2
- Secretaire (D.A.F).....	1
Echelle 5	
- Commis	1
- Standariste.....	1
Echelle 4	
- Chauffeur.....	3
- Journalier permanent.....	1
Echelle 3	
—	
Echelle 1	
—	
Agent occasionnel	
- Femmes de ménage.....	2

Suite). ANNEXE 2/

FILIERE TECHNIQUE		NOMBRE
Echelle 11		
- Ingénieur Agronome	(Biomasse)	1
- Ingénieurs	(Solaire)	3
- Ingénieur	(Eolien)	1
- Ingénieur	(M.C.H)	1
- Architécte	(Solaire)	1
Echelle 10		
- Ingénieur d'Application (Solaire)		1
- Ingénieur d'Application (Eolien)		1
- Ingénieur Agricole (Biomasse)		1
- Ingénieur d'Application (M.C.H)		1
Echelle 8		
- Adjoint Téchnique spécialisé (M.C.H)		1
- Adjoint Téchnique spécialisé (Eolien)		2
Echelle 7		
- Adjoint Téchnique (B.M)		2
- Adjoint Téchnique (E.S)		4
- Adjoint Téchnique (E.E)		2
- Adjoint Téchnique (M.C.H)		1
- Adjoint Téchnique (Déssinateur)		1
Echelle 6		
- Agent Téchnique		1
Echelle 4		
- Ouvriers spécialisés (Solaire)		2
- Ouvriers spécialisés (Biomasse)		2
- Ouvriers spécialisés (Eolien)		2
- Ouvriers spécialisés (M.C.H)		2

Coopérants et V.S.N.A.

2 pour les projets A.F.M.E.

RESEARCH TRIANGLE INSTITUTE
POST OFFICE BOX 12194
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27709

Office for International Programs

September 13, 1983

MEMORANDUM

TO: Files

FROM: H. Minis

SUBJECT Strategic Plan for CDER

The attached text and charts which were presented to Mr. Fakihani during his visit at RTI in August, represent the first draft of the strategic planning approach, objectives, and plan framework. The objectives have been defined after a review of a number of pertinent documents including the legislation creating CDER, the Five Year Plan (GOM), previous AID energy sector studies, Renewable Energy Program Phase I documents (by Charles T. Main, Inc.), and the AID project paper.

A preliminary document will be sent to CDER for review in early October. Shortly thereafter an RTI team will facilitate discussion of priorities for action and alternative strategies for which detailed work plans will be developed. The direct participation of CDER management is vital at this stage to assure that the plan reflects their thinking and to bring them into a continuing planning process.

TELEPHONE (919) 541-6000

CABLE RESTRINS
TELEX: 802509 (RTI RTPK)

Strategic Institutional Development Plan for CDER

Strategic planning is the process of making current decisions with the best possible knowledge of their future consequences. Through this process, an organization can review current strategies while scanning potential influences in the environment. By balancing external opportunities and threats against the organization's internal strengths and weaknesses, management can identify strategic options and evaluate each of these options in terms of the organization's objectives. Then, selecting a strategy or strategies, management can implement them through appropriate shorter term operational work plans.

Key words in the above definition of strategic planning are process, decisions, and future.

Process implies an active and ongoing review of options. A strategic plan is not a blueprint; it is a flexible framework within which opportunities and risks can be measured and acted upon. Central to the concept of process is the fact that planning is an internal management function. The role of outsiders can only be to facilitate plan development.

Decisions are the bottom line of management for any organization. Good planning leads to better management decisions because the planning process provides essential information for evaluation of strategic alternatives and effective conduct of day to day operations.

A future orientation enables planning to become a tool for anticipating changes in the internal or external environments so that an organization is able to control its destiny rather than be controlled by unexpected events or other external forces.

For CDER, the benefits of effective strategic institutional development planning include:

- an enhanced ability to justify its actions and obtain resources to support its activities;
- an improved network of linkages to sources of political, technical, and financial support; and
- increased control over future events affecting the organization's effectiveness and even survival.

CDER's planning process should begin with a clear statement of its mission as an organization. This statement answers the questions of why CDER exists.

Mission should then be translated into a set of organizational objectives that state the desired outcomes of each of CDER's major program emphases. These objectives should be consistent with a careful assessment of CDER's strengths and weaknesses and position in overall Moroccan energy planning and development.

Objectives may relate to CDER's institutional structure, its role in technology development and diffusion, or its influence on Moroccan national policy. It is at this point in the planning process that hard thinking and sound judgment are particularly important. Definition of objectives is what will determine the character of CDER but, if the objectives are not realistic, they will not serve as a basis for good operational decisions.

For each objective, CDER should then define measurable outcomes, budgets, schedules, and staff needs. This portion of the planning process develops the operational work plans for achieving the stated objectives. It enables managers and staff to know what they must really do and why. It provides a basis for measuring progress along the way. And it offers a framework for reassessing CDER's impact over time in order to modify the plan as internal and external factors change.

This preliminary document is designed to assist CDER management to think about its planning process and to be a first step in the preparation of a CDER strategic plan. As emphasized above, planning must be a function of management itself; the role of RTI should only be to assist the process by raising key questions and providing a suggested framework for the plan.

There follows a suggested CDER mission statement and listing of three broad CDER objectives. Several program outcomes are defined for each objective and, by way of example, elements of an operational work plan are illustrated for certain of these outcomes. This material should help focus the discussions of RTI staff with CDER leadership both here and in Marrakesh. Through a continuing process of interaction that draws on the knowledge of CDER management and staff, a more complete strategic plan will be developed.

The <u>mission</u> of CDER is to promote the development and use of renewable energy in the Kingdom of Morocco and to facilitate the domestic infrastructure necessary to achieve that development and use.

CDER objectives directed to the accomplishment of the CDER mission are the following:

1.0 Develop a CDER institutional capability to manage and coordinate renewable energy research activities that are applicable and relevant to Moroccan economic and social development. Tasks to be achieved under this objective include:

- Establish an ongoing institutional planning process which includes a completed strategic plan, a timetable for plan revisions, and information needs for planning.
- Define an organizational structure for CDER consistent with its mission and operating guidelines.
- Define the programs to be carried out by CDER to achieve its mission.
- Define the position functions and staff capabilities required to perform those functions for all proposed positions. Establish a recruitment program to fill the positions according to a defined growth plan for CDER.
- Establish a training program to provide initial skills needed by all CDER staff and to renew and extend those skills to meet future program needs.
- Initiate and carry out a continuing program of cooperation with other government agencies in planning and conducting mutually beneficial projects with a renewable energy content.
- Define a comprehensive set of operating policies and procedures that will guide the activities of all CDER staff to effectively carry out its programs.

2.0 Develop renewable energy technology for application to Moroccan energy needs. Tasks to be achieved under this objective include:

- Identify renewable energy resources of all types in Morocco and quantify them to allow technical assessment and design of energy technology,
- Assess the energy demand in Morocco and define future market share targets for renewable energy in terms of conventional fuels replacement,
- Identify renewable energy technology options for Morocco and define programs to develop and adapt them to specific needs,
- Define and conduct programs to commercialize renewable technology through CDER internal R&D programs, pilot projects, and development of standards and testing programs,

Develop or obtain and adapt energy model(s) suitable for design and evaluation of renewable energy technologies in identified Moroccan applications. Make these models operational and train CDER staff in their use.

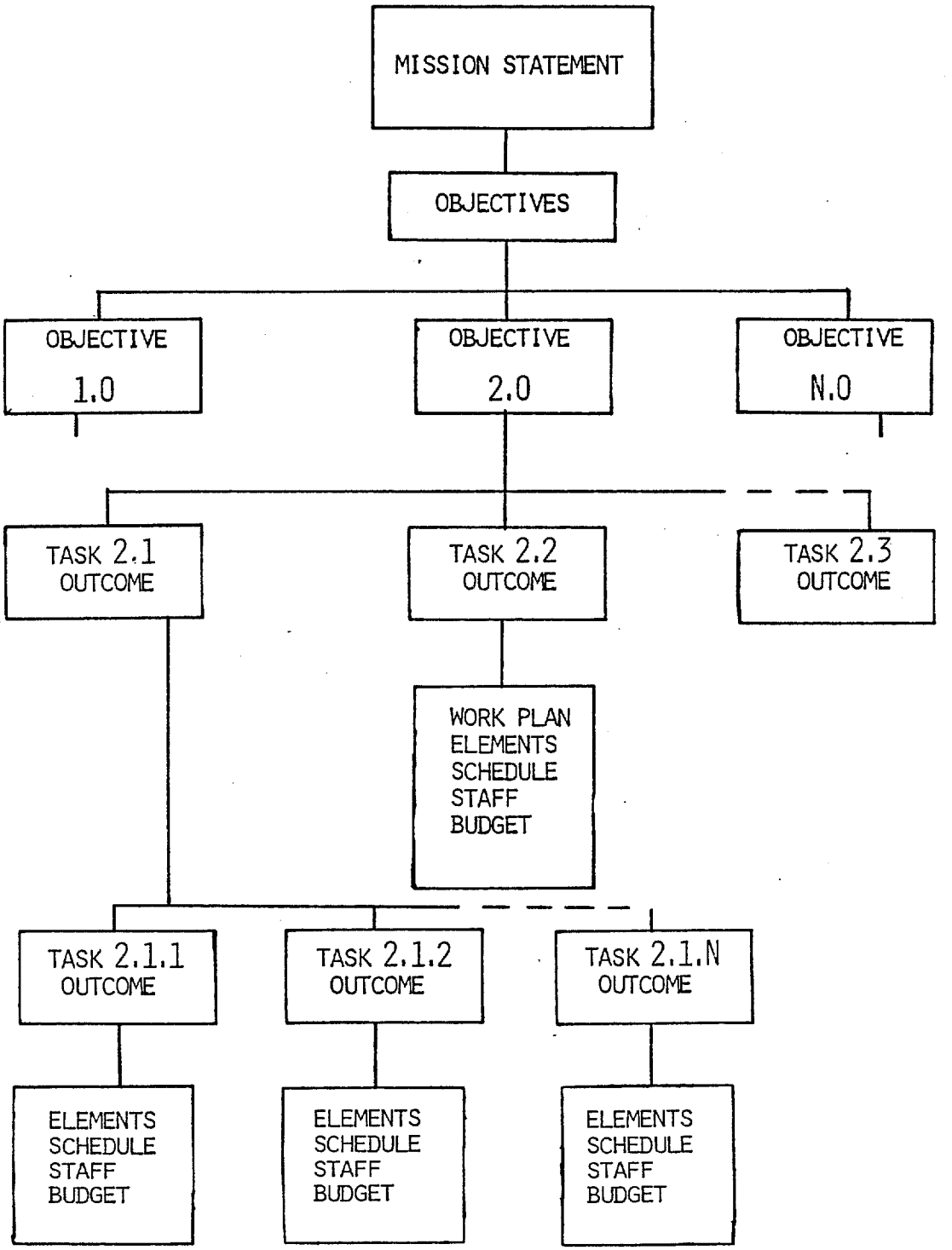
3.0 Develop renewable energy technology transfer mechanisms and promote diffusion of technology into general use. Task include:

- Establish a CDER renewable energy library and information service,
- Define and establish cooperative technical and scientific activities with Moroccan universitis and other public interest groups,
- Set up the administrative mechanism required and implement a small project fund programs to stimulate private and public sector involvement,
- Establish working relationships with individuals and organizations representing potential suppliers, users, and financing agencies of renewable energy equipment through conducting workshops and seminars, product certification programs, testing services, and general information dissemination.

Each of these objectives will be implemented with separate CDER program elements that will be defined in terms of a set of tasks. Each task will have an objective, a work plan that includes staff and budget allocations and a timetable for completion. Task definitions will take into account the national economic goals, as defined by the various government ministries, available funding for CDER and the organizational development constraints for CDER imposed by a prudent approach to evolution of such an organization from its conception to an effective force for renewable energy use.

It is very important that CDER become an integral part of the energy planning structure for Morocco and that the program elements be structured to both draw upon the resources of existing public and private resources to accomplish its own mission, and to assist other government agencies or private groups to accomplish their roles to the extent that renewable energy use may contribute to these.

STRUCTURE OF INSTITUTIONAL DEVELOPMENT PLAN



Sample
Task Schedule
Renewable Energy Market Shares (Task 2.2)

Task Element	CY 1983				CY 1984				CY 1985				CY 1986				CY 1987			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Task Planning & Support																				
2.2.1 Task Planning																				
2.2.2 Design Reports & Archive																				
2.2.3 Data Reduction Software																				
2.2.4 Establish Continuing Data Service																				
Survey Data Acquisition																				
2.2.5 Preliminary Data Discovery & Estimate																				
2.2.6 Design & Conduct 1st Survey																				
2.2.7 Design & Conduct 2nd Survey																				
2.2.8 Design & Conduct 3rd Survey																				

Sample
Staffing Plan
Renewable Energy Market Shares (Task 2.2)

Task Element	CY 1983			CY 1984			CY 1985			CY 1986			CY 1987		
	C	ST	R	C	ST	R	C	ST	R	C	ST	R	C	ST	R
Task Planning & Support															
2.2.1 Task Planning	1	1	2	1	.5	1	1	.5	1	1	.5		2	.5	
2.2.2 Design Reports & Archive				6	2	4									
2.2.3 Data Reduction Software				6	2	4									
2.2.4 Establish Continuing Data Service													3		
Survey Data Acquisition															
2.2.5 Preliminary Data Discovery & Estimate	1	3	2												
2.2.6 Design & Conduct 1st Survey				12	3	12	12	3	6						
2.2.7 Design & Conduct 2nd Survey							12	3	6						
2.2.8 Design & Conduct 3rd Survey										12	3	4			

C = CDER
ST = Short-Term Advisors
R = RTI/WS

All times in person months

Première application des études du Centre de Développement des Energies renouvelables

Equipement d'une ferme de la région de Marrakech avec un digesteur à méthane

La fermentation des déjections animales constituera une source d'énergie

Le Centre de Développement des Energies Renouvables (CDER) dont le siège est à Marrakech vient de réaliser l'installation d'un premier digesteur à méthane au Maroc dans une ferme près de Marrakech.

Après cette première expérience réalisée au Maroc par les ingénieurs du C.D.E.R. nous avons con-

(SUITE EN PAGE 2)

(Suite de la page 1)

tactée M. Abdelhaq Fakihani, Directeur Général du Centre de Développement des Energies Renouvables qui a bien voulu nous donner les explications suivantes :

La fermentation anaérobie méthanogène des déjections animales et des résidus agricoles, est une méthode intéressante de valorisation de cette biomasse.

Elle produit en effet du biogaz (mélange de méthane et de gaz carbonique essentiellement) qui peut être utilisé pour la cuisson des aliments, l'éclairage ou la production d'énergie mécanique.

De plus, le sous production d'énergie mécanique.

De plus, le sous produit de cette fermentation est une substance qui peut avantageusement être utilisée comme engrais, ses qualités fertilisantes étant généralement reconnues comme au moins égales à celles de la matière première digérée.

En outre, les germes pathogènes contenus dans les fumiers sont pour la plupart détruits lors de la fermentation, et le résidu produit ne dégage pas d'odeurs désagréables.

Ce procédé permet donc de produire un vecteur énergétique tout en valorisant l'utilisation de la matière première comme engrais. C'est ce qui explique son succès dans certains pays comme la Chine ou l'Inde, et motive le regain d'intérêt qu'il connait dans la plupart des pays.

Devant le manque quasi-total d'expérience au Maroc dans ce domaine le Centre de Développement des Energies Renouvables (C.D.E.R.) Office sous tutelle du Ministère de l'Energie et des Mines, après la réalisation d'un petit digesteur prototype de 200 litres a construit une unité en vraie grandeur de six (6) mètres cubes-jour destinée à l'alimentation en énergie d'une petite exploitation agricole.

Cette unité à plusieurs buts, a-t-il précisé :

— mieux comprendre le fonctionnement d'un digesteur placé dans des conditions réelles de fonctionnement, afin d'en optimiser les performances.

— étudire et adapter les caractéristiques de conception et de construction (type de digesteur, forme, choix des matériaux, etc...) afin qu'elles répondent au mieux aux conditions locales.

— obtenir des informations précises et fiables sur le coût de l'énergie produite.

— étudier l'éventuelle modification des habitudes de consommation des utilisateurs du digesteur, dûe à l'introduction d'une nouvelle source d'énergie.

M. Abdelhaq Fakihani a indiqué que la conduite de ces activités contribuera de manière importante à la formation des cadres du CDER, et il a précisé que ce projet a été élaboré par les ingénieurs marocains du CDER et qu'il a été conçu comme projet de Recherche-Développement.

M. BENHIDA

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CHAUFFAGE

التدفئة

429 CAPTEURS SOLAIRES

429 - ملتقطات الشمس

e.n.o*.....03 604 24
hierro*.....02 516 98
ithersom* 09 320 35
protec*..... 02 411 42
somafen*.....02 469 80
a.c.m.i.f.....02 769 34
brown boveri maroc.....02 459 57
casa mazout 03 035 38
c.e.e.m. 01 333 51
dolbeau 03 041 82
gerep.....02 720 93
radelec.....02 757 90
radelec industries.....02 757 90
real air technic 02 447 73
sirmel 03 072 72
sococharbo.....02 497 20
sofimetal 07 203 15
umareq 02 415 42

DEPARTEMENT
THERMIQUE
دولبو
DOLBEAU
81, RUE KARATCHI - CASABLANCA 01
Tél: 30.41.82/30.68.38 Télex 22 833
AGENCES
KENITRA - MEKNES OUJDA AGADIR

cl compagnie solaire de lorraine
l'eau chaude solaire
c'est l'assurance
d'une énergie gratuite
et inépuisable
INTER INDUSTRIE
433, bd mohammed V
CASABLANCA 05 - télex : 25074
tél : 24.84.02 / 24.84.27

0446 CHAUFFE - EAU SOLAIRES

protec* 02 484 41
réal air technic 03 043 77
umareq 03 015 42

SOCOCHARBO
chauffage central
conditionnement d'air
chauffage domestique
électro-ménager
FRIGIDAIRE
direction générale et dépôt :
rue lécrivain - tél : 24.97.20 +

ENERGIES NOUVELLES OMARBAT
PARIS 1889 s.a. E.N.O CASABLANCA 1981
constructions industrielles
ETUDES - FABRICATION - INSTALLATION - MONTAGE : CHAUFFAGE SOLAIRE
GEOTHERMIQUE - CONVECTEURS ELECTRIQUES - ECLAIRAGE PAR CONSOLES
ET CANDELABRES DE STYLE - TOUTES FABRICATIONS SUR DEMANDE
c.i.l. messaoudia - rue n° 7 - lotissement 92 - CASABLANCA 02 - tél : 36.18.66 / 36.04.24

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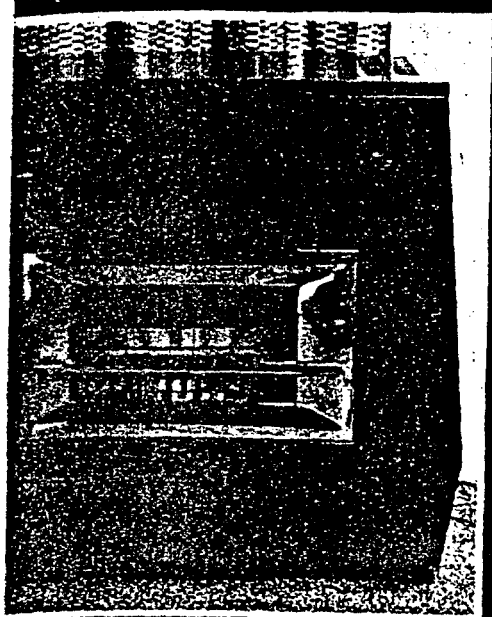
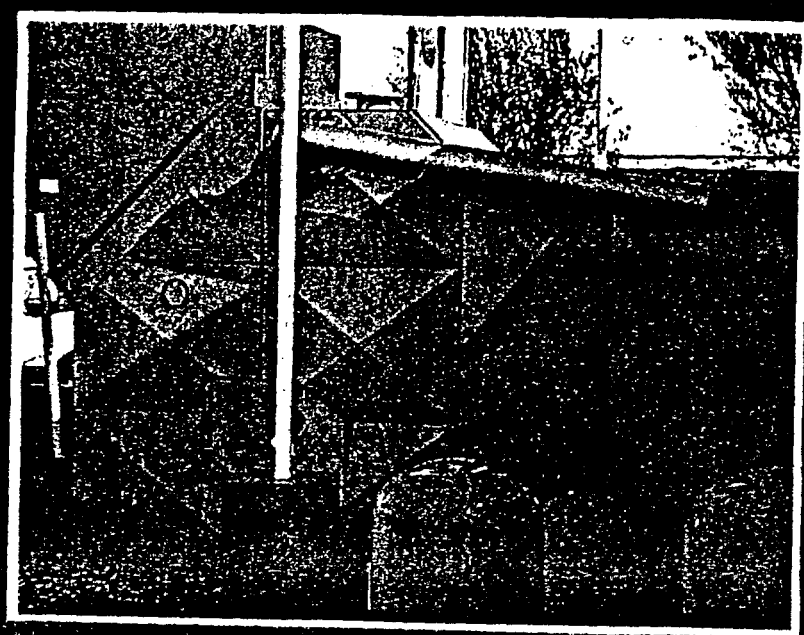
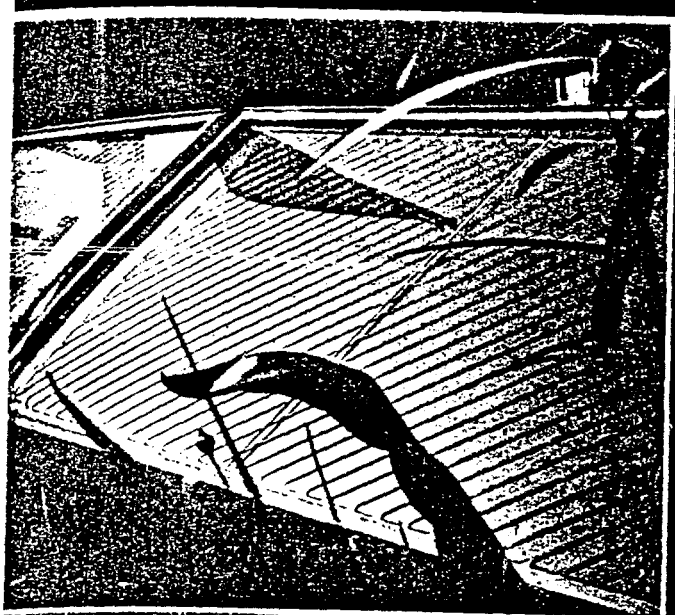
SOCOCHARBO سوكوشاربو



POELES "LE JERADA"



CHAUDIERES SOCOMAR



CAPTEURS SOLAIRES SOCOCHEM'S

CHAUDIERES SOCOFUEL

ection générale et magasin de vente : Rue Lécrivain - CASABLANCA

Tél : 24.97.20 / 24.34.70 / 24.47.60 - Telex : 25.012

Agences : RABAT - Tél : 204.08 / 254.91 / 232.92

MEKNES : Tél : 216.69 / 228.10 / 228.11

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APPENDIX X-3

POELE A CHARBON "JERADA"

Un moyen pratique, économique pour le chauffage individuel.
Le poêle à l'anthracite "JERADA"
7.000 Kcal/h à 11.000 Kcal/h parfaite synthèse des progrès techniques

- Plaque et foyer fonte
- Fenêtre panoramique
- Calandre en acier Inox
- Combusion en couche mince
- Rendement thermique excellent
- Régulation thermostatique

"JERADA" un produit SOCOCHARBO

SOCOMAR

Source nationale, économique, le "Charbon" renaît de ses cendres, il revient en force.
Votre chauffage charbon, c'est notre affaire...
Chaudières automatiques à l'anthracite de JERADA :
"SOCOMAR" Chaudières pour eau chaude

SERIES

- ALIZE à tirage naturel
  15.000 Kcal/h à 20.000 Kcal/h
- ZEPHYR à tirage forcé
  28.000 Kcal/h à 44.500 Kcal/h
- CHERGUI
  55.000 Kcal/h à 85.000 Kcal/h
- SIROCCO
  100.000 Kcal/h à 125.000 Kcal/h
- MISTRAL
  155.000 Kcal/h à 280.000 Kcal/h
- SIMOUN
  300.000 à 450.000 Kcal/h
- TORNADE
  550.000 Kcal/h à 900.000 Kcal/h

- SOCOMAR chaudières vapeur basse pression
  100.000 Kcal/h à 450.000 Kcal/h

"SOCOMAR" plus d'un quart de siècle d'expérience dans la fabrication de chaudières à charb

SOCOMAR un produit SOCOCHARBO

SOCOCHEM'S

Notre pays est un réservoir d'énergie inépuisable, du fait qu'il est sans cesse rechargé par la plus tante source d'énergie :
LE SOLEIL
Au maroc le chauffage solaire, c'est la LOGIQUE.
Votre chauffage solaire, c'est encore une fois notre affaire...

Capteurs Solaires
Ballons de stockage
Régulation pour chauffage solaire

SOCOCHEM'S, un produit SOCOCHARBO

SOCOFUEL

Le pétrole l'on le découvrira un jour. Malgré son coût, il aura toujours des adeptes.
Votre chauffage mazout, c'est encore notre affaire.
- Chaudières tout acier SOCOFUEL pour chauffage seul
  série FA 26.000 Kcal/h à 52.000 Kcal/h
- Chaudières pour chauffage et production d'eau chaude sanitaire, série FA.B 26.000 Kcal/h à52.00
- Chaudières tout acier, série BPF 65.000 Kcal/h à 210.000 Kcal/h
- Chaudières pressurisées série PRN 280.000 Kcal/h à 1.500.000 Kcal/h
- Accumulateurs modulaires rapides pour production d'eau chaude "UNIT - ACN"

SOCOFUEL un produit SOCOCHARBO

SOCOCHARBO vous propose également tous les accesoires pour chauffag

- Brûleurs, pompes, circulateurs CUENOD
- Robinetterie pour chauffage GIACOMINI
- Radiateurs Alu, Fonte - Acier BIASI
- Régulation électronique ZENTR
- Vases d'expansion ZILMET
- Conditionnement d'air Riello

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E.N.O.

énergies nouvelles amarbat
CASABLANCA 02.....tél. 36 04 24 - 36 18 66
c.i.i. messaoudia rue 7 n° 92
s.a. 200.000 dh - création 1981
Banques : cmcb - classe C
Effectif du personnel : 25 à 50
Conseil d'administration :
mouloukil abdelkrim (pt)
Direction :
pelgris christian (adm. dr tech.)
galfon suzanne (dr ad.)

Genre d'activité :
construction, montage, fabrication de chauffage solaire, géothermique, convecteurs électriques, éclairage de style, équipements électriques, tous systèmes électro.technique

Marques : airelec - e.n.o.* - electral* - seit - comaroc* - climaro

HIERRO

constructions métalliques
CASABLANCA 02 ..... tél : 25 16 98
45 - 47, rue de roncevaux
affaire personnelle - création 1946 - r.c. 108 596
Banques : bcm - classe C
Effectif du personnel : 60
Direction : hierro françois (dr gl)
hierro francis (dr cl)
hierro louis (dr tec.)
hierro philipe (c.s. brûleurs et chantiers)
hierro manuel (c.s. chaudronnerie)

Genre d'activité :
études et réalisations centrales hydrauliques, vérins hydrauliques simple et double effet, pompes hydrauliques 250 bars - moteurs hydrauliques - composants hydrauliques - blocs forés pour centrales joints de vérin - fabrication de chaudières eau chaude et charbon - capteurs.solaires -
surface : 2.500 m2 couverts

Marques :
transtub* - riello - danfoss - tropic* - amanda* -

ITHERSOM

TANGER ..... tél : (09) 320 35 - 409 58
zone industrielle de tanger - b.p. 2 030
s.a. 800.000 dh - création 1978 - r.c. 3043
Banques : uniban - bmci - bp - classe C
Effectif du personnel : 50 à 90
Direction : aît salid kacem (p.d.g.)
garcia rodillas (dr tech.)

Genre d'activité :
fabrication de capteurs solaires, appareils de dessalinisation - chaudronnerie et menuiserie métallique et polyester -
surface : 8.000 m2 dont 3.000 m2 couverts
puissance installée : 160 kva

Marques : ithersom* -

PROTEC

CASABLANCA 05 ..... tél : 24 84 41+
650, bd mohammed V - b.p. 2 019
télex : 25976 - 25088 - 25909
ateliers : casa : rue de noyon
s.a. 2.482.000 dh - création 1948 - r.c. 9733
maison mère : fénié-brossette - maroc
Banques : sgmb - sbc - bcm - smdc - bmci - cmcb classe G
Effectif du personnel : 70
Conseil d'administration :
cherif d'ouezzane abdeslam (pt)
Direction générale :
gaign robert (dr gl)

Genre d'activité :
protection incendie - traitement général des eaux - chauffage solaire - équipements hydrauliques - pompage - irrigation - purgeurs d'eau condensée -
surface : 1.500 m2 couverts

Marques :
sicli - générale de protection incendie - sergi - pons - manufactures réunies de saint chamond - sides degremont - perma - dosapro - hydrocure - bayer - wallace + tiernan - byvap - worthington turbodyne - vanrullen - worthington - irrifrance - giordano -

A.C.M.I.F.

africaine de climatisation, matériel minier, industriel foration
CASABLANCA 01.....tél. 27 69 34
44 bd de paris - télex : 22 913
s.a. 10 000 dh - création 1979 - r.c. 37 653
Banques : smdc classe D
Effectif du personnel : 3
Conseil d'administration :
prince moulay ismail alaoui (pt)
Direction : fortan claude (dr)

Genre d'activité :
représentations industrielles

Marques :
giordano - dosco - halco - failing - christensen - lindquist international - eimco envirotech - himmel - hausherr - ugine aciers - weco - wemco.unitec - hazemag - loesche - ferrostaal - victor - patry - american air filter - air traitement - taim -

BROWN BOVERI MAROC

CASABLANCA 05.....tél : 24 59 57
26 rue A de la pyramide - belvédère - télex : 26616
s.a. 1.000.000 dh - création 1980 - r.c. 39581
maison mère : brown boveri et cie (baden)-suisse
Banques : sgmb classe C
Effectif du personnel : 8 à 12
Conseil d'administration :
faraki abdelwahab (pt)
faraki latifa - trachen mohamed - bbc - thomas
Direction générale :
koltunski édouard (dr gl)

Genre d'activité :
importation, vente, représentation, distribution, montage et assemblage de tous produits et composants servant à la production, au transport, à la distribution, à la transformation et à l'utilisation de l'énergie électrique et de toute autre source d'énergie

Marques : brown boveri et cie - cem - t.i.b.b. - sace - o.e.b.b. - n.e.b.b. - i.e.b.b. - gould brown boveri - petercem - busch jaeger - kabel + draht - metrawatt - electrocondutture - goerz - t.c.a. - c.e.a.g. - micafil - brown boveri kent

CASA - MAZOUT

CASABLANCA 01.....tél. 30 35 38 - 30 37 23
260, bd mohammed V - télex : 22 032
Succursales :
tanger : 79, r. prince héritier - (09) 317 02 - 382 88
s.a. 500.000 dh - création : 1953 - r.c. 21 933
Banques : bcm - cmcb - bmce - sgmb classe B
Effectif du personnel : 45
Conseil d'administration : sahiaoui lahcen (pt)
Direction :
sahiaoui lahcen (p.d.g.)
bellamine abdelhamid (dr gl)
maratray henri (adm.dr tech.)

Genre d'activité :
importation de matériel thermique : chauffage - conditionnement d'air - régulation thermique - traitement des eaux - cuisine - buanderie - installation et service après vente
surface : 1 600 m2 couverts

Marques :
thermador - weishaupt (monarch) - julien + mège - diàmo - a.c.e.i. - soffée - koolair - chavanin - rellumix - esso-mico - ciat - sarlin - spanex - aventrop - mouvex - sunstrand - sarco - apic - atlantic - drivex - satchwell - tropical - almar - lamella (reggane) - arcom - sapca - vallès - semia - purpex - aqua - farat - finimetal - sib - geclisa - stork - vortex - lucifer - mil's - fontini -

C.E.E.M.

cie électrique et électronique du maroc
RABAT ..... tél : (07) 633 51 - 600 69
rue benghazi, résidence tarfaya - télex : 31 714
s.a. 100.000 dh - création : 1975 - r.c. 28 288
équipements complets de laboratoire
Banques : cmcb classe C
Effectif du personnel : 6 à 50
Conseil d'administration : fouad jaafar (pt)
jerzy pulanik (sec.gl)

Genre d'activité :
travaux industriels d'équipement électrique haute et basse tension - électronique industrielle : automatismes - contrôle - régulation - systèmes de téléinformation - projets techniques - unités de production, équipements complets de laboratoire

Marques :
labimex - métronex - zeiss jenc - solar sense - nestlé

DOLBEAU

établissements h. dolbeau & fils
CASABLANCA 01.....tél. : 30 41 82 - 30 68 38
81, rue karatchi - b.p. 133
télex : 22 833 - 23 051 - télégr : materio
agences :
meknès : rue bandoeng - tél : (05) 224 27 / 28
télex : 41908
kénitra : 127, av. med diouri - tél : (016) 41 36/58 77
oujda : bd zerktouni - tél : (068) 37 93 - télex 61002
agadir : 101 av. hassan II - tél. (08) 216 29 - 214 85
magasins de ventes et livraisons :
casa : 30, rue saad bni.oukass - tél : 24 26 03 / 04
s.a. 9.000.000 dh - création 1921 - r.c. 17
Banques : sgmb - bcm - bmce - bmci - cam - smdc - classe G
Effectif du personnel : 250
Conseil d'administration : benkirane ahmed (pt)
Direction générale : dolbeau robert (dr gl)

Genre d'activité :
importation, distribution de matériel d'équipement produits industriels, produits de bâtiment et canalisations
surface : 15 700 m2 dont 6 000 m2 couverts
puissance installée : 200 kva

Marques :
achro - acieries de genevilliers - advance - amri - allia (cec - queroy) - asea - buderus - bricard - beckman - aturia - necchi - balteau - bayard - indo-france air - gardy - guerpillon - g.h.m. - grane - dimatit - dervaux - landis + gyr (billman) - oliva - hart & cooley - hewlett packard - holophane - huot - minex - imt salmson - e.a.i. - saunier duval - bourkane - cerabati - serseg - servo balans - s.i.r. - sicma - singer - continental électronics - perfeclair - rhonelec - elektrisk bureau - silec - trw mission - valentin - veriant beaurin - franke - villeroy et boch - sofica - s.r.a. - eurojouge - pont à mousson - ormat - martin lunel - nicoli - sabir - prescold - teddington - kheops - airelec - motorola - raguet - saint gobain - sheffer - tolartois winkelmann - radiatube - westinghouse - nife - wilkinson - uranus - cameron - reed - gould - maissen - technicair - johson - humet - rolland -

GEREP

groupement d'études et de représentation
CASABLANCA 01.....tél : 27 20 93/94/95
2, rue d'agadir - télex : 23 739
s.a. 500.000 dh - création : 1967 - r.c. 23 623
Banques : bmce - smdc - sbc - classe B
Effectif du personnel : 25
Direction générale : butaye paul (dr gl)

Genre d'activité :
importation de calculatrices électroniques, mini ordinateur et ordinateur - équipement d'informatique, micrographie, matériel et produit pour le traitement des eaux.
surface : 1 000 m2 couverts

Marques :
baumfolder - bell & howell - canon - benson - tec - commodore - hewlett packard - kalle - microbox - lampertz - peritel - phillipsburg - durango - rockwell - arnold & richter - astral - h.t.h. (olin) - jets stream (u.w.e.) - lagerhoim - purex - dynan compact - myers - autotrol - soaf - kastel - dieter grasslin - hauseman - paterson candy int. permutit body - portacel - talbot - arco solar - ten.cate (windsurfer) - bio energy (solaroll) - metraplan - rosemount -

RADELEC

sté marocaine de radio électricité
CASABLANCA 01.....tél : 27 57 90+
10, rue pégoud - télex : 21 840 - télégr : radelec
dépôt : casa : 7, r. louis ferre - tél : 24 24 83
s.a. 3.000.000 dh - création : 1949 - r.c. 14 207
Banques : cmcb - smdc - bmce - bcm -
Effectif du personnel : 140
Conseil d'administration :
iz el arab kettani (pt)
Direction :
drissi azzedine (adm.dr gl)
couturier michel (secr.gl)

Genre d'activité :
importateur electro-ménager-radio-télévision - équipement hôtelier et collectivités -

Marques :
siera - sigma - necchi - pony - white westinghouse - braun - karina -

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RADELEC INDUSTRIES

CASABLANCA 01.....tél : 27 57 90+
10 rue pégaud
usine : casablanca 05 - 30 rue béni amar-ain bordja
tél : 24 17 64
télex : 21840 - télégr. radelec
s.a. 100.000 dh - création 1980 - r.c. 39557
Banques : cmcb - bmce
Effectif du personnel : 30
Conseil d'administration :
lz el arab kettani (pt)
Direction :
drissi azzedine (adm.dr gl)
couturier michel (adm.dr gl adj.)

Genre d'activité :
importateur, installateur, constructeur chaudronnerie inox - matériel d'équipement collectifs et hôteliers,

Marques :
rosières* - sudinox - laurent - querry et fils - satam brandt

REAL AIR TECHNIC

CASABLANCA 05 .....tél : 30 43 77 - 30 42 06
16 r.colonel simon - télex : 26854
s.a. 500.000 dh - création : 1952 - r.c. 19 885
Banques : sgmb - classe : C
Effectif du personnel : 7
Direction : costes georges (adm.)
costes gérard (dr.tec.)

Genre d'activité :
importation de matérial thermique : chauffage - sanitaire - ventilation - régulation - robinetterie industrielle -
surface : 1 000 m2 couverts

Marques :
de dietrich - elge - aldes - cotherm - elesta - russenberger - sidea - netair - thermowatt - jaeger - joannes - oventrop - gioca - anisa - arthermo -

SIRMEL

société d'importation et représentation de matériel électrique
CASABLANCA 01 ..... tél : 30 72 72+
68, bd de la résistance - b.p. 807
télex : 21 021 - télégr : electexpel
division distribution "mardis" :
dépôt + comptoir ventes périphériques :
km 1, c.t. 1015 - beaulieu supérieur - ain.sebâa -
tél : 35 31 20+ - télex : 24 047
comptoir de ventes centre ville :
casa : place khaibar (descas)-tél : 24 43 80/24 54 39
s.a. 4.000.000 dh - création : 1974 - r.c. 32 295
maison mère : c.g.e. maroc
Banques : sgmb - bmci - bcm - cdm - smdc - sbc
classe G
Effectif du personnel : 95
Conseil d'administration : amor mohamed (pt)
Direction : de fourcaud gérard (dr)
maurice jean.loup (dr mardis)

Genre d'activité :
importation et représentation des matériels du groupe c:g.e.
surface : 15.000 m2 dont 8.000 m2 couverts

Marques :
groupe cge - cge maroc - alsthom - alsthom i.v.a. - delle alsthom - stein industrie - unelec - c.g.m.s. - laborde & kupfer - c.i.t. alcatel - c.i.t. transac - s.i.e.-citerel - cables de lyon - filotex - mors actel- c.g.a. - cilas - ceraver (spirelec)- joint français - neyrpic - soget - a.a.i.p. - schlumberger (walter) - merger - minnesota (scotch) - permali - rai-tilliers- ruhrtaler - sciaky - sicame - tiss metal - vahle - fonderies de tamaris - mavil - arnould - f.a.e. - simel - philippe - mengin - rateau - merger - neyrtec - alsthom unelec (unelec) - emerson - alsthom atlantique - comessa - perrier - miom - c.g.e.e. alsthom - garba lahmeyre - ceralep - tudor - cipel (mazda - leclanché) - cuivre + alliages s.f.e. - petitjean - vedette flash - alspa - ferrix - enertec schlumberger - flonic schlumberger - colas - sereg schlumberger - sautelma -mazda - sigmaform -

SOCOCHARBO

sté commerciale de charbon et bois
CASABLANCA 05.....tél : 24 97 20+ - 24 34 70
rue l'écrivain - télex : 25 012
agences :
rabat : 7, r. normand - tél : (07) 204 08
meknès : 15, r.chefchaouen - tél : (05) 228 10 & 11
s.a. 1.980.000 dh - création : 1945 - r.c. 6241
maison mère : charbonnages nord-africains - rabat
Banques : bcm - bmce - sbc classe G
Effectif du personnel : 210 à 245
Direction :
aouad mounir (adm.dr gl)
aouad abdelmjid (c.div.ventes)
kessous charles (c.div.achat - import)
boudraa tahar (c.div.tech.)

Genre d'activité :
agent exclusif des charbonnages nord-africains pour distribution de l'anthracite de jerada - import coke et charbons gras - bois de chauffage - fabrication par sous-traitance de chaudières de chauffage central à anthracite et à mazout - bois de mines - import de matériel de chauffage central et de production d'eau chaude - climatisation chauffage solaire -
surface : 45 000 m2 dont 5 000 m2 couverts
matériel d'entreprise :
voir "forges marocaines"

Marques :
socofuel - cuenod - giacomini - socomar* - biasi - riello - socochems* - zilmet - zentra - supra -

SOFIMETAL

sté mroc. de finissage de produits métallurgiques
RABAT ..... tél : (07) 203 15
6, rue moulay slimane - b.p. 4055
usine : témara : r.e. 1 pont oued yquem
s.a. 500 000 dh - création 1975 - r.c. 24 448
Banques : sgmb
Effectif du personnel : 20 à 30
Conseil d'administration : el mouhendiz bochir (pt)
boutane m'barek - rousseau michel
Direction : debelle andré (dr cl)

Genre d'activité :
fabrication de radiateurs de chauffage central - import matériel de chauffage
surface : 1 000 m2
puissance installée : 160 kva
Capacité de production : 60 000 m2/an

Marques :
lamella*

UMAREQ

union marocaine d'équipement
CASABLANCA 05 ..... tél : 30 15 42 - 30 30 11
30 48 16 - 30 33 03
30 46 19 - 30 44 41
43, bd ibn tachfine - télex : 26 786 - télégr : umareq
s.a. 6 000 000 dh - création 1946 - r.c. 8 967
Banques : smdc - sgmb - bmci - - cdm - abm - bmce - classe G
Effectif du personnel : 80
Direction : tazi mohamed (p.d.g.)
deniau gérard (dr gl adj.)
faure paul (dr secr. gl)

Genre d'activité :
équipement frigorifique, hôtelier, collectivités, climatisation, ménager, radio.hifi - télévision - importation - distribution -

Marques :
grundig - airwell - zanussi - dita soma - girbau - voluna - dagard - - scotsman - unidad hermetica zaegeld held - coste - frigeavia - giravia - cointra - olimpia - bitzer - miele - thermo mécanique - teleavia - freon - f.a.r. - frigerst - norva - fermod-