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AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D. C. 20523

PROJECT PAPER

MOROCCO: Energy Demand Management
(608-0193)

July 22, 1988

UNCLASSIFIED

ENERGY DEMAND MANAGEMENT

(608-0193)

PROJECT PAPER

USAID/MOROCCO

JULY, 1988

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: Original

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Morocco

3. PROJECT NUMBER: 608-0193

4. BUREAU/OFFICE: USAID/Morocco — 608

5. PROJECT TITLE (maximum 40 characters): Energy Demand Management

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 09 DD 30 YY 93

7. ESTIMATED DATE OF OBLIGATION (Under "B" below, enter 1, 2, 3, or 4)
A. Initial FY 88 — B. Quarter 3 — C. Final FY 88

8. COSTS ($000 OR EQUIVALENT $1 = 8.0)

A. FUNDING SOURCE	FIRST FY 88 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	4500	500	5000	4500	500	5000
(Grant)	(4500)	(500)	(5000)	(4500)	(500)	(5000)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country		800	800		800	800
Other Donor(s) Private Sector	1000	1200	2200	1000	1200	2200
TOTALS	5500	2500	8000	5500	2500	8000

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ESF	B741	878	NA			5000		5000	
(2)									
(3)									
(4)									
TOTALS						5000		5000	

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

11. SECONDARY PURPOSE COD

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)
A. Code
B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To develop and implement the core of a national Energy Demand Management Program in Morocco.

14. SCHEDULED EVALUATIONS
Interim MM 12 YY 90 — MM YY — Final MM 03 YY 93

15. SOURCE/ORIGIN OF GOODS AND SERVICES
[X] 000 [ ] 941 [ ] Local [X] Other (Specify) 935

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

USAID Morocco Controller's approval of proposed methods of implementation and financing.

Signature: Richard T. Warren Title: Controller

17. APPROVED BY
Signature: Charles W. Johnson
Charles W. Johnson
Title: Director, USAID/Morocco
Date Signed: MM 07 DD 22 YY 88

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTI
MM DD YY

AID 1330-4 (8-79)

ENERGY DEMAND MANAGEMENT PROJECT (608-0193)

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ACTION MEMORANDUM FOR THE USAID/MOROCCO DIRECTOR

JUL 22 1988

DATE:

FROM: Kenneth G. Schofield, Supervisory Program Officer

SUBJECT: Energy Demand Management Project (608-0193)

PROBLEM:

Your approval is requested for the Project Paper and the Project Authorization for the Energy Demand Management Project (608-0193) as well as for a Source/Origin Waiver from Geographic Code 000 to Code 935 to permit the procurement of two project vehicles for a total cost not to exceed $30,000.

DISCUSSION:

USAID first identified the importance of energy demand management (EDM) in Morocco in the FY 1988 Country Development Strategy Statement (CDSS). Project design preparations began with a large delegation from Morocco (three senior Moroccan officials, two USAID representatives, one USAID-financed energy specialist resident in Morocco) attending the autumn 1986 ANE Bureau regional workshop on Energy Conservation and Private Power Generation. Feasibility studies were then contracted for by USAID/Morocco. Based on these prefeasibility studies, USAID prepared and submitted the Project Identification Document (PID) for AID/W approval in December 1986. AID/W approved the PID in January 1987 and authorized you to exercise your AID Redelegation of Authority 654 to approve the project in the field in 87 State 024073, dated January 28, 1987. However, AID/W deferred approval of the capital financing activity until further information and analysis identified credit liquidity as a true constraint to the adoption of EDM technology in Morocco. The ANPAC cable also raised several policy and design issues which are summarized in Section I. of the project paper.

As a result of a feasibility study which noted that liquidity was currently not a constraint to the application of EDM in Morocco, the Mission deferred consideration of the capital financing component of the project. In depth feasibility studies on all aspects of EDM were undertaken following the approval of the PID. These studies formed the basis of the activities and analyses presented in the project paper.

On February 12, 1988 and March 29, 1988 the Mission Review Committee reviewed and recommended approval of the Energy Demand Management Project. Subsequent to the Mission's review of the Project Paper, minor revisions in the project design were made as a result of further discussions with Government of Morocco and representatives of the Moroccan private sector. The project will concentrate on, but not be limited to, three sectors that offer promising energy saving potential, appear capable of absorbing and benefitting from EDM technologies, and are important to Morocco's economic base. These sectors are agroindustry, construction materials, and hotels. Project activities in these sectors will be directed largely to private sector energy users, firms, and

associations. USAID and MEM will not contemplate adding new target sectors until they examine the results of the first project evaluation. However, discrete project activities in other sectors, as determined by the project Steering Committee, may be included if warranted.

This determination of the Mission Review Committee, together with the decision to decrease the project time frame from seven years to five years, led to a decrease in the total funding requirements of the project to $5.0 million. The technical support, training, and studies components were reduced accordingly.

At the request of the Mission Review Committee, a cost-sharing arrangement involving private sector participants was devised. The objective of cost sharing is to demonstrate a commitment to project activities on the part of beneficiaries. The beneficiaries will be expected to provide a contribution in cash or kind according to a formula devised by the project Steering Committee, consisting of USAID and MEM representatives. For the first year of the project, the beneficiaries contribution will be the following: no charge for quick diagnostic audits (such as conducted by an "energy bus") that require from one to three days total effort; 25% for in-depth audits and feasibility studies; 50% for U.S. training; and 75% for technical applications and demonstration projects. The formula will be reviewed at the end of the first year to determine whether the minimum share should be modified and the formula otherwise revised.

The goal of the Energy Demand Management Project is to save foreign exchange and increase productivity by reducing energy waste and by improving the efficiency of energy use in Morocco. The project purpose is to develop and implement the core of a national energy demand management program (EDM). The project has a life of project AID funding level of $5.0 million and a PACD of September 30, 1993. The project will have four major components: technical support; information and awareness; U.S. and in-country training; and policy analysis.

For each of the target sectors, the project will finance a series of coordinated activities. These will include: (1) firm-specific audits, and technical and economic feasibility studies of potential investments; (2) demonstration projects; (3) information and awareness campaigns (e.g., seminars, workshops, newsletters, study tours); (4) U.S. and in-country training of plant managers, energy auditors, and engineers; and (5) studies (e.g., technically oriented changes in Moroccan manufactured products, and policy issues).

Under the project, two vehicles of non-American source and origin will be purchased. A source and origin waiver for procurement of vehicles and spares from geographic code 000 to code 935 in an amount up to $30,000 is required. These vehicles will be of French origin and Moroccan source. French vehicles available in Morocco are considered preferable to vehicles of U.S. source and origin because of the availability of spare parts and maintenance as well as due to their durability vis-a-vis conditions in Morocco.

The Congressional Notification for this project expired without objection on June 28, 1988.

RECOMMENDATION:

That, according to the authority granted to you in AID Redelegation of Authority 654, you sign the Project Paper Data Sheet and the attached Project Authorization, thereby approving the Energy Demand Management Project with a life-of-project funding of $5.0 million and a PACD of September 30, 1993, and approving a source and origin waiver from geographic code 000 to code 935 to permit the purchase of two project vehicles as justified above.

APPROVED: Charles W. Johnson DATE: 7/22/88 DISAPPROVED: _____

Charles W. Johnson
Director

Drafting Officers:ENR:RKahn/PDO:RThompson:rak:7-22-88

CLEARANCE: ENR:SKlein
CONT:RWarin
ADDIR:KSchofield

PROJECT AUTHORIZATION

Name of Country: Morocco

Name of Project: Energy Demand Management
Number of Project: 608-0193

1. Pursuant to Section 531 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Energy Demand Management Project for Morocco (the "Cooperating Country") involving planned obligations of not to exceed $5,000,000 in grant over a five year period from date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project will assist Morocco to develop and implement the core of a national energy demand management program to reduce energy waste and improve efficiency in energy use in Morocco.

3. The Project Agreement shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Commodities, Nationality of Services

Commodities financed by A.I.D. with grant funds shall have their source and origin in Morocco or in the United States except as A.I.D. may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services financed by grant funds shall have Morocco or the United States as their place of nationality, except as A.I.D. may otherwise agree in writing.

Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States. The requirements of the Cargo Preference Act will be met with respect to all commodities financed by A.I.D. that are transported on ocean vessels.

b. Conditions Precedent

Prior to the first disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made, the Cooperating Country will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(i.) A statement of the name of the person or persons representing the Cooperating Country, together with a specimen signature of each person specified in such statement;

(ii.) The designation of a Moroccan project manager responsible for managing the project for the Ministry of Energy and Mines.

c. Waiver

As a result of lack of service facilities and spare parts in Morocco, a source/origin waiver from geographic code 000 to geographic code 935 is granted for the purchase of up to two project vehicles of probable French origin and Moroccan source. I certify that the exclusion of the procurement from the Free World countries, other than the Cooperating Country, would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program; and that special circumstances exist which justify the waiver of section 636 (i) of the Foreign Assistance Act.

Charles W. Johnson, Director

Date July 22, 1983

List of Project and Mission Review Committee Members

USAID Project Committee

Robert Kahn	Project Officer, Energy and Natural Resources Division
Randal Thompson	Project Development Officer
Daniel Kohler	Program Economist
Robert Meighan	Regional Legal Officer
Pamela Callen	Budget & Fiscal Officer
Monique Bidaoui	Training Officer

Mission Review Committee

Charles Johnson	Director
Janet Ballantyne	Deputy Director
Stephen Klein	Chief, Energy and Natural Resources Division
Kenneth Schofield	Supervisory Program Officer
James Smith	Program Economist
Richard Warin	Controller

LIST OF ACRONYMS AND ABBREVIATIONS

ACC	American Chamber of Commerce
ALC	American Language Center
ANE	Asia Near East Bureau
ANPAC	Asia Near East Bureau Project Advisory Committee
CDER	Centre de Dédevelopment des Energies Renouvelables (Renewable Energy Development Center)
CDI	Code Des Investissements (Investment Code)
CDSS	Country Development Strategy Statement
CEED	Chemical and Engineering Department at ENIM
CGEM	Confédération Générale Economique du Maroc (Employers Confederation)
DE	Direction de l'Energie (Direction of Energy, MEM)
Dh	Dirham
EDM	Energy Demand Management
ENIM	Ecole Nationale de l'Industrie Minérale (National Engineering University)
ENR	Energy and Natural Resources Division (USAID/Morocco)
FCCI	Féduration des Chambres du Commerce et de l'Industrie (Federation of Chamber of Commerce and Industry)
FY	Fiscal Year
GDP	Gross Domestic Product
GOM	Government of Morocco
GWh	Gigawatt hours
EEC	European Economic Commission
IEE	Initial Environmental Examination
IEW	International Energy Workshop
Kcal	Kilocalorie

KWh	Kilowatt hours
Mcal	Megacalories
MEA	Ministère des Affaires Economiques (Ministry of Economic Affairs)
MEM	Ministère de l'Energie et des Mines (Ministry of Energy and Mines)
MJ	Megajoules
MOCI	Ministère du Commerce et de l'Industrie (Ministry of Commerce and Industry)
MOF	Ministère des Finances (Ministry of Finance)
OCP	Office Chérifien des Phosphates (National Phosphate Agency)
ONAREP	Office National de Recherches et d'Exploitations Petrolières (National Office for Petroleum Exploration and Development)
ONE	Office National de L Electriciteé (National Electricity Authority)
OYB	Operating Year Budget
PACD	Project Activity Completion Date
PID	Project Implementation Document
PLAN	Ministère du Plan, de la Formation des Cadres et de la Formation Professionnelle (Ministry of Planning and Executive and Professional Training)
PMI	Petite et Moyenne Industrie (Small and Middle Sized Industries)
RAD	Régie Autonome Intercommunale de Distribution d'Eau et d'Electricité Casablanca (Local Electrical Utility in Casablanca)
RFP	Request of Proposal
SPD	Service de Planification et de Documentation (Planning and Documentation Unit, Direction of Energy, MEM)
ST/EY	AID's Bureau of Science and Technology, Office of Energy
TA	Technical Assistance
Toe	Ton of oil equivalent
TOR	Terms of Reference
UNDP	United Nations Development Program

Energy Units and Equivalencies

Petroleum	Unit	Heat Content (Mcal/unit)
Diesel Oil	ton	10,000
Residual Oil	ton	9,600
Coal		
Imported	ton	6,100
Local	ton	5,700
Electricity	kWh	0.86

1 toe = 10,000 Mcal = 41,800 MJ = 39.7 MBtu
1 kWh = 2.45 Kcal in primary energy
1 GWh = 245 toe
1 toe = 7.33 barrels of oil

Currency Exchange Rate

1 U.S. dollar = 8.00 Dirham (Dh) as of July 1988

Energy Demand Management
(608 - 0193)
Morocco

I. SUMMARY AND RECOMMENDATIONS

A. Summary Background

Economic development in Morocco is currently constrained, inter alia, by a chronic dependence on energy imports, which supply almost 90% of commercial energy. Oil imports are next to debt service the largest claim against foreign exchange, reaching a peak in 1985 when the commercial energy import bill was close to $1 billion or nearly half of foreign exchange earnings. Although the drop in oil prices in 1986 provided a foreign exchange respite, the subsequent 1987 increase and longer run outlook for oil prices are not favorable. Investments in the energy sector -- projected to total $2.5 billion -- are the largest single element in the five year plan (1988-92). With Morocco's exceptionally high debt ($17 billion or the equivalent of 7 years of exports), the country will be hard pressed to make this investment, much less sustain the level of oil imports to support a growing economy.

Given these facts, establishing an energy demand management program (EDM) is a practical as well as least cost energy policy for Morocco. Industrialized countries such as the U.S., France, and Japan have achieved increases in energy efficiency on the order of 15-20%. Morocco will be importing in excess of 100 million tons of oil equivalent (toe) which will cost $12 to $13 billion at current international oil prices over the next fifteen years. If Morocco could achieve even a much more modest improvement in efficiency of 5%, the savings in foreign exchange would be around $600 million. The improvement in energy efficiency would foster productivity gains and increased competition in the economy. Savings of this magnitude will make an important contribution to the Government's current efforts at structural adjustment at the macro-economic level.

B. Summary Project Description

The goal of the Energy Demand Management Project is to save foreign exchange and increase productivity by reducing energy waste and by improving efficiency of energy use in Morocco. The purpose is to develop and implement the core of a national energy demand management program (EDM).

The project will concentrate on, but not be limited to, three sectors that offer promising energy savings potential, appear capable of absorbing and benefitting from EDM technologies, and are important to Morocco's economic base. These sectors are (i) agroindustry; (ii) construction materials; and (iii) hotels.

For each of the target sectors, the project will finance a series of coordinated activities. These will include:

- information and awareness campaigns (e.g. seminars, workshops, newsletters, study tours);
- firm-specific audits, and technical and economic feasibility studies of potential investments;

- o demonstration projects;
- o U.S. and in-country training of plant managers, energy auditors, and engineers;
- o policy analysis (e.g. technical and policy oriented studies on Moroccan manufactured products, taxation, and standards).

At the outset, AID and MEM will implement activities already planned under the Energy Planning project (608-0180), notably in the fish canning and hotel industries, and follow up on past work in the construction materials sector. Project activities will subsequently address EDM requirements of the agroindustrial subsector as a whole.

The project will undertake EDM activities with firms selected on the basis of energy savings potential, replicability potential, firm visibility and willingness to contribute resources and cooperate in disseminating results. Energy audits and feasibility studies will result in a plan which can be used by plant managers to pursue sensible EDM activities. Local engineers and technicians will receive on-the-job training with each technical application financed under the project. Plant owners and managers will participate fully in the development of any action plan proposals.

In addition to on-the-job training, the project will finance U.S. and in-country training, including technical courses, seminars, workshops, and study tours for senior officials, plant managers, energy engineers and auditors, consulting engineers, and technicians.

The policy and technical analyses will advise the GOM on further steps to take to support the EDM effort, to suggest changes in policies, and to further an understanding of the technical and managerial aspects of EDM.

AID will contract with a U.S. consulting firm specialized in energy demand management to implement project activities and interact directly with firm owners. This technical assistance contractor will hire specialized Moroccan professionals to work with the resident experts and to assure transfer of skills and continuity over the life of the project. Furthermore, the technical assistance contractor will subcontract with Moroccan firms as needed to implement discrete elements of the project.

A project steering committee consisting of GOM and AID will formulate policies for the contractor. The Ministry of Energy and Mines will provide a project manager to act as liaison among AID, the GOM, the contractor, and the public and private sectors to assure effective day to day implementation. The MEM project manager will report directly to the Director of Energy.

The GOM plans to establish an Interministerial Commission which will constitute a forum for information exchange, dialogue, and coordination among the various ministries and departments concerned with energy demand management issues. The work of the Commission, organized and led by MEM (which will assure the linkage between the Commission and the project steering committee), will serve to orient project activities and contribute to the adoption of a national EDM strategy.

The project will demonstrate to energy policy makers, and especially energy users, that energy demand management practices such as undertaken in many other countries can achieve significant returns for Morocco. The GOM has already taken the most important EDM policy step of assuring price incentives. Moreover, energy demand management activities under the Energy Planning project have already achieved benefits of 25,000 toe saved per year representing foreign exchange savings of about $3 million per year at current prices. These results show that with a consistent effort, difficult non-price barriers to more efficient use of energy can be overcome.

The project is expected to result in energy savings of 60,000 toe per year by the end of the project for the three specific sectors selected for initial concentration. Assuming static oil prices, the internal rate of return (IRR) of the project is 22% over fifteen years. Assuming even modest price increases averaging 4% per year in real terms, the IRR increases to 32%. This analysis confirms the economic attractiveness of investment in an energy demand management project in Morocco.

C. Summary Financial Plan ($000 U.S.):

Budget Line Item	AID Grant	GOM	Private Sector	Totals
Technical Assistance	$ 2800	$ 400	$ 200	$ 3400
Commodities	850	50	1800	2700
Training	500	200	200	900
Policy Analysis	200	50	--	250
Evaluations/Audits	150	--	--	150
Contingency	500	100	--	600
Total	$ 5000	$ 800	$ 2200	$ 8000

The project will have a Project Assistance Completion Date (PACD) of September 30, 1993.

D. ANPAC Concerns and Design Guidelines

The concerns and design guidelines which were raised at the ANPAC review of the PID (see Annex C) are summarized below:

1. Project time frame: The ANPAC suggested that a longer time frame (more than five years), or a phased approach, be considered to carry out all activities and achieve the project purpose. USAID has decided to narrow project activities and to concentrate on three sectors for which work has already started under the Energy Planning Project. Since the project focus has been narrowed from that originally proposed in the PID, five years should be an adequate time frame within which to complete the activities.

2. Target areas: The ANPAC suggested the Mission expand and refine the analysis of energy using sectors and subsectors to determine those with the highest potential for reduction of waste and improved energy efficiency. This analysis is provided in Section III. Project Description and in Section VII C. Technical Analysis. The sectors selected are agroindustry, construction materials, and hotels.

3. Constraints to efficient energy usage: As requested by the ANPAC, the project paper identifies important constraints (barriers) to efficient energy usage that currently exist and describes the framework and mechanism by which the project will be addressing them. See Section III. Project Description and Section VII. Project Analysis.

4. Linkages with Mission Energy Strategy and Other Donor Programs: The EDM project was identified as a priority activity in the 1986-92 CDSS, which is discussed in Section II. Background and Rationale.

The World Bank, the European Economic Commission (EEC) and the French Government have all expressed support for Morocco to implement an EDM program. The EDM project will welcome complementary initiatives by other donors, especially in sectors identified as having high potential (transport and textiles) which are presently considered outside of AID's project concentration. Efforts are already underway to coordinate these proposed activities with the project components described herein. The project's relationship to these and other donor programs is further described in Section II.

5. IEE: As suggested by the ANPAC, the strategy for carrying out Initial Environmental Examinations for project funded activities on a case-by-case basis is described in Annex D.

6. Project goal: The ANPAC requested USAID to consider changing the project goal to stress energy efficiency and eliminate reference to the "rate of investment". In light of the ANPAC's comments, the project goal has been revised to "save foreign exchange and increase productivity by reducing energy waste and by improving efficiency of energy use in Morocco". The Project Committee believes this statement of the goal is now appropriate. Energy consumers, and not energy producers and distributers (i.e., suppliers), are the prime targets of the EDM program. Nonetheless, EDM will have an impact on energy production and distribution by reducing the amount of energy used, delaying expansion projects, and inducing firms and consumers to adjust to the new demand patterns.

7. Capital financing: The ANPAC deferred approval of a capital financing component of the project at the PID stage and requested that additional analysis be carried out by the Mission during PP preparation. Additional analysis was undertaken by the Mission with the assistance of financial and banking experts. The conclusion of this analysis was to defer making a decision on the proposed capital component for the project until an assessment could be made of the success of the project in promoting EDM technologies and in encouraging investment in EDM equipment.

The demand for U.S. EDM equipment through 1996 is currently estimated at between $9.3 million and $17 million, or $1-2 million per year. If the cost of U.S. equipment requiring financing does not exceed $12 million, the creation of a special credit line for the EDM Project is not warranted, at least not in the short term.

If financing is identified as a constraint, or a greater demand for U.S. equipment is stimulated by the project activities, then the need for a credit component will be reconsidered at a later date.

E. Recommendations

The USAID Project Committee has determined that the proposed activities are technically, administratively, and financially feasible within the five year project. Consequently, the Committee recommends that AID authorize a grant of $5.0 million for the Energy Demand Management project.

II. BACKGROUND AND RATIONALE

A. Project Paper Development

USAID first identified the importance of energy demand management (EDM) in Morocco in the FY 1988 Country Development Strategy Statement (CDSS) approved by AID/W in March, 1986. Project design preparations began with a large delegation from Morocco (three senior Moroccan officials, two USAID representatives, one USAID-financed energy specialist resident in Morocco) attending the autumn 1986 ANE Bureau regional workshop on Energy Conservation and Private Power Generation. Feasibility studies were then contracted by USAID/Morocco. Based on these feasibility studies, USAID prepared and submitted the Project Identification Document (PID) for AID/W approval in December 1986. AID/W approved the PID in January 1987 "for designing PP and approving PP in field for activities concerning technical support, training, and studies/action plans." AID/W deferred approval of the capital financing activity "until further information and analysis is provided to AID/W." As a result of a feasibility study which noted that liquidity was currently not a constraint to the application of EDM in Morocco, the Mission deferred consideration of the capital financing component of the project. In depth feasibility studies on all aspects of EDM were undertaken following the approval of the PID. These studies form the basis of the activities and analyses presented in this project paper.

B. The Energy Context

1. Economic Impacts of Energy Imports

Economic development in Morocco is currently constrained, inter alia, by a chronic dependence on energy imports. In 1985, the country imported 4.8 million tons of oil, nearly one million tons more than in 1980, and about 450,000 tons of coal. This imported oil and coal represented 88.7% of all commercial energy used. Moreover, the 1985 energy import bill was close to U.S. $1 billion (See Table 1 giving Morocco's energy balance).

The dramatic increase in the cost of energy imports in the late 70's was paralleled by sharp reductions in prices for Morocco's chief export, phosphates. There was a four fold reduction in the ratio of phosphate to oil prices between 1975-1984. These concurrent external events, and Morocco's inability to adjust to them, have contributed to Morocco's current financing difficulties, including its present debt problems. Morocco's debt, exceeding $17 billion at the end of 1986, equals the value of almost 7 years of exports. Servicing this debt requires more than one-third of Morocco's annual export revenues, even after debt rescheduling.

Energy use, and the measures necessary to handle the heavy debt burden, have contributed to a slowdown in both foreign exchange and local currency investment. Energy-related public sector investments (about 10% of the total investment budget between 1981-1985) and private investment in energy saving technology have been lower than in many other countries. Morocco is caught in a vicious circle. In the absence of increases in imported energy or energy saving investment, Morocco's productive sector will have difficulty in sustaining the comparatively modest economic growth rates needed to expand exports and foreign exchange earnings, and without such growth, Morocco will not be able to afford the increased energy imports.

Table 1

Morocco's Energy Balance

EVOLUTION DE LA BALANCE ENERGETIQUE

	1979		1980		1981		1982		1983		1984		1985	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Consommation (10^3 TEP)														
- Charbon	359	8	371	8	445	10	438	9	560	12	507	11	662	13
- Produits Pétroliers	3823	82	3868	83	3897	83	4086	87	4117	85	4267	86	4295	83
- Gaz naturel	57	1	52	1	66	1	60	1	63	1	63	1	66	1
- Electricité hydraulique*	416	9	397	8	266	6	149	3	125	2	95	2	126	3
Total	4655	100	4688	100	4674	100	4733	100	4865	100	4932	100	5149	100
Dont fourni localement														
- Anthracite	337	41	352	43	418	54	396	54	374	64	383	67	367	63
- Pétrole et gaz naturel ..	75	9	64	8	82	11	75	12	80	14	79	16	86	15
- Electricité hydraulique .	416	50	397	49	266	35	149	24	125	22	95	18	126	22
Total	828	100	813	100	764	100	619	100	579	100	537	100	579	100
- Déficit Energitique	3827		3873		3910		4114		4288		4395		4502	
En pourcentage de la consommation globale ..	82.2 %		82.7 %		83.7 %		86.9 %		88.1 %		89.1 %		80.7 %	

* Y compris l'électricité d'origine hydraulique produite par les mines d'Aouli

Source: Ministry of Energy and Mines

Morocco is likely to remain almost entirely dependent on imported oil for its commercial energy for the foreseeable future. This is indicative of the relatively small amounts of domestic oil, natural gas, and coal that appear on the horizon, the long time required to develop renewables, and the prohibitive cost of developing the country's sizable oil shale deposits.

Because Morocco is heavily dependent on imported energy, its foreign exchange position is highly sensitive to changes in international oil prices. In 1986, Morocco's total imports of oil and coal increased by 2.8%, but the overall energy import bill fell by almost $500 million due to the drop in oil prices (prices as low as $10 per barrel were reported). The present oil price range of $16-$18 per barrel, or about $130 per toe provides some temporary relief from the experience in 1984 and 1985.

The longer run outlook for oil prices, however, is not favorable for Morocco. By the 1990's most analysts expect prices to reach $20-25 per barrel in constant 1986 dollars (See Annex F giving results of the International Energy Workshop 1987 poll). As prices rise, Morocco will be forced to pay the oil bill, if it has the foreign exchange; or limit oil imports if it does not have the foreign exchange and thus constrain future economic activity in the country.

2. GOM Energy Policies and Programs

The Government of Morocco has taken several actions to address its energy problems. It established the Ministry of Energy and Mines (MEM) in 1977, reflecting the increased importance of energy to policymakers. It initiated an exploration and development program to exploit available domestic oil, natural gas, and oil shale reserves (mostly through ONAREP) and hydroelectricity potential (with ONE) accompanied by an initial effort to promote energy conservation by end users. Most notably, domestic energy prices were increased substantially to reach or exceed world prices, contributing to a reduction in the growth rate of energy consumption.

The MEM, acting through its Energy Conservation Unit in the Direction de l'Energie, organized high-level and comprehensive seminars (1979 and 1984), and conducted a survey of large energy users (financed by bilateral technical assistance from France) to define an energy audit program. The potential for industrial energy conservation was also investigated by the World Bank (1982 and 1985), but a discrete project for Bank consideration was not identified.

The MEM took the lead in incorporating incentives for energy conservation investments in the Code des Investissements or CDI (1983). Such incentives stipulate that energy conservation investments may receive a subsidy of DH 500 per ton of oil equivalent (toe) saved, under specific conditions.

Government actions also took the form of a campaign launched in early 1984 to educate the public about the need to reduce energy waste and economize on electricity and gasoline (this campaign has lapsed in the past few years). The government adopted specific measures, such as shortening the work week to five days, and applying selective power cuts to agricultural and industrial facilities during peak evening hours.

The Ministry of Energy and Mines has affirmed that energy demand management is a high priority for the GOM. The next Five-Year Plan (1988-92) includes EDM as part of the action plan, with a specific line item budget proposed. The plan states:

> Rational energy demand management aimed at reducing energy consumption growth rates should not constrain economic growth and constitutes, in itself, an energy resource ("un gisement énergétique"). As a follow-up to the convincing results obtained during the 1980-85 period due, inter alia, to a determined pricing policy, a large program is envisioned for the 1988-92 period aimed at obtaining new energy savings through demonstration activities, seminars, and the publication of specialized brochures.
>
> (Ministry of Energy and Mines, Orientation Plan for Economic and Social Development 1988-92, National Committee for Energy and Mines, Report of the Sub-Committee on Energy, September 1987, p. 40.)

Measures have also been taken to effect changes in energy use for power generation, industry, and households. Plans to convert industrial facilities to gas have been shelved because the Meskala gas field has not yielded the large output expected. In an alternative move, a major switch from fuel oil to coal has been initiated both in the industrial and power generation sectors (although this does not affect dependence on imported energy). The cement industry has converted most of its plants to coal. Further fuel substitution may occur if the present exploration efforts yield sizable natural gas reserves or if additional domestic coal reserves are found.

The combined net impact of all these measures is not known with precision. The MEM estimates that current national energy consumption is about 1-1.5 Mtoe lower than it would have been if the pre-1980 trend had continued. The GOM Five-Year Plan for 1988-92 attributes the declining growth rate in energy consumption over the period 1980-85 (1.5% per year) from the period 1973-1979 (6.5% per year) as evidence that these energy conservation measures -- especially pricing -- had an impact. The Five-Year Plan estimates 6.7 Mtoe were saved during the 1980-85 period, at a value of 12 billion dirhams (nearly $1.5 billion).

Current government policy is aimed at encouraging the private sector to become more independent and to compete in the international market. The policy climate is conducive to favorable investment attitudes in sectors that were traditionally protected and thus reluctant to undertake productivity improvements. Accompanied by policies to restructure and privatize the government-dominated industrial sector in particular, this policy will promote substantial progress in cost control and thus efficient energy use.

C. Rationale for a National Energy Demand Management Program

Given its economic and energy scenarios, Morocco must concentrate on the more efficient use of energy through an aggressive promotion of energy demand management policies and programs and efficient investment in energy saving technology at the end user level. This is the most viable energy policy option available to help Morocco meet its projected 4% growth, while limiting future demands on foreign exchange.

Notwithstanding past measures, the GOM presently has no formal program to promote energy demand management. The initial effort (1974-1985) resulted in the realization of energy saving of "first level" or primary potential by raising domestic prices and encouraging large energy users to conserve. The GOM maintains energy prices at above border prices, driven by the need for revenue. However, the GOM has taken virtually no policy action to overcome non-price barriers to more efficient use of energy, despite acceptance of these actions in the industrialized countries. There is no concerted effort to enhance Moroccan technical capability, diffuse information on effective EDM practices, or carry out analytical and policy studies.

The GOM has recently recognized the deficiency in its energy policy from not having an energy demand management program, and has placed priority on developing such a program in the new Five Year plan. Its proposals in the Plan are based on studies and discussions with USAID officials.

Energy demand management consists of techniques, applications, and policies primarily directed to addressing demand side, as opposed to supply side issues (see Table 2 for illustrative list). An EDM program encouraging these practices would constitute a more structured Moroccan effort to achieve higher energy efficiency.

Morocco now needs to "switch gears" to benefit from recent international advances in energy management, (e.g., end-use electric load management, automatic temperature controls), and the broad use of new technologies such as advanced electronic controls and engine efficiency meters. By implementing energy demand management activities, Morocco can reduce energy consumption in certain sectors by 5-10% over and above the improvements now being achieved.

D. Relation to USAID's Country Development Strategy

One of the objectives of the 1988 CDSS is the improved management of energy and natural resources in Morocco. This component contains two sub-objectives: (i.) the strengthening of the energy sector policy analysis, planning, and management capacity, and (ii.) the increase of the development and use of Morocco's renewable energy resources. The number one activity under the first sub-objective is the development of a national energy demand management (conservation) program. USAID's ability to assist the GOM implement a strengthened energy demand management program is based on building blocks already in place (see Annex G: Case Studies). Under the Energy Planning Assistance Project (608-0180), USAID is financing a long-term energy conservation advisor. Numerous studies have already been completed and audits on industrial, commercial, and energy sector installations and enterprises are ongoing along with modest training efforts of designated industry energy managers. An interim evaluation of the Energy Planning Assistance project reaffirmed the usefulness and importance of these activities.

E. Relation to Other Donor Activities

Considerable interest has been expressed by international donor and lending organizations in participating in a national EDM program. The World Bank and the European Economic Community (EEC) have held discussions with the GOM to explore possible steps to take, either to provide technical assistance or financial resources for investment. The World Bank Assessment Update of the Energy Sector (January 1986) recommended a conscious and intensive energy

Table 2

Illustrative Energy Demand Management Practices

- Install energy efficient equipment
- Intensified maintenance
- Fuel Substitution
- Pricing Policy
- Loss reduction
- Energy Recycling
- Cogeneration and private power generation
- Improved operation
- Adapting to existing environment
- Product changes
- Reducing demand for energy intensive products
- Auditing of energy use

demand management program such as is proposed herein because it appears to offer Morocco the highest return on investment in the short-run to reduce dependence on imported oil.

The World Bank is currently pursuing four initiatives, three of which have direct implications for EDM: (i) a power distribution program involving loss reduction in the Regies, the community level utility authorities; (ii) a power tariff study which is just beginning; and (iii) an energy sector loan for 1989. The World Bank has expressed interest in cooperating with USAID, and the energy sector loan could potentially help finance EDM technical applications identified under the AID project.

The EEC has identified EDM training opportunities and study tours for Moroccan engineers to European centers and is discussing plans to finance an "energy bus" capable of conducting limited energy audits and monitoring technical applications and demonstration projects. The AID project will provide the basis and structure for a program capable of coordinating and mobilizing forces from all sectors in Morocco and resources from a number of donor and international organizations.

III. DETAILED PROJECT DESCRIPTION

A. Project Goal:

The goal of the Energy Demand Management Project is to save foreign exchange and increase productivity by reducing energy waste and by improving efficiency of energy use in Morocco.

B. Project Purpose:

The project purpose is to develop and implement the core of a national energy demand management (EDM) program.

The strategy for achieving the project purpose involves several elements:

- develop an understanding, awareness, and consciousness of EDM, first within key sectors and then throughout Morocco;
- intervene with selected firms within key sectors by conducting audits, feasibility studies and demonstration projects;
- build up a capability within Morocco to conduct energy audits and implement energy demand management techniques;
- conduct specific studies to influence policy decisions on energy management issues.

The project will draw from Moroccan and international experiences to date in energy demand management and build on a carefully monitored and well coordinated sector-by-sector approach to ultimately spread EDM to all sectors of the economy. The project will encourage full participation by the private sector, whose share in energy use is expected to increase from 30 percent to 50 percent over the next five to seven years.

C. Project Components:

The project will have four major components:

- Information and awareness;
- Technical support;
- U.S. and in-country training;
- Policy analysis.

The project will concentrate on, but not be limited to, three target sectors -- agroindustry, construction materials, and hotels -- that offer promising energy savings potential, appear capable of absorbing and benefitting from EDM technologies, and are important to Morocco's economic base. For each of the target sectors, the project will finance a series of coordinated activities. These will include (i) information and awareness campaigns (e.g. seminars, workshops, newsletters, study tours); (ii) firm-specific audits, and technical and economic feasibility studies of potential investments; (iii) demonstration projects; (iv) U.S. and in-country training of plant managers, energy auditors, and engineers; and (v) studies designed to influence policy decisions on energy demand management issues.

At the outset, AID and MEM will implement activities already planned under the Energy Planning project (608-0180), notably in the fish canning and hotel industries; and follow up on past work in the construction materials sector. The project will subsequently address EDM requirements of the agroindustrial sector as a whole through working with individual firms in the sector.

If the project is successful in the selected target sectors in the initial years, the Mission may consider other energy consuming sectors such as irrigation pumping, office buildings, and medium to light industry. The USAID does not contemplate adding new target sectors until it examines the results of the first project evaluation and the possible replicability of EDM techniques in other sectors. However, discrete project activities in other sectors, as determined by the project steering committee may be included if warranted.

The project components are described in detail in the section which follows:

1. Information and Awareness

The information and awareness component of the project will organize workshops, seminars, and targeted campaigns; promote technical publications; conduct surveys and data base development; fund international exchanges and study tours; and establish information centers for EDM technology. Information and awareness activities described below:

a. Information campaigns, seminars, and workshops:

The project will organize specialized campaigns, technical workshops, and seminars in order to disseminate information and raise awareness about EDM practices and technologies.

Information campaigns will target initially the agroindustial subsectors already studied under the Energy Planning project, followed by the construction materials and hotels sectors. The campaigns will consist primarily of lectures, discussions, brochures and posters to sensitize upper level managers to the potential benefits of EDM.

Seminars and workshops will occur several times per year over the five year life of project. These seminars and workshops will focus on particular sectors or subsectors and on particular EDM technologies. Seminars will encourage discussion on how EDM can benefit specific industries, such as the brick and ceramics industry, and present specific EDM practices such as equipment maintenance and timing and load management techniques. The seminars will reach energy users in key sectors in different parts of Morocco and during different years throughout the project life, updated when necessary to include more recent information. The Ministry of Energy and Mines, engineering schools, the Ministry of Commerce and Industry, professional organizations, the Chambers of Commerce, CGEM, and other relevant entities will host the seminars and workshops, aimed at technical personnel, plant managers, and energy managers.

In the hotel sector, an initial information and awareness seminar will present EDM issues for chain presidents, large hotel owners and managers, and architects. Over the course of the project, approximately ten specialized seminars conducted for hotel technical managers will cover: air conditioning; heat

production and utilization; and energy management. Seminars for architects will include presentations and discussions on air conditioning; heat production and utilization; solar protection; and introduction to computer software developed in the U.S. to maximize energy efficiency in buildings.

b. Technical publications and brochures:

The project will finance a technical publication similar to the French publication Energie Plus for wide distribution in Morocco, targeted in particular to Moroccan industries. The publication will include articles about EDM practices and technologies as well as advertisements for EDM equipment. Circulation will include plant managers and other engineering and management staff. The publication, initiated at the end of the second year of the project after a basic demand for EDM information has been created, will eventually sustain itself by advertisements and subscriptions. The publication, initially subcontracted to a local public relations firm or produced jointly by the EDM contractor and a professional association will include editorials on EDM policy issues directed at GOM and private sector subscribers.

In addition to the EDM publication, the project will sponsor articles submitted to various trade association newsletters to broaden the understanding of EDM concepts within a target interest group. Short technical and practical articles published in the hotel profession's news publication are also envisioned. Special technical newsletters sent to hotel technical managers and industrial plant owners will apprise them of recent advances in EDM for hotels.

c. Surveys and establishment of a data base:

The EDM project will finance an annual energy consumption survey to obtain a good information base on energy use within target sectors. The survey will provide information used to track project activities and monitor project progress. The technical assistance contractor or Moroccan sub-contractors specializing in survey methodology, will coordinate and carry out this activity. The contractor will have primary responsibility for the storage of the data gathered by the surveys using a standard microcomputer and software (e.g. DBase III). The Planning and Documentation Unit at the Ministry of Energy and Mines will incorporate the EDM data into the national energy documentation center at MEM and share the data analysis responsibilities with the technical assistance contractor.

d. Information centers:

The project will establish information centers at cooperating Moroccan professional and trade association headquarters with books, magazines, and publications relevant to EDM on display. MEM and other government entities as well as the private sector will draw on the centers for ideas and reference materials. As warranted, the project will help upgrade MEM's Information and Documentation Center in the field of energy demand management.

e. Energy Managers Association:

The project will support the establishment of an Energy Managers Association to develop professionalism and to serve as a forum to share information and

the latest technologies for EDM. The target membership for the Association includes public and private sector energy managers and engineers. Once formed, the association will host several of the project funded seminars and workshops and contribute extensively to the technical publication described above.

f. Study tours:

The project will finance up to five study tours over the life of project. Each study tour will involve four to six individuals. The study tours will serve to acquaint key Moroccan managers and engineers in government, the private sector, professional associations, and educational institutions with recent advances in EDM and familiarize them with U.S. equipment.

2. Technical Support:

This component stresses know-how and technology transfer to plant operators and managers. The planned activities fall within two major categories: (a) audits and feasibility analyses; and (b) technology applications.

a. Energy audits and feasibility studies:

This category of activities will consist of energy audits and feasibility studies. Audits of selected industrial firms in the agro-industry and construction materials sectors and in the hotels sector are the first step in applying EDM. Audits inform the firm of how energy efficient it is in general and identify areas for further analysis. Audits are not always necessary, however. Often, an energy engineer can simply survey a plant to determine in which areas a specific project might be carried out. In these cases, one moves directly to a techno-economic feasibility study. These studies work out the details of specific EDM interventions, including their technical and economic costs and benefits.

The project will finance approximately 40 audits over the life of the project. Targets will include firms and enterprises of the agroindustry and construction material industry, as well as hotels.

The project will finance approximately 45 techno-economic feasibility studies of EDM investment projects, based on recommendations made during the audits and visits by the technical assistance contractors. Approximately one third of the feasibility studies will take place in agroindustry (e.g. food and fish canning, dairies); one third in construction materials (bricks, cement, ceramics); and one third in hotels.

In the hotel sector, feasibility studies will follow the audits as warranted, in areas such as: (i) heat recovery from compressors; (ii) sewage water primary treatment plants; (iii) pipe water temperature regulation systems; (iv) lighting; and (v) industrial versus hotel laundry.

The project contemplates a cost sharing formula for both audits and feasibility studies. This cost sharing formula is laid out in Section V C., Cost Sharing Arrangements.

b. Technology applications

The project will finance approximately fifteen technology applications over the life of the project. Technology applications include the installation of

hardware such as a new boiler, a cogeneration system, a heat exchanger, or other EDM equipment which will significantly increase the energy efficiency of the firm. The purpose of this activity is to demonstrate the technical, economic, financial and managerial feasibility of using selected EDM technologies (of U.S. origin) in Morocco. Firms who participate in this activity will be used as models to illustrate the success of EDM investments in improving energy management. Selection criteria for the technical applications include:

- Energy savings potential: Since the major objective of the project is to improve the efficiency of energy use in the Moroccan economy, the selected technologies should result in significant energy savings. This refers, in the first place, to the relative savings in a specific plant for a specific operation, and ultimately to the overall impact in the country. The quantitative threshold for selecting a technology application is to save not less than five percent of initial energy consumption of the candidate application. On average, however, 10-30 percent savings are expected.

- Financial and economic merits: To foster economic efficiency, the technical application component will concentrate on energy efficiency improvement technologies which provide attractive financial performance to the end user and have a positive economic value to the country.

- Replicability: Priority applications are for those technologies that can be widely replicated in various sectors of the economy. The quantitative measure of replicability for the project is that no less than five other plants able to use the same technology are identified.

- Proven technology, but not used in Morocco: Proven technologies will reduce the investment risks associated with efficiency improvement projects, and therefore, their application in Morocco can be expected to lead to widespread use in the future.

Other site-specific criteria will include:

- Willingness to allow others to visit the site and to share information on actual costs and performances (this undoubtedly will be a sensitive area since companies may be reluctant to share confidential corporate information).

- The plant operators agree to effective oversight and maintenance to assure that the systems work properly.

- The site is convenient to visit.

A major objective of this component is to gather reliable information on each technology application. To this end, the firms participating in the program will monitor (with contractor assistance) the technical and economic performance of each application. Dissemination of detailed case studies among professional associations and interested end-users is essential. The selection of technical applications will follow from audit and feasibility study recommendations and negotiations with individual firm or hotel managers.

As with audits and feasibility studies, the project contemplates that a cost sharing formula will apply (per section VC).

3. Training

The project will finance U.S. and in-country training to build within Morocco a cadre of people at various levels who understand and can continue to apply energy management techniques within their domains. Training activities will include U.S. short-term training (internships and short courses) and Moroccan short-term training such as seminars, refresher courses, and hands-on workshops.

While the U.S. training will take place at industrial plants and university departments (short-term), most of the in-country training will be provided through the Ecole Nationale d'Industrie Minerale (ENIM) in Rabat, and in particular through one of its six departments, the Chemical and Energy Engineering Department (CEED). In addition, the project will finance the upgrading of the current sixth year curriculum at CEED to cover the latest developments of EDM.

a. U.S. Training:

Short-term training and internships: 30 courses (6 participants per year).

The project will fund internship programs and short courses in the United States for selected candidates from the target sectors, consultant firms, and the academic community. For candidates from the target sectors, this training will take place at U.S. companies that have operational activities that are comparable to those of the Moroccan company the candidate works for, and that have had successful energy conservation and management methods and practices. Candidates can be engineers, or financial or other managers who will play a future role in EDM. For the Moroccan consulting engineers, this training will take place at similar U.S. engineering firms and will prepare them to be the providers of updated training programs beyond the life of the project.

Candidates will undertake internships with U.S. companies, consistent with program experience under the S&T/EY financed energy programs which have taken place over the past seven years. For candidates from CEED, training will take place at U.S. universities to establish links and contacts with one or various departments that have an Energy Management curriculum. For other candidates, training at U.S. companies is anticipated. A combination of the two options, if feasible, will give candidates the opportunity to obtain theoretical and practical training. The internship element is aimed at candidates such as consulting engineers, and company engineers, who will have responsibilities to carry out in-country training programs, and CEED faculty who in addition will have responsibility to co-design upgraded curriculum in specific areas. Through this training component the participants will have the opportunity to experience current U.S. EDM practices in plant operations and university departments.

b. In-country training

i. In-country training programs:

The project will fund the following types of in-country training (see Section V F. EDM Training Plan):

- Intensive courses in cost control for company

managers and financial directors from the various sectors.

- o Intensive courses in energy audits for energy auditors, company engineers, and consulting engineers.

- o Intensive refresher courses in the latest energy engineering technologies for company engineers and GOM officials involved with EDM.

- o Practical 'hands-on' training on maintenance and operation of energy systems for boiler operators and maintenance technicians.

- o Curriculum development, to upgrade and update the current curriculum of the 6th year program at CEED.

ii. Implementation of the in-country training component:

The technical assistance contractor will design the training programs and subsequently conduct the first series of each type of program. The contractor will subcontract short-term advisors from U.S. universities or firms, or local consulting firms to assist in completing the various tasks. (See Section VII D. Institutional Analysis for description of CEED capabilities).

Upon successful completion of the first series of training courses, the contractor will turn over the further training responsibilities to CEED and local engineering consultants who have been subcontracted to participate in the initial design of the programs and the teaching. The contractor will also provide the required course materials including instruments and equipment to successfully conduct the training program.

With the exception of practical 'hands-on' training, all training will take place at CEED. In cases where a practical aspect needs to be emphasized, a company plant will serve as the training location. For example, practical training for boiler operators can only be efficiently conducted at either a company plant or a hotel, according to the specific group of technicians targeted. Further, this course can only be conducted in Arabic (Moroccan dialect in particular). The contractor will subcontract with a local consulting firm to conduct these particular training programs. The subcontractors will conduct one or half day sessions at major hotels or firms in major cities. Boiler operators and maintenance technicians from the area will be invited to attend the session.

iii. ENIM's organization and its capabilities through CEED to conduct training programs

ENIM is a public institution under the purview of the Ministry of Energy and Mines. In its current status it offers the 'Engineering Diploma' in all six departments. The Moroccan faculty consists of a staff of 63, of whom 16 hold Doctoral Degrees (PhD), 38 Masters (MS) or equivalent degrees, and 9 are teaching assistants. A total of 10 faculty are assigned to the CEED. As part

of the academic programs, ENIM has the capability to provide research services as well as refresher courses and 'continuing education programs' to the public and private sector.

One of CEED's major objectives is to study transformation processes of raw material with limited energy consumption. The department has six training and research laboratories as well as a simulation laboratory equipped with software (e.g. ASPEN Plus) to help determine physical properties of materials and analyze fabrication techniques. CEED has the capability to organize workshops for Moroccan industry, and plans to do so in the near future. While training aspects currently revolve around the different laboratories, efforts to start up research programs are underway, in particular in the areas of energy conservation, solar energy, and energy management.

iv. Curriculum Development

This element will address the current sixth year curriculum of the ENIM/CEED program, by expanding and upgrading it in order to cover the latest Energy Demand Management developments. Currently the sixth year program is too broad and too heavily loaded with courses that do not directly relate to energy conservation and management. In addition, Morocco's demand for engineers in the energy sector indicates a need for a stronger focus on the energy departments and programs of the engineering schools. ENIM is already aware of this and a revision of the curriculum is needed. Currently 60% of CEED graduates find jobs in industry and other sectors (chemical industry, processing industry, consulting firms, banks and insurance companies) during the year following graduation. ENIM does not have an active follow-up system nor does it play a large role in career development of its graduates. With an energy concentration and a degree that acknowledges energy expertise, (currently the degree for engineers graduating from the CEED reads "Diplome d'Ingenieur en Genie Chemique"), CEED graduates will have easier access to job opportunities related to EDM (see Annex H for current sixth year curriculum).

The project will finance technical assistance to work with ENIM staff to implement the curriculum development element. ENIM faculty responsible for the teaching of those courses that will be most affected by the change in curriculum will be involved in the process from the start in order to ensure the most impact. The project will provide materials and other teaching equipment to support the revised and expanded EDM curriculum.

4. Policy Analysis

The project will provide policy analysis and advice through two types of studies -- technical and policy oriented. The studies will advise the GOM on further steps needed to implement a national EDM program, and further an understanding of the technical and managerial aspects of EDM. The studies will identify specific actions that can be taken to make locally manufactured products more energy efficient, and suggest changes in GOM policies to promote energy demand management.

The project will provide analysis through (i) technical studies on Moroccan manufactured products, such as heating and cooling equipment and lighting systems; and (ii) policy studies on EDM related issues, such as efficiency

standards in the target sectors, and government laws and regulations affecting EDM, including taxation, and their relationship to the decision making process regarding EDM investments.

The project may also support additional studies, as yet undetermined, to address EDM issues that arise over the life of the project. Annex I contains a description of the proposed studies.

5. First Year Activities:

During the first year, the EDM project will continue the efforts and activities undertaken by the long term Energy Conservation Advisor under the Energy Planning Project (608-0180). These activities have already been identified in cooperation with the Energy Conservation and Environment Unit of the Ministry of Energy and Mines during the period March 1986 through March 1988.

The efforts already undertaken represent useful but heretofore uncoordinated interventions in energy demand management in Morocco. These efforts include information seminars (e.g., fish canning industry); information dissemination to several industrial subsectors; on-the-job training in energy audit techniques; and audits of selected firms. The first year of the EDM project will serve to bring together the experiences of the past into a coherent program. The composite of these experiences will help form the basis for subsequent EDM activities in other subsectors, if results in the selected sectors are successful.

First year project activities will include technical support, information and awareness, and training. Once the long term resident energy management contract team is in place, they will develop a first year work plan as a top priority, taking into consideration the activities of the past AID financed efforts in this area.

The proposed work plan for the interim period (estimated six to eight months) is outlined below:

a. Technical support:

- Follow-up on audits in fish canning industry (10 plants);
- Conduct additional audits in fish canning industry (5 plants);
- Conduct technoeconomic study on feasibility of fish oil as substitute for fuel oil;
- Follow-up on diagnostic audits performed in cane sugar industry (4 plants);
- Follow-up on diagnostic audits performed in beet sugar industry (9 plants);

b. Information and awareness:

- Develop questionaire and data base on energy consumption in the fish canning industry;

- o Produce and disseminate a technical brochure on energy demand management in the fish canning industry;
- o Arrange for a study tour by representatives of Moroccan fish canning industry to visit U.S. plants;
- o Develop a questionaire and data base on energy consumption in agroindustry and conduct subsector wide survey;
- o Conduct informational seminars on EDM in the brick and ceramic industry, the dairy industry, and the hotel sector.

c. Training:

- o Conduct on-the-job training in the audits performed;
- o Conduct on-the-job training in the organization and presentation of EDM informational seminars;
- o Develop preliminary training plan for short term EDM training in the U.S.

d. Policy analysis:

- o Prepare preliminary terms of reference for a study on Moroccan manufactured heating and cooling equipment.
- o Prepare preliminary terms of reference for a study on efficiency standards in the target sectors.

USAID inputs during the initial period of project implementation (i.e. 6-8 months under the interim work plan) will include the following:

Technical assistance: One resident energy conservation advisor (energy conservation engineer) funded under project 608-0180 to coordinate and conduct follow-up activities (six person months); short term technical advisors to organize and make technical presentations at information seminars (two person months); short term advisors (two person months) or subcontract to local firm to prepare information brochure; short term advisors (two person months) or subcontract to local firm to develop questionaire and conduct survey on energy consumption in agro-industry.

Commodities: Audit kits (e.g., boiler efficiency meters, infrared sensors to detect energy leaks, etc.); training materials for on-the-job training; monitoring equipment used in follow-up to audits (e.g., engine efficiency meters); and a microcomputer, including software, lasar printer, and scanner to produce technical brochures.

Training: Expenses in the U.S. for a study tour (five participants for two week tour) to visit energy efficient canneries.

Studies: Developing the terms of reference (TOR) for key studies to be carried out under the project will require approximately two person months. These TOR's will be available for review upon the arrival of the full time resident contract team.

D. Summary of Project Outputs

Outputs	Number	Notes
Information and Awareness		
EDM Information Packages	3	One per target sector, updated periodically.
Seminars and Workshops	45	two-three per year in key subsectors.
Technical Publication		Biannual Publication
Energy Survey	5	Annually
Information Centers	3	Centers established in trade and professional associations
Energy Managers Association		Association established.
Study tours	5	One trip per year, involving 4-6 persons.
Technical Support		
Audits	40	
Feasibility studies	45	
Technical applications	15	
Training		
U.S. short courses and internships	30	Six per year.
In country programs:		
Intensive courses	150	Thirty per year
"Hands-on'	400	Eighty per year
ENIM		Curriculum upgrade of sixth year program
Policy Analysis		
Key studies		Four studies completed

E. Summary of Project Inputs:

The project will provide two long term U.S. technical advisors to implement the project: an Energy Demand Management Specialist (Chief of Party) and an Information and Training Specialist. An Administrative Assistant hired locally will assist with day-to-day operations, including sub contracts with local firms and individuals. The EDM Specialist (Chief of Party) and the Administrative Assistant will be funded for roughly four years each (50 person months). The Information and Training Specialist will be funded for two years (24 person months).

Qualified Moroccan professionals, hired by the contractor to work with the resident experts, will implement project activities and assure transfer of skills and continuity over the life of project. In addition, U.S. and Moroccan firms specializing in energy audits and studies, information campaigns, and training will be subcontracted to carry out discrete tasks in project implementation.

The project will also finance forty two person months of short term U.S. experts. These consultants will, individually or in cooperation with the technical assistance team and its subcontractors, conduct seminars and workshops, and other information dissemination activities; assist in the development and implementation of EDM training courses; conduct audits and feasibility studies; carry out policy and technical studies and devise action plans; and undertake other project activities as required.

Commodities provided by the project will include two vehicles, microcomputers and accessories, office furniture and supplies to facilitate the work of the technical assistance team; audit and monitoring equipment to assist the technical advisors, subcontractors, and participating firms assess energy efficiencies; and demonstration equipment for EDM technical applications.

IV. FINANCIAL PLAN

The total cost of the project is estimated at U.S. $8.0 million. The financial plan consists of inputs from three sources: USAID, the GOM, and the Moroccan Private Sector.

USAID will contribute technical assistance, commodities, training, studies, evaluations and an audit with a total cost of $5,000,000. Technical assistance -- estimated at $2,800,000 -- consists of both long and short term U.S. and Moroccan energy management specialists. Commodities valued at $850,000 include vehicles, microcomputers and accessories, office equipment and supplies, audit and monitoring equipment, demonstration equipment, and training aids. U.S. and in-country training, valued at $500,000 includes U.S. short term training, and internships; and in-country seminars, workshops and technical courses. Studies to provide technical and policy analysis total $200,000. Two project evaluations and an end-of-project audit, estimated at $150,000, will occur over the life of the project. The balance of $500,000 will cover inflation and contingencies over the life of the project.

The GOM contribution is estimated at $800,000 and will include of funds for financing the salaries of counterpart personnel, such as the MEM project manager, and the other steering committee members; salary maintenance and international airfares for participants; operating expenses (e.g., staff support, facilities, maintenance of equipment, etc.) by participating departments; and local contracts. The MEM laboratory in Casablanca will provide instruments and facilities necessary to conduct certain audits. ENIM will provide training and seminar facilities for in-country training, and a project coordinator to work with the Information and Training Advisor.

The Private Sector contribution is estimated at $2,200,000 and consists of cost sharing for selected activities (e.g., audits, feasibility studies, commodities, training, etc.) and contributions in kind to the technical assistance activities.

Table 3

Project Summary Cost Estimate
($000 U.S.)

Component	USAID	GOM	Private Sector	Total
Technical Assistance	$ 2800	$ 400	$ 200	$ 3400
Commodities	850	50	1800	2700
Training	500	200	200	900
Policy Analysis	200	50	--	250
Evaluations/Audit	150	--	--	150
Contingencies	500	100	--	600
Total	$ 5000	$ 800	$ 2200	$ 8000

Table 4
Project Financial Summary by Fiscal Year
($ US)

Component	1989	1990	1991	1992	1993	Total
Technical Assistance	385,000	745,000	685,000	625,000	360,000	$2,800,000
Commodities	220,000	245,000	185,000	150,000	50,000	$850,000
Training	110,000	110,000	110,000	85,000	85,000	$500,000
Policy Analysis		100,000	100,000			$200,000
Evaluations/Audit			50,000		100,000	$150,000
Contingencies	85,750	129,800	124,600	96,300	63,550	$500,000
Total	800,750	1,329,800	1,254,600	956,300	658,550	$5,000,000

Table 5
Project Financial Plan by Fiscal Year
($ US)

Component	1989	1990	1991	1992	1993	Total
Technical Assistance						
EDM Specialist (COP)	90,000	180,000	180,000	180,000	120,000	$ 750,000
Info/Trng Specialist	60,000	120,000	60,000			240,000
Short term Advisors	75,000	160,000	160,000	160,000	75,000	630,000
Home Office	15,000	30,000	30,000	30,000	15,000	120,000
Admin. Assistant	15,000	30,000	30,000	30,000	20,000	125,000
Local Support staff	10,000	20,000	20,000	20,000	10,000	80,000
Local Prof Staff	45,000	90,000	90,000	90,000	45,000	360,000
Local Sub Contracts	30,000	60,000	60,000	60,000	30,000	240,000
Study tours	15,000	15,000	15,000	15,000	15,000	75,000
Office operating	30,000	40,000	40,000	40,000	30,000	180,000
Commodities						
Vehicles	25,000					25,000
Microcomputers	20,000	20,000				40,000
Office furniture	15,000	15,000				30,000
Auditing Equipment	25,000	25,000				50,000
Monitoring Instr.	25,000	25,000	25,000			75,000
Training Aids	10,000	10,000	10,000			30,000
Demonstration Equipm	100,000	150,000	150,000	150,000	50,000	600,000
Training						
US Training ST	60,000	60,000	60,000	60,000	60,000	300,000
Local Training	50,000	50,000	50,000	25,000	25,000	200,000
Policy Analysis						
Technical		50,000	50,000			100,000
Policy		50,000	50,000			100,000
Evaluation/Audits			50,000		100,000	150,000
Subtotal	715,000	1,200,000	1,130,000	860,000	595,000	$4,500,000
Inflation 5%	35,750	61,800	59,600	46,000	32,000	235,150
Contingency	50,000	68,000	65,000	50,300	31,550	264,850
Total	800,750	1,329,800	1,254,600	956,300	658,550	$5,000,000

Table 6

Methods of Implementation and Financing

Methods of Implementation	Method of Financing	Amount (Appr) (U.S. $000)
TA - AID Direct Contract (Technical Assistance)	Cost Reimbursement	2,800
TA - Host country contract (Policy Analysis)	Direct Pay	100
TA - AID Direct Contract (Policy Analysis)	Cost Reimbursement	100
COM - Under AID Direct TA contract	Cost Reimbursement	250
COM - Direct contract between supplier and firm, with USG reimbursing % of purchase cost	Cost Reimbursement	600
TRNG - Under AID Direct TA contract	Cost Reimbursement	250
TRNG - Placed by ST/IT, through non-profit contract	FRLC	100
TRNG - Host Country Contract	Direct Pay	150
EVAL - AID Direct Contract	Cost Reimbursement	100
AUD - AID Direct Contract	Cost Reimbursement	50
CONT/INFLAT	To Be Determined	500
	TOTAL	$5,000

V. PROJECT IMPLEMENTATION

A. Implementation Arrangements

Structure for Implementation

Set forth below is a summary of the structure of project implementation (see Table 7), and subsequently, a more detailed discussion of the roles of each of the individual actors.

Project implementation will take place as follows:

- o AID will contract with a U.S. consulting firm specialized in energy demand management to implement project activities and interact directly with firm owners. This technical assistance contractor will subcontract with Moroccan individuals and firms to help carry out project activities.

- o AID and the GOM will establish a project Steering Committee to monitor project activities and formulate policy direction for the contractor.

The MEM Direction of Energy will coordinate project activities involving the parastatal agencies under MEM. The Direction will represent the MEM on the project Steering Committee, and will coordinate EDM action plans and policy agenda discussions within this forum. In addition, MEM will enter into "program contracts" with concerned agencies to assure involvement and support for project activities in the target sectors and facilitate project implementation.

MEM and the Ministry of Finance (MOF) will sign the Project Grant Agreement (ProAg) and all subsequent Amendments.

Specific Roles

The specific roles and responsibilities of the organizations participating in project implementation are briefly described below. They involve the Ministry of Energy and Mines, the Ecole Nationale de l'Industrie Minerale, the project Steering Committee, the technical assistance contractor, Moroccan associations, agencies, and departments, and USAID Morocco's Division of Energy and Natural Resources.

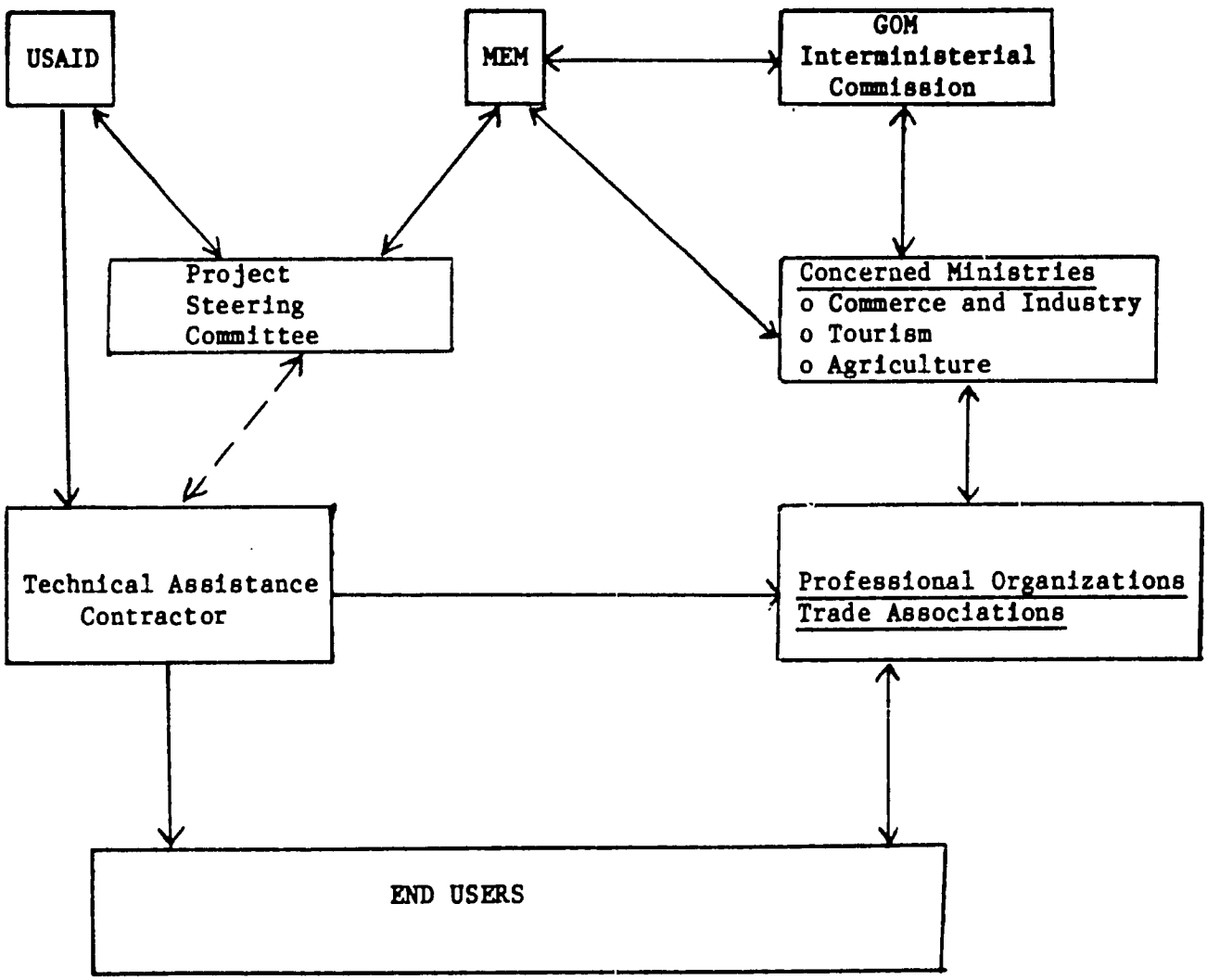
Role of the GOM

MEM

MEM will be the designated representative of the GOM for this project, and take the lead for the Government in project implementation. MEM will: (a) designate a project manager to facilitate the work of the project Steering Committee and act as liaison among the GOM, the contractor, AID, and the public and private sectors to assure effective day to day implementation; (b) participate in the project Steering Committee; (c) participate in the technical review of proposals leading to the selection of the technical assistance contractor; (d) monitor contractor activities and performance; (e) ensure coordination with MEM parastatal agencies and other agencies and

Table 7

Project Organizational Schema



departments of the GOM; (f) formulate, and where appropriate, sign program contracts with GOM agencies and departments to assure their involvement and support for project activities; (g) facilitate work of the technical assistance contractor; and (h) contribute additional service as mutually agreed by USAID and MEM.

The GOM plans to establish an Interministerial Commission which will constitute a forum for information exchange, dialogue, and coordination among the various ministries and departments concerned with energy demand management issues. The work of the Commission, organized and led by MEM (which will assure the linkage between the Commission and the project Steering Committee), will serve to orient project activities and contribute to the adoption of a national EDM strategy.

The Ecole Nationale de l'Industrie Minerale (ENIM)

ENIM will conduct classroom training on energy management topics such as cost control, energy auditing, and energy engineering technologies. The technical assistance contractor (or sub contractors) will provide necessary training materials, instruments, and equipment to implement the training program and assist in the development of an EDM curriculum in the 6th year program at the Chemical and Engineering Department (CEED) at ENIM.

ENIM will receive financing under the project to conduct the above named activities. ENIM will provide a project coordinator, research staff, classroom facilities, and operating expenses.

Project Steering Committee

Permanent GOM membership in the project Steering Committee will include MEM's Director of Energy, the MEM project manager, and one additional representative. USAID representatives will include the Deputy Director, the Chief of the Division of Energy and Natural Resources (ENR), and the ENR Project Officer. Selected individuals will also be invited to participate in the project Steering Committee meetings when their expertise is essential to the discussions.

The Committee will meet regularly (quarterly, or more often if necessary). It will: (a) act as a conduit for decisions taken by the GOM to promote EDM; (b) formulate and discuss strategies and action plans for the promotion of EDM in Morocco; (c) review all project documents, such as contractor quarterly reports, annual workplans, training and procurement plans, and evaluation reports, and propose follow-up activities; (d) monitor contractor activities and performance; and (e) discuss contract directions being provided to the contractor by USAID. The MEM project manager, working together with the USAID project officer, will develop the work agenda to be circulated prior to each meeting.

Technical Assistance Contractor

The technical assistance contractor responsibilities will include: managing day-to-day project implementation; developing and assuring accomplishment of annual work plans; preparing annual training and procurement plans; procuring goods, equipment and services; preparing terms of reference for carrying out

special studies; conducting or coordinating information and training; conducting or overseeing audits, technical feasibility studies, and demonstration projects; subcontracting selected project activities to qualified consulting firms (Moroccan or U.S.) or parastatals; managing and evaluating subcontractor work; and monitoring energy savings.

The technical assistance contractor will assist in the establishment of energy management information centers at cooperating professional and trade association headquarters, and assist enterprises to identify potential equipment suppliers and costs by obtaining catalogues from suppliers, and developing and updating energy equipment and cost directories that will be kept in the information centers.

The technical assistance contractor will conduct energy use surveys on an annual basis. These surveys will form the basis for monitoring changes in energy consumption primarily among private energy users. The contractor will also process and analyze the data to determine the performance of project activities (in percent change of energy savings by firm and sub sector) and the overall effectiveness of project components towards this end.

The contractor will carry out technical support (i.e. energy audits, technoeconomic studies, installation and monitoring of technology applications), either directly or through subcontracts to suitable firms. Local consulting firms will implement many of these activities, following AID's competitive procurement regulations, under subcontract to the contractor. Local Moroccan firms may also participate in the project's information and awareness, and training activities, either as subcontractors to carry out discrete tasks or as participants. Qualified firms, whether Moroccan or U.S., will be given the opportunity to submit proposals to help carry out the major studies to be conducted under the project. The contractor may also engage full time Moroccan experts (e.g. energy engineers, energy economists, etc.) to work along side the U.S. experts.

The contractor will present project activities to the Steering Committee and identify and analyze policy issues critical to project success. In addition, the contractor will work with the private sector to foster the creation of an energy users association (or an energy managers associations).

The contractor will work directly with the client energy users to prepare plans for implementing project activities at the firm level. The contractor will consult regularly with trade and professional associations, equipment suppliers, the American Chamber of Commerce in Morocco (ACC), the Federation of Moroccan Chambers of Commerce (FMCCI), the Confederation Generale Economique Marocaine (CGEM), and sector representatives to develop sector wide action plans.

The contractor will contact professional associations to exchange information on the potential for energy savings among the associations' membership, to provide updates on EDM technologies and practices in Morocco and worldwide, and to develop lobbying strategies for influencing government decision makers to undertake EDM-inspired policy reforms. The contractor will draw upon the approximately 40 engineering firms, a pool of some 15,000 engineers, and numerous equipment suppliers in Morocco for its local expertise, and assist in the transfer of EDM technologies as common engineering practice in Morocco.

The contractor will work closely with Moroccan individuals or firms to carry out project activities and will provide on-the-job-training of these Moroccan professionals. After the project completion, there will therefore be a trained Moroccan cadre to implement EDM techniques.

Moroccan Associations

Moroccan organizations will play a central role. The FMCCI, with assistance coordinated through the contractor, will host seminars on EDM practices at its sixteen provincial offices throughout Morocco, reaching a large percentage of its more than 10,000 members and, in particular, those representing small and medium-sized enterprises targeted under the project.

The ACC will also advance the project goals through contact with its members to encourage EDM practices. Of the ACC's approximately 20 members, replicable energy saving experiences have already been achieved in some (i.e., Goodyear) and interested members will be approached by the contractor to share energy saving experiences, conduct on-the-job and in-plant training, and coordinate study tours to U.S. parent company facilities to demonstrate successful EDM practices in operation.

The project will also consider cooperation with CGEM after concrete achievements have been made. The CGEM -- a well established organization -- consists of some 4000 members including forty five professional organizations divided into four federations (industry; trade and services; public works, building and engineering; and mining). The CGEM will be encouraged and assisted by the project to undertake a variety of activities to spread information and awareness of EDM technologies and practices to its membership. The CGEM weekly newspaper Cedies Information is an important target for dissemination of news and feature stories on EDM, and will be tapped for communicating technical and financial information and project accomplishments to members. La Vie Economique also has an important readership that the project should reach.

USAID

The Mission's Division of Energy and Natural Resources (ENR) will manage the project, with the support of the USAID project committee, and decisions by the USAID Director as necessary. The primary responsibilities of USAID will include: (a) participation in the project Steering Committee; (b) regarding the selection of the technical assistance contractor: prepare requests for proposals, make final selection, and execute the contract; (c) monitor contractor activities and performance; (d) assist in the placement of, and in-country English language for, qualified candidates in U.S. training courses and internships; (e) prepare evaluation terms of reference and follow-up on recommendations with the MEM; (f) coordinate all activities with the GOM; and (g) report.

B. Summary Implementation Schedule

Date	Responsible Party	Action
7/88	AID	Project Authorization
7/88	MEM, MOF, AID	Sign Project Agreement
8/88	AID, MEM	Convene project Steering Committee
9/88	MEM	Satisfy conditions precedent
9/88	AID	Issue request for proposal (RFP) for technical assistance contractor
1/89	AID, MEM	Select contractor
2/89	AID	Sign contract
3/89	Contractor	Contractor team fielded
5/89	Contractor	Present annual work plan
6/89	AID	Approve work plan
1/91	AID, GOM	Conduct interim project evaluation
3/91	AID, GOM	Implement evaluation recommendations
3/93	AID, GOM	Conduct final project evaluation
6/93	AID	Conduct financial audit
7/93	Contractor	COP departs
9/93	PACD	

C. Cost Sharing Arrangements

EDM experience worldwide has shown that firms are more willing to implement EDM technologies if they provide some financial commitment. Consequently, participating firms in audits, techno-economic feasibility studies, technical applications, and U.S. training will be expected to provide a financial contribution.

Private sector beneficiaries will be expected to provide a contribution in cash or kind according to a formula devised by the project Steering Committee. For the first year of the project, the beneficiaries contribution will be the following: no charge for quick diagnostic audits ("audits rapides") such as those conducted by an "energy bus" requiring from one to three days total effort (including consultant visit and report writing); 25% for in-depth audits and feasibility studies; 50% for U.S. training (including airfare, perdiem, insurance, tuition, course materials, etc.); and 75% of the total cost for technical applications and demonstration projects. The 75% firm contribution for technical applications is justified on the basis that these are relatively expensive interventions requiring the purchase of equipment. The firm must show a substantial commitment to making these applications work and should also reap short and long term financial rewards if the applications are successful.

For goods (i.e., equipment for technical applications) which the technical assistance (TA) contractor advises the beneficiary firms to procure, the beneficiary firm will either directly contract with the supplier of the goods, using HB 11 contracting procedures, and will directly pay the supplier the full costs of the goods, or will request the TA contractor to procure the goods on its behalf. In either case, AID will reimburse 25% of the costs of the goods to the beneficiary firm through the TA contractor upon evidence of delivery, installation, and start-up.

In order to maximize opportunities to demonstrate EDM technical applications over the target sectors, the project will limit the AID contribution per application to $100,000. However, the Mission reserves the right to consider exceeding this limitation if deemed warranted upon review by the project Steering Committee.

For services which the TA contractor arranges to provide to the beneficiary firms, the TA contractor may either provide the services itself or subcontract for the provision of services. In either case, the beneficiary firm will remit its percentage of the cost of services to the TA firm which will be responsible for management of the funds. AID will reimburse the TA firm for AID's percentage of the agreed upon costs in accordance with the cost reimbursement provisions of AID's contract with the TA firm.

Costs of goods and services furnished or provided by the TA contractor(s) to participating firms benefiting under the cost sharing arrangements shall be itemized and calculated for each firm receiving benefits, and the TA contractor(s) periodic voucher submissions to AID will be reduced by the amount owed by the beneficiary firm. Payment for the costs of above mentioned goods and services shall be made by the participating firm(s) to the TA contractor(s) with the collection thereof vested with the TA contractor(s).

All commodities purchased under the project will become the property of the party (e.g. firm) contributing the cost share. The contributing party will assume title and responsibility for operation and maintenance of the equipment upon receipt.

D. Procurement Plan

Contracting Arrangements

AID will issue a competitive Request for Proposals (RFP) for the technical assistance contractor. Criteria for selection of the contractor will include competence and experience of the firm, identification of key personnel, and description of how they would propose to mobilize and organize to achieve the project purposes. (See below for more detailed list).

The contractor will prepare annual plans which will include review of the previous year's activities and a specific work plan and operating budget for the new year. The contractor will plan, mobilize, coordinate and implement all contract activities. As part of this responsibility, the contractor will develop RFPs for the individual tasks to be implemented by sub contractors and recommend selection of the winning offeror. The recommendation will be submitted in writing to USAID for approval. Once approved, the contractor will subcontract the implementation of the work to the winning offeror. Specified short term advisors may assist the resident staff set up the subcontracting procedures. An example of typical steps involved to set in motion a project activity with a firm is shown in Annex J.

Skills and Capabilities of the Technical Assistance Contractor

The contractor will have the following skills and capabilities:

- Engineering, finance, economic analysis, policy analysis, and communications skills, particularly as they relate to energy.
- Management and accounting skills.
- Experience with major EDM technologies.
- Knowledge of equipment and processes used in Moroccan industry (to help determine technical feasibility and replicability potential of technology applications).
- Knowledge of USAID training and procedures regulations.
- Experience in providing training.
- Experience in organizing workshops and seminars.
- Familiarity with U.S. equipment suppliers.
- French language proficiency.
- Experience in developing countries.

Prior to the mobilization of the contractor, EDM activities already started under the Energy Planning Project (608-0180) will continue to be implemented under the technical assistance of the full time resident energy conservation advisor, whose contract will be extended through June, 1989. The energy conservation advisor's costs will be financed under the Energy Planning Project as they have been to date, although other project costs will be financed directly as part of this EDM project.

E. Monitoring Plan

The contractor's staff will visit, on a regular basis, the sites where demonstrations are taking place. If need be, the staff will be assisted by outside advisors and consultants. The visits will ascertain progress during the technology implementation phase and recommend or undertake corrective actions on system performance, if necessary.

The contractor will provide USAID and the GOM with quarterly reports showing:

- Comparison of actual vs. expected contract achievements over the quarter.
- Issues and proposed solutions.
- In-country training.
- Actual vs. expected disbursements.
- Tasks to be performed in next quarter.

In addition, the contractor will set up a subproject status tracking system and submit detailed status reports to USAID and MEM along with their quarterly reports. These status reports will include the number of public and private subproject proposals, approvals, on-going technology applications, sectors of application, types of technology applications, size of investments, status and performance of applications, implementation schedules, schedule of the information dissemination program, participants in training, and other relevant information. These reports will also include information on any general technical assistance and special studies which might have been carried out.

USAID will monitor the project to ascertain the effectiveness of the overall implementation process and compliance with project policies and procedures. The Project Officer will prepare a checklist of monitoring responsibilities within USAID.

Through the project Steering Committee, both USAID and the GOM will monitor project implementation, including annual progress reviews of the contractor's performance, and review and approval of annual work plans and operating budgets. The USAID and MEM project officers will meet at least monthly (more frequently during the first year of the project), generally with the contractor's Chief of Party, to discuss administrative matters, implementation arrangements, and schedules.

F. EDM TRAINING PLAN

IN-COUNTRY TRAINING:

Type of Training and intended audience	Description/Objectives language of instruction	Location	Duration/ Frequency	Participant per course/ p.m.	Selection procedures	Funding Source and staff	When
1. Training for Managers and Financial Dirs. of industrial plants and hotels.	Intensive courses in cost control, with special focus on the impact of energy cost reduction. Case studies on local and foreign examples will be used. To be held in French.	ENIM	3-5 days 2/year	20 (32 pm)	Nominations to MEM per annual training Plan	TA first 4 courses (prepare and teach) with participation of CEED faculty. Private sector will pay fee for participants.	years 2-5
2. Training for energy auditors; Plant engineers or managers and consulting engineers.	Intensive courses in conducting detailed energy audits in industrial plants. Classroom and "hands on" training. To be held in French.	ENIM and Plants	6 weeks 1/year	20 (120 pm)	-	TA with subcontractors to local consulting engineering firm.	years 2-5
3. Refresher courses for engineers in the sectors and GOM specialists directly involved with EDM.	Intensive short engineering courses to update and upgrade the energy engineering skills of engineers (Course ex. combustion instrumentation, energy accounting). The specific courses identified and selected during year one of project. To be held in French.	ENIM	2-3 days 2/year	20 (20 pm)	-	TA contractor as above subcontracted to local consultant firm and ENIM/CEED.	years 2-5

Type of Training and Intended audience	Description/Objectives language of instruction	Location	Duration Frequency	Participant per course/ p.m.	Selection procedures	Funding Source and staff	When
i. Training for plant technicians (boiler operators, and maintenance technicians).	Practical "hands on" to improve skills in the operation and maintenance of major energy systems-boilers and steam systems; kilns and furnace and electrical systems. To be held in Arabic (Moroccan dialect).	Various locations	1 day 4/year in different cities.	20 (10 pm)		TA contractor will design and implement the training concept. Local consultant firms will conduct. Use of portable equipment to demonstrate and train at the premises of selected industrial plants or hotels in major cities.	years 2-5
i. Curriculum Development for ENIM's 6th year program in the CEED.	Expanded and upgraded CEED program to cover the latest developments in EDM worldwide. Course information transferred from the U.S.	ENIM/CEED	Once in Year one with review for possible update in Year 3.	6th year students at ENIM	ENIM/CEED	TA will subcontract with U.S. experts to develop curriculum together with ENIM/CEED faculty who will attend short internships in the U.S. to fully understand new program and methodology. ENIM to establish links with U.S. Universities to develop curriculum.	years 2-3
. English Language	Counterparts of U.S. T.A. and Participants	ALC	As needed	As needed	1) Direct counterparts 2) Selected candidates	PIO/P through USAID Training Office	LOP

Type of Training and intended audience	Description/Objectives language of instruction	Location	Duration Frequency	Partici-pants per course/ p.m.	Selection procedures	Funding Source and staff	When
U.S. TRAINING							
Internships/Short courses	Internships and short courses to transfer information and technologies on EDM applications. English.	U.S.Industrial plants/utilities/universities.	2-3 months 6/year	1-3 (60 pm)	Ministries & firms nominate qualified cands for review. Biannual approval of candidates by Project Steering Committee. Internships arranged by TA. ALIGU: 40% Start 70% Dept. (ST)	PIO/P. Placement by USAID Training Office for IIE courses. All others placed by TA.	years 2-5.

VI. EVALUATION PLAN

As a pioneering effort to promote efficient energy use throughout the Moroccan economy, the EDM program will be of interest and value to a broad audience within the GOM and USAID, and among other donors and AID-assisted countries. It is important, therefore, that the project receive careful evaluation both during and after its lifetime. There will be two formal evaluations of the EDM program: a mid-point evaluation to be completed in 1991 (2nd Quarter) and a final evaluation to be completed at the end of the project. These evaluations will be based upon both quantitative and qualitative measures.

The quantitative objective of the project itself is to save at least 60,000 toe annually by the end of the project. These objectives are to be achieved through the transfer and demonstration of EDM technologies, especially from the United States, information and awareness activities, training, technical support, and studies and policy initiatives. The project must be evaluated from two points of view: 1) whether the types and numbers of planned project activities are being carried out, and 2) whether these activities have achieved the desired results (i.e., are project activities saving energy). One of the critical benchmarks against which to measure the success of the project will be an energy intensity index established for each of the target sectors. These will be established by the consulting energy engineers and used as a basis against which to measure project activities.

Evaluation Framework and Data Collection Plan:

1. The Users of the Information

The primary users of the information will be the technical assistance contractor, the project Steering Committee, participating Moroccan associations, and USAID.

2. Project Goals, Purpose, and Outputs

The goal of the Energy Demand Management Project is to save foreign exchange and increase productivity by reducing energy waste and by improving efficiency of energy use in Morocco. The project purpose is to develop and implement the core of a national energy demand management program (EDM).

Activities directed at these sectors will include information and awareness campaigns (e.g. seminars, workshops, newsletters, study tours) to educate key sector personnel about energy demand management concepts; firm-specific audits, techno-feasibility studies, and demonstration projects to lay out energy-efficient strategies in cooperation with participating firm owners and to illustrate energy savings through the installation of equipment and management aids; and U.S. and in-country training of plant managers, energy auditors, and engineers to improve technical standards and enhance individual capabilities in dealing with energy management issues and concepts. The project will also include special studies designed to influence policy decisions and raise the overall level of understanding on such issues as taxation on EDM equipment, and standards.

3. Managers' Questions Related to Project Goals, Purposes, and Outputs

The following questions will be investigated during the life of the project to determine: (a) whether project purpose and goal are being achieved and (b)

whether the project is being implemented as planned and outputs are contributing to purpose and goal achievement.

Goal-Level Questions

- Has the project directly resulted in energy savings and deferred energy sector investments?

- Has EDM been diffused from target firms to other firms? What has been the spread effect of the project?

Purpose Level Questions

- Has the core of a national EDM Program been established?

- Has an institutional capability been established within Morocco, especially in the private sector, to deliver EDM technologies and services?

- What has been the measurable impact at the level of participating firms of implementing the EDM activities?

- What has been the knowledge gained from the project for understanding the constraints to EDM, especially the reluctance to invest in EDM technologies having a long payout period?

- Has the project directly resulted in energy savings among targeted firms?

- Has firm productivity increased as a result of the implementation of EDM activities?

- Has the efficiency of firm-level use of energy increased as a direct result of project activities?

Output Level Questions

- Have private-sector enterprises (e.g., equipment suppliers, consulting and engineering firms) in Morocco entered the EDM equipment and services markets or expanded their EDM activities?

- Have the planned activities under each project component (information and awareness, training, technical support, policy analysis) and in each sector (agroindustry, construction materials, and hotels) been carried out?

4. Selecting Methodologies to Answer Managers' Questions

Goal and Purpose Level Questions

Energy savings will need to be determined on two levels: micro (individual energy users) and macro (national). To determine energy savings at the micro level, first an energy "baseline" must be developed, consisting of data on past and present energy consumption for a sample of individual energy users. Under the information and awareness component of the project, such an energy use survey will be conducted and a database developed during the first year of the project by the technical assistance contractor. Based on this survey it will be possible to establish a null hypothesis, i.e., a prediction of what future energy consumption would be in the absence of the project. It is

against this null hypothesis that energy savings can be evaluated, by comparing it to actual consumption which will be measured in subsequent surveys.

The core of the evaluation will be the enterprises that directly benefit from the project's technical support -- those enterprises in which audits, technoeconomic studies, and technology applications are carried out. To assist in tracking energy savings, enterprises that participate in the project's technology applications will be required to monitor the technical and economic performance of the technology and report to the TA contractor.

In addition, annual energy consumption surveys will be carried out during every year of the project so that energy savings in other enterprises and across sectors can be monitored. Finally, to assist project evaluation, questionnaires will be sent annually to determine if EDM measures have been implemented as a result of information disseminated by the project and how those EDM technologies have performed. The project will work with the Direction de l'Energie (MEM) to develop national and sectoral energy consumption and investment baselines and to track energy savings on a national level.

An assessment must be made to determine if EDM know-how is being transferred to Moroccan institutions and individuals and if a capability is being developed to conduct project activities without external assistance. This can be done by determining each year what share of total project activities has been carried out, and successfully, by Moroccan institutions and individuals. This effort will also be assisted by the annual questionnaires described above.

Several measures should be used to determine whether the EDM equipment and services market has expanded as a result of the project. Existing consulting and engineering firms and equipment suppliers should be surveyed to determine if they have initiated or expanded EDM-related services. EDM equipment suppliers and consulting and engineering firms could be contacted either directly or through their professional association. Given the small size of the current EDM market, it should also be simple to determine if new EDM equipment suppliers enter the Moroccan market and if new consulting and engineering firms specializing in EDM are formed as a result of the project. Finally, it can be determined from import statistics and through surveys of energy users, suppliers, and consulting and engineering firms whether more EDM equipment is being imported and what share is coming from the United States.

Output Level Questions

Answering the first question should be relatively straightforward. The first activity of the TA contractor after arrival in Morocco is to develop a draft work plan for the first two years of the project. During the project, detailed work plans will be prepared for each sector and for the remainder of the project overall. These workplans will indicate year-by-year, what and how many activities are to be carried out under each project component. Project performance can be measured against these workplans (e.g., How many engineers were trained? How many seminars were held? How many audits were conducted?). In addition, the TA contractor will submit detailed annual activity reports and action plans to the Mission which will assist in monitoring efforts.

VII. PROJECT ANALYSES

A. Economic Analysis

1. Potential Benefits from Energy Savings

The EDM project will produce major benefits for the Moroccan economy. It will improve Morocco's foreign exchange position by reducing the level of energy imports for a given level of output; it will improve productivity in the economy by the more efficient use of resources; and it will reduce the level of investment in the energy sector required to support the economy.

We expect that the project will result in energy savings amounting to 60,000 tons of oil equivalent (toe) annually in the three target sectors by the end of the project, approximately 5 percent of the total energy demand in these sectors. These expected savings which are directly attributable to the EDM project are above and beyond what is likely to be achieved under a "business as usual scenario" which incorporates all ongoing energy efficiency efforts undertaken in the target sectors by both the private and the public sector. The potential benefits would not materialize in the absence of the project because of the existence of constraints discussed in the Social Soundness Analysis Section.

At the level of annual savings of 60,000 toe projected above, the foreign exchange savings for Morocco would amount to almost $7 million per year or $100 million for a fifteen year period. These savings have an internal rate of return of 22% over 15 years assuming static oil prices, and 33% assuming oil prices rise at 4% per year in real terms. This analysis confirms an economic attractiveness that is more than enough to justify the project investment (See Annex K: Economic Analysis).

2. Target Sectors

Three target sectors have been selected for concentration of project activities: (a) agroindustry, (b) construction materials, and (c) hotels.

a. Agroindustry

The roughly 1200 plants in this sector consumed about 240,000 toe in 1987, dominated by the sugar industry. Other agroindustrial plants include: oil and fat products, from both animal and vegetable sources; food canning industries, such as fruit, vegetable, fish, and other seafood; milk and dairy industries; and the tobacco and beverages industries.

The food and fish canning industry, traditionally export oriented, is rapidly growing in Morocco and a large potential exists for energy innovation, quality improvement, and replacement of out-dated equipment.

The domestic oriented dairy and vegetable oil industries are highly regulated, have limited markets, and no competition. They have largely subsidized products, out-dated technology, no financing capacity, and are generally under capitalized. Energy savings are possible mostly through no cost and low cost actions supported by technical and management assistance, and accounting assistance to establish an adequate pricing formula for products.

The economic analysis identified the agroindustrial sector as the one with the highest EDM potential in proportional terms. It seems reasonable to expect that about fifty to sixty firms will meet the thresholds identified (i.e. firms consuming an excess of 2000 toe per year) as a minimum to consider investments in EDM. Of this total, approximately fifteen to twenty are likely to adopt EDM techniques as a result of the project. If they each realize savings of around 20% of their current use, this results in energy savings of about 8,600 toe per year. In addition, up to 400 smaller firms (those using only about 100 toe per year) will adopt no cost or low cost EDM practices. They may save up to 10% of their current use, adding another 4,500 toe to energy savings attributable to the project. Overall, the project might save up to 13,000 toe of current energy use in agroindustry, a number which might reach 16,000 toe or more if energy use increases as forecast in the GOM five-year plan.

Agricultural exports are a strong foreign exchange earner in Morocco. Improving the efficiency of export oriented agroindustry will have beneficial effects on the balance of payments that go beyond savings on the energy import bill. In addition, there are positive externalities associated with better energy management in this sector. Occasional cases of botulism and other health and sanitary problems have tended to hamper the expansion of this sector, especially in export markets. Many of these problems can be traced to improper or insufficient heating and sterilization, problems that are directly linked to energy use.

b. Construction materials

The largest EDM potential in absolute terms exists in the construction materials industry. There are approximately 300 firms in the industry consuming 700,000 to 800,000 toe overall. The largest energy user, the cement plants, are already fairly energy efficient, but more can be accomplished. The glass industry consists of 15 plants of which most are small and transform imported glass. The brick and tiles industry consists of 65 plants, most of them small, and suffers from a lack of standardization and incentives for productivity improvement. The ceramic industry includes 18 companies that manufacture plates and dishes, sanitary products, and china.

In the cement industry, the specific fuel consumption has decreased for more than ten years under the combined effect of new plant start-ups, the revamping of inefficient old plants, and the outright closing of the oldest and least fuel efficient plants. In spite of these overall improvements, additional fuel savings can be achieved in two or three of the plants through optimization of quarrying, improvement in the stability of crude mix, improvement in grinding and preheating operations and heat recovery on the furnace, and insulation. Cement plants are also good candidates for improved electric load management during the electric peak hours. ONE has already tested this technique under negotiated arrangements and is now considering a new tariff structure with strong incentives for self load shedding during peak hours.

The few small plants that make up the glass subsector of the construction materials industry transform primarily imported glass. Similarly, the tiles and brick industry consists primarily of small firms. In the ceramics industry, there are about 18 companies that manufacture a variety of ceramic products. Given the high heat requirements in ceramics manufacturing, it is to be expected that some considerable potential for EDM exists in this sub-sector. The problem here appears to be that at least some ceramics firms use butane or propane gas to heat their furnaces, two fuels subsidized by the Moroccan government to increase their use as a substitute to woodfuel in households. As any subsidy, this one also discourages savings of the subsidized good and effectively leads to over consumption.

Given the variety of firms and the different levels of energy efficiency under which they operate, estimates of expected energy savings in this sector vary greatly. Overall, savings of about 15,000 toe (2% percent of current use) by the whole construction materials sector seems to represent a reasonable target.

c. Hotels

The energy demand in the services sector was 414,000 toe in 1985, or nearly 8% of the total national energy demand. Of this total, hotels accounted for an estimated fuel consumption of 55,000 toe and an electricity consumption of 253 GWh, i.e., approximately 120,000 toe overall. On the basis of historical data, the growth of the hotel sector is estimated at 7.7%. As tourism growth is limited by the capacity of existing hotels, and taking into consideration the current hotels construction program, however, the growth rate is expected to reach 9% per year by 1993. This growth is consistent with the official Ministry of Tourism target of five million tourists by 2000. It follows then, that the number of hotels will more than double by 1993 and 150 new hotels will be built. Accordingly, since energy consumption in hotels is roughly proportional to the number of guest-nights it is estimated that energy consumption could reach 220,000 toe per year by 1993. The potential for energy savings is around 30,000 toe per year.

The hotel sector falls under the supervision of the Ministry of Tourism which controls conformity of hotels, both built and planned, to existing regulations. There is no regulation on energy conservation and the Ministry does not have the capacity to evaluate energy use patterns of hotels, establish energy standards, or to provide incentives to hotel promoters to build energy efficient hotels.

Hotel chains account for about 50% of the large hotels. The most important are: Africa Palace, Club Mediterranee, Dounia Hotels-PLM, Farah, Interidec-Hyatt, Maroc-Tourist, Meridien, Sahara-Tour, Safir, and Salam. The industry professional association, Federation Nationale de l'Industrie Hoteliere, is based in Casablanca with local branches in Marrakech and Agadir.

Unit energy consumption (guest-nights) is likely to stay at the same level in the absence of an energy demand management program. More critically, new hotels run the risk of being built with the same standards as in the past five

years if aggressive EDM efforts are not undertaken. The professional association, chain presidents, technical managers in hotel chains and large hotels, and architects will be targeted for EDM information and awareness campaigns and training.

EDM can be applied to already existing hotels as well as being integrated into the architectural design of new hotels. Consolidating hotel laundries, improving air conditioning systems, improving the flow of air within the hotels' open spaces, improving the operation of the hotels' boilers, and controlling lighting, are just a few of the major techniques which can be employed to conserve energy in existing hotels. Structural design of new hotels can be modified so that the buildings will be more energy efficient.

B. Technical Analysis

EDM technologies have been surveyed and analyzed for their potential applicability to Morocco. The technical applications financed under this project will determine with more precision which technologies are best suited. This section presents the major EDM technologies which are most likely to be applicable to Morocco and sets forward the criteria of selection of the target sectors within which the technologies will be applied.

Target Technologies and Practices

The selection of target technologies and practices is based on the results of a market study for EDM equipment in the Moroccan energy, industry, and hotel subsectors.

In that study, five criteria were used to identify target EDM technologies and practices:

1. Potential for large energy savings.

2. EDM practices and technologies that have been proven in other countries, particularly the United States and, to a lesser extent, countries similar to Morocco (e.g., Tunisia), but are not yet widely used in Morocco.

3. EDM practices and technologies that show economic rates of return of at least 15% and also provide sufficient financial return to the investor of at least 25 percent.

4. Replicability of technology.

5. EDM technologies that are available from U.S. suppliers.

Subsequently, the following nine technologies and practices were selected for funding consideration under the project components:

- Solid-fuel and high-efficiency boilers.
- Cogeneration equipment.
- Waste heat recovery systems (for boilers and direct heat equipment).
- Insulation (for boilers, steam systems, furnaces, and kilns).

- o Instruments and process control systems.
- o Energy/load management systems.
- o Combustion controls (for medium to large boilers and furnaces).
- o High-efficiency electric motors.
- o High efficiency lighting.

Energy Demand Management Equipment

The technologies to be demonstrated have already been tested, proven and made available in the United States and other countries. Nonethelens, their application to Morocco will, in most cases, be innovative. Successful demonstrations are expected to be replicated in other plants, buildings, commercial units and centers as plant equipment and building stock is changed or replaced. Successful demonstration will help accelerate technology transfer, and promote the local manufacture.

A description of some of these technologies follows.

EDM Equipment and Commodities

1. Energy Conservation and Fuel Conversion Equipment

Energy efficient equipment will play a major role in achieving Morocco's energy conservation and productivity goals. Included in this category are: steam generation equipment, furnaces and direct heating equipment, high efficiency motors and power (load) factor connection equipment, coal handling equipment, cogeneration systems, and high efficiency lighting.

- o Steam Generation Equipment: Steam generation equipment includes upgrade equipment on water treatment systems; steam traps; high efficiency oil, gas or coal fired boilers; waste fuel boilers including pith, bagasse, paper waste; and high efficiency and multifuel burners.

  Upgrade equipment improves boiler water quality and effective steam distribution. Existing boilers with efficiencies below 70% that are over 25-30 years old should be replaced with new package boilers which can fire on multiple fuels with fuel to steam efficiencies of 80-85%.

  Inefficient boilers that are too young to retire can be retrofitted with new gas oil fired high efficiency burners. The high efficiency burners are forced draft and are made for gas, or liquid fuels. Liquid fuels burners can be pressure or steam atomized. Coal fired boilers consist of stoker, pulverized fuel, or fluidized bed. In stoker fired boilers, solid fuel burns on a grate. Pulverized fuel fired boilers use a forced draft burner to burn pulverized coal. Fluidized bed boilers burn solid fuels in a churning bed of hot sand and limestone set in motion by upward flowing air through the bed.

- o Furnaces and Direct Heating Equipment: Furnaces and direct fired heating equipment include all fuel fired operations that are not

related to steam generation. The generic type of equipment for Morocco includes electric arc furnaces, fuel fired melting operations, fuel processing equipment, high efficiency furnaces and multiple fuel furnaces. Melting furnaces are designed to heat metal scrap to 2200-3000 F range, indirect heat of oil in the refinery (250-600 F); and direct or indirect drying of solids (100-300 F).

- o High efficiency motors and power factor connection equipment: Recent developments in electric motor technology have allowed higher efficiencies to be achieved. Improvements in motor efficiency are achieved by reducing losses from friction and windage, core, static, rotor and stray load. High efficiency motors optimize reduction in each of these losses to improve efficiency by 5-10%.

- o Coal Handling Equipment: Coal handling equipment refers to all equipment used to transport, grind and store coal during the time between delivery and plant use. Coal requires special care in transport and storage. The coal can lose a significant portion of its volatile matter content and there is a constant danger of spontaneous oxidation during the transportation and storage. Coal must be blanketed in an inert environment to minimize particle breakage and attrition during transport.

- o Cogeneration Systems: Cogeneration refers to the simultaneous production of electricity and heat from the same fuel source, to reduce the amount of waste energy. Industries with large and continuous demand for low quality steam (low pressure), in particular, provide attractive opportunities for cogeneration (topping cogeneration). In such industries, the existing low pressure boiler will be replaced by a high pressure boiler and steam turbine. High pressure steam will be expended through the turbine and generate electricity. The low temperature steam leaving the turbine will be used for industrial processes.

  Cogeneration requires a sizeable capital investment, and its financial feasibility depends primarily on the price of electricity and fuel. Industries with access to waste fuel and with large demand for process steam, such as sugar plants, paper and pulp mills, are prime candidates for cogeneration applications. In general, the application of cogeneration systems is limited to large industries with steam demand of over 10 tons per hour. However, there are some prepackaged small cogeneration systems applicable to very small industries which use natural gas as fuel.

  Another type of industrial cogeneration, bottoming cogeneration, is where the hot gases from the furnace are used for industrial processes and the waste heat from them in used to generate electricity. These systems are very costly and have limited applications in high temperature industries.

- o High Efficiency Lighting: Relamping with more efficient lamps can increase lighting efficiency without the need to modify lighting fixtures or ballasts. Changes in fixtures and ballasts can provide further energy savings at substantially higher capital costs. Electricity savings of 15-25 percent from high efficiency bulbs are common.

2. Building Energy Management Systems

An energy management system is composed of microprocessor-based devices that control and optimize energy use in a building or facility, and is capable of on-site programming by building operating personnel. In general, the cost of the system, and the energy savings achievable with its use, increase with the capability of the system. Some specific uses for energy management systems are:

- Optimum start and stop. By monitoring indoor and outdoor conditions, the system starts equipment as late as possible while still allowing comfortable conditions to be maintained in the spaces served by building heating, ventilation, and air conditioning equipment.

- Time-of-day duty cycling with temperature compensation will help to reduce building peak demand and electric energy use. This strategy is most effective where air conditioning is not needed for humidity control.

- Peak electric demand control by load shedding or cycling. This option, while not necessarily cost effective under present utility rate schedules (which tend to have low demand charges), will become more attractive as utility rates increase or rates are restructured to include higher demand charges. A World Bank-financed study with ONE is currently studying electricity pricing, and recommendations for possible changes that would encourage this type of EDM measure.

Target Sectors for EDM Activities

Given AID's limited resources and the need to maximize the project's chances of success, the program will focus initially on those three sectors that offer the greatest energy demand management potential. Six criteria used to identify target sectors for EDM in Morocco are described below.

Criterion 1: Magnitude of Potential Savings

The more a subsectors consumes, the more room there is for energy efficiency improvement (even if the percentage of energy that can be saved is lower than it is in less energy intensive subsectors).

Criterion 2: Concentration of Energy Users

By concentrating on heavy energy using subsectors, it is possible to reduce the number of decision makers involved.

Criterion 3: Proven Results of Technology Application

The project will target those subsectors where most of the savings will result from the use of a technology that is already well-proven in Morocco or elsewhere.

Criterion 4: Large and Growing Private Sector

The private sector has more incentives to save energy and invest in EDM equipment that the public sector. Thus, the greatest results are likely to be achieved in those subsectors with a large growing private sector.

Criterion 5: Expected Financial and Economic Return to the end user

The most responsive subsectors will be those in which the project provides the highest return.

Criterion 6: Maximum Impact on Energy Supply

Subsectors in which implementation of improved EDM leads to major improvements in the electrical system (e.g., good candidates for load management) or the refineries (e.g., saving gasoil) will be priority targets, as opposed to subsectors in which gasoline (currently in excess supply due to the high official price), for instance, is saved.

These six criteria were weighted according to relative importance for project success, with the greatest emphasis on criteria 1 (35 percent) and 6 (25 percent). Criteria 4 and 5 were given a lower priority, with respective weightings of 20 and 10 percent. Criteria 2 and 3 were each given a weighting of 5 percent. Based on the results of the analysis described above, target subsectors were ranked according to their relative attractiveness for the EDM program (see Table 8: Analysis of Sectors for the EDM project).

In the initial phase of the project, target sectors will include: agroindustry, construction materials, and hotels. These sectors were selected for their promising energy savings potential, their capability of absorbing and benefitting from EDM technologies, and their importance to Morocco's industrial base. Based on AID and World Bank experience to date in Morocco and elsewhere, the prospect for achieving success is most favorable in these three sectors. Later on, if warranted, AID may consider extending project activities into other promising sectors such as agriculture (e.g. irrigation pumping), transport (e.g. road transport), households, office buildings, and industry. Extending EDM project activities into transport and households, for example, would require further analysis on possible strategies and methodologies needed to assure successful project interventions, as these sectors are relatively complicated with dispersed energy users, and AID experience in these sectors has been limited. The studies and analyses conducted under the project will provide further evidence on the effectiveness of EDM activities in the target sectors, and assist in the determination of those sectors for future concentration, if appropriate.

Table 8

Analysis of Sectors for the EDM project

	1.[a]	2.[b]	3.[c]	4.[d]	5.[e]	6.[f]	weighted score	target groups
Weight of criteria (%)	35	5	5	10	20	25		
Industry								
phosphate	3	5	5	0	3	0	2.15	
other ores			5	0	2	0	0.65	
sugar industry	4	5	5	3	2	3	3.35	
other agroindustry	2	2	5	5	4	0	2.35	
textile and leather		2	5	5		0	0.85	
cement	5	5	5	3	3	0	3.15	
other const mat.	3	2	5	2	3	0	2.20	
metal industry		5	5	2	2	0	1.10	
chemical industry		5	5	2	4	0	1.50	
pulp & paper		5	5	5	4	0	1.80	
other			5	5	4	0	1.55	
Transport								
road transport	5	2	5	2	5	3	4.05	
Services								
hotels	4	2	5	5	4	0	3.05	
public administ.			5	0		0	0.25	
Household	4	0	5	5	3	5	4.00	
Agriculture	3	3	5	0	3	5	3.30	

a. Magnitude of potential savings
b. concentration of energy users
c. proven results of technology application
d. large and growing role of private sector
e. expected financial and economic return
f. maximum impact on energy supply

C. Social Analysis

The primary beneficiaries for the EDM project are firms within the three target sectors who stand to substantially reduce their energy consumption and improve their energy efficiency through the application of techniques promoted by project activities. The key to successfully convince these target firms that EDM can in fact help them achieve these objectives is to provide information and technical interventions which will break down the identified constraints to adopting this technology.

Several constraints need to be assessed, and addressed through suitable actions, to realize the energy saving potential of individual firms. Among these, the most prominent are (i.) investment attitudes, (ii.) access to information and awareness, (iii.) availability of EDM services and equipment, (iv.) policy incentives, and (v.) institutional coordination. In each case, the EDM project will concentrate on removing those constraints which can be effectively overcome through targeted components and activities. These constraints are analyzed in created detail in feasibility studies available in the project files.

1. Investment Attitudes

The Moroccan entrepreneur is very risk averse and will normally not invest in projects or products unless the return is very high and there is little risk and uncertainty associated with the investment. These investment attitudes have their roots in several factors. They are strongly related to policy factors such as the pricing of products, the tax system, and the financial system. In addition, investment attitudes are related to managerial and technical factors, and institutional and historical factors.

The pricing of products is a key determining factor in the decision to invest in EDM technologies. If productivity is improved (by reducing the cost of energy per unit of output), the profit margin is generally assumed to increase. Unfortunately, the prices of certain products intended for the domestic market are regulated by the government to be equal to cost plus profit margin (as a fixed percentage of costs). With this cost-plus-margin pricing system, there is no incentive to improve productivity since ex-factory prices will be revised downward by the government should production costs decline. Keeping expenses high tends to maximize the profit margin. Nonetheless, there are still incentives to improve energy efficiency, since costs are generally determined by industry standards instead of measuring actual firm specific costs. When products are submitted to the government for officially sanctioned pricing there are always delays, which impose additional costs on the producer. Therefore, any productivity improvement, namely low-cost and no-cost EDM improvements, will benefit the plant in the short term.

High-cost investments will be considered by plant managers in both the public and private sectors when plant survival is threatened either by the economic efficiency of other plants in the country (e.g., the cement industry) or by international prices (e.g., agroindustry). Such investments need to be approved by the board of directors, and must generally be included in a short-term investment budget. For some public sector plants, the prospect of privatization has begun to serve as a stimulus to improved plant performance.

The system for taxing imports does not encourage investments in productivity improvements in sectors oriented toward the domestic economy, as it provides tax credits only for expansion investment. Managers, therefore, give preference to expansion investments, often waiting for a major revamping so they can group the different kinds of investment and apply for a global tax credit. The tax system is clearly oriented toward the support of production and exports. It thus tends to promote investments aimed at increasing production, not improving productivity. The EDM project will inform decision-makers that EDM investments generally provide a quicker return than production investments, and encourage reforms in the tax system.

2. Information and Awareness

In order to identify and implement energy demand management measures, an energy-consuming enterprise must have information on its energy consumption, how it compares with standards in that business, and its energy costs. It must also be aware of the benefits of energy conservation and the availability and costs of EDM technologies and measures, and have the technical, financial, and managerial skills to identify, evaluate,install, operate, and monitor specific EDM investments. Large energy users -- generally well-informed about energy efficiency through access to the most current information on EDM -- can still make further improvements on their already reasonably efficient operations. However, few small and medium-sized enterprises, large buildings (e.g., hotels), or transport fleets have taken steps to increase the efficiency of their energy use.

Small and many medium-sized energy users are generally cut off from the information channels available to larger enterprises, and as a result, they have little or no information or awareness about their energy costs and energy efficiency techniques and the associated benefits. They often lack adequate instrumentation and monitoring equipment to properly manage their energy use. Among small and medium-sized enterprises, projects cannot and will not be identified and implemented unless energy users are adequately informed about their energy consumption and costs and how they compare with international standards, are aware of the benefits of energy efficiency and the availability and costs of EDM technologies, and have personnel with the necessary technical, financial, and managerial skills. There are few local sources of EDM information in Morocco. The EDM project will establish information networks and promote awareness of EDM practices, particularly among small and medium sized firms.

3. Availability of EDM Services and Equipment

Few experienced Moroccan engineers and managers work in the EDM field and there are no firms that specialize in energy management. This is because they generally believe that the market for EDM equipment is too small. Because the perceived narrowness of the market, equipment importers have been reluctant to invest in efforts to foster demand for EDM equipment. Suppliers in general are unwilling to invest in the promotion of new equipment and tend to limit themselves to supplying the existing market. Several companies, however, have attempted to offer their services in order to diversify their activities. Typically such companies are involved in engineering and consulting, maintenance, and safety control. The EDM project will review the availability of energy efficient appliances, monitoring equipment, etc. and

assess the Moroccan market for such items. The project will also facilitate the transfer of energy efficient techniques and practices to Moroccan consulting firms.

4. Policy Incentives

Whereas it is the responsibility of government to take the initiative to provide policy incentives for energy demand management, the private sector must play a key role in identifying and studying the policies that constrain EDM in Morocco; recommending policy reform; and participating actively in their implementation. High energy prices are a powerful incentive to invest in EDM in Morocco, yet energy users need information and direct experience via demonstration that EDM practices work -- and work within the policy context -- before they will agree to implement changes in their own facilities. The EDM project will encourage GOM officials to adopt EDM policies, starting with the promotion of energy efficiency in the target sectors, as a national priority. The project will provide analysis and needed advice on policies such as:

- duty taxes on imported EDM equipment;
- EDM personnel requirements (e.g. energy managers hired at the firm level); and
- Equipment standards (e.g., lighting fixtures, air conditioner and water heater specifications, temperature controls, etc.)

5. Institutional Coordination

Finally, although the MEM is responsible for overall energy policy and planning, the formulation and implementation of EDM policies is complicated because energy pervades all sectors of the economy, and a number of other ministries are responsible for energy consumers and make decisions that affect energy use. Responsibilities overlap and cooperation among these ministries is limited, at best. Improved coordination at the policy level can be expected to result from the EDM project which stresses involvement by high level Ministerial involvement and by highly respected individuals in and out of government to oversee project activities, set objectives, and monitor results.

A major objective of the EDM project is to create a widespread awareness of the benefits and opportunities for EDM and to develop local EDM information channels -- and thus local institutional capabilities in EDM. There is no reason to believe that energy users will resist energy-saving, and hence money-saving and profit-increasing investments once this awareness and institutional capability have been developed. Therefore two of the key components of the EDM project are information and awareness, and training.

Current Information Channels

The principal technical and commercial information channels for large enterprises are:

- Contacts and exchanges with Europe (e.g., conferences, plant visits, collaboration with universities, visits by European consultants).

- International technical publications.
- Local equipment suppliers.
- Banks.
- Confederation General Economique Marocaine (CGEM), especially its weekly publication Cedies Information and its workshops and seminars.
- Some of the professional associations (i.e., fish canning, hotels, cement).

Small- and many medium-sized enterprises are generally cut off from information channels because of a lack of financial, technical, and managerial resources; because individually they do not offer a large enough market for the information suppliers (e.g., equipment suppliers); and because, in some cases, energy accounts for only a small share of total production costs, and is this a minor concern.

In order to maximize the impact of an EDM information dissemination program, the following strategy will be used:

1. Develop well-targeted information campaigns.
2. Provide as much "hands-on" and result-oriented information as possible.
3. To the extent possible, rely on existing institutions and information channels rather than creating new ones.
4. Work through institutions that are well-respected and trusted by enterprises.
5. Give the program high visibility and priority by involving high level officials.

Target Campaigns

The first step in developing an effective information dissemination campaign is to develop a database on industrial plants and hotel chains, that includes information on their products and processes, energy problems and priorities, and individual EDM information needs. This will be done through a survey that would then be used to tailor or "personalize" information and training campaigns to the specific needs of enterprises. Much of the information needed already exists, in one form or another, and simply needs to be organized in a usable fashion.

Both management and technical staff need to be targeted by the project: management because they have to be convinced of the opportunities and benefits of EDM before they will approve investments, and technical staff because they will actually identify and implement the technologies. Even if plant technical staff are already aware and convinced of the importance of EDM,

energy efficiency is often not a top priority for management. Campaigns have to be targeted to generate an awareness and interest at the highest levels of enterprises.

In addition, because the industrial processes, energy problems, and appropriate EDM measures vary across sectors, the project will target information campaigns and training, at least initially, to agroindustry, construction materials, and hotel sectors.

D. Institutional Analysis

Reports in the project files contain in depth institutional analyses of the organizations which will play a key role in the implementation of EDM in Morocco. This sections summarizes pertinent information about the functioning of these organizations as well as some analysis of their capability to participate in the project activities. Both public and private sector organizations will be involved in this project.

I. Public Sector Organizations

Ministry of Energy and Mines

The Ministry of Energy and Mines (MEM) was created in 1977 to formulate and implement national energy, mining, and geology policies. MEM is divided into three directorates:

ENIM has also organized activities in continuing education for industries, including three seminars in 1985-1986. It plans to hold approximately 10 continuing education seminars during 1987. ENIM's research centers conduct research on request for government organizations (including ONAREP, ONE and the refineries) and for industry.

ENIM works closely with industrial enterprises to ensure that engineers are properly trained to meet the needs of industry. Industry staff often offer courses at ENIM, and ENIM students participate in internships in industrial enterprises. In addition, ENIM has organized workshops and seminars to coordinate its activities with industry. ENIM also works with local private architecture and engineering firms to develop a market for consulting and engineering services. Based on this experience to date, ENIM will play a critical role in implementing the training activities of this project.

Ministry of Interior

The main responsibility of the Ministry of Interior that is relevant to the EDM Project is its control over the Regies, which distribute electricity and water and are owned by municipalities, communes, or groups of neighboring communes. There are about 10 Regies, which together sell approximately 56 percent of the electricity produced by ONE. A number of Regies have initiated energy demand management activities so that they can better manage peak demand (e.g., RAD in Casablanca).

Ministry of Tourism

The tourism sector is under the supervision of the Ministry of Tourism: the

Ministry controls conformity of hotels -- both built and planned -- to existing regulations. As there is no regulation on energy conservation, the Ministry cannot evaluate the energy aspect of hotels. Nor does it have the means to establish energy standards and provide incentives to hotel promoters to build energy-efficient hotels. Chains account for about 50 percent of the large hotels. The most important are: Africa Palace, Club Mediterranee , Dounia Hotels-PLM, Farah, Interedec-Hyatt, Maroc-Tourist, Meridien, Sahara-Tour, Safir, and Salam. There is a professional organization, the Federation Nationale de l'Industrie Hoteliere in Casablanca; its president is the chairman of the Dounia Hotels-PLM chain. There are also local associations in Marrakech and Agadir.

According to Ministry officials, targets for promoting EDM include chain presidents, technical managers in hotel chains or large hotels, and architects.

Ministry of Commerce and Industry

The Ministry of Commerce and Industry (MOCI) is responsible for industrial development and investment. MOCI supervises the activities of some of the country's largest energy users and is also responsible for developing and implementing regulations on industrial equipment standards. The Ministry is divided into three directorates: Direction de l'Industrie, Direction du Commerce Exterieur (Foreign trade), and Direction du Commerce Interieur (Domestic trade). The Direction de l'Industrie has separate divisions for food and agricultural industries and chemical industries. The Direction du Commerce Exterieur has divisions for imports and general supplies, exports, external relations, and administrative affairs. The Direction of Commerce Interieur has a division for economic studies of standards, electromechanical industries, and textile industries.

Chambers of Commerce and Industry

The Moroccan Chambers of Commerce and Industry are public sector organizations under the oversight of the Ministry of Commerce and Industry. Their primary responsibilities are to represent and defend the interest of private industry before the government and to promote the development of private industrial and commercial enterprises. There are 16 Chambers of Commerce, representing all the major industrial and commercial centers in Morocco.

The Chambers of Commerce are grouped under the Federation of Moroccan Chambers of Commerce (FMCCI), located in Rabat, which coordinates the activities of the chambers and works with the government to identify problems for commerce and industry and to encourage policies that encourage industrial development. With a total 1984 membership of more than 10,000, the FMCCI and its chambers have the largest private industry membership of any Moroccan organization; its members include small, medium-sized, and large companies.

In the past, the FMCCI and its chambers have organized a number of seminars on various commercial and economic topics. Some of these seminars have been conducted in cooperation with the ILO and the Arab Labor Organization, including a seminar on small and medium-sized industrial enterprises.

The most important current and future activity of the FMCCI and its chambers is to modernize and improve their structure, organization, and capabilities.

Under its current plan, the FMCCI is establishing a number of "assistance cells" aimed at providing information and technical support to industrial enterprises and trying to better equip its chambers (e.g., computers, more staff with better skills). In addition, the FMCCI hopes to establish contracts with research organizations, universities, and training institutions to develop and provide technical assistance to members. The chambers are also trying to computerize their membership lists so they can better target and meet the needs of their members. Furthermore, the United Nations Development Program (UNDP) plans to work with the Chambers of Commerce to organize workshops and information dissemination activities in connection with a future small and medium-sized industry development project for rural areas.

2. Private-Sector Organizations

Confederation Generale Economique Marocaine

The Confederation Generale Economique Marocaine (CGEM) is the private employers confederation, often viewed as the functional equivalent of the U.S. National Association of Manufactures. CGEM's proclaimed goals are to promote a rational economic development policy and to strengthen the role of private enterprises in Morocco's economic and social development. CGEM is primarily a lobbying organization that promotes policies that are in the interest of its members. It sees its specific tasks as:

- Promoting improved management of private enterprises;
- Ensuring the representation of its members before the government;
- Coordinating the activities of its members;
- Providing services to its members to increase their efficiency; and
- Strengthening the private sector initiative in Morocco.

The CGEM was established in Casablanca more than 20 years ago and between 1976 and 1985, its membership grew from 180 to 4,000 members, including 45 professional associations. CGEM has an elected president and federation presidents, but its day-to-day activities and operations are overseen by a Secretary General. CGEM is divided into four federations: industry; trade and service; public works, building, and engineering; and mining. There are also two permanent committees, one for economic, financial, and fiscal matters and one for social affairs, which is concerned with issues such as salaries, training, and working conditions. In addition, CGEM has 30-35 "Groupes de Reflexion" (working groups) on numerous issues, including one that is dedicated to technology and production. CGEM used to have a special working group for energy, but this group was abolished after the termination of ONE's load shedding.

CGEM's activities include organizing seminars, workshops, and luncheons, facilitating contacts between Moroccan and foreign businessmen, publishing a weekly newsletter to keep its members informed about issues and activities that might interest or affect them, collecting statistics on its members, preparing analyses (mostly economic), and actively lobbying the government on behalf of its members. CGEM's principal means of communicating with its members is through its newsletter, Cedies Information. Cedies informs CGEM members about a wide range of economic, commercial, and financial topics and activities; it describes key economic and commercial events of the week; discusses trade, tourism, and industry issues; explains laws and legislation

that might affect CGEM members, announces upcoming trade fairs, seminars, and meeting of interest and summarizes those recently held; identifies opportunities for business arrangements with foreign buyers and investors, and summarizes CGEM's own activities.

Professional Associations

There are professional associations covering almost every type of economic and commercial activity in Morocco, including agriculture, industry, buildings and public works, insurance, transport, tourism, medecine, architecture, law, and banks. In industry, there are more than 40 professional associations, that represent all the major industrial subsectors.

There are also professional associations for consultants and engineers, builders, and transportation. These associations are private organizations whose principal functions are to represent, defend, and promote the interests of their members before the public authorities and to lobby for favorable commercial and industrial policies.

Generally, these organizations have budgets provided by members dues, and small staffs consisting of a full-time secretary general and perhaps one or two support staff. All the associations have an elected president, who is usually the chairman of a member company, and is neither full-time nor paid.

There is a wide variation in the level and scope of activity of the professional associations. The degree of activity and the technical and administrative capabilities of the associations depend greatly on the capabilities and strength of the individual secretary general and president, and also on the cooperation of their members.

Consulting and Engineering Firms

There are approximately 15,000 engineers in Morocco. Approximately 40 engineering firms and 1,000 engineers belong to the industry trade association, the Association Marocaine du Conseil et de l'Ingenierie. According to the association, a recent study revealed the following distribution of consulting and engineering firms' activities and projects:

- infrastructure - 40 percent;
- buildings - 34 percent;
- industry - 2 percent;
- planning and economics - 7 percent;
- organization and computer - 17 percent.

One problem for local engineering firms is that a large share of the market goes to foreign firms. The industrial enterprises and engineering firms interviewed indicated that many enterprises prefer to hire foreign expertise, believing that the quality of their services will be higher. However, interviews with local engineering firms and a review of their studies reveal that the firms have conducted energy audits and prefeasibility studies in the past and that the quality of their work is very good.

American Chamber of Commerce

The American Chamber of Commerce in Morocco is a private organization whose primary role is to promote the development of Morocco and to cultivate U.S. interest in investing in Morocco through the exchange of information and ideas and by working with the GOM to remove obstacles to trade and investment. The chamber has approximately 160 members consisting of both American and Moroccan companies. There are approximately 20 American members, including General Tire, Goodyear, Gillette, Johnson Wax, Johnson & Johnson, Proctor and Gamble, Colgate Palmolive, Kodak, Xerox, IBM, NCR, Texaco, and Mobil.

In addition to discussing trade, business, and investment issues with the government, the Chamber of Commerce's principal activities are the organization of seminars, debates, and working luncheons and dinners. The Chamber participated directly in the design of the 1983 Code des Investissements and lobbied for the provisions to make foreign firms eligible under the Code. The president of the Chamber of the Commerce believes that each American company that belongs to the chamber should share some of its expertise with Morocco. To this end, he has asked a number of them to offer seminars in their areas of expertise. For example, in 1986 the Chamber sponsored a two-day seminar on energy conservation in cooperation with the Goodyear Tire Company. Colgate Palmolive offered a seminar on marketing and IBM presented a seminar on data processing. All these seminars were well attended. Seminars have also been held on technology transfer, investment, and advertising. The Chamber of Commerce no longer publishes a magazine but rather contacts its members directly through letters on specific issues.

VII. CONDITIONS AND NEGOTIATING STATUS

A. Conditions

The Project shall be subject to the following essential terms and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

1. Source and Origin of Commodities, Nationality of Services

Commodities financed by A.I.D. with grant funds shall have their source and origin in Morocco or in the United States except as A.I.D. may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services financed by grant funds shall have Morocco or the United States as their place of nationality, except as A.I.D. may otherwise agree in writing.

Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States. The requirements of the Cargo Preference Act will be met with respect to all commodities financed by A.I.D. that are transported on ocean vessels.

2. Conditions Precedent

Prior to the first disbursement under the Grant, or to the issuance by A.I.D. of documentation pursuant to which disbursement will be made, the Cooperating Country will, except as the parties may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

(i.) A statement of the name of the person or persons representing the Cooperating Country, together with a specimen signature of each person specified in such statement.

(ii.) The designation of a Moroccan project manager responsible for managing the project for the Ministry of Energy and Mines.

c. Waiver

The Project Authorization will include a source/origin waiver from geographic code 000 to geographic code 935 to purchase two vehicles of French origin and Moroccan source. The justification for the purchase of these vehicles is the necessity to have vehicles for which spare parts and maintenance are readily available locally and which are specifically designed to withstand Moroccan conditions. The Project Authorization will include a certification that the exclusion of the procurement from the Free World countries, other than the Cooperating Country, would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program; and that special circumstances exist which justify the waiver of section 636 (i) of the Foreign Assistance Act.

B. Negotiating Status

The above Conditions Precedent and conditions have been discussed with the Government of Morocco. During Project Agreement negotiations, USAID Morocco will incorporate into the Agreement appropriate language to cover these terms and conditions.

ANNEX A

Project Logical Framework

ANNEX A

ENERGY DEMAND MANAGEMENT 608-0193

PROJECT LOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	Means of Verification	Important Assumptions
Program or Sector Goal:	**Measures of Goal Achievement:**		
Save foreign exchange & increase productivity by reducing energy waste and by improving efficiency of energy use.	- Energy savings of 5-10% in target sectors (60,000 toe saved). - Improved energy intensity index in target sectors (5% from 1988 base).	World Bank figures Oil price indicators Industry records	- Energy prices do not drop below $12 per barrel. - GOM maintains positive growth policies.
Project Purpose	**End of Project Status**		
To develop and implement the core of a national energy demand management program.	- National energy demand management program in place. - Total EDM investments reach $20 million. - GOM policy to encourage EDM in place.	Independent review Investment records	- GOM is willing and able to provide adequate incentives. - That sufficient demand for energy audits and investments can be generated to support private energy auditing and engineering business. - Pay back period on EDM investments reasonable and acceptable. - Technology available and transferable.
Outputs:	**Magnitude of Outputs:**		
Information and Awareness of Energy Demand Management concepts and techniques.	- 3 information packages (by sector) - Technical Publication (10 issues) - 45 seminars and workshops - Annual energy consumption survey (5) - 3 Information Centers established - International Exchanges (25 invitees) - Energy Manager Assn. established	Public record	GOM decides internal coordination of policies is important and practicable.
Technical support and tech transfer to identify firm specific EDM actions and applications.	- 40 Energy Audits performed - 45 Feasibility studies - 15 Technical applications	Company (sector) records On-site monitoring	Users amenable to audits, demonstration projects, and special projects. Auditing and engineering skills provide sufficient payoff.
Training on energy managers, energy auditors, engineers, technicians, students, and faculty.	- Curriculum upgraded at ENIM - 60 p/m U.S. short courses and internships (30 participants). - 62 p/m in-country EDM (150 parts) - 120 p/m in-country 'hands on' (400 parts).	Financial records	
Policy analysis and advice to GOM on EDM issues.	- 4 studies completed		
Inputs:	**Implementation Target:**		
USG $5.0m (ESF grant)	- Technical Assistance, Training, Audits, Studies, Commodities, Engineering, Technology transfer	Project agreement	Approval of project by GOM/AID. Appropriate TA and training available.
GOM $ .8m Private Sector $ 2.2m Total $ 8.0m	- Counterparts, Facilities, Airfares, Equipment	Contracts	

ANNEX B

Statutory Check List

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A includes criteria applicable to all projects. Part B applies to projects funded from specific sources only: B(1) applies to all projects funded with Development Assistance; B(2) applies to projects funded with Development Assistance loans; and B(3) applies to projects funded from ESF.

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

A. GENERAL CRITERIA FOR PROJECT

1. FY 1988 Continuing Resolution Sec. 523; FAA Sec. 634A. If money is sought to obligated for an activity not previously justified to Congress, or for an amount in excess of amount previously justified to Congress, has Congress been properly notified?	CN Expired 1988.
2. FAA Sec. 611(a)(1). Prior to an obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance, and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	YES
3. FAA Sec. 611(a)(2). If legislative action is required within recipient country, what is the basis for a reasonable expectation that such action will be completed in time to permit orderly accomplishment of the purpose of the assistance?	NONE REQUIRED

4.	FAA Sec. 611(b); FY 1988 Continuing Resolution Sec. 501. If project is for water or water-related land resource construction, have benefits and costs been computed to the extent practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines.)	NA
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively?	NA
6.	FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	PROJECT BY ITS NATURE WILL CONCERN LOCAL FIRMS AND LOCAL ENERGY POLICY ONLY.
7.	FAA Sec. 601(a). Information and conclusions on whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	THE PROJECT WILL MAKE LOCAL FIRMS MORE ENERGY EFFICIENT. IT MAY INCREA INTERNATIONAL TRADE IN EQUIPMENT RELATED THERETO
8.	FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	A PRIVATE TA FIRM FROM T US WILL MANAGE THE PROJE IN MOROCCO. LOCAL FIRMS WILL BECOME AWARE OF US EQUIPMENT AND TECHNOLOGY
9.	FAA Secs. 612(b), 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	BOTH THE GOM AND LOCAL INDUSTRY WILL BE REQUIRE TO CONTRIBUTE TO THE PROJECT IN AN AMOUNT EXCEEDING 25% OF TOTAL PROJECT COSTS.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release? NO

11. FY 1988 Continuing Resolution Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? NA

12. FY 1988 Continuing Resolution Sec. 553. Will the assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country markets in direct competition with U.S. exports, of textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel? NO

13. FAA Sec. 119(g)(4)-(6). Will the assistance (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; NO
(b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other wildlife habitats; NO
(c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; NO
or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas? NO

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14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (either dollars or local currency generated therefrom)? NA

15. FY 1988 Continuing Resolution. If assistance is to be made to a United States PVO (other than a cooperative development organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States Government? NA

16. FY Continuing Resolution Sec. 541. If assistance is being made available to a PVO, has that organization provided upon timely request any document, file, or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.? NA

17. FY 1988 Continuing Resolution Sec. 514. If funds are being obligated under an appropriation account to which they were not appropriated, has prior approval of the Appropriations Committees of Congress been obtained? NA

18. FY Continuing Resolution Sec. 515. If deob/reob authority is sought to be exercised in the provision of assistance, are the funds being obligated for the same general purpose, and for countries within the same general region as originally obligated, and have the Appropriations Committees of both Houses of Congress been properly notified? NA

19. State Authorization Sec. 139 (as interpreted by conference report). Has confirmation of the date of signing of the project agreement, including the amount involved, been cabled to State L/T and A.I.D. LEG within 60 days of the agreement's entry into force with respect to the United States, and has the full text of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for agreements covered by this provision). NA

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3. Economic Support Fund Project Criteria

a. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of Part I of the FAA?	YES. THE PROJECT IS DIRECTLY RELATED TO FAA SECTION 106.
b. FAA Sec. 531(e). Will this assistance be used for military or paramilitary purposes?	NO
c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?	NA

ANNEX C

ANPAC Guidance Cable

12

OFFICIAL FILE

ACTION AID INFO: DCM ECON/5

V2C2CRAC677SYS184
PP RUEHRA
DE RUEHC #4073 0282313
ZNR UUUUU ZZE
P 282312Z JAN 87
FM SECSTATE WASHDC
TO AMEMBASSY RABAT PRIORITY 7893
BT
UNCLAS STATE 024073

608-0193.

LOC: 231 92
29 JAN 86 0747
CN: 04885
CHRG: AID
DIST: AID

ACTION: ENR

DUE DATE: 02/06

INFO: DIR, D/DIR
PROG, CONT, CAHROD, RF.

AIDAC

E.O. 12356: N/A
TAGS: N/A
SUBJECT: MOROCCO ENERGY DEMAND MANAGEMENT (608-0193)
PID REVIEW

1. ANPAC OF SUBJECT PROJECT PID WAS HELD ON 1/15/87, CHAIRED BY DAA/ANE R. BELL. APPROVAL WAS GRANTED TO MISSION FOR DESIGNING PP AND APPROVING PP IN FIELD FOR ACTIVITIES CONCERNING TECHNICLU U?:), TRAINING AND STUDIES/ACTION PLANS Z(ZPPROVAL OF CAPITAL FINANCING ACTIVITY IS DEFERRED UNTIL FURTHER INFO AND ANALYSIS IS PROVIDED TO AID/W.

2. APPROVAL TO DESIGN AND APPROVE PP FOR TECHNICAL SUPPORT, TRAINING, AND STUDIES/ACTION PLANS WAS GRANTED WITH COMMENDATION TO MISSION FOR A WELL-PREPARED PID. SPECIFIC ANPAC GUIDANCE FOLLOWS.

A. PP DESIGN EFFORT SHOULD CONSIDER A LONGER TIME-FRAME TO CARRY OUT ALL ACTIVITIES AND ACHIEVE PROJECT PURPOSE. PROJECT MAY CONSIDER A PHASED APPROACH, AS EXPERIENCE IN OTHER COUNTRIES HAS SHOWN THAT TIME REQUIRED TO COMPLETE AN ENERGY DEMAND MANAGEMENT PROGRAM ON A NATIONAL SCALE IS USUALLY UNDERESTIMATED. IF A LONGER TIME-FRAME IS CONSIDERED, THE BUDGETARY

IMPLICATIONS WILL HAVE TO BE CAREFULLY EVALUATED.

B. PP WILL NEED TO EXPAND AND REFINE ANALYSIS OF ENERGY DEMAND SUB-SECTORS WITH HIGHEST POTENTIAL. PERSPECTIVE SHOULD BE TECHNICAL, ECONOMIC, FINANCIAL, AND PRCTICAL IN NATURE. PROJECT SHOULD TARGET KEY AREAS WHERE TANGIBLE RESULTS CAN BE ACHIEVED WITHIN PROJECT TIME-FRAME. SUCH AREAS MAY INCLUDE INDUSTRIL COGENERATION AND TRANSPORTATION CONSERVATION EMPHASIS.

C. PP MUST IDENTIFY IMPORTANT POLICY CONSTRAINTS TO EFFICIENT ENERGY USAGE THAT CURRENTLY EXIST AND THE FRAMEWORK/MECHANISM BY WHICH PROJECT WILL BE ADDRESSING THEM. IT IS ALSO ESSENTIAL THAT THE STRUCTURE FOR FORMULTING, COORDINATING AND ACTIVATING POLICY REFORM BE KNOWN. THE INSTITUTIONAL ANALYSIS PROPOSED AS PART OF PP DESIGN MUST PROVIDE NEEDED INFORMATION FOR INCORPORATION INTO PROJECT.

USAID/RABAT
C & R
29 JAN 87
RECEIVED

D. PP SHOULD INDICATE LINKAGE OF PROJECT WITH MISSION'S OVERALL ENERGY PROGRAM AND STRATEGY, AS WELL AS RELATED PROGRAMS OF OTHER DONORS (I.E., WORLD BANK STRUCTURAL ADJUSTMENT PROGRAM AND ENERGY PROJECTS).

E. STRATEGY PROPOSED FOR IEE ON CASE-BY-CASE BASIS IS APPROPRIATE AND SHOULD BE INCLUDED IN PP.

F. MISSION SHOULD CONSIDER CHANGING PROJECT GOAL TO SOLELY IMPROVE EFFICIENCY OF ENERGY PRODUCTION, DISTRIBUTION, AND UTILIZATION UNQUOTE, RATHER THAN REDUCE THE RATE OF INVESTMENT. THIS ADDITIONAL LANGUAGE APPEARS MORE APPROPRIATE IN LIGHT OF ACTIVITIES DESCRIBED.

3. ANPAC DEFERRED APPROVAL OF CAPITAL FINANCING PORTION OF PID AT THIS TIME. UNTIL WE HAVE CERTAIN BASIC INFORMATION, NO DECISION CAN BE MADE. THE PROPOSED INVESTMENT CREDIT STUDY/ANALYSIS MUST BE CARRIED OUT PRIOR TO AID/W APPROVAL OF THIS ACTIVITY. ESSENTIAL QUESTIONS THAT MUST BE ANSWERED INCLUDE:

A. IS IT CRITICAL TO PROJECT PURPOSE THAT CAPITAL FINANCING BE A PART OF AID FUNDING AND THIS PROJECT?

B. ARE THERE ALTERNATIVES TO AID FUNDING OF CAPITAL PURCHASES FOR ENERGY EFFICIENT EQUIPMENT?

C. ARE THERE MOROCCAN STRUCTURAL/INSTITUTIONAL PROBLEMS INHIBITING ENERGY-RELATED CAPITAL FINANCING?

D. ARE EXISTING CREDIT LINES INEFFECTIVE, AS INDICATED IN THE BAGLER, BAILLY REPORT? CAN EXISTING LINES OF CREDIT BE MODIFIED TO ACCOMODATE ENERGY EFFICIENCY CREDIT NEEDS?

E. IF AID CAPITAL FINANCING IS ESSENTIAL, WHAT INSTITUTIONAL FRAMEWORK OR BANKING PROGRAM WILL BE MOST EFFECTIVE IN PROVIDING CREDIT?

F. IS U.S. ENERGY EFFICIENT EQUIPMENT COST COMPETITIVE AND WOULD AN AID LINE OF CREDIT ENHANCE ITS APPEAL?

4. WHEN AID/W RECEIVES INVESTMENT CREDIT STUDY/ANALYSIS, A PROMPT REVIEW WILL BE HELD TO DETERMINE WHETHER CAPITAL FINANCING SHOULD BE PART OF PROJECT. MISSION SHOULD COMMENCE STUDIES/ANALYSES ASAP AND CAN INITIATE PP DESIGN OF ALL PORTIONS OTHER THAN CAPITAL FINANCING AT THIS TIME. SHULTZ
BT
#4073

NNNN

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ANNEX D

Initial Environmental Evaluation

ANNEX D: Initial Environmental Evaluation

Implementation of the proposed project is anticipated to have significant environmental behefits by improving the conservation of energy and reducing the emission of waste products to the air and water. The project has a number of components, those concerned with technical assistance, training, and research are subject to a "Categorical Exclusion" under the provisions of 22 CFR 216, "A.I.D. Environmental Procedures." All demonstration projects and equipment procurements proposed for project funding will be reviewed on a case-by-case basis by the Mission Environmental Officer. All designs for feasibility studies prepared by technical assistance contractors for demonstration projects will include a review of potential environmental impacts. This approach to addressing project related environmental issues was reviewed and approved by the ANE Bureau Environmental Coordinator during his May 1987 visit to Morocco.

ANNEX E

Request for Assistance

Royaume du Maroc

MINISTERE DE L'ENERGIE ET DES MINES

DIRECTION DE L'ENERGIE

N° 3386 DE.

TION : ENR (W/Ahs)

DATE: 05/11

O: DIR. DIR PROG

CITRON - RF

RABAT, le

المملكة المغربية

وزارة الطاقة والمعادن

OFFICIAL FILE

608-019

LE MINISTRE DE L'ENERGIE ET DES MINES

A

MONSIEUR LE DIRECTEUR DE L'USAID

RABAT

OBJET : Projet de gestion de la demande de l'énergie.

REFERENCE : Ma lettre n° 22/88 du 9.2.88.

Suite à ma lettre citée en référence et aux différents entretiens entre nos services concernés, j'ai l'honneur de vous adresser ci-joint une note de synthèse relative à la position de ce département quant à certains aspects du projet de gestion de la demande de l'énergie. Ceux-ci concernent principalement les composantes de ce projet, ses secteurs cibles et les conditions de sa mise en oeuvre.:

Je vous rappelle par ailleurs que ce département a inscrit ce projet comme action prioritaire dans le cadre du Plan de Développement Economique et Social pour la période 1988-92 et l'a doté en conséquence.

En effet, la réalisation de ce projet soutiendrait indéniablement la politique de maîtrise de l'énergie menée par notre pays, renforcerait son indépendance énergétique et aurait des retombées positives sur la compétitivité des différents secteurs de l'économie nationale.

Aussi, vous saurais-je gré de bien vouloir considérer favorablement la possibilité d'entreprendre le lancement de ce projet commun et l'inscrire parmi les actions prioritaires de l'USAID pour 1988.

En vous remerciant pour toute l'assistance que vous apportez à ce Département et pour l'intérêt particulier que vous portez à notre coopération dans le domaine énergétique, je vous prie d'agréer, Monsieur le Directeur, l'expression de mes meilleurs sentiments.

USAID/RABAT
C & R
04 MAY 1988
RECEIVED
07

ACTION TAKEN

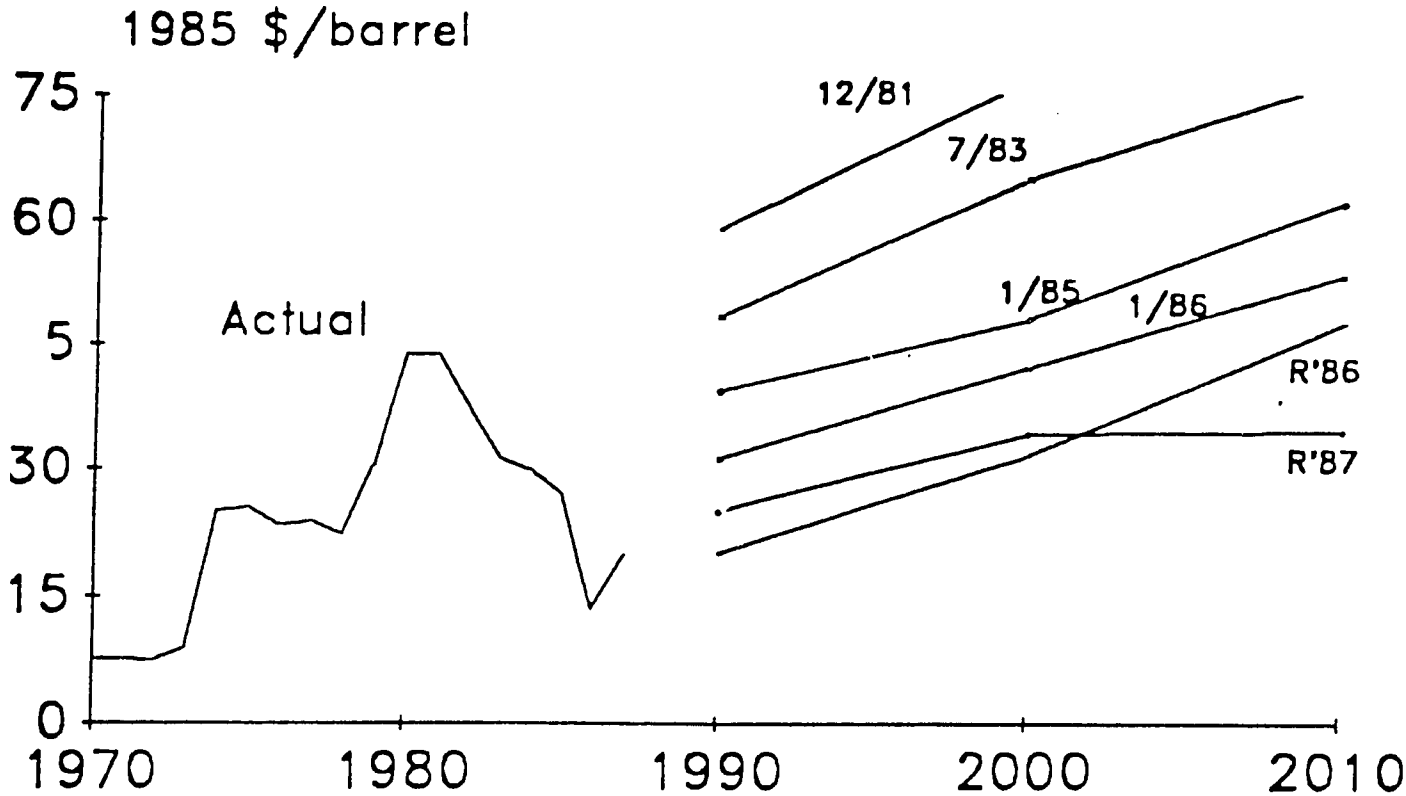
No Action Necessary.....

Replied by : _____

ANNEX F

International Energy Workshop
International Oil Price Scenarios

International Price of Crude Oil Actual and Six Successive IEW Polls



Note: For comparative purposes, above graph compares the medians for six IEW polls: four early ones (12/81, 7/83, 1/85, 1/86) and two recent ones (R'86, R'87. According to the 1987 poll medians, oil prices are likely to rise between 1990 and 2000, but to remain stable during the following decade.

Source: International Energy Workshop (IEW): Overview of Poll Responses. July 1987.

IEW Poll Respondents, July 1987

Includes only those responses dated 1985-87

Organization/project		Last Year Reported	Country/ Region Coverage
ADLMN	M. Adelman, MIT Energy Research Laboratory, April 1986	2000	7
AMOCO	Amoco Corporation, July 1987??	2010	1-8, Canada Japan, OECDE USA
ASHB	Ashland Oil, baseline scenario, August 1986	2000	7
ASSUH, ASSUL, ASSUM	Academy of Sciences, USSR, high, low and moderate energy price scenarios, April 1986	2010	Japan, OECDE, USA
BPP	BPP Teknologi, MARKAL model, March 1987	2010	Indonesia
CDIC	Center for Development and International Cooperation Mogadishu, January 1985	1990	Somalia
CEE	Centro de Estudios Energeticos, November 1986	2010	Mexico
CEGB	Central Electricity Generating Board, December 1986	2000	7
CERG	Cambridge Energy Research Group, September 1986	2010	4,7
CHVNB, CHVNL	Chevron Corporation, World Energy Outlook, base and low oil price scenarios, June 1986	2010	4
CIESH, CIESL	Center for International Energy Studies, Erasmus University - high and low energy growth, November 1986	2010	3-8
CONCO	Conoco, World Energy Outlook through 2010, August 1986	2000	4,7, DC, Japan, OECDE, USA

CRIEP	Central Research Institute of Electric Power Industry, July 1986	2010	Japan
DOE	US Department of Energy, National Energy Policy Plan, draft projections, December 1986	2010	3-7, USA
DRI	Data Resources Inc., Spring 1986	2010	USA
DRIE	DRI Europe, December 1986	2000	OECDE
ECC	Economic Council of Canada, October 1986	1990	Canada
ECE	Economic Commission for Europe, March 1987	2000	1, OECDN
EIA	US Energy Information Administration, midprice scenario, December 1986	2000	4,7, DC, USA
EMVEN	Ministerio de Energia y Minas, Venezuela, August 1986	2010	Venezuela
ENEA	Economic Analysis Division, ENEA, Rome, May 1987	2000	Italy
ESCN	Energy Study Centre, Netherlands, March 1987	2010	Netherlands
ETAMC	ETA-MACRO, Trinational Project, March 1985	2010	Canada, Mexico, USA
EWC	East-West Center, August 1985	2010	5
GATLY	D. Gately, New York University, September 1986	2000	7
GDRIE	GDR Institute for Energetics, Leipzig, December 1986	2000	GDR
GRI	Gas Research Institute, September 1986	2010	USA
HNPO	Hungarian National Planning Office, Energy Modeling Group, July 1985	2000	Hungary
IAEAH, IAEAL	International Atomic Energy Agency - high and low demand, 1985	2000	1,4,8, Latin America, OECDE, OECDN, OECDP

IEA	International Energy Agency, December 1986	2000	4
IEAGH, IEAGL	International Energy Agency, "Natural Gas Prospects", high and low oil price scenarios, 1986	2010	OECDE
IEE	Institute of Energy Economics, Tokyo, December 1986	2010	Japan
IEPE	Institut d'Economie et de Politique de l'Energie, Grenoble, November 1986	1990	1-8
IGU	International Gas Union, 16th World Gas Conference, moderate scenario, June 1985	2010	1,4,8, OECDE
IIASC, IIAST, IIATU	International Institute for Applied Systems Analysis - Gas Study, Conventional Scenario, Technological Development, Technical University of Vienna, April 1987	2010	OECDE, Austria
INET	Institute of Nuclear Energy Technology, Beijing, June 1985	2010	2
INSEE	Institut National Statistique et Etudes Economique, 1987	2000	France
IPE	IPE Model, N. Choucri, MIT, June 1986	2000	4-7, Japan, USA
KAIST	Korea Advanced Institute of Science and Technology, December 1985	2000	Korea
KFAJ	KFA (Nuclear Research Center) Julich, STE, October 1986	2000	FRG
LBL	Lawrence Berkeley Laboratory, December 1986	2000	Mexico
LIEF	Liston International Energy Forecasts, London, October 1986	2010	7
LTM	Long-Term Model, A. Manne and T. Rutherford, Stanford University, April 1987	2010	4-7, USA
MRCTI	C. Marchetti, IIASA, 1986	2010	8
MROTA	Y. Murota, Saitama University, March 1985	2000	Japan

NEA	Nuclear Energy Agency, OECD, 1987	2010	4
NEAS	National Energy Administration, Sweden, December 1986	2010	Sweden
NEBH, NEBL	National Energy Board, high and low price cases, October 1986	2000	Canada
NPCL, NPCU	National Petroleum Council, lower and upper price trends, October 1986	2000	USA
NRMPE	Norwegian Royal Ministry of Petroleum and Energy, December 1985	2000	Norway
ONTHY	Ontario Hydro, Economics & Forecasts Division, December 1985	2000	Canada
PAEC	Pakistan Atomic Energy Commission, Applied Systems Analysis Group, July 1986	2010	Pakistan
PAT	Petroleum Authority of Thailand, October 1986	2000	Thailand
PGE	Pacific Gas and Electric Company, Oil Price Forecast, April 1986	2010	7
PLECB, PLECC, PLECR	PlanEcon, Inc. - base, oil production crisis, and rationalization scenarios, October 1986	2010	1
POLH, POLL	Polish Academy of Sciences, high and low scenarios December 1986	2010	Poland
RESPR	Respondent R, April 1985	2000	7
RESPS	Respondent S, September 1986	2000	4,7, DC, OECDE, USA
ROLND	K. Roland, ECON, Center for Economic Analysis, Oslo, July 1987	2000	4,5,7, USA
ROWSE	J. Rowse, University of Calgary, November 1986	2000	Canada
SAUNS SAUNV	H. Saunders, smooth and volatile scenarios, December 1985	2000	4-7
SPIL	M. Waterhouse, Strategic Planning International Ltd., August 1987	2010	4,5,7, Canada, Japan, OECDE, USA

ULG	A. Umnov, M. Lenko, A. Golovin, CMEA Study, IIASA, February 1985	2000	1
UTV	F. Wirl, University of Technology, Vienna, November 1986	2000	4-7
WBK	World Bank, December 1986	2000	1-8
WIFO	Austrian Institute for Economic Projections, December 1985	2000	Austria
YOHEH, YOHEL, YOHEM	G. Yohe, Wesleyan University high, low and median price scenarios, March 1987	2010	8

ANNEX G

EDM in Morocco: Case Studies

ANNEX G.

CASE STUDIES AND LESSONS LEARNED: ENERGY DEMAND MANAGEMENT IN MOROCCO 1986 - 1988

I. Background

During the period 1982-88, Morocco took several measures to improve its energy usage. Some of these measures were taken at the national level such as speed limits for trucks, initiating the five day work week, conversion from oil to coal use in the power sector, and others. Measures were also taken by individual firms acting alone or on the recommendations of USAID financed energy conservation specialists. Still other measures, some recommended by USAID financed experts, have not been put into practice for a number of reasons, many identified in the feasibility study for an EDM project in Morocco.

At the national level, energy conservation efforts were widely discussed and publicized during a campaign in 1983-84. An interministerial Sub-Committee on Energy Conservation, appointed by the Prime Minister and chaired by the Ministry of Planning, came up with a variety of specific proposals for energy conservation in Morocco. Many of these proposals were intended for immediate implementation, while others were designated for further study by the responsible Ministry or Department (e.g. Transport, Interier, Finance, Commerce and Industry, Agriculture, Energy and Mines, Housing, Equipment, and Tourism). The Sub-Committee presented its official proposals at a seminar in January 1984 attended by the Ministers of Energy and Mines and Commerce and Industry.

The changing trends in the use of energy in Morocco can not be directly attributed to the energy conservation campaigns and seminar of 1984. Higher energy prices no doubt played an even more decisive role (see attached). The draft Five Year Plan prepared by the Ministry of Energy and Mines points out that the growth rate in energy consumption in Morocco declined over the period 1973-79 at a rate of 6.5% per year, and over the period 1980-85 at a rate of 1.5% per year. The Plan estimates 6.7 M toe was saved during the 1980-85 period at a value of 12 billion dirhams or $1.5 billion.

USAID Involvement in Energy Demand Management

Energy Demand Management (or energy conservation) is not a totally new concept to Morocco in terms of USAID support to the GOM over the past several years. In 1982-83, AID provided funding under the Energy Policy Development and Conservation (934-5782) project, which included the fielding of a resident energy advisor to the Ministry of Energy and Mines, and short term consultancies directed at the problem of energy conservation.

In 1986, a resident energy conservation advisor financed under the Energy Planning Assistance project (608-0180), began a two year work plan that included diagnostic visits to a number of energy consuming firms in Morocco, often in cooperation with short term consultancies to conduct in-depth audits or feasibility analyses, and seminars. Six major short term consultancies were financed under the project to further an understanding of the potential for EDM in the power, refinery, sugar, cement, fish canning, and transportation sub-sectors.

Starting with the largest energy consumers first, the advisor quickly established the premise that although significant tons of oil equivilent (toe) can be saved among the large energy users (e.g. refineries, the national electricity utility (ONE), and cement factories), the percentage of energy savings relative to overall energy consumption is not great. Conversely, the advisor found that far greater relative energy savings can be found among small and medium sized consumers, but that the total toe amount saved at each firm is small. (For clarification, small firms are described as those that consume no more that 1000 toe per year; medium firms consume from 1000 toe per year to 5000 toe per year). Taking the lead from the Minister of Energy, the advisor shifted his attention away from large energy consumers in favor of smaller consumers, such as fish and fruit canneries, textiles, and hotels.

The energy conservation advisor intended to work closely with the cadre from the Direction of Energy's Service des Economies d'Energie and engineers from the Service de Planification et de Documentation to reach nine industrial sectors in the country. In fact, the DE provided only two part-time counterparts, one a very junior level engineer, to work with the advisor. This greatly limited the ability of the advisor to conduct detailed studies, carry out certain promotional activities and replicate his efforts, and conduct training as anticipated. Instead the advisor channelled his efforts to informing decision makers at individual firms of possible energy saving activities that could be undertaken, leaving the problem of follow-up to the end users themselves. Nonetheless, the results of the (now nearly) two year consultancy have yielded significant results, such as:

- recommendations implemented to carry out a detailed audit and eventually replace the kiln-heat exchanger system at the ASMAR cement plant in Marrakech, involving an investment of Dh 25 million ($3 million), that should lead to annual energy savings of 4050 toe and a five year payback;

- cement industry recommendation to reduce the upper limit of cement strength, which will enable the sub-sector to save about 20,000 toe per year or $14 million;

- reduction of energy consumption per unit output (specific energy consumption) in two fish canning factories resulting in savings of 150 toe per year;

- o encouragement of the starting of an energy management program at the Jerada coal mine, including the installation of electric meters and regular computations of energy consumption and specific energy consumption ratios, which could save 1500 toe per year;

- o promotion of EDM concepts through lectures and seminars to the Direction de l'Energie, industry and trade associations (e.g., Fish Canners Association, Air Conditioning and Ventilation Association) and civic groups (e.g. Rotary Club, Lions Club);

- o train engineers at the National Coal Marketing Company (SOCOCHARBO) in energy auditing.

In October 1986, the advisor attended the ANE Bureau Energy Conservation and Private Power Generation Workshop along with three senior Moroccan officials and USAID/Morocco energy officers. At the workshop, the advisor presented a case study (la Cellulose du Maroc) of a successful energy management program in Morocco. The advisor provided assistance to USAID and MEM in assessing energy saving potential in Morocco that could result from a national energy demand management project being considered for the 1988-92 period.

The Evaluation Report of the Energy Planning Project prepared in December 1987 by TvT Associates, stated that:

> We believe that the long term conservation advisor has done a commendable job in working on a variety of areas, not all of them compatible. However, the relationship with the GOM cadre has been scanty. In any enhanced project, closer support from the MEM will be necessary. For example, a program to provide training or audits to small factories requires a great deal of labor effort.

Indeed, the MEM support for the advisor's work was less that satisfactory. The advisor virtually worked by himself and at his own pace, with only modest counterpart support (normally limited to the occasional official telex advising firms of an upcoming diagnostic visit by the advisor). In addition to this general lack of counterpart support and no infrastructural support at the level of the Ministry of Energy and Mines, the advisor's reports generated infrequent or no feedback, official or otherwise.

II. Case Studies

A more in-depth look at the activities undertaken by the energy conservation advisor under the Energy Planning Project and the results thereof are described below:

A. Cement Industry

In order to evaluate and then achieve the energy conservation potential in the cement industry, the energy conservation specialist collected data on all nine cements plants in Morocco and calculated specific fuel and electricity consumption. Three plants were initially selected because of either their high specific fuel consumption (e.g. Cements d'Agadir and the Societe Anonyme Ciments de Marrakech (ASMAR) or their high specific electricity consumption e.g. Societe Anonyme Ciments de Temara (ASMENT). The other large plants were new or very efficient, or both, or shut down. The smaller Tetuan and Tanger cement plants were added to the list later on and visited at the end of November 1987. Related reports are not yet available.

The three selected plants were then inspected with the help of a short term expert, Mr. Cottin, who has spent his whole active life with LAFARGE, a leading French cement company. The visits usually took half a day and were carried out in October 1986. A report based on the Mr. Cottin's findings and recommendations was sent to each of the plants' top management in December 1986.

Main findings

At Cement D'Agadir, the original data indicating high specific fuel consumption was found to be inaccurate and the plant was in fact very efficient. At ASMENT (Temara) a lot of problems of many sorts were found and the consultant recommendations received a very cold welcome from the plant's technical manager, so cold in fact that MEM later received an apology from the President of the company for the harsh treatment. There has been no comment on the report to date and no follow-up on the part of ISTI or MEM. The conservation advisor is prepared to provide additional analysis and technical advice upon request.

The consultant's report on ASMAR (Marrakech), suggesting changes in the kiln heat exchanger system, was sent to the General Manager in December 1986. Some months later, in discussions with the Assistant General Manager, the consultant was informed that the basic recommendation, to carry out an audit of the kiln-heat exchanger system, had been implemented. Interestingly, the original consultant's report was not distributed to the technical people at the plant.

Because of its size, ASMAR was able to attract three suppliers who provided the audit of the plant at no cost. ASMAR then reviewed the audit reports and selected the "best deal" among the three to provide and install the equipment. A contract valued at Dh 25 million ($3 million) has just been signed with a Japanese machinery supplier. There is hope that the specific energy consumption will drop from a high 960-970 thermies per ton of clinker to an normal 830-850 thermies per ton. Savings of about 4050 toe per year are anticipated.

The additives issue

Cement is made of three components which are ground together in a grinding mill. These are:

- Clinker, which is produced at high temperature in the kiln from a finely ground mixture of limestone, clay and other minor components;
- Gypsum, which slows down the setting process; and
- Additives, called pouzzolanes, a very fine material which dilutes the clinker but sometimes improves the cement quality.

When discussing with plant managers, the consultants noticed that the additive content of the Moroccan CPZ 325 cement (cement with a compression strength of 325 kilogrames/square centimeter-Kg/cm2) was usually low compared with those achieved in France, where up to 35% of additives are mixed to clinker. As a consequence, the compression of some Moroccan cement is very high, sometimes as high as 529 Kg/cm2 as compared to the European standard of 325 Kg/cm2.

COMPRESSION STRENGTHS AND ADDITIVE CONTENTS
OF SOME CPZ 325 CEMENTS PRODUCED BY MOROCCAN PLANTS

Cement plant	Production of cement CPZ 325 (metric tons)	Compression strength (Kg/cm2)	Additive content (%)
ASMENT	428,000	460-529	14-15
ASMAR	350,000	450	16-17
Agadir			21
CIOR (Oujda)			25
Tanger	48,000		15-17
Tetouan	155,000		11-12
European Standard		325	30-35

source: ISTI

This is true with the other cement produced in Morocco, CM250. CM250 is currently being used to build columns and floors, a practice which would look foolish to any American or European architect. This practice is both

wasteful, because more clinker, and therefore more fuel and more electricity, is required to produce the same quantity of cement, and dangerous because cements from different plants have very different characteristics. Some builders take advantage of these differences and reduce the proportion of cement in concrete. As long as they stick to the same brand, this can be tolerated. But when in Tanger you notice lorries loaded with cement from Oujda, you can be sure that both local and CIOR cements coexist on the same yard. The consequences can be very detrimental to the building.

The consultant reports strongly recommended that the upper strength limit of the CPZ 325 cement (or its equivalent CPJ 35) be reduced from 450 kg/cm2 as indicated in the draft specifications then under discussion, to a far lower figure. The reports recommended new specifications as follows:

Designation	Compression strength limit (kg/cm2) Minimum	Maximum
CM 25	160	275
CPJ 35	346	385
CPJ 45	445	495

source: ISTI

According to the ASMAR Assistant General Manager, this recommendation was followed and the CPZ 325/CPJ 35 compression strength upper limit was reduced from 450 kg/cm2 to 385 kg/cm2.

If this practice is replicated throughout the cement industry in Morocco, the resulting savings could reach 20,000 toe/year or US$ 13.7 million. There is every indication that, apart from the Tetuan plant, which is still under scrutiny by ISTI, this level can be reached.

Other findings

The consultants identified other opportunities for energy conservation in cement when visiting the plants in the Rif, as well as reaching some general conclusions on the industry:

- The cement industry is highly competitive, with local firms competing against each other to gain a larger share of the market. There is a wide range of technical and managerial competency among the plants, and relatively little cooperation between individual firms. The consultants had to deal with the various plants one at a time, a time consuming process that is difficult to replicate in other industries.

- The cement industry is fairly efficient in terms of energy use. The breakdown comes in the linkages between the production of the cement itself, the industry standards, the handling and transport of the product, and the end use. One of the objectives of the EDM project is to pinpoint some of these ideas and supply the GOM with intelligent documents to substantiate them: if the reports are good, they will be read in the GOM and the Moroccan private sector by smart people ready to implement them.

- Government contracts account for about 25% of cement use in Morocco. The standard procurement regulations, however, encourage waste of cement, and hence of energy.

- Attaining credit for investments in production improvement is not a problem, at least if you happen to be a large, well known firm with a good track record.

- Each year in the Tanger cement plant, 2000 toe per year (or US $1.4 million N.P.V.) could be saved in an annex unit - the fuel heating system - by closing down a huge boiler and its back-up and replacing the whole system with some electric heaters and better insulation. At Tetouan, 4000 toe per year or US $2.8 million N.P.V.) can be saved by improving the quality of the clinker. This would require minimum investment limited primarily to technicial advice on the quality of materials for consideration by the plant's laboratory technicians.

- In the Tetouan plant, 2% of the cement produced is lost when cement bags burst or break from a failure to withstand the rough handling they have to go through between bagging and use. If this is also true for the other plants, 7000 toe per year or US$5.0 million savings could be realized.

- Producing cement is an energy intensive process. Promoting the use of soil stabilized bricks could provide an acceptable alternative. The potential savings might range from 100,000 to 200,000 toe/year.

- Cement plant grinding sections could be stopped during the peak hours if provided adequate incentive (i.e. higher electricity prices during peak hours). This could save at least 30 MVA (worth US$14 million) at ONE.

B. Fish Canning

A program to demonstrate the possibilities for improved energy efficiency in the fish canning industry was initiated in 1986. Two canneries were selected for the project, MIDAV and SCCP, for their apparent dynamism, and to encourage them, with the aid of technical support, to make modifications in their processes or their equipment in order to reduce the energy consumption per unit output (specific energy consumption) of their production processes. With the help of a short-term advisor familiar with the sector, the possibilities for improved energy efficiency in the two plants were determined. As a result, fuel consumption per unit (case of 100 cans) was reduced at the SCCP plant by 23%. Electricity consumption per unit at MIDAV was reduced by 15%.

Even more significant improvements, not included in the figures above, are expected. One company has installed modern autoclaves, an investment of $85,000. At the same time, comprehensive energy demand management programs (insulation, reevaluation of process water flow, etc.) are in progress at both companies which should provide even further improvements.

Additional benefits have been identified related to energy savings in the fish canning industry. Most notably, to the extent that improved energy management practices leads to better sterilization practices, there are associated positive externalities such as an improved product and more confidence in the export market.

In November, 1987, local authorities and professional organizations in Agadir and Safi helped organize two seminars in order to publicize the findings of this effort. More than 40 cannery directors, equipment suppliers, and local officials participated in each of these two seminars. The sessions attracted the attention of the national press for the eight point energy conservation program that grew out of the resulting exchanges. Expected savings from a sustained effort of diagnostic and follow-up could result in additional fuel savings of 3000 toe/year valued at US $1.0 million per year for the next five years.

C. Sugar

Sugar cane plants visited in early 1987 were found to be both modern and endowed with highly efficient equipment. They are limited only by the low productivity of cane. Few of the parcels of land growing cane are able to produce up to the norm of 100 tons of cane per hectare. Estimates show that it will take approximately three years for cane production to attain this level, given the necessary attention. At that time, however, the sugar refineries will be in a unique position: they will have the potential to be not only self-sufficient in their energy needs, but to produce surplus electricity that could be sold on the national electric grid, the quantity produced -- between 55 and 140 GWh, equivalent to 16,500 and 42,000 toe -- varying proportionately with the level of investment in generating equipment. The advisors recommended a feasibility study be undertaken on the investment requirements for introducing cogenerated electricity for sale to the national grid. At the lower level, an investment of $6.6 million with a payback period of 5 years was envisioned.

D. Fruit juice bottling

An interesting example of EDM opportunities in the medium sized plants is that of FRUMAT, specializing in bottled orange juice for export and local consumption. FRUMAT has two plants, in Kenitra and Ain Sbaa. The initial visit by the energy conservation advisor led to recommendations on improved plant lighting to reduce energy use and little else. Generally the plant is well managed with modern efficient equipment. Interestingly, the plant manager told the advisor that the plant had initially contacted a U.S.

supplier of food industry equipment, Food Marketing Company. When it came to installing the equipment, the U.S. company suggested the Moroccans contract instead a Brazilian subsidiary of the firm to get the best deal. As a result both FRUMAT plants are now fully equipped by the Brazilian company. (Of note the implementation of the FRUMAT project was seriously delayed due in part to the company's decision to install the equipment without the help of an outside engineering firm. The equipment itself is reported to be excellent.)

E. Textiles

In October 1986, a retired executive in the U.S. textile industry visited a Moroccan textile plant in Fez (COFITEX) as part of the IESC component of the Private Sector Export Promotion project (608-0189). The resulting report indicated that energy savings on the order of 10% (valued at $200,000 per year) of current energy consumption, were possible to the firm. The report recommended the firm use less electricity through a disciplined energy management program, including maintenance, changing the plant air conditioning system, and by improved load factoring. The report indicated that an additional $60,000 per year could be saved if certain investments (e.g. installing additional cables, reconnect transformer loads) were undertaken.

Although the plant manager was initially critical of the consultant's report for its lack of technical depth, the company engaged additional experts to elaborate on a number of the general recommendations made. A number of measures have since been taken such as:

- Restructuring of the electrical network and the creation of electricity "zones" that can be controlled independently;
- Equipping each zone with electricity control guages and transformers;
- Separating the machinery and lighting functions, so that transformer use for lighting does not affect machinery, and vice versa.

An updated energy balance has not been made, and investment costs for the purposes of improving energy efficiency (as opposed to the plant extension also underway) have not been calculated. The plant manager expects to attain energy savings on the order of 5-10%.

III. Conclusions and Lessons Learned

- The estimated returns from USAID financing for energy conservation activities over the past two years in Morocco are significant. For the cost of salary (plus benefits) of one full time resident energy efficiency advisor and approximately six man/months of short term technical assistance per year, totalling roughly $450,000 over two years, investments on the order of US $3.1 million have been made.

- Energy savings as a result of these investments, and the no-cost or low-cost changes in energy demand management behavior at the individual firm level, amount to approximately 25,700 toe per year. Carried out over a five year period, these savings in energy amount to roughly 128,500 toe, for a net present value of US $10.75 million. Should the work to date result in additional investment, the net energy savings will be even greater.

- There is certainly a difference between potential energy savings identified by consultant visits to individual firms and actually realizable energy savings at any given plant. Whereas the potential may be great, a number of constraints may exist at any given time to impede implementation of expert recommendations. Generally, however, once people are informed of what is possible, attempts are made to rectify difficiencies.

- Typically, moving from project intervention (consultant visit, seminar, etc.) to action on the part of an individual plant or sector takes a long time. The ASMAR plant was visited by the energy conservation advisor in October 1986, received a report in December 1986, and signed a contract with an equipment supplier in late 1987. Recommendations regarding the strength of cement, made in December 1986 are to be implemented at ASMAR in April 1988. Recommendations in the sugar industry could take three years to implement.

- Government involvement is critical to lend credence to activities implemented by project financed (e.g. foreign) experts. Even the modest interventions by the DE counterpart responsible for the Service de l'Economie d'Energie, such as the occasional telex advising plant managers of up-coming visits, arranging meetings, organizing seminars, and generally requesting some level of cooperation, were essential to even gaining entry to many firms.

- Small and medium sized firms are by and large more receptive to outside advisors than large established firms. The experience in the fish canning industry, especially, underlines the usefullness of seminars, and hands on contract by outside advisors.

- Generally firms that are large, well connected and with good reputations have little trouble gaining financing. Financing is easier to get for plant expansion than for improved production (efficiency) projects. Most firms report they have no difficulty in gaining access to foreign exchange to import equipment.

Estimated Total Savings Achieved as Result of USAID Project Interventions March 1986 - Feb 1988

Sector/Firm	TOE Saved/year	US$ Million Investment
ASMAR Cement - new equipment	4,050	3.0
Cement Industry - new standards	20,000	-
Fish Canneries - new equipment	150	1
Jerada Coal Mine - EDM practices	1,500	-
	25,000	$3.1

Note: Net present value of the savings calculated at 15% per year for 5 years (1989-93) e.g. 3.36 x $ 3.2m = $10.75

EDM in Morocco: Case Studies

The case of La Cellulose du Maroc

La Cellulose du Maroc is a paper pulp plant which processes eucalyptus wood from the Mamora forest. The company exports 80% of its production and 50% of its Board is composed of private stockholders. In 1979, the company realized that it was not energy efficient and that plant energy consumption was far above that of its North American and Scandinavian competitors. To reduce energy consumption, the firm paid 400,000 Dh (about $73,000 in 1980) which produced a four phased plan of action which was to reduce the energy index from a 100 basis in 1979 to 40 in 1984.

The Plan:

Phase One - This phase required little investment; it aimed at reducing the energy index from 100 to 82 by process rationalization and a better instruction control at workshop level. The objective of this phase was to install some measuring equipment, to reach a better process control and optimize it; another objective was to suppress steam losses and obtain a better control of the various fluids.

Phase Two - This phase required an investment of Dhm 8.5; to reduce the energy index from 82 to 66; the investment pay-back was 18 months.

Phase Three - It required an investment of Dhm 42 to bring down the energy index from 66 to 40.

Phase Four - It would substitute eucalyptus wood wastes (barks, branches and leaves) for 50-70% of the quantities of fuel consumed by the plant, at a cost of Dhm 30.

The pay-back of this investment would be 5 years, including the benefits of the Investment Code, which means this investment has a pay-back time well above the maximum acceptable on energy conservation, say three years.

When the General Manager exposed his plan, whose effect was to reduce the production costs by 25%, his proposal was met with such incredulity that a commission of high-ranking officials was appointed to verify his calculations. After examination the commission gave the green light and the go-ahead was given to implement the first measures.

The Results:

After implementation of the first three phases, the results were quite spectacular:

- in 1980, 73% of the plant's electricity requirements were met by autoproduction against 38% in 1975;
- the specific fuel-oil consumption went down from 475 kg/ton of product in 1979 to 259 kg/ton in 1985;

- the soda specific consumption went down from 125 kg/ton of pulp in 1974 to 40 kg/ton in 1984;

- the power factor is in the 0.90-0.92 range.

Implementation of Phase Four has not started yet due to its high pay-back time; 7 years with the benefit of the Investment Code or 5 years without. Shifting from fuel oil to coal was also studied but here again due to a long (6 years) pay-back time this opportunity has not been implemented.

Lessons:

1. The case of Cellulose illustrates that major results can be obtained in conserving energy by little or low investment. Phase One involved process rationalization and Phase Two involved a relatively minimum investment. This is a positive result, showing the high pay-back of audits and technical assistance.

2. The case of Cellulose illustrates the benefits of firm level, firm specific interventions which can serve a demonstration effect.

3. The case of Cellulose shows the importance of information to a firm. In this case, a seminar showed them that their costs were not competitive.

ANNEX H

ENIM (CEED) Sixth Year Curriculum

ANNEX H. ENIM/CEED Sixth year curriculum

Ecole Nationale de l'Industrie et des Mines

Subjects taught in the 6th year of Energy Chemical Engineering 1985 - 86

Subjects	credits
- English	4
- Work legislation	4
- Sociology	4
- Hydrometallurgy	4
- Industrial ovens	4
- Materials	4
- Water processing	5
- Thermic discharges	5
- Internal - combustion-engines	
- Flow sheeting	6
- Energy production	4
- Plant project	10
- End-of-study thesis	40

ANNEX I

Technical and Policy Studies -- Summary Descriptions

ANNEX I. Technical and Policy Studies — Summary Descriptions

Preliminary descriptive summaries of the technical and policy studies identified for funding consideration under the project are given below. The topics included are illustrative. The studies will respond to specific project needs for detailed information and analysis as either technical or policy constraints are identified during the course of project implementation.

A. Technical Studies

1. Review of Standards in Agroindustry

Objective: To review existing quality control and safety standards in the various agroindustry sectors in Morocco to determine which, if any, energy efficiency standards might be proposed and incorporated into current standards.

Rationale: Quality control standards in agroindustry are normally set by buyers; while safety standards are set by government. These standards, particularly those affecting the quality of the project for export, are strict and are closely followed by producers. Quality standards are subject to change, and often do, to reflect consumer demands. Buyers regularly send expert representatives to the producing firms to assure that these standards are met before placing orders. The onus for compliance with safety standards also falls on the producing firm, who must hire government approved inspectors to certify that electrical wiring, boilers, and other plant equipment comply. Failure to receive the government required certificate of safety can result in plant closure. Energy efficiency is presently not a criteria considered by either quality control or safety inspectors. In fact, recommendations made for plant "improvements" are often wasteful in terms of energy efficiency. At the same time, producers may be exceeding the standards due to lack of confidence, excessive concern that they comply, or simply by faulty instrumentation. By installing closer controls, some firms may actually save money and energy by meeting, not exceeding, standards. Energy efficiency criteria could be added to the inspectors' checklists initially for informational purposes. Safety inspectors who, in particular, are paid by the producing firms, are usually engineers and are probably qualified to conduct simple energy efficiency diagnostics and make recommendations to firm owners on low and no cost energy saving practices.

Description: The study will:

- Review both buyer and government imposed standards to determine their effect on plant energy efficiency.
- Propose criteria for energy efficiency standards for possible inclusion on quality control and safety inspectors' checklists.
- Evaluate potential energy savings per plant that could be attributed to incorporation of energy efficiency standards.
- Identify alternative methods of informing plant owners of proposed energy efficiency standards and promoting compliance.

2. Hot Water Production Using Recovered Heat for Hotel Applications

Objective: To determine under what conditions hot water may be produced using direct recovery of hot gases from hotel air conditioning compressor units and whether this method is technically and economically viable in Morocco.

Rationale: Hot water production accounts for a significant percentage of energy costs in hotels, often up to 50%. The normal method of producing hot water is to burn fuel oil. Another method being considered as a supplement to hot water heating by fuel, solar collectors, is currently being studied by the Centre de Développement des Energies Renouvelables. Another method worth studying for Morocco is the use of electric heat exchangers used in conjunction with hotel air conditioning compressor units. Such a system has shown significant results in tropical countries (e.g. Ivory Coast) where air conditioners are operated year round, 24 hours a day. For Morocco, there may be conditions whereby heat exchange cogeneration is technically feasible and economically viable.

Description: The study will, at selected hotels:

- Analyze electricity consumption for air conditioning by season.
- Analyze hot water consumption and related costs.
- Calculate investment requirements for purchase, installation, and maintenance of heat exchanger water heaters, safety devices, and related equipment.
- Recommend sites for technical applications of heat exchanger cogeneration systems for hot water production.

3. Hotel Laundry Cooperatives

Objective: The review existing laundry usage in the hotel sector and develop proposals for economically sound alternatives to current hotel laundry practices, namely the establishment of hotel laundry cooperatives.

Rationale: Individual hotel laundries consume about 33% more energy (fuel oil) than commercial laundries and typically use in excess of 600 liters of water to clean between four and five kilograms of laundry. The establishment of hotel laundry cooperatives, possibly owned and operated by a hotel association or hotel chain, may have the potential of saving both energy and water, reduce redundancy in personnel, and still assure the quality and timeliness of service required by the industry.

Description: The study will:

- Analyze existing hotel laundry practices in selected hotels in Morocco, comparing cost and service with commercial laundry services.

- Propose guidelines for the establishment of hotel laundry cooperatives and set up a proposed framework for the operation of such cooperatives.

B. Policy Studies

1. Review of government laws and regulations affecting EDM in the Target Sectors

Objective: To review government laws and regulations affecting EDM, to analyze their role in encouraging (or discouraging) energy efficiency and saving foreign exchange in the target sectors.

Rationale: Although the GOM has taken actions to address its energy problems (e.g. establishing high domestic prices for energy products, shortening the work week to five days, etc.), the effect of these actions is not accurately known. Similarly duty taxes on imported energy equipment are extremely high in Morocco and probably discourage the introduction of advances in energy demand management technologies.

Description: The study will:

- Analyze existing laws and regulations affecting EDM in the target sectors to determine the impact they have on firm operating procedures and practices.

- Identify and analyze alternatives to existing laws and regulations affecting EDM in the target sectors.

2. Investment decision making in EDM.

Objective: To increase the rate of implementation of energy conservation investments by analyzing and understanding the energy conservation decision making process in Morocco. The study will attempt to determine what makes enterprises invest in energy conservation by identifying and analyzing key factors that affect investment decisions.

Rationale: Many financially and technically attractive energy conservation projects exist and have been identified in Morocco, but the rate of implementation of investments has been very low. Moroccan decision makers as well as those at USAID and the donor community need to understand better why investments are not being made so that effective energy conservation activities can be designed and implemented.

Description: The study will:

- Collect data on two levels: micro (companies, projects identified and implemented) and macro (energy conservation environment or climate).

- Conduct a multivariable analysis to measure the impact of these variables on the rate of energy conservation project implementation.

- Gather information on variables that are difficult to quantify (e.g., investor attitudes, decision making styles).

- Provide a quantitative analysis on the impact of a number of variables identified on energy conservation investment.

- Recommend ways to increase investments in EDM, especially investments to increase productivity while saving energy.

ANNEX J

Implementing Technical Application Activities -- How it will work

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Step 1: The technical assistance contractor ("the contractor") meets plant management ("the plant") to identify candidate project activities such as audits, feasibility studies, technical applications, etc.

Step 2: The contractor drafts terms of reference (TOR) and contracts for work to be done at the plant (protypical contracts will have been developed earlier). Work may include several phases, e.g. prefeasibility and feasibility.

Step 3: The contractor requests three bids from local firms and evaluates bids.

Step 4: The plant provides formal agreement on the TOR, the contract, and implementing firm selection. The contract stipulates how much the plant will pay and what its obligation will be vis a vis the project.

Step 5: The selected implementing firm carries out the local component of the work (e.g., audit, feasibility study) leading to an action proposal for implementation of a specific technology application.

Step 6: The contractor reviews the proposal and reaches agreement with the plant on post-feasibility activities, including equipment procurement and installation conditions.

Step 7: The contractor requests approval of USAID on the proposal.

Step 8: Upon agreement from USAID, the contractor requests three bids from U.S suppliers, selects best bid and requests USAID approval for funding the U.S. dollar cost if USAID financing is required. (Bids to include maintenance contract provisions, ocean shipping, etc.).

Step 9: USAID approves (disapproves) and authorizes payment to supplier.

Step 10: The plant receives and installs equipment (with or without help of specialized local or U.S. firm).

ANNEX K

Economic Analysis

ANNEX K: ECONOMIC ANALYSIS

The economic success or failure of this project will depend most crucially on the way in which the EDM technologies offered are being adopted by the Moroccan firms. The feasibility studies have established that a potential exists. The project will have to tap as much as possible of this potential.

Throughout, conservative assumptions have been made. For example, the feasibility study identified between 60 and 70 thousand toe of energy savings possible in the construction materials sector. For the economic analysis we have assumed that the project will be able to realize only about one quarter of this potential, i.e. slightly over 15 thousand toe. This corresponds to about 100 to 150 firms actually implementing some EDM techniques and being moderately successful (four to six percent savings). The detailed assumptions and the resulting schedule of energy savings are given in Table K-1.

Even more conservative assumptions are made regarding agro-industry, primarily due to the prevalence of small firms in that sector. For the purpose of this analysis we predict energy savings of about 13 thousand toe out of a potential of 54 thousand toe identified by the feasibility study (see Table K-2). Only for the hotel sector have we adopted the figure estimated by the feasibility study, because this estimate seemed to be sufficiently conservative.

Table K-3 lays out the detailed economic analysis based on these assumptions. The discount rate is taken to be 15 percent. As a basis for the current oil price we take $16.50 per barrel, which translates into $129.95 per toe.

The first part of Table K-3 repeats the predicted energy savings from Tables K-1 and K-2 and adds the estimate for the hotel sector. We also list the specific investment necessary to bring about these savings for each sector, as they had been identified in the feasibility study. For example, in order to install equipment capable of saving one toe per year, firms in the construction materials industry can expect to have to spend about $410. The corresponding estimates are $600 per toe in the agro-industry, and $400 per toe in the hotel sector.

The next part lists the project planned expenditure by fiscal year, as well as the net present value of this planned expenditure stream (discounted to 1989 at 15 percent interest rate).

The remaining five parts provide the economic analysis based on the above assumptions for five possible oil price scenarios: constant oil prices at $16.50 per barrel, and oil price increases of 1, 2, 3, and 4 percent per year in real terms. The economic measures given are the benefit of the oil saved (after deduction of the specific investment costs necessary), the net benefit (after also deducting the project costs), and the internal rate of return. This last measure corresponds to the discount rate at which the net benefit (after deducting specific investments and project costs) would become zero.

As can be seen, the project shows satisfactory rates of return, even under the conservative assumptions employed here. The internal rates of return range from about 22 percent to 33 percent. A project investment of 5 million dollars (3.4 million in present value terms) is likely to generate between 8 to 16 million dollars in benefits, even after the specific investments necessary by the firms adopting EDM techniques are taken into account. The gross value of the energy saved is between 7 and 11 million dollars per year by the end of the project.

Table K-1: Predicted Energy Savings in the Construction Materials Industry Attributable to the EDM Project.

Total Sector Energy Use:	700000
number of Firms	300
Number of large firms (2000+ toe)	150
Average E use in large firms	4000
Total Energy use in large firms	600000
Total energy use in small firms	100000
Average E use in small firms	666.6666666
Savings potential in large firms	6.00%
Savings Potential in Small firms	4.00%
Number of direct beneficiaries:	12
Number of indirect beneficiaries	
Large	100
Small	20
E savings per Direct Beneficiary	240
E savings per Indirect Beneficiary	
Large	120
Small (use no cost/low cost tech.)	13.33333333
Specific Investment costs per toe saved:	
Large	$410
Small (use no cost/low cost tech.)	$100

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Direct Ben. (Cumulative)	2	6	10	12	12	12	12	12	12	12	12	12	12	12
direct E savings	480	1440	2400	2880	2880	2880	2880	2880	2880	2880	2880	2880	2880	2880
Indirect Ben. (Cumulative)														
Large		20	40	75	100	100	100	100	100	100	100	100	100	100
Small		5	10	20	30	30	30	30	30	30	30	30	30	30
Indirect E savings														
Large		2400	4800	9000	12000	12000	12000	12000	12000	12000	12000	12000	12000	12000
Small		66.66666666	133.3333333	266.6666666	400	400	400	400	400	400	400	400	400	400
Total Energy Savings														
Large	480	3840	7200	11880	14880	14880	14880	14880	14880	14880	14880	14880	14880	14880
Small	0	66.66666666	133.3333333	266.6666666	400	400	400	400	400	400	400	400	400	400
Combined Total	480	3906.666666	7333.333333	12146.66666	15280	15280	15280	15280	15280	15280	15280	15280	15280	15280

Table K-2: Predicted Energy Savings in the Agro-Industry Attributable to the EDM Project.

Total Sector Energy Use:	240000
number of Firms	1200
Number of large firms (2000+ toe)	50
Average E use in large firms	2500
Total Energy use in large firms	125000
Total energy use in small firms	115000
Average E use in small firms	100
Savings potential in large firms	20.00%
Savings Potential in Small firms	12.00%
Number of direct beneficiaries:	10
Number of indirect beneficiaries	
Large	20
Small	500
E savings per Direct Beneficiary	500
E savings per Indirect Beneficiary	
Large	250
Small (use no cost/low cost tech.)	6
Specific Investment costs per toe saved:	
Large	$600
Small (use no cost/low cost tech.)	$50

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Direct Ben. (Cumulative)	1	3	6	8	10	10	10	10	10	10	10	10	10	10
direct E savings	500	1500	3000	4000	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
Indirect Ben. (Cumulative)														
Large		1	5	10	15	20	20	20	20	20	20	20	20	20
Small		10	20	50	18	120	200	300	500	500	500	500	500	500
Indirect E savings														
Large		250	1250	2500	3750	5000	5000	5000	5000	5000	5000	5000	5000	5000
Small		60	120	300	108	720	1200	1800	3000	3000	3000	3000	3000	3000
Total Energy Savings														
Large	500	1750	4250	6500	8750	10000	10000	10000	10000	10000	10000	10000	10000	10000
Small	0	60	120	300	108	720	1200	1800	3000	3000	3000	3000	3000	3000
Combined Total	500	1810	4370	6800	8858	10720	11200	11800	13000	13000	13000	13000	13000	13000

Table K-3: Economic Cost-Benefit Analysis

	per bbl.	per toe
ic Oil Price (1989)	$16.50	120.945
count Rate	15.00%	

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
struction Materials Sector:															
Energy Savings due to Project	0	480	3,907	7,333	12,147	15,280	15,280	15,280	15,280	15,280	15,280	15,280	15,280	15,280	15,280
Specific Investment Necessary		$196,800	$1,405,070	$1,404,660	$1,973,740	$1,284,530	$0	$0	$0	$0	$0	$0	$0	$0	$0
o Industry															
Energy Savings due to Project	0	500	1,810	4,370	6,800	8,858	10,720	11,200	11,800	13,000	13,000	13,000	13,000	13,000	13,000
Specific Investment Necessary		$300,000	$786,000	$1,536,000	$1,458,000	$1,234,800	$1,117,200	$288,000	$360,000	$720,000	$0	$0	$0	$0	$0
el Sector															
Energy Savings due to Project	0	500	1,000	3,000	10,000	20,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Specific Investment Necessary		$200,000	$200,000	$800,000	$2,800,000	$4,000,000	$4,000,000	$0	$0	$0	$0	$0	$0	$0	$0
Sectors Combined:															
Energy Savings due to Project	0	1,480	6,717	14,703	28,947	44,138	56,000	56,480	57,080	58,280	58,280	58,280	58,280	58,280	58,280
Specific Investment Necessary		$696,800	$2,391,070	$3,740,660	$6,231,740	$6,519,330	$5,117,200	$288,000	$360,000	$720,000	$0	$0	$0	$0	$0
ect Expenditures:	$800,750	$1,329,800	$1,254,600	$956,300	$658,550										
Discounted to 1988 $3,400,927															
l Project Benefits (Assume oil price inc. = 0.00%)															
Value of oil saved net of specific investment necessary:		($517,801)	($1,578,682)	($1,962,406)	($2,730,745)	($1,181,060)	$1,655,720	$6,542,974	$6,543,541	$6,328,675	$7,048,675	$7,048,675	$7,048,675	$7,048,675	$7,048,675
Discounted to 1988 $7,606,512															
Project cash-flow after deducting Project costs:	($800,750)	($1,847,601)	($2,833,282)	($2,918,706)	($3,389,295)	($1,181,060)	$1,655,720	$6,542,97-	$6,543,541	$6,328,675	$7,048,675	$7,048,675	$7,048,675	$7,048,675	$7,048,675
Net Benefit: $4,205,584															
estimated IRR 22.22%															
l Project Benefits (Assume oil price inc. = 1.00%)															
Value of oil saved net of specific investment necessary:		($514,204)	($1,554,066)	($1,890,201)	($2,552,159)	($852,648)	$2,144,287	$7,108,966	$7,190,301	$7,066,122	$7,863,983	$7,942,623	$8,022,049	$8,102,270	$8,183,292
Discounted to 1988 $9,421,172															
Project cash-flow after deducting Project costs:	($800,750)	'$1,844,004)	($2,808,666)	($2,846,501)	($3,210,709)	($852,648)	$2,144,287	$7,108,966	$7,190,301	$7,066,122	$7,863,983	$7,942,623	$8,022,049	$8,102,270	$8,183,292
et Benefit: $6,020,245															
stimated IRR 24.91%															

Table K-3: Economic Cost-Benefit Analysis (Cont.)

	per bbl.	per ton
Basic Oil Price (1989)	$16.50	120.945
Discount Rate	15.00%	

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Project Benefits (Assume oil price inc. = 2.00%)															
Value of oil saved net of specific investment necessary:		($510,570)	($1,528,958)	($1,815,820)	($2,366,359)	($507,570)	$2,662,756	$7,715,574	$7,890,370	$7,872,295	$8,764,141	$8,939,424	$9,115,212	$9,300,575	$9,486,589
Discounted to 1989 $11,403,482															
Project cash-flow after deducting Project costs:		($900,750)	($1,840,370)	($2,783,558)	($2,772,120)	($2,024,909)	($507,570)	$2,662,756	$7,715,574	$7,890,370	$7,872,295	$8,764,141	$8,939,424	$9,115,212	$9,300,575	$9,486,589
Net Benefit: $8,402,554															
estimated IRR 27.63%															
Total Project Benefits (Assume oil price inc. = 3.00%)															
Value of oil saved net of specific investment necessary:		($506,900)	($1,503,352)	($1,739,219)	($2,173,127)	($145,156)	$3,212,637	$8,265,273	$8,647,555	$8,752,829	$9,757,914	$10,049,725	$10,351,216	$10,661,753	$10,981,605
Discounted to 1989 $13,555,078															
Project cash-flow after deducting Project costs:		($900,750)	($1,836,700)	($2,757,952)	($2,695,519)	($2,831,677)	($145,156)	$3,212,637	$8,265,273	$8,647,555	$8,752,829	$9,757,914	$10,049,725	$10,351,216	$10,661,753	$10,981,605
Net Benefit: $10,169,151															
estimated IRR 34.38%															
Total Project Benefits (Assume oil price inc. = 4.00%)															
Value of oil saved net of specific investment necessary:		($503,195)	($1,477,244)	($1,660,354)	($1,972,244)	($235,285)	$3,795,501	$9,060,659	$9,465,891	$9,713,760	$10,851,111	$11,285,155	$11,736,561	$12,206,024	$12,694,265
Discounted to 1989 $15,935,043															
Project cash-flow after deducting Project costs:		($900,750)	($1,832,595)	($2,731,844)	($2,616,254)	($2,670,734)	($235,285)	$3,795,501	$9,060,659	$9,465,891	$9,713,760	$10,851,111	$11,285,155	$11,736,561	$12,206,024	$12,694,265
Net Benefit: $12,534,115															
estimated IRR 37.15%															