ESMAP

Energy Sector Management Assistance Programme

July 1995

Morocco

Energy Sector Institutional Development Study

Report No. 173/95

JOINT UNDP / WORLD BANK
ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

PURPOSE

The Joint UNDP/World Bank Energy Sector Management Assistance Programme (ESMAP) is a special global technical assistance program run by the World Bank's Industry and Energy Department. ESMAP provides advice to governments on sustainable energy development. Established with the support of UNDP and 15 bilateral official donors in 1983, it focuses on policy and institutional reforms designed to promote increased private investment in energy and supply and end-use energy efficiency; natural gas development; and renewable, rural, and household energy.

GOVERNANCE AND OPERATIONS

ESMAP is governed by a Consultative Group (ESMAP CG), composed of representatives of the UNDP and World Bank, the governments and other institutions providing financial support, and the recipients of ESMAP's assistance. The ESMAP CG is chaired by the World Bank's Vice President, Finance and Private Sector Development, and advised by a Technical Advisory Group (TAG) of independent energy experts that reviews the Programme's strategic agenda, its work program, and other issues. ESMAP is staffed by a cadre of engineers, energy planners, and economists from the Industry and Energy Department of the World Bank. The Director of this Department is also the Manager of ESMAP, responsible for administering the Programme.

FUNDING

ESMAP is a cooperative effort supported by the World Bank, UNDP and other United Nations agencies, the European Community, Organization of American States (OAS), Latin American Energy Organization (OLADE), and public and private donors from countries including Australia, Belgium, Canada, Denmark, Germany, Finland, France, Iceland, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Sweden, Switzerland, the United Kingdom, and the United States.

FURTHER INFORMATION

An up-to-date listing of completed ESMAP projects is appended to this report. For further information or copies of completed ESMAP reports, contact:

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MOROCCO

ENERGY SECTOR

INSTITUTIONAL DEVELOPMENT STUDY

JULY 1995

Power Development, Efficiency
and Household Fuels Division
Industry and Energy Department
The World Bank
1818 H. St., N.W.
Washington, D.C. 20433

CURRENCY EQUIVALENTS
(as of December 1993)

Currency Unit = Moroccan Dirham
US$1 = Dh 9.4

MEASUREMENTS

Bbl	Barrel of oil	0.15899 cubic meter = 42 US gallons
BTU	British Thermal Unit	0.252 kilocalaries = 1.055 kJ
GWh	Gigawatt-hour	1,000,000 kilowatt-hours (kWh)
kg	kilograms	1,000 grams
kcal	kilocalorie	4.19×10^{-3}MJ = 3.968 BTU
km	kilometer	1,000 meters; 0.62 miles
kV	kilovolt	1,000 volts
kWh	kilowatt hours	1,000 Watt hours
m^3	cubic meter	1,307 cubic yards
MJ	megajoules	10GJ = 10^3kJ
MVA	megavolt ampere	1,000 kilowatt amperes
MW	megawatt	1,000 kilowatts; 1,000 kW
MWh	megawatt hour	1,000 kilowatt hours = 860,000 kcal = 0.248 TOE at 34% efficiency in thermal (oil) generation
TOE	Tons of Oil Equivalent	10.2 million kcal = 40.5 million BTU = 42.5 GJ
t	metric tons	1,000 kilograms; 2,204.6 pounds
lb	pound	0.454 kilograms
l	liter	1,057 quarts (liquid)

ENERGY CONVERSION FACTORS

Fuel	Bbl/Ton	Litre/Ton
LPG	11.60	1,852
Kerosene	7.90	1,235
Gasoline	8.50	1,350
Diesel	7.30	1,150
Fuel oil	6.70	1,099

ENERGY CONVERSION FACTORS

Fuel	GJ = 10^3MJ/unit	Physical Units/TOE
Liquid fuels (tons):		
Crude oil	42.7	1.00
LPG	45.2	0.94
Kerosene	43.1	0.99
Jet fuel	43.5	0.98
Gasoline	44.0	0.97
Gasoil	42.7	1.00
Industrial diesel oil	42.3	1.01
Fuel oil	41.0	1.04
Methane	33.5	
Electricity (MWh)	3.6 (per def.)	4.0
Fuelwood (ton)	16 a/	2.91
Charcoal (ton)	30 a/	1.46

a/ Air-dried wood, 15% moisture content wet basis (m.c.w.b.).

ABBREVIATIONS

DH	Moroccan Dirham
GM^3	one billion cubic meters
GWh	Gigawatt hour
kg	Kilograms
ktoe	thousand tons of oil equivalent
kV	Kilovolts
kW	Kilowatt
kWh	Kilowatt hour
LNG	Liquified Natural Gas
LRMC	Long-run marginal cost
Ltd	Limited
LV	Low Voltage
M	million
M^3	cubic meter
MM	billion
MVA	Mega-volt ampere
MW	Megawatt
t	metric ton
toe	tons oil equivalent
US$	U.S. dollar

ACRONYMS

CCGT	Combined Cycle Gas Turbine
CDER	Centre de Developpement des Energies Renouvelables/ Renewable Energy Development Center
CIPEP	Commité Interministériel Permanent des Entreprises Publiques/ Permanent Interministerial Committee for Public Anterprises
DE	Direction de l'énergie/Directorate of Energy
EMPL	Europe-Maghreb Pipeline Limited
ESMAP	Energy Sector Management Assistance Programme
GDP	Gross Domestic Product
GME	Gas Maghreb-Europe Pipeline
GNP	Gross National Product
GT	Gas Turbine
IDA	International Development Association
IFC	International Finance Corporation
IPP	Independent Power Producer
LPG	Liquified Petroleum Gas
MEM	Ministère de 'énergie et des mines/Ministry of Energy and Mining
MIGA	Multilateral Investment Guarantee Agency
OCP	Office Chérifien des Phosphates (phosphate company)
ONAREP	Ofice National de Recherche et exploitation Petrolières/National Office for Petroelum Exploration and Development
ONE	Office National de l'Electricité (national power utility)
PA	Purchasing Agency
PCE	Production Concessionnelle d'Electricité
SAMIR	Société Anonyme Marocaine de l'Industrie du Rattinage/ Moraccon Refining Industry Corporation
SCP	Société Chérifienne des Pétroles (petroleum company)
SNPP	Société Nationale des Produits Pétroliers (petroleum company)
SONATRACH	Société Nationale de Transport, Recherche et Production d'Hydrocarbures (Algerian national petroleum company)
SODUGAZ	Société de Developpement et d'Utilisation du Gaz (Gas Development Company)
UNDP	United Nations Developmen Programme
USAID	U.S. Agency for Inernational Development

FISCAL YEAR

January 1 - December 31

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PREFACE

In early 1993, the Government of Morocco requested ESMAP assistance to undertake a study on the restructuring and institutional development of the Morocco energy sector. The objective of this activity was to establish an overall framework for the re-organization of the energy sector which needs to be developed in line with the country's economic policies related to privatization, market liberalization, restructuring of the sector and future introduction of natural gas.

A reconnaissance mission visited Morocco in March 1993 to define and agree with the Government on the study methodology, work program and schedule. It was agreed that the study would be carried out jointly by an ESMAP/World Bank team and a local Task Force, established by the Ministry of Energy and Mines (MEM). The Task Force was headed by Mr. A. Bouhaouli, advisor to the cabinet, and included Mme. A. Haddouche (Natural Gas), L. Afsahi, (Electricity) S. El Aoufir (Petroleum Products), M. Adyel (Energy Conservation). Mr. R. Filali, (Lawyer, Consultant) was responsible for drafting the natural gas legislation. The main mission visited Morocco in June-July 1993 and included Mr. A. Ferroukhi (Mission Leader, IENPD), Ms. E. Battaglini (Economist, IENPD) and Messrs. J.M. Chevalier (Energy Economist, Consultant), B. Dutkiewicz (Refinery Specialist, Consultant), D. Robinson (Power Specialist, Consultant), B. Laponche (Energy Efficiency Specialist, Consultant), R. Pleasant (Lawyer, Consultant). Messrs. J.P. Charpentier (IENPD), C. Khelil, H. Beaussant (IENOG) and J. Larrieu (MN1IE) provided assistance to the mission team.

The study was developed in three phases: (1) diagnostic of the sector and analysis of the main issues; (2) identification of institutional alternatives for reorganizing and strengthening the energy sector; and (3) selection of the most suitable options.

The preliminary results of the study were presented during a three-day energy seminar on "Prospects for Development of the Morocco Energy Sector" which was jointly organized by the MEM and ESMAP/World Bank and took place in Rabat on December 13-15, 1993. The seminar was conceived and designed to involve Moroccan high-level decision makers in defining the needs and options for the energy sector restructuring and preparing a plan of action for implementation. The seminar main achievement was reaching the consensus among the parties on a set of recommendations which would constitute the framework for the Government action plan. The seminar conclusions and recommendations, most of which have been endorsed by ESMAP/World Bank, have been incorporated in this report at the end of each chapter.

In line with the main conclusions and recommendations of the ESMAP/World Bank study, the Government is already implementing some sector reforms, in particular for what concerns the restructuring of the power sector and, to some extent, of the petroleum sector.

The energy sector is leading the process of liberalization and privatization of the Moroccan economy. This process aims at achieving two major objectives of the country energy strategy, namely providing least-cost energy and increasing access to energy in rural areas.

In the electricity sector, competitive bidding for private provision of electricity has been recently introduced. The approach adopted by the Government - Production Concessionnelle d 'Electricité (PCE) - is the first step in the process of separating ONE's activities in generation, transmission and distribution. In the petroleum sector, the Government withdrew completely from the distribution of petroleum products, and this activity is now handled by the private sector. The next step will be the privatization of SAMIR. As concerns the recommended regulatory environment, the MEM has set up a committee whose responsibility will be to identify the options and implementation schemes for the establishment of a regulatory agency.

The team wishes to express their appreciation to the Government of Morocco, to the many enterprises and organizations in the power and hydrocarbon sectors for the guidance, cooperation and assistance rendered to the ESMAP/World Bank during the preparation of the report and the organization and development of the seminar.

This activity has been funded by UNDP, UNDP/Government of Morocco, and the World Bank. This report has been prepared by Ms. Emilia Battaglini with the assistance of Mmes. Gwendolyn White, Linda Walker-Adigwe and Vonica Burroughs.

EXECUTIVE SUMMARY

OVERVIEW

1. Morocco is heavily dependent on imported energy to meet its energy demand. This dependence has had an unusually large impact on Morocco's economy and environment, affecting foreign exchange, the national debt, and government revenues and investment budgets.

Background Data, 1992

• **Population: 26.2 Million** (Growth Rate 1980-92: 3.8%	• **GDP: US$ 28.4 Billion** (Growth Rate 1980-92: 4.0% p.a.) • **Per Capita GDP: US$ 1,084**
• **Energy Consumption: 10.8 Mtoe** Commercial: 7.3 Mtoe Traditional: 3.5 Mtoe	• **Energy Imports: US$ 1,103 Million** (15% of Total Imports) • **Ratio of Energy Dependency: 92%**
• **Energy Consumption Per Capita** (kgoe per capita) **Morocco 278** Tunisia 567 Algeria 614 Spain 2409 France 4034	• **Energy Intensity** (kgoe per US$ 1000 of GNP) **Morocco 256** Tunisia 344 Algeria 453 Spain 164 France 175

Source: WDR 1994 and mission estimates.

2. Throughout the past decade (1981-90), the government has sought to ameliorate Morocco's oil dependence by converting to other fuels and developing indigenous resources. For the current decade (1991-2000), the Government has established an energy policy emphasizing: optimization of energy supply conditions and investigation of alternative supply strategies; improvement of demand-side management; promotion of private sector participation; protection of the environment. ESMAP recommends that these efforts be supported through projects for natural gas development, gas pricing and institutional restructuring of the energy sector.

3. The process of liberalization of the economy decided by the Government and supported by the Bank is currently being implemented. The law on the liberalization of external trade is being implemented and the Government has called for the improvement of the private/foreign investment environment and for an acceleration of the privatization process. These initiatives are expected to induce significant changes in the energy sector, particularly for what concerns:

- power sector reform;
- the traditional way of supplying petroleum products and the protection of the refining industry;
- the reorganization of the petroleum product distribution industry, and, in the medium term, of other public enterprises (refineries, ONE, Regies);
- the availability of new sources of financing, especially private and foreign, to meet the growing investment requirements of the sector.

4. The energy sector response to the changing economic/institutional environment requires a combination of short-term and long-term initiatives. In the short term the sector must address the issues of shortages and inefficiencies in the power sub-sector as well as the pricing and taxation regime in the petroleum product sub-sector. These are the major obstacles to the private investment participation and to the development of the sector in general. The sector should also start immediately to develop the institutional framework in which the private investors will operate; as a medium-term objective, the implementation of the most suitable institutional option for the Moroccan energy sector should be considered. In the long-term, the sector should focus on developing the most efficient, least cost option to meet the country energy requirements.

THE ELECTRICITY SECTOR

ISSUES

5. The Moroccan electricity sector has been experiencing a number of serious problems, including:

- power shortages;
- a substantial build-up of unpaid bills and debts;
- a lack of management autonomy from Government ministries;
- absence of competition among enterprises;
- a lack of coordination between the enterprises;
- absence of a predictable and economically sound approach to tariff regulation;
- absence of a clear legal code and regulatory system for the sector.

6. Morocco also faces a number of difficult policy decisions in the electric sector. For instance how to realize the substantial investment program in generation required to meet expected electricity demand, and how to curb demand growth especially at peak. It needs to take advantage of the advent of gas in Morocco as a result of the construction of the gas pipeline linking Algeria with Spain through Morocco (GME).

7. The Government of Morocco has already embarked upon wider economic reforms which favor private investment and liberalization. It has also indicated support for private investment in electricity generation. Different potential reform paths exist, some more radical than others and requiring more substantial changes to the structure and regulation of the sector. More radical reform programs, such as the one in England & Wales, usually claim more substantial benefits in the long term, but at substantial potential cost in terms of the efforts required to make the transition and with uncertainty as to the outcome. Less radical reform, for

instance allowing for independent generation but leaving the industry structure essentially unchanged, may promise less in the longer term but is easier to introduce and the short-term benefits are more certain. It is therefore essential to define the objectives and priorities carefully before embarking on any institutional reform path.

OPTIONS AND RECOMMENDATIONS

Short-Term Measures

8. Competitive Bidding By Private Sector Generators: It has been recommended and agreed by the Government to adopt competitive bidding to select the first (and future) independent generators, rather than negotiating only a direct deal with a single developer. It has also been recommended and agreed that the Government commission a study of the rules and procedures that need to be adopted to encourage independent power production in Morocco.

9. Energy Demand: It is recommended that the Government, the power utility ONE (Office National d'Electricité) and the regional distribution companies (*Régies*) take advantage of the awareness of Moroccan customers to electricity shortages in order to strengthen CDER (Centre de Développement des Energies Renouvables) as promoter of demand-side management programs aimed at energy efficiency and conservation.

10. Unpaid Bills: Most recently, the introduction of a new system of payment which imposes penalties for late payment has been proposed; the enforcement of such a system is a necessary precondition to improve the enterprises' financial performance. It is clear that the issue is one of discipline, autonomy and management incentives of public sector organizations at all levels. This suggests a need for more fundamental institutional reforms as proposed in the Plan of action (par. 14.).

11. Tariff Reform: The Government should give immediate attention to the introduction of a tariff structure that reflects economic costs, and in particular, to measures discouraging consumption in peak hours and months. The Government has agreed to update the LRMC tariff study, including the design of a system of tariff regulation, and, as a result, implement new tariff level/ structures.

Long-Term Options

12. Some of the most beneficial reforms in the electricity sector involve measures aimed at promoting competition in electricity generation, while introducing incentive regulation in those parts of the business with strong elements of natural monopoly (transmission and distribution) . Three possible structural models for introducing competition into generation have been considered:

- Competitive bidding to supply electricity to ONE.
- Competitive bidding to supply a Purchasing Agency (PA).
- Competing generators sell direct to distribution companies.

It is feasible to imagine the first model as an initial step towards a more liberalized electricity system.

13. Reform Options in Electricity Distribution: The *Régies* (regional distribution companies) do not have the autonomy from political pressures, nor the incentives, to make commercially necessary decisions. These findings lead to recommend a reform of the institutional and regulatory options for the distribution sector. The reforms are related to the following four basic issues :

- relationship of the electricity distribution business to other parts of the electricity industry (generation and transmission) and to other municipal services (water and sewerage);
- regulatory and other economic incentives to provide more efficient and better quality electricity distribution services;
- "retail competition" to supply final customers;
- introduction of private capital or management to the electricity distribution business.

PLAN OF ACTION

14. During the seminar which took place in December 1993, a consensus among the parties involved in the management and operation of the power sector was reached. Specific measures would be implemented in the short to medium term and, some strategic measures for the restructuring and reforming of the sector would be fully developed over a long-term period. These measures were agreed upon and endorsed by the participants of the seminar who are decision-makers from within the industry and from the administrations concerned.

Specific Measures

- agree on and enforce a solution for past electricity arrears at the earliest;
- introduce and enforce a new system of payment which includes late payment penalties;
- adjust the price of electricity up to its economic cost to meet the currently existing gap;
- eliminate the fiscal distortion between fuel oil and imported coal which applies to ONE;
- submit all IPPs to competitive bidding, in order to ensure real competition in power production;
- strengthen ONE demand-side management programs.

Strategic Measures

- adopt a "gradual" structural reform model, with no major shocks, i.e. corporatization of ONE into three independent and autonomous companies - generation, transmission (power pooling & planning) and distribution
- prepare a new law and regulations - Electricity Code - which defines principles and rules for the operation of the sector, with the assistance of local and international legal experts;

- create an independent regulatory body to monitor the law and regulations enforcement.

RECENT DEVELOPMENTS

15. Recently, MEM and ONE have decided to implement some of the recommendations described above and the strategy followed includes a set of measures to attract the private sector in power generations. MEM has requested the World Bank's assistance in realizing the following program: corporatization of ONE into three independent agencies; preparation and implementation of the new electricity law and regulations; preparation of bidding documents and power purchase agreements for independent power producers; and update of the LRMC tariff study and implementation of new tariff levels and structures. MEM and ONE have requested the World Bank's advice and assistance and the Bank will provide financial support for preparing the electricity law and code and the IPPs bidding documents and PPAs, and for the updating of the tariff study and the implementation of new tariff level and structure.

THE PETROLEUM SECTOR

ISSUES

16. For the last eight years the petroleum sector has been under close scrutiny and analysis in an effort to make it more efficient and competitive. The question of international competitiveness of the refining subsector continues to be the focal point of petroleum sector efficiency considerations. Three new exogenous factors are influencing the restructuring of the petroleum sector:

- Privatization, which has already begun in the petroleum distribution subsector.
- Foreign trade liberalization (loi de libéralisation du commerce extérieur) which will affect petroleum product imports.
- Introduction of natural gas from Algeria, which will severely alter the market structure for petroleum products in Morocco.

17. The policy of petroleum sector liberalization is generally supported by the Government and the sector. There is less unanimity, however as to the route and timing that this liberalization should take, and as to what the optimum structure of the sector should be to provide the lowest cost of supply of petroleum products to the country, while at the same time maintaining security of supply.

18. The major issues the petroleum sector is facing can be summarized as follows:

- Market structure characterized by major distortions in price and taxation and potential severe changes that could be caused by the introduction of natural gas;
- Sector organization: privatization has begun in the distribution sector but no plan has been made for the overall petroleum supply optimization, including the future of the two domestic refineries;

- Petroleum pricing and taxation: prices are controlled, their structure fixed, and the taxation mechanism cumbersome.

19. Some of the above recommendations endorsed by the seminar call for the following observations. The Bank considers that the country would be better served by decontrolling ex-refinery prices and liberalizing imports so that the two domestic refineries would have to compete with oil imports at world prices without any imports barriers. With the elimination of the current import licensing restrictions on the imports of petroleum products, the seminar proposed the establishment of a differential tariff system between crude oil and products for a transitionary period, and subsequent decontrol of imports and prices. The Bank suggests that if this route is taken, the differential tariff imposed on petroleum products be gradually phased out during the duration of the transition period.

OPTIONS

20. The Government has started to move in the direction of a more liberal and open petroleum sector under the impetus of the privatization and the liberalization of foreign trade laws. The ultimate stage of liberalization, the timing of implementation, and the intermediate steps taken are not yet well defined. Three scenarios have been envisaged to take into account the impact, in terms of savings and risks, of different policy options on the sector restructuring:

- Scenario 1: Liberalization of the petroleum sector in the shortest practical time, consistent with the implementation of the Trade Privatization Law. This scenario envisages the rapid and extensive liberalization of the Moroccan petroleum sector resulting in unrestricted import or export of petroleum products; a domestic industry unrestricted by price or margin controls, and/or taxation distortions. This would meet the immediate objectives of the foreign trade and privatization laws; and establish a free market system where decisions at the supply and consumer levels are set by border prices for tradable petroleum products.

- Scenario 2: Progressive decontrol with longer term retention of a domestic refining capability. The objective of this scenario is to provide the lowest cost supply of petroleum products to the country based on internationally dictated border prices, while at the same time retaining the flexibility of supply afforded by maintaining the most efficient domestic refining capability. This scenario explores the operational and investment options that should be considered if the decision is made to retain a long-term domestic refining capability.

- Scenario 3: Deregulation, following a transition period to allow the industry to adapt to the competitive requirements. This scenario falls between Scenario 1 and 2, in that refineries are protected from excessive competition for a very limited transition period. After a transition period (three years), the refining sector would be decontrolled and expected to fend on the open market.

PLAN OF ACTION

21. During the Seminar of December 1993, a set of specific and strategic measures were recommended based on the discussion of the above options.

Specific Measures

- eliminate fiscal distortions between gasoline and gasoil by taxation of diesel (vignette);
- adopt fiscal harmonization for all fuels;
- introduce indexation system in parallel with the application of new trade law;
- extend off-shore zone to refinery product and profit;
- address the issue of special tariff agreements with selected supplier countries.

Strategic Measures

- gradually eliminate import monopoly;
- allow five year transition period for refineries to adapt to a competitive, unprotected environment;
- diversify and vertically integrate refinery upstream and downstream;
- strengthen anti-dumping measures;
- establish regulatory body for petroleum distribution industry using SNPP;
- regulate import, storage and distribution of LPG.

RECENT DEVELOPMENTS

22. The Government objective is to arrive at the complete decontrol of the petroleum sector and thus ensure the optimization of the petroleum market supply. The privatization of the SAMIR refinery is considered within this global context. The objective is to open the sector to private investors, both national and international.

THE NATURAL GAS SECTOR

ISSUES AND OPTIONS

23. The introduction of natural gas in Morocco will help achieve broader economic goals, including increasing the competitiveness of domestic industries, stimulate economic growth and attract foreign investment. To maximize these benefits several key issues must be addressed. They include institutional decisions on the structure of the industry as well as the legal framework and creation of a regulatory authority to oversee the industry. The Government needs to develop and continually revise market strategies to enable the economic expansion of the pipeline system and increased use of gas by the electric power utilities.

24. The major areas of analysis for the development of natural gas are:

- global approach to a new energy policy: the introduction of large quantities of natural gas into Morocco will introduce major structural changes in the country's energy sector. It implies inter-fuel substitution and increased inter-fuel competition. It brings more flexibility, less pollution, regulation of the industry, and new forms of organization. Therefore, the introduction of natural gas into the economy must be planned carefully, taking into account natural gas'

characteristics and the role that this new energy source will play in the national energy policy;

- supply of natural gas includes: transit gas, commercial gas contracted with Algeria, and other potential sources of natural gas;

- institutional issues: the organization of the industry in an open market environment, the gas legislation needed for transmission and distribution, gas authority in charge of economic, administration and technical regulation;

- economic issues in general and pricing, tariffs and taxation in particular: pricing principles and regulation, fiscal regime, financing, risk and guarantees.

PLAN OF ACTION

25. During the Seminar, the following strategic as well as specific measures have been recommended in order to finalize the institutional, financial and legal management necessary to implement and expedite the use of natural gas in Morocco:

Specific Measures

- define gas tariff principles which allow cost recovery (transport and distribution) and fair profit margins to the investors while protecting the interests of the consumers;
- ensure a fair fiscal regime, by considering the impact on fuel diversification, environment infrastructure and industrialization);
- promulgate the gas code (under preparation).

Strategic Measures

- prevent state monopoly and abuse of monopoly power;
- grant pipeline concessions for a limited period;
- ensure free access to the transmission line;
- regulate prices and tariffs;
- establish a regulatory body financed by the gas industry itself.

RECENT DEVELOPMENTS

26. The draft Gas Code has been ecently completed, and will soon be submitted to the Government. As a follow up of the ESMAP institutional study, ESMAP has launched a Gas Tariff Study, with the active participation of the Task Force and SNPP staff. MEM is in favor of the Wold Bank Group participation in the financing of the domestic Gas Network which should be built with private partners, following the construction of the Gas Maghreb-Europ Pipeline (GME). In line with the conclusions of the ESMAP Gas Development Study (Phase II), MEM would like to promote gas utilization in the industrial sector. The expected development of the future gas industry implies gas supply to industrial installation along the major economic axis Kenitra-Mohammedia-Casablanca.

ENERGY EFFICIENCY, RENEWABLE ENERGY AND ENERGY PLANNING

ISSUES

27. Morocco's energy supply is not sufficient to meet demand, presenting a major impediment to economic and social development. The economic and political constraints of energy dependence are joined by social and environmental constraints. Resource and financial constraints, as well as the increasing difficulty of managing the entire energy system (supply and demand) during a period of transition and uncertain future, could turn the current critical situation into potential crises with :

- power supply disruptions and load shedding (as mentioned above) with severe economic production and social repercussions;
- woodfuel deficit and environmental consequences, which stress the issue (economic, social and political) related to rural electrification and in general to energy supply to rural communities;
- potential crisis due to rapid, uncontrolled increases in LPG consumption (which is the only credible short-term alternative for woodfuels).

28. In order to attenuate the energy supply/demand imbalance it is necessary to:

- improve efficiency in energy uses;
- develop renewable energy resources, both in the "new energy" sector (such as thermal solar, photovoltaics, wind-power generators and mini-hydro) which are particularly useful for decentralized electrification, and in the use of biomass, through more modern and efficient techniques.

29. The major issues the energy sector must address for the development of an overall energy strategy are:

- insufficient energy supply: the country has limited natural resources and a low, imbalanced energy consumption;
- considerable, underutilized renewable energy potential;
- inefficient use of energy, especially in urban areas and industrial plants.
- insufficient resources for an effective energy demand management;
- lack of an integrated energy planning.

RECOMMENDATIONS

30. Since there is a trend towards greater institutional autonomy, more competition, open markets and greater private sector involvement, the country must strive to create appropriate conditions for developing energy efficiency and renewable energy which stimulate participation by economic agents, yet restrain public sector management of these activities. Two modifications to the current situation will facilitate this objective:

- a strong energy planning core should be created within the Energy Department so that the Government has access to all factors essential to developing an energy policy;

- CDER (Centre de Développement des Energies Renouvelables) should be given the responsibility to promote and provide incentives for energy efficiency, in conjunction with its mission to develop renewable energy.

31. These modifications are fundamental to providing a new dynamic within the energy sector, yet will not require a complete overhaul of the existing organizational structure. In fact, they are a logical extension of past activities conducted primarily by the Energy Directorate (Direction de l'Energie). This arrangement makes the Authorities' willingness to advance in the areas of energy efficiency and renewable energy more concrete.

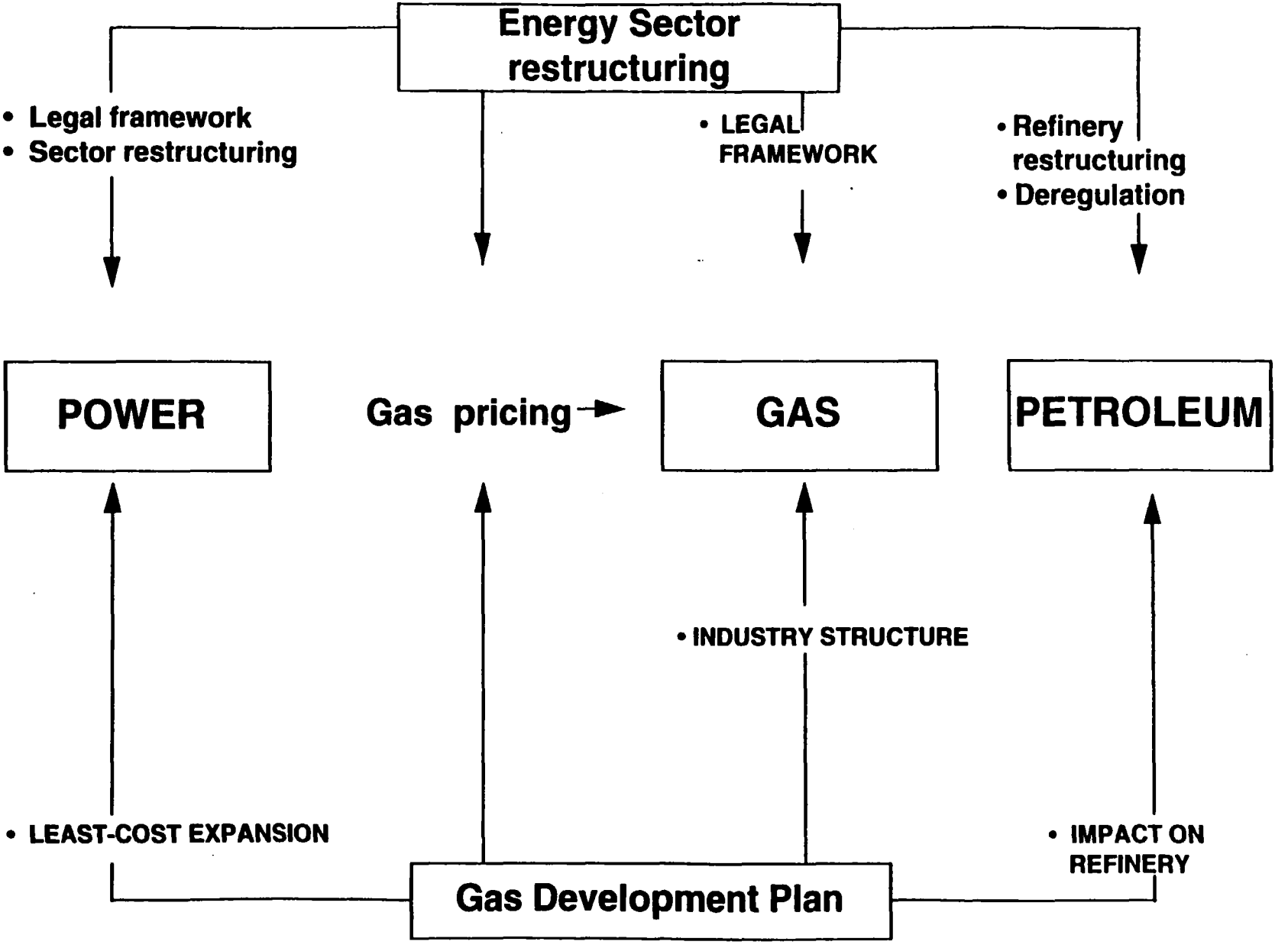
32. The so-called "demand-side" actions currently adopted are in reality "short term actions to manage power shortages by imposing demand reductions and power cuts". The immediate predicament caused by power shortages highlights the need for actions which target improved efficiency in electricity utilization. Such actions should be designed not only to attenuate the immediate effects of the crisis, but to lay the foundation for long-term efficiency conversion throughout power consuming sectors. Focus is needed also on efficiency related issues upstream from demand actions, where it is vital to develop autonomous power generating capacity in key industries (refining, sugar) which could be used for cogeneration. Given the urgency of the current situation, it is essential that the Government take a decision:

- to proceed quickly with an inventory of resource supply and availability;
- to establish an ONE purchase price with favorable terms for industrial cogenerators;
- to have ONE agree to take on the investment expenditures necessary to establish connections with cogenerators, within technically appropriate bounds.

RECENT DEVELOPMENTS

33. The planning and studies division has been recently reorganized. Its new responsibilities include formulating energy policies and representing the MEM in its interaction with the institution operating outside the energy sector. Energy efficiency and renewable energy will be one of the main areas of responsibility of this new division.

Morocco Energy Sector Strategy



I. THE ELECTRICITY SECTOR

INTRODUCTION

1.1 The Moroccan electricity sector has been experiencing a number of serious problems, including:

- power shortages which are expected to last until the end of 1994 and which reveal problems related to investment planning and financial constraints;
- a substantial build-up of unpaid bills and debts throughout the sector, which has resulted in financial trouble for individual enterprises;
- a lack of management autonomy from Government ministries, which in turn leads to political interference and discourages management initiative;
- absence of competition among enterprises in the sector and therefore less incentive for enterprises to be efficient;
- a lack of coordination between the enterprises in the sector, particularly between the monopoly generation company (ONE) and the municipal distribution companies (*Régies*);
- absence of a predictable and economically sound approach to tariff regulation, with the consequence that tariffs do not properly reflect economic costs and do not adjust to reflect inflation rate and fuel cost changes; and
- absence of a clear legal code and regulatory system for the sector, with instead a complicated set of overlapping ministerial and other controls over the different enterprises in the sector.

1.2 Morocco also faces a number of difficult policy decisions in the electric sector. For instance how to realize the substantial investment program in generation required to meet expected electricity demand, and how to curb demand growth especially at peak. It needs to take advantage of the advent of gas in Morocco as a result of the construction of the gas pipeline linking Algeria with Spain through Morocco (GME).

1.3 The Government of Morocco has already embarked upon wider economic reforms which favor private investment and liberalization. It has also indicated publicly support for private investment in electricity generation. In order to mobilize private funds, whether foreign or domestic, investors need to be assured that they have adequate guarantees of earning an appropriate return. The best guarantee is a power sector structure which ensures that each enterprise is run as an efficient business; that customers pay enough to cover the costs of the new investment; that incentives are in place to promote the most efficient construction and operation of generation plants and of transmission and distribution services; and that the industry takes advantage of the economies in fuel use created by economic (merit order) despatch and fully

utilizes other economies available to a network system. A legal and regulatory system needs to be in place to ensure these objectives are met.

1.4 There are many different potential reform paths, some more radical than others and requiring more substantial changes to the structure and regulation of the sector. More radical reform programs, such as the one in England & Wales, usually claim more substantial benefits in the long term, but at substantial potential cost in terms of the efforts required to make the transition and with uncertainty as to the outcome. Less radical reform, for instance allowing for independent generation but leaving the industry structure essentially unchanged, may promise less in the longer term but is easier to introduce and the short-term benefits are more certain. It is therefore essential to define the objectives and priorities carefully before embarking on any institutional reform path.

1.5 This chapter first analyses the most important issues the Moroccan power sector now faces; then it discusses structural and legal/regulatory reform options and finally presents the action plan for the sector development. A description of the sector (demand/supply balance, players, institutional setup, economic and financial overview) and its main trends is given in the Annex 1.

MAIN ISSUES

1.6 The most important issues which the sector has to address are:

- capacity shortage;
- promotion of private investment;
- level and structure of electricity prices;
- management autonomy and incentives;
- lack of coordination and predictable regulation;
- unpaid bills.

A. Capacity Shortage

1.7 The reasons for the shortage (which is expected to continue until end 1994) are primarily on the supply side, but also related to demand. On the supply side, ONE's planning models have assumed a hydro cycle which has turned out to be too optimistic; indeed, Morocco has had 12 years of dry weather, whereas planning models assume a mixture of dry and wet years. The result is that hydro has provided as little as 60 MW at times, whereas planning models assume that the minimum (in dry years) will be 315 MW. The planning model assumptions are now being reviewed. If the result of that review were to reduce forecasts of the minimum guaranteed hydroelectric capacity, this would have important implications for the size of future capacity requirements and the relative balance between investment in hydroelectric plants and in thermal plants. In effect, it would increase the estimates of necessary investments in coming years.

1.8 Also on the supply side, there have been long delays in the commissioning of plants, for instance Matmata (240 MW, due in service end 1992, but which won't be commissioned until the second semester of 1994). These delays are largely due to the form of

financing: bilateral country credits which require a considerably longer approval process (mainly in the donor country) than is true for normal supplier-credits. On the other hand, the bilateral country credits are very low cost (10 years grace, payback over next twenty years, interest rate 1.5%) compared to supplier credits (10 year payback at 8-10% interest). This explains why the Ministry of Finance prefers ONE to finance investment with bilateral country credits. The issue here is not simply one of delay, but rather one of weak financial autonomy for ONE.

Table 1
ONE HYDROELECTRICITY CAPACITY AND GENERATION, 1980 - 1991

Year	Hydroelectricity		
	Capacity MW	Generation GWh	Hydro-Generation as % of total
1980	604	1,515	31.8
1981	604	1,024	20.0
1982	604	573	10.5
1983	604	481	8.2
1984	604	367	6.0
1985	610	486	7.5
1986	610	643	9.3
1987	616	825	11.3
1988	616	936	12.1
1989	616	1,157	14.1
1990	616	1,220	13.8
1991	616	1,266	13.5

Sources: World Bank Staff Appraisal Report, *Second Rural Electrification Project*, # 3262-MOR, August 30, 1990; ONE's 1990 and 1991 *Rapports d'Activité*

1.9 As a result of these delays and the hydro planning problem, the remaining plants have been pushed harder than is optimal, and consequently there have been serious problems with availability. For instance, the Gas Turbines (GTs) (designed to run on diesel for short periods of time) have been running as if they were base-load plant. Consequently, there has been inadequate time to do daily maintenance (to clean the residue of the heavy diesel fuel from the turbines) and the GTs have broken down. Hence, we see a trend of lower availability leading to maintenance being postponed, which in turn leads to even lower availability. It is difficult to blame this availability problem on poor technical management of plant. The outages are clearly related to the wider planning and financing problems listed above which have led to the overuse of thermal plants.

1.10 On the demand side, demand has grown at about 7% per annum over the past ten years and there have been virtually no efforts to reduce demand in a systematic way, e.g. by discouraging demand at peak through peak tariffs, or by encouraging energy efficiency with the help of programs aimed at promoting conservation (e.g. better insulated refrigerators, low-wattage public lighting).

1.11 The short-term measures being taken to deal with the power shortage include measures aimed at reducing demand and others for increasing supply. On the demand side, ONE and the *Régies* had to cut off customers, often entire industrial zones, as well as stopping television programs between 14.00 and 18.00 hours, reducing public lighting and taking other measures that have more to do with supply restriction than the encouragement of more efficient use and conservation of energy. The cuts are very expensive to the country in lost industrial production, and the other curtailment measures are also highly inconvenient.

1.12 On the supply side, the main measure (apart from intensive use of existing plants) has been to order six gas turbines to be installed at Tetouan (3 X 33) and Tit Mellil (3 X 33) and commissioned in 1994. ONE is considering adding another 3 X 33 MW GT at Casablanca.

1.13 By far the most important question is what lessons to draw from this power shortage and what long-term measures should be taken in order to avoid shortages in the future. We have already mentioned three key issues which deserve serious attention: (1) a review of Morocco's investment plan taking account of the evidence of lower-than-planned "guaranteed" contribution from hydro; (2) the need to provide ONE with greater management autonomy and responsibility (accountability) for planning and financing of investment; and (3) the need to introduce serious demand-side measures to slow the growth in demand at peak.

B. Private Investment

1.14 The major issues here have to do with whether to encourage private investment and what changes are required to the planning, institutional and legal framework for that to happen.

1.15 Currently, the legal arrangements give ONE a monopoly of generation above 300 kW, although auto-generators account for about 12% of output. There is now a political commitment to allow and indeed encourage independent private generators. The difficult financial situation is one of the important reasons why the Government has shown considerable interest in the idea of private investment in electricity generation. The other reason is that the private investment could stimulate greater efficiency and dynamism throughout the Moroccan electricity sector. Based on experience in other countries, it is likely that the benefits of private investment will be greatest if competition (e.g. competitive bidding to build new plant) is simultaneously encouraged.

1.16 A number of arguments have been made against private investment. One is that it could actually raise the cost and price of electricity in the country because private investors will require profits that ONE does not require. Experience in many countries suggests that the combination of competition and private investment will actually drive costs down. In any case, if private investment is not economic, then an open competition (on a level playing field) between private investors and ONE will reveal that. We are also unconvinced by the argument that private investors will not respond effectively to emergencies and other commands by central despatchers, although it is true that private investors will expect to have transparent contractual obligations to do so and to be paid for doing so. Finally, we do accept the argument that ONE has been given a heavy public service obligation and is handicapped (compared to potential private investors) because of these obligations and the many taxes it pays to the state. We think that ONE should be treated on the same basis as independent generators, and that the advent of

private capital should be seen as an opportunity for ONE to gain greater financial and management autonomy in order to compete effectively or indeed join private investors. It is also important for the State to recognize that private independent generators may not yield as much tax revenue as ONE currently pays (for instance in the case of import duties which do not apply to a private investor, as initially envisaged). Nevertheless, we conclude that private investment could make an important contribution to Morocco's electricity industry, especially if it is accompanied by competition which obliges private investors to prove that they are indeed more efficient.

1.17 There are two kinds of private investment in generation which are currently under serious consideration. The first concerns cogeneration and auto-production by large industries. Auto-generators currently provide about 12% of Morocco's electricity production, but sell negligible amounts to the public network. Cogeneration is insignificant. The question is whether investment in these sources of electricity could and should be stimulated, for instance by raising purchase tariffs or providing other incentives. The benefits of additional investment, e.g. to meet current shortages and to reduce financial pressures on ONE, must be weighed against the risk of encouraging expensive and uneconomic investment. One way to weigh the benefits and costs is to include auto-generation and cogeneration explicitly in any future competitive bidding and to examine the prices which the competing operators offer.

1.18 The more important potential for private investment is from independent power producers (IPPs) building large conventional thermal generation stations or combined cycle gas turbines (CCGTs). The expectation is that a private investor would raise its own finance for such a project on the basis of expected proceeds from selling the electricity to ONE on a long-term contract. The Government has recently decided to go on competitive bidding for IPPs.

1.19 One of the important questions raised by the Government's initiative in seeking private investment is what sort of institutional arrangements are required to ensure that private investment will bring maximum benefit. On what basis should investors be selected and who should select them if there are a number of options? On what basis should they be paid? Is there a need to restructure the industry or to reform the law in order to permit and encourage private investment? These and other questions should be addressed before taking decisions with respect to the future role of private investment in the Moroccan electricity sector. We consider some of these questions later in this chapter.

1.20 Finally, we raised an issue about the existing expansion plan. It is important to recognize that new generators may offer to supply electricity at prices which make previous plans look outdated. For instance, if IPPs can build CCGT plants that offer electricity at prices well below the costs assumed in the national expansion planning stage, there would be good reason to consider an expansion of gas-fired plant at the expense of other plant. Thus, opening a system to competitive bidding between IPPs may reveal information that raises doubts about planned investments. This in turn may create uncertainty for ONE and for organizations which extend credit to ONE. Any reform to the sector must therefore be carried out carefully so as not jeopardize credits which have already been committed to ONE, but also to allow for an adjustment of the expansion plan to reflect new information about the cost of alternative generation sources that is revealed through competitive bidding.

C. Electricity Prices

1.21 End-user tariffs are set with social, political concerns in mind, and do not reflect economic costs of supplying specific customer groups. This explains the policy of uniform national tariffs, as well as the policy of favoring residential customers. While uniform national tariffs are widely applied in other countries, they do entail some economic costs. Even if one accepts these costs, there are many reforms to tariffs which can be introduced.

1.22 Electricité de France (EdF) has studied Morocco's end-user tariffs and bulk supply tariffs. Within the constraint of uniform national tariffs, they recommend a number of reforms to tariff structure, including:

- the introduction of a two-part tariff for low voltage (e.g. residential) customers;
- the introduction of more time-sensitive tariffs for all customers (e.g. three daily periods including peak tariffs and seasonal tariffs for high voltage customers);
- fixed capacity charges and kWh charges related to the load factor;
- discounts on capacity charges for capacity subscribed off-peak; and
- a method for systematically reflecting the different costs of distribution (i.e. either by having different ONE transfer prices to each distribution company, or by having common ONE transfer prices to all distribution companies as well as compensations between the distribution companies).

1.23 These recommendations have been considered by the Government and the *Régies* as difficult to implement, ostensibly because of metering problems (e.g. all customers paying a peak tariff would need a new meter) and the problem of explaining to customers why there is a peak tariff and how to respond to it. In addition, changing bulk supply tariffs (or introducing compensations between *Régies*) will be difficult politically if it entails a change from the previous no-win, no-lose policy.

1.24 An additional and important issue has to do with "purchase" tariffs for energy sold to ONE by cogenerators and auto-generators. ONE's view is that the potential for cogeneration is very small in Morocco because of the relatively low level of industrialization and because most potential producers are so small that their costs are bound to be higher than ONE's avoidable costs. Nevertheless, it is also clearly time to consider whether the terms on which ONE has been willing to buy energy from independent producers, auto-generators and cogenerators are reasonable. In particular, the question is whether ONE should offer capacity and energy contracts to cogenerators and auto-generators which can guarantee availability, as well as energy-only prices to suppliers which cannot guarantee availability.

D. Management Autonomy and Incentives

1.25 One important issue in the sector is whether the current institutional structure provides the right environment to encourage efficient investment, operations and management.

1.26 There is political involvement at all levels of the sector, which reduces management autonomy and effectiveness. For instance, there is lack of compliance by both ONE and the Government of their "Contrat Programme". ONE's investment plan is developed and financed in a way which reflects immediate problems facing the central Government. Financial constraints on the Government lead to a preference for bilateral aid financing, rather than commercial credits, which in turn leads to delay in realizing projects. Moreover, ONE must pay a number of taxes (e.g. douane, import taxes) which private foreign investors would not have to pay and ONE is also obliged to buy domestically produced fuel oil at prices which include substantial taxes.

1.27 The management of individual *Régies* perceive their roles as partly "social" and that sometimes translates into a lack of autonomy and discipline when it comes to collecting accounts receivable (mainly from publicly owned organizations), paying bills (mainly to ONE) and cutting off customers which do not pay. The decision to connect customers is sometimes also driven by political and "social" pressures rather than by a pursuit of commercial gain.

1.28 There is evidence of poor operating and investment performance in the broadest sense of the word, including financial performance, payment of bills, losses on the system and delayed construction. It is however difficult to generalize about the reasons for poor performance. Non-payment of electricity bills is partly the responsibility of the Administration (as customer) and partly due to a lack of incentives for electricity managers to insist on payment. The financial problems of the sector are partly due to a reluctance on the part of the Government to raise tariffs. Poor availability of plant may be blamed on a variety of factors, including the enormous pressure to push operating plants harder than normal in order to deal with the supply shortage facing the country.

1.29 Nevertheless, it is important to ensure that the responsibility for improving performance is clearly identified, and that managers have clear incentives and autonomy to carry out their responsibilities. We therefore see the issue of performance as part of the wider question of institutional reform that will provide management autonomy and responsibility.

E. Absence of Proper Coordination and Predictable Regulation

1.30 Apart from the question of political intervention and the lack of autonomy of management, there is also a problem of coordination. This is particularly evident at the interface between ONE and the *Régie*, where interconnection decisions cause considerable difficulties.

1.31 Regulation also seems unduly dispersed and unpredictable; several Ministries are involved (MEM, Finance, Interior, Economic Affairs). And there is no system of independent economic regulation (notably of tariffs) on which investors could rely with confidence.

F. Unpaid Bills

1.32 One important issue that could stop private power in Morocco is the tradition of not paying bills. Unpaid debts are one aspect of the wider financing problem facing ONE and other companies in the electricity and petroleum sector. As of end March 1993, ONE's clients were in arrears by approximately 5,000 Million dirhams (approximately US$ 500 Million). Of that amount, the *Régies* owed ONE about 3,000 Million. The *Régies* were in turn owed substantial amounts by their customers, mainly those in the public sector. ONE also has

substantial debts, in particular to the petroleum distribution companies for fuel oil and to the State for service on the debt. The problem of past unpaid debts, and avoiding the build-up of new debts, is widely perceived as a problem that needs to be solved. If it is not solved, it could seriously complicate the entry of private investors into the electricity sector. Independent power producers and their bankers will be inclined not to accept assurances over future payment from ONE if ONE has a history of not collecting money it is owed and in turn not paying its suppliers.

1.33 If the problem of non-payment is not solved convincingly, IPP investors are likely to demand guarantees (e.g. from the Ministry of Finance), and are likely to include a higher risk premium in their calculation of the acceptable price of electricity. Private power could then turn out to be more expensive than ONE power, if investors are seriously worried about the risk of default.

OPTIONS AND RECOMMENDATIONS

A. Short-Term Measures

Competitive Bidding By Private Sector Generators

1.34 It has been recommended and agreed by the Government to adopt competitive bidding to select the first (and future) independent generators, rather than negotiating only a direct deal with a single developer. Competitive bidding will also help to determine the most economic site. The only caveat to this recommendation is that this competition should not delay the commissioning of a combined-cycle gas turbine (CCGT).

1.35 It has been recommended and agreed that the Government commission a study of the rules and procedures that need to be adopted to encourage independent power production in Morocco. It should consider (a) the institutional and legal changes required to permit and encourage private generation, auto-generation and cogeneration, (b) the process and criteria for selection of independent private generation and (c) the basic contractual terms on which an independent generator would sell to ONE or to the system.

Energy Demand

1.36 It is recommended that the Government, ONE and the *Régies* take advantage of the consciousness of Moroccans to electricity shortages in order to strengthen CDER (Centre de Développement des Energies Renouvables) as promoter of demand-side management programs aimed at energy efficiency and conservation (see Chapter IV. on Energy Efficiency).

Unpaid Bills

1.37 The Administration's efforts to solve the problem of past debts and to avoid future debts by allocating *vignettes* (a form of quasi-money to be spent on electricity only) to public sector managers have not yet yielded positive results. Most recently, the introduction of a new system of payment which imposes penalties for late payment has been suggested; the enforcement of such a system is strongly recommended.

1.38 However, it is apparent that the issue is one of discipline, autonomy and management incentives of public sector organizations at all levels. In particular, if *Régie* managers do not have better incentives to insist on payment of their bills, then they are unlikely to put necessary pressure on their clients, particularly given the important element of political control over the *Régies*. This suggests a need for more fundamental institutional reforms (see par. 1.60 and ff.).

Tariff Reform

1.39 Some of the basic elements of a logical tariff structure reform are described in the results of the 1992 EdF study which requires updating. It is here recommended that the Government give immediate attention to the introduction of a tariff structure that reflects economic costs, and in particular, which discourages consumption in peak hours and months.

1.40 Tariff structure reform, however, is only part of the problem. A related and important question is how to establish a regulatory system which will be based upon sound economic principles, allow enterprises to recover the costs of their investment and operations, ensure predictable and automatic changes in electricity tariffs, and which give electricity operators incentives to lower their costs and improve their service quality. It is recommended that the Government commission a study on the design of a system of tariff regulation.

Contract Plan

1.41 It is recommended that the Government of Morocco and ONE comply with their Contract Plan (*Contrat Programme*), by which ONE has agreed to achieve adequate technical and financial performance targets and the Government has agreed to assure appropriate tariff levels.

B. Long-Term Options

1.42 The main objectives of longer-term reforms are: improved economic efficiency (in investment, operations, central despatch, management and consumption) and security of supply in the electricity sector. The efficiency objectives include a range of management aims, such as better incentives to collect unpaid bills, to improve availability of generation plant and to keep investment and operating costs to the minimum required to ensure supply security. To achieve security of supply, the Government may wish to ensure diversity of fuel supply types and sources, as well as the development of domestic fuel resources.

1.43 The Government will also have a number of social or political aims which it hopes to achieve through the electricity sector, for instance provision of tax revenue and development of rural electrification. One aim of the reform should be to ensure that the economic costs of achieving these political objectives are clearly identified and that as far as possible these aims are pursued without undermining the commercial viability and incentives of the companies in the sector. For instance, it may be preferable to give direct subsidies to vulnerable customers rather than to set tariffs which are below the costs of supply, and it would certainly be a mistake to set taxes on gas which effectively made gas-fired generation financially unviable.

1.44 Based upon the experience in many developed and developing countries, some of the most beneficial reforms in the electricity sector involve measures aimed at promoting competition in electricity generation, while introducing incentive regulation in those parts of the business with strong elements of natural monopoly (the transmission and distribution businesses). The following assessment of structural options concentrates first on options that are likely to promote competition in generation, while assuming throughout that distribution companies retain a monopoly over supply to their final customers; it will then examine options for reforming the institutional arrangements in electricity distribution.

1.45 We consider three possible structural models for introducing competition into generation:

- Competitive bidding to supply electricity to ONE.
- Competitive bidding to supply a Purchasing Agency (PA).
- Competing generators sell direct to distribution companies.

1. Competitive bidding to supply electricity to ONE.

1.46 Description: Under this model (which corresponds closely to the US model and to most models where developing countries are trying to encourage IPP investment), ONE remains responsible for meeting the country's generation requirements (either as a producer or a buyer), as well as being the company responsible for high voltage transmission and central despatch. The main change of this model compared to the *status quo* is that while ONE could retain ownership of its existing plants, it would be required to put any future generation capacity and energy needs out to formal and regulated competitive bidding.

1.47 The competition to build new plant would be between IPPs, potential cogenerators and the generation affiliate of ONE. The winner of the competition would sign a long-term electricity supply contract with ONE, which in turn would supply the *Régies* and its own distribution market. The regulatory authorities would be responsible for ensuring that ONE did not discriminate against non-ONE generation. This would be easier if ONE's transmission and distribution business were at arm's length from its generation affiliate, at least in accounting terms if not as separate companies.

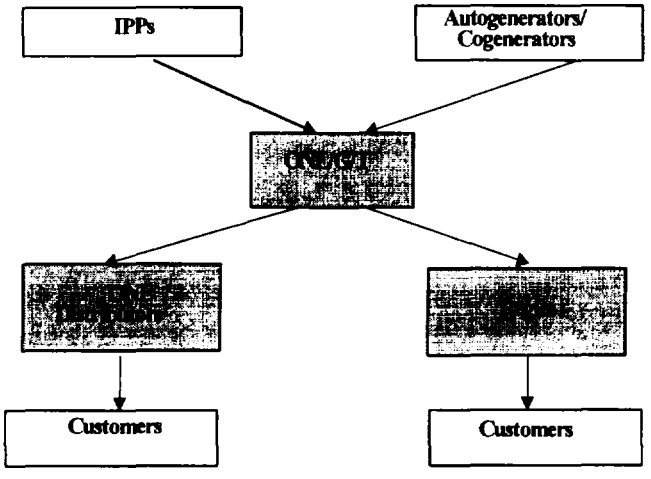
1.48 This model is consistent with leaving the distribution business as it is now (half in ONE's hands, half in the hands of other *Régies*), but is also consistent with a change to the distribution end of the sector. For instance, to maximize the flexibility with respect to future competition in the sector, it would be preferable for ONE-generation/transmission to sign transparent long-term contracts with ONE-distribution.

1.49 Advantages: The main advantage of the model is that it has a reasonable likelihood of being attractive to foreign investors in the near term, since the latter would be selling to an established monopoly. A second benefit is that this approach is likely to involve minimal costs in terms of disruption to current investment plans or despatch efficiency, and should minimize the costs related to reorganization and competitive bidding.

1.50 Disadvantages: The first is that competitive bidding may not be fair if ONE is both a buyer and a potential seller. Moreover, as a monopsony buyer which also produces electricity, ONE could perhaps use its dominant position to favor its own generation stations or

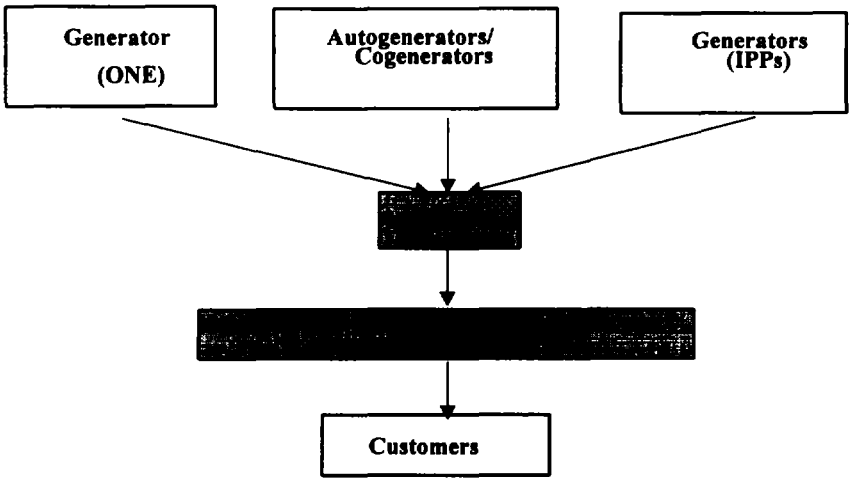
to minimize payments to the IPP once the IPP's plant has been built. Investors will therefore seek guarantees to protect themselves. A second problem is that, in view of the limited extent of change, investors may be concerned that the structure will change again in the near future. It will be essential to convince investors that their money will not be put at risk from future changes.

1. COMPETITIVE BIDDING TO SUPPLY ELECTRICITY TO ONE



IPP = Independent Power Producers
G/T= Generation/Transmission
Shaded boxes indicate monopoly

2. COMPETITIVE BIDDING TO SUPPLY A PURCHASING AGENCY (PA)



IPP = Independent Power Producers
PA/T = Purchasing Authority/Transmission
Shaded boxes indicate monopoly

2. Competitive bidding to supply a Purchasing Agency (PA).

1.51 Description: The PA would be independent of existing generation companies and would be responsible for selecting the companies which would build and operate new plant. The PA would also purchase electricity from existing plants (which may be owned by ONE or which could be sold to private investors). It would have long-term contracts with all generators and those contracts would provide economic incentives for plant owners to be available when needed and to minimize operating costs. The PA would in turn sell wholesale electricity to distribution companies, either at annual bulk supply tariffs (reflecting the full cost of generation and transmission) or on the basis of long-term contracts with the distribution companies.

1.52 This model requires ONE generation to be separated (in terms of management and probably ownership) from transmission so as to ensure that ONE does not use its control over transmission to bias choice in its own favor. As with model 1, it is consistent both with the creation of new regional distribution companies, to take over ONE's previous distribution responsibilities, or with distribution remaining in ONE's hands. In addition, this model shifts planning responsibility for ensuring adequate supply to the Purchasing Agency. This in turn implies that the PA will be closely associated with transmission issues and so the merging of ONE's transmission affiliate with the PA may make sense.

1.53 Advantages: This could be an attractive model for introducing competition in generation. The main attraction of this model over the previous one is that it is more likely to ensure fair competition between potential generators, and is also compatible with the privatization of existing ONE generation stations. A second advantage (which might be considered a disadvantage by some) is that it enables the Government to maintain control over the planning of investment.

1.54 Disadvantages: The main disadvantages are that this model requires substantial changes to the structure and operations of the sector, and in particular requires new contractual relations between an independent transmission company and the independent generation companies. This sort of relationship may be very beneficial, as has proved to be the case in Spain, but it is not straightforward to implement. Another concern is that the decision making is centralized. A third problem is that there may be serious legal and financial problems associated with establishing a Purchasing Agency which carries heavy financial obligations.

3. Competing generators sell direct to distribution companies.

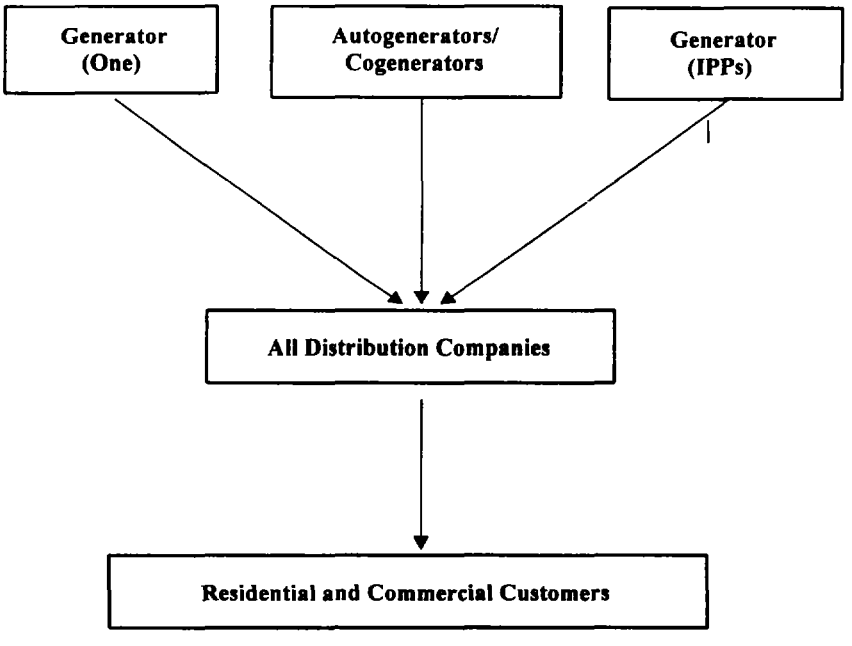
1.55 Description: This model most closely approximates the liberal models of Britain and Chile. Under it, generators and distributors have open access to the transmission network and can contract directly. The model probably requires a full ownership separation of ONE's generation, transmission and distribution businesses. It also requires the development of a pooling or wholesale market mechanism to ensure efficient planning and despatch.

1.56 It may be considered desirable to move the sector towards this model gradually, so as to minimize disruptions. In this case, reform might begin with a move to one of the previous models as an initial stage. It would be preferable (although not absolutely necessary) to transfer distribution assets from ONE to independent distribution companies during the initial stage so that the progression to this model would be smoother.

1.57 Advantages: The main advantages of this model over the other two are that it avoids the problems of bias in competitive bidding under model 1 and of centralized decision-taking under model 2. It offers the maximum potential for independent decentralized decision-taking, which can lead to greater innovation and lower costs through competition in the electricity market and in capital markets (where shareholders compare performance).

1.58 Disadvantages: One drawback of the model is that it requires a long time to introduce the substantial structural changes which are implied, including ownership separation of generation, transmission and distribution, and the development of complex contractual relationships to permit open access to the transmission network. A second drawback (not shared with model 2) is that of coordination between companies. Pooling and wholesale market arrangements are required to ensure that the autonomous actions of independent generators and distribution companies are consistent with efficient despatch and generation. A third problem is that direct contracting between generation and distribution will naturally lead distribution companies to select the lowest cost sources of power. This may leave some plant "uncontractable", even if there are security of supply (or political) reasons for keeping such plant open. Finally, this model would only be feasible if distribution companies were perceived as good credit risks by investors.

3. COMPETING GENERATORS SELL DIRECT TO DISTRIBUTION COMPANIES



IPP = Independent Power Producers

1.59 There are many other potential models, for instance which would involve full vertical integration and national monopoly (*à la EdF*), but the most basic features of an

electricity system allowing for competition in generation are captured in the three models described above. None of these models is inherently better than another, unless one has clearly defined the aims and timetable of the reform. Certainly model 1 is the easiest to introduce and offers potential benefits quickly. The other models promise greater benefits, but over a longer period of time and with substantial cost in the short run. It is feasible to imagine model 1 as a first step towards a more liberalized electricity system. However, if the aim is to move to model 3, this should be explicitly recognized and planned for at the outset.

Reform Options in Electricity Distribution

1.60 The *Régies* do not appear to have the autonomy from political pressures, nor the incentives, to make commercially necessary decisions. This finding covers such considerations as whether to press harder to collect unpaid bills, whether and when to connect customers, and whose electricity to cut off when load shedding is required. Coordination between the *Régies* and ONE is poor, for instance when planning interconnection investments. These findings lead to recommend a review of the institutional and regulatory options for the distribution sector.

1.61 The Government may wish to consider reforms related to the following four basic issues:

- the relationship of the electricity distribution business to other parts of the electricity industry (generation and transmission) and to other municipal services (water and sewerage);
- regulatory and other economic incentives to provide more efficient and better quality electricity distribution services;
- "Retail competition" to supply final customers;
- introduction of private capital or management to the electricity distribution business.

1.62 The relationship of electricity distribution to other services. There are two important questions: Should the distribution business be vertically integrated with electricity generation and transmission (as at ONE) or separate (as with the Municipal *Régies*)? Should electricity distribution be separated from water and sewerage?

1.63 On the first of these questions, economic reasoning and international experience suggest that efficiency in distribution is possible with either industry model, i.e. with separate distribution companies or with vertically integrated companies, and that regulatory incentives and history probably matter more than the degree of integration. Many countries, such as Germany and Spain, have mixed systems such as Morocco's, where specialist distribution companies co-exist alongside vertically integrated companies. From the perspective of improving distribution services, therefore, the solution does not lie primarily in changing the degree of vertical integration or separation. However, in order to allow for informed comparisons of the performance of different distribution companies, it is important that ONE's electricity distribution business be identifiably separate from its generation and transmission businesses, at least from an accounting perspective. Furthermore, if the Government wishes to see competition in generation develop as in model 3, where competing generators have the right

to sell directly to distribution companies, then ONE's distribution business would have to be separated fully from its upstream business.

1.64 The second question is whether to separate electricity distribution from water, sewerage and related (e.g. construction) services. Economic theory and international experience once again provides support for both models, i.e. where the services are combined or where they are provided separately. In choosing between these models, the key economic attraction to combining the municipal services is to obtain economies of scale and scope that could not be obtained by contracting between separate organizations. The potential economic benefits of combining these services within one company or probably small and have to be weighed against the potential inefficiency that could result due to the absence of management specialization, especially for services which could more efficiently and economically be provided by outside specialists. For similar reasons to those described above, it is important to introduce maximum transparency and management accountability for the electricity distribution business, and to ensure that ONE and *Régie* managers have incentives to improve distribution service quality and lower costs, for instance by contracting with outside firms for construction services where that is economic. Creating electricity distribution companies would contribute to achieving these objectives, but is neither a necessary nor sufficient measure.

1.65 Regulatory and other economic incentives of the Municipal *Régies* and ONE to provide more efficient, better quality electricity distribution services. One way to improve the efficiency of the distribution business would be to introduce regulatory incentives which would directly link a company's performance to the prices it could charge and to the rewards or penalties for managers. For instance, the Government may wish to consider the potential for a contract okab which could specify service targets related to losses, speed of connection, reduced outages, faster collection of bills and cost reduction. These contracts would specify the Government's undertakings and the way in which the Municipal Company managers would be rewarded or penalized, respectively, for good or bad performance.

1.66 A second reform option is the introduction of yardstick competition. This approach allows the regulatory authority to compare a number of electricity distribution companies and to set prices (or rewards or penalties for management) in terms of an individual company's comparative performance. Inevitably, the distribution companies will begin from very different situations and will face different problems; these must be taken into account when making comparisons. The experience in other countries suggests that this sort of regulation can introduce dynamic efficiency because public or private sector managers are encouraged to compete with each other to improve their performance. In order for this kind of competition to develop, regulators will need consistent information for all of the electricity distribution businesses. This serves to underline the importance of the accounting and management separation ("unbundling") of electricity distribution from other activities.

1.67 A third option, which could be introduced along with the first two, is "price cap" incentive regulation, whereby prices are indexed to a formula (such as inflation minus a productivity improvement factor, x) for a number of years and the regulated company is able to keep any surplus revenue that results from lowering its cost, subject to a service quality threshold.

1.68 For each of these proposals, the regulatory authority will require good comparative information on service quality indicators. These should be published widely as a way of putting pressure on management.

1.69 The introduction of competition to supply final customers. Some countries have introduced or are considering the introduction of "retail competition". For instance, in England & Wales, the Government has separated the distribution business (access to local wires) from the retailing of electricity services to final customers. Competing retailers then sell to final customers, and pay the distribution companies for the use of the local wires.

1.70 In principle, the idea of separating natural monopoly segments of the electricity business (such as the wires used in local distribution) from the inherently competitive segments of the business when there are no economies of scope associated with integrating these segments should be supported. In that way, competition can achieve maximum results in terms of lower costs and improved customer service quality, and the inefficiencies of administrative regulation are confined to those segments of the business where regulation appears necessary to protect customers from unregulated monopoly. However, the calculus of benefits and costs is complicated when there are economies of scope from vertical and multi-product integration, which is the case between electricity distribution and retail sales. The appropriate policy in any country therefore requires a balancing of the costs and benefits of introducing retail competition.

1.71 Experience in other countries suggests that to achieve the benefits of retail competition, the organization and regulation of the electricity system has to change radically. For instance, it would be necessary to reach agreements over access to the transmission and distribution networks, to develop wholesale market mechanisms, and generally to adapt to a situation where customers were unlikely to face uniform national tariffs. The cost of introducing a policy of retail competition in Morocco outweighs the likely benefits in terms of service quality and improved efficiency. Although the possibility that some very large customers could have the choice to buy from competing suppliers (ONE, a *Régie* or an independent generator) should not be ruled out, a full-scale separation of the distribution and retail functions, as in Bolivia, is not recommended, nor would be recommended the introduction of retail competition for the majority of customers.

1.72 Introduction of private capital or management of the electricity distribution business. The reforms described above are all consistent with continued Municipal ownership of the electricity distribution business, under the supervision of the Ministry of the Interior and Information. A more radical reform would be the introduction of private sector management or "ownership".

1.73 There are, broadly speaking, two models that should be considered (in addition to contracting out an increasing number of non-core services, such as construction). The first approach is to sell shares in distribution companies to institutional and small private shareholders. This has been the basis for utility sector reform in Britain for over a decade and is increasingly being adopted throughout the world. According to this model, private shareholders will exert pressure on distribution company managers to meet profit expectations. Provided the regulatory system is properly designed (e.g. using yardstick comparisons and price cap incentives), profitability will rise as distribution company costs fall and service quality improves.

1.74 The successful introduction of private capital is dependent upon having an industry structure in place so that the incentives on private providers of services are aligned as closely as possible with the wider public interest. This requires careful attention to the competitive, structural and regulatory framework prior to any sale. The main economic advantage offered by private equity is the introduction of capital market regulation. Performance incentives and sanctions for industry managers are generally heightened under private ownership. The value of independent performance monitoring by the providers of debt and equity capital is dependent to some extent on the presence of a hard constraint on companies in the form of either competitive pressures or a regulatory regime that does not allow poor performance to be passed on to consumers. It is hard to imagine this approach working in Morocco at this stage, in part because of the undeveloped capital market.

1.75 A second and more feasible approach in the Moroccan context involves the awarding of limited-duration franchises to private firms. This form of privatization would involve competition between private companies for the market (i.e. for the right to supply services under conditions of monopoly for, say, 15-25 years), rather than competition in the market. The company which provides distribution services would sign a franchise agreement or license that specified the obligations (service quality, investment, etc.) of the company and the basis on which it would be paid. This contract could incorporate the incentives which were discussed earlier, perhaps along with price caps and yardstick competition.

1.76 This model has been common in the French water sector for many years, and is becoming increasingly popular in countries such as Argentina, Mexico, Malaysia, and in Eastern Europe. Although franchising usually involves no transfer of ownership, the private sector franchisee typically must bear some of the risks, such as revenue risk. In theory, the tendering procedure should lead to a competitive bidding process, and subsequent incentives to operate efficiently. In reality, experience in France has shown that the competitive process needs nurturing. For long term contracts, there may be strong biases towards the incumbent when it comes time to re-award a concession or franchise contract. Specialist skills for the monitoring of the private contractor are also required, to ensure that undertakings on prices, service quality and asset maintenance, for example, are properly fulfilled.

Legal and Regulatory Framework

1.77 At present there is no comprehensive legislation covering Morocco's electricity sector. Instead, the sector remains under the direct supervision of central Government, but with responsibility divided between several different ministries and committees. This situation results in a number of problems, including:

- a lack of management autonomy from Government, for instance with respect to financing investment;
- the absence of a clearly defined and predictable regulatory structure for setting tariffs contributing to financial problems;
- a lack of co-ordination between the different organizations in the sector, notably between ONE and the *Régies*; and

- difficulty to attract foreign investors since the latter will not feel confident that they know the "rules of the game".

1.78 Aside from the legal framework, the power sector also lacks a system of explicit economic regulation. The purpose of such regulation is to encourage economic efficiency and service quality in those parts of the electricity sector where competition is not possible (transmission), as well as to ensure that prices to consumers and returns to investors are both considered reasonable.

1.79 Morocco should consider enacting a comprehensive law for the electricity sector, and should develop a system of economic regulation which will help to give practical effect to the aims of the law. Options related to (1) the regulatory institutions, (2) the nature of such institutions' responsibilities, and (3) legal and regulatory reforms that could help to encourage private sector investment and competitive market forces in the electricity sector are considered below.

1.80 The choice of regulatory institutions is an important consideration. Three main options should be considered:

- to create an independent regulatory authority that would be independent of other electricity sector organizations and that would experience minimal political interference especially on day-to-day sector management issues;

- to create separate regulatory divisions within existing ministries (or inside one ministry, say MEM);

- to leave general regulatory responsibilities with the ministries (or ministry) without setting up a separate division with them.

1.81 Although regulators are never entirely unaffected by political pressures, the idea of creating as firm a separation as is possible between regulatory responsibilities and the day-to-day political pressures that are inevitably exerted on ministries is firmly supported. This normally translates into a preference for the first option. However, it is just as important to ensure that the principles that guide regulations are predictable and transparent, and that the roles/responsibilities of the regulator and ministries are clearly specified.

1.82 The new electricity sector law should define clearly the policy responsibilities of the Government, the regulatory authority and the organizations being regulated. This should help to reduce unnecessary Government interference in the management of enterprises. A precise definition of responsibilities will depend on the industry structure which is chosen and on the degree of competition permitted. However, the main responsibilities which a regulatory authority could be assigned might include:

- setting tariffs which are based upon strict pricing principles defined by law and regulation;

- issuing licenses for generators and franchises for distributors that specify the responsibilities of enterprises consistent with structural reforms, e.g. the franchising of distribution if that reform were adopted;

- developing technical and performance standards designed to ensure system reliability and efficient performance;

- contributing to the implementation of national energy policies, such as rural electrification and demand-side management;

- reviewing and approving investment plans and power project proposals developed by enterprises; and

- reviewing and approving transmission, pooling and despatch arrangements (if they exist).

1.83 If the Government wishes to encourage private sector investment in generation, the law and regulatory framework must explicitly do so. For instance, the law, regulations and contracts should clearly specify the rights and obligations of private investors in power projects. The legal and regulatory regime should also specify how disputes will be resolved. It would also be wise to consider developing model transaction documents (e.g. power purchase agreements).

1.84 If the aim is to encourage competition as well as private investment, the law and regulations should reduce the barriers to competition. For instance, the law could encourage the use of competitive bidding for new generation capacity. Model bidding and evaluation procedures and criteria could be developed. Depending on the structural reforms undertaken, it may also be desirable that the legal and regulatory framework prohibit the cross-subsidy by an integrated utility of one competitive activity (e.g. generation) using resources from another monopoly activity (e.g. distribution).

1.85 Finally, an electricity law and regulatory system cannot be created overnight, and it is probably not necessary to introduce a fully developed legal and regulatory system before private investment in generation begins. However, there are priorities that should be studied urgently. These include the rules for price regulation, as well as the essential preconditions for private investment in generation.

PLAN OF ACTION

1.86 During the seminar which took place in December 1993 a consensus among the parties involved in the management and operation of the power sector was reached on the following main causes of the financial difficulties faced by ONE:

- high level of arrears accumulated by the utilities (both owed by the *Régies* to ONE and by the public sector to ONE and the *Régies*);
- excessive taxation of heavy fuel used for power generation;
- excessive control of electricity prices and utilities budgets by the central Government;
- lack of managerial autonomy.

1.87 It was also recognized that in the current situation of:

- lack of adequate legal and regulatory framework;
- lack of financial reliability of ONE and *Régies*;
- monopoly position of ONE,

the solution represented by the introduction of independent power production could results in other distortions and inefficiencies (for examples if Government guarantees and/or non-competitive bidding were pursued).

A. Specific Measures

1.88 In order to improve the sector efficiency the seminar recommended a series of specific measures to be implemented in the short-medium term:

- to agree on a solution for past electricity arrears at the earliest;
- to introduce and enforce a new system of payment which includes late payment penalties;
- to adjust the price of electricity up to its economic cost;
- to revise the fiscal regime which applies to ONE on fuel;
- to submit all IPPs to competitive bidding, in order to ensure real competition in power production;
- to strengthen ONE demand-side management programs.

B. Strategic Measures

1.89 A consensus was also reached on some strategic measures for the restructuring and reforming of the sector, which would fully develop over a long-term period. The rationale behind it should be the establishment of a truly competitive environment in which all parties are treated equally (particularly in the fiscal context). The reform process should apply to all three parts of the electricity chain, generation, transmission and distribution. It should follow a three-step path which would determine the organizational structure, define the legal framework (electricity code) and establish an independent regulatory body in charge of monitoring the sector operations and enforcing the law.

Sector Structure

1.90 The seminar envisaged a "gradual" structural reform model, with no major shocks, as the most suitable option for Morocco. The model adopted by Portugal has been considered the best example. It implies the corporatization of ONE into three independent and autonomous agencies - generation, transmission (power pooling&planning) and distribution. Power generation will be provided by ONE and new independent producers. All new generation capacity and energy needs will be met through formal and regulated competitive bidding.

Legal and Regulatory Framework

1.91 It was agreed that, once defined the structure, the Government should start preparing a new law and regulations - Electricity Code - which defines principles and rules for

the operation of the sector. The seminar recommended the assistance of legal experts, local and international.

Regulatory Agency

1.92 An independent regulatory body should be created to monitor the law and regulations enforcement. The possibility of expanding the agency competence to the whole energy sector (and not only to electricity) was discussed. Further analysis is required to define which regulatory set-up is most suitable to the Moroccan energy sector.

1.93 The seminar achieved a major consensus on the need for reforms in the power sector and on the specific structure to be adopted, particularly for generation. A few issues, however, were not exhaustively discussed and no agreement was reached on recommending implementation steps. This concerns particularly the reform of the distribution system; the legal and regulatory framework (incentive/sanction system; the tariff setting) and the risk analysis, for which the study provided recommendations in the previous paragraphs (see "Options" section).

RECENT DEVELOPMENTS

1.94 The moroccan authorities have embarked on a comprehensive power sector restructuring process which includes a national rural electrification program. Some of the concrete measures being considered are based on the recommendations of the December seminar. The strategy followed includes a set of measures inviting the private sector to: a) take over new coal-fired power generation units under completion (Jorf 1 and 2, i.e. 2*330 MW); b) build, own and operate new thermal power generation units, either coal-fired (Jorf 3 and 4, i.e. 2*330 MW) or gas-based combined cycle (350 to 450 MW); and c) get transferred part of the disribution grid. MEM is convinced that IPP (i.e. PCE) is the best solution for Morocco to meet its electricity needs. The Ministry is curently discussing the possibility to grant concessions of local distribution grids operated by ONE (Agadir).

1.95 MEM has requested the assistance of the Bank for the realization of this program. The Bank provides advice and financial support for:

- the evaluation of bids for prequalification of two combined cycle units, firing Algerian gas and to be commissioned by 1997-98;
- the preparation of bid documents for the take over and construction of power generation units;
- the preparation and negotiation of Power Purchase Agreement (PPA);
- the preparation of the Electricity Code;
- the electricity tariff study updating; and
- the reorganization of ONE.

II. THE PETROLEUM SECTOR

INTRODUCTION

2.1 For the last eight years the petroleum sector has been under close scrutiny and analysis in an effort to make it more efficient and competitive. The size and processing configuration of the two refineries, SAMIR (Societé Morocaine de l'Industrie du Raffinage) and SCP (Societé, Chérifienne des Pétroles) has raised the issue of whether the two refineries were efficient in an internationally competitive environment. The conclusions were that the refineries would have a slight economic disadvantage (approximately 6% of border prices) if they had to compete at world oil market prices, and that based on national security of supply considerations, it was considered justifiable to maintain an operating domestic refining industry, rather than relying on imported products. A modification to the method of petroleum price control was recommended to bring domestic oil prices closer to border prices and modify other distortions that existed due to differential taxation. The question of international competitiveness of the refining subsector continues to be the focal point of petroleum sector efficiency considerations. The changes that are now taking place both in the Moroccan economy and the energy sector, dictates a reassessment of the issues and options facing the whole petroleum sector including the refinery subsector.

2.2 Three new exogenous factors are influencing the potential restructuring of the petroleum sector. They are:

- Privatization Law Privatization of the petroleum sector has already begun with the privatization of the distribution subsector.

- Foreign Trade The new foreign trade liberalization law (Loi de Liberalization du Commerce Exterieur) dictates the opening of Moroccan Markets.

- Impact of Natural Gas The introduction of Natural Gas from the Maghreb Europe pipeline will severely alter the market structure for petroleum products in Morocco.

2.3 The liberalization trend of the Moroccan economy embodied in the Foreign Trade Law, and the directives on privatization of the State Companies and their application to the petroleum sector are consistent with the World Bank's policy of opening the sector to foreign trade and improving the sector's efficiency. These policies and their ultimate objectives are supported by the Government agencies with responsibility for the oversight on energy, as well as by the various petroleum companies. There is less unanimity, however as to the route and timing that this liberalization should take, and as to what the optimum structure of the sector should be to provide the lowest cost of supply of petroleum products to the country, while at the same time maintaining security of supply. The ultimate structure of the sector and the degree of continuing Government intervention and control that may be needed to assure a competitive petroleum sector is still under discussion. The distribution and marketing subsector is in the process of being privatized. The other major areas under discussion are a) the rate and timing of import/export decontrol needed to allow the refinery subsector to readjust to the new more open

environment, b) the timing of decontrol of domestic petroleum product prices at the ex-refinery and consumer levels, and c) the best institutional structure for the refining subsector.

MAIN ISSUES

A. Sector Efficiency

Potential Savings

2.4 There are three major areas of the petroleum sector where efficiency improvement could be realized :

- Supply Side Optimization - Recent studies of the refining subsector indicated that the Moroccan refineries while efficient by world standards, had certain inherent inflexibilities and inabilities to meet domestic demand. An analysis of the performance of the refineries for the period 1980 through 1988 indicated that the cost of supply by the refineries on average amounted to some 6% above border prices, equivalent to 540 million Dh per year. A recent study carried out by Beicip indicates that this inefficiency in current operations could be (i) eliminated by changes in refinery operations (alternative choice of crudes) and/or (ii) a further reduction of approximately 3% (300 million Dh) could be achieved by upgrading the refinery processing flexibility.

- Optimum Market Structure - There are a number of areas where artificial market distortions are created through the pricing mechanism, discriminatory taxation and /or product subsidy. These are: (i) transportation fuels which favor diesel oil over gasoline, (ii) differential taxation of heavy fuel oil relative to coal and (iii) subsidies of LPG.

- Company Structure - It is expected that the privatization of the distribution companies and ensuring market competition will enhance the efficiency of the distribution and marketing sectors. While significant savings are expected through the consolidation of the industry it will be offset by higher margin requirements which are currently deemed inadequate. The net result will thus be in improved service and safety rather than monetary or price terms to the end consumer.

B. Market Structure

Impact of Natural Gas

2.5 The introduction of natural gas into the Moroccan energy sector in the 1997 to 2000 time-frame will have a significant impact on the refining subsector. Preliminary studies of the impact of gas introduction conclude that: (i) the proportion of heavy fuel oil in the overall petroleum slate will drop from 40% today to 25% by the year 2000; and (ii) current refinery capacity limits will be extended from the currently forecasted date of 1997 to early in the next century. The main uncertainty in the petroleum product forecasts are an assessment of the extent

to which natural gas will displace current fuels used in the power sector, i.e. whether natural gas entry will come at the expense of coal or heavy fuel oil. SAMIR currently estimates that the refinery will loose about half of the heavy oil market to natural gas, while the balance of the gas market will come at the expense of coal. In all cases, the result will be a lightening up of the refinery product slate, making it more difficult for the refineries to balance out petroleum product supply and demand through refining alone, without some modification or adjustments. Thus the pricing policy of natural gas as well as investment decisions relative to gas based power projects adopted by the Government will have very significant impact on SAMIR and SCP's future operational plans and viability.

Price and Tax Distortions

2.6 The major distortions impacting the structure and efficiency of the petroleum sector are (i) different import duties and taxes on crude oil and petroleum products which favor the importation of crude oil ; (ii) taxes on regular and premium gasoline higher than on diesel have resulted in the dieselification of the motor pool; and (iii) high taxes and import duties and price inducted distortions on heavy fuel oil hide the true competitive position of fuel oil and imported coal. The differential pricing of crude oil, petroleum products and coal, has been recognized by the Government, and it is the intent of the Government to rectify these distortions with the adoption of a new border price related pricing system.

LPG

2.7 The LPG market has become a very important part of the petroleum sector in Morocco, both as a source of conveniently distributed fuels and as a replacement of depleting renewable energy sources especially wood, thus playing an important social and environmental role in the country's energy mix. In recent years the consumption has increased dramatically, from an average rate of 5 % prior to 1985, to in excess of 10% today. The current demand far exceeds the supply from the two refineries resulting in increasing imports which now account for over 67% of demand. This rapid demand has lead to a confusing picture of the future development of the supply and demand of LPG. Current forecasts of demand growth vary between 3 and 10% per year for the next decade. The upper growth would translate into a consumption in excess of 2 million MT/Y by the end of the decade. A clearer picture of the future growth expectations, sources of supply, and the need for demand side management of this rapidly growing sector is necessary.

C. Sector Organization

Privatization

2.8 The privatization of the petroleum sector has already started with the privatization plans of SNPP (Societé Nationale des Produits Pétroliers). Three tail distribution companies (CMH, Petrom and Shell) have already been privatized. Negotiations are currently underway for the privatization of the other companies. Petrom and CMH were purchased by domestic investors. No plans however have been made for the privatization of the refining companies SAMIR and SCP, nor have any decisions yet been made on the limitation of concentration of the industry and restraint of trade. This raises a number of questions as to the future structure of the industry. One concern is the potential for excessive control of the distribution system by a private monopoly. Three distribution companies - Shell, Mobil and

Total would control 60% of the market on privatization of their SNPP affiliates and current participation in other private companies. Another yet undefined question is to what extent the refining companies will be allowed to diversify into distribution and marketing (either through acquisition or diversification). SCP is considering downstream diversification as a potential pre-requisite for long term viability.

Refinery Sector Options

2.9 An recent analysis of the impact of the introduction of natural gas and the implementation of the privatization law leads to the consideration of three refining operational options:

- Option 1: Continuation of current refinery configuration and mode of operation.
- Option 2: Continuation of the current refinery configuration with a more flexible approach to the choice of crude oils.
- Option 3: Upgrading the refinery processing flexibility by the installation of hydrocracking capacity in SAMIR.

2.10 The analysis of these options arrived at the following general conclusions. The continuation of the current mode of operation and configuration (Option 1) will require refinery sector protection (or subsidies) from foreign imports both in the short and long term. The subsidy requirement calculated were of the order of $4 per ton for SAMIR and $8 per ton for SCP. With the proper choice of crude oils (Option 2) both SCP and SAMIR would be marginally competitive with imported products. Option 3 would require a significant bottoms upgrading facility investment in SAMIR of the order of $300-400 million, which would make SAMIR competitive with imported products. The conclusions are not materially impacted by the introduction of natural gas. Thus the major issues facing the Moroccan refinery sector are that a) for the long term operation of domestic refineries, significant investments must be made to remain competitive or b) protection from international imports will be continually needed. A resolution of the long term choices facing the refineries need to be defined prior to defining a short term strategy. In all cases a more flexible approach to refinery operational flexibility appears to have both short and long term impact on petroleum supply efficiency.

2.11 The liberalization of the petroleum sector is based on the privatization of the refining and distribution companies, liberalization of imports, and decontrol of margins and prices. Apart from the privatization of the distribution companies which has already begun, neither the timing nor extent of the other actions have been addressed. As far as timing is concerned it is generally agreed that complete opening of the domestic market to the uncontrolled import of foreign products would probably result in the flood of imports resulting in the shut down of the domestic refineries. Conversely privatization of the refineries without continued Government support will be difficult if not impossible. The choices facing the country are a) rapid decontrol with unknown outcome; b) a managed transition period leading to a clearly defined objective that includes an efficient refining sector; or c) short-term reactive response to current policy directives which may neither meet short term efficiency improvements nor the long term objectives.

D. Petroleum Pricing and Taxation

2.12 Petroleum Prices have been fixed by the Government for the last two decades. The current system of price control fixes petroleum product prices at the ex-refinery, wholesale and at the retail levels. Ex-refinery prices have been determined historically by setting individual petroleum prices relative to the proportional ratio on the international market and the dictates of allowing the refineries a fixed operating margin. Wholesale and retail petroleum prices are set by a rigid price structure that allows for predetermined fixed margin at both the wholesale and retail levels. Regional price differences are controlled through the allowance of controlled transportation differentials from the two main refinery points of supply. Cross subsidization of petroleum product by the pricing mechanism is limited to the subsidization of LPG by the control of ex-refinery (or import) prices with compensation at the distribution level. Differences experienced between crude oil price fluctuation and the fixed domestic product prices are reconciled and adjusted annually between the refiners and the Government through the Compensation Fund and/or changes in ex-refinery prices in the case of large price deviations. The current price levels have been in effect with only minor modifications since 1986.

2.13 The fiscal revenues from the petroleum sector came from ten different levies of petroleum refining and distribution. Total revenues derived from petroleum operations in 1992 and forecasted for 1993 are shown in Table 2.1. At the refinery subsector level these are: import duties on crude oil and products, special import duties on crude oil, normal excise tax , special excise tax, consumer Tax (TIC), and excess accumulation. Revenue from the distribution sector consists of: Value added tax (TVA), Tax on domestic Consumption (TIC), Credit de Droit, and adjustments through the Compensation Fund. The Special Import Duty on crude oil is tied into crude oil prices with the intent on recapturing windfall profits when crude oil prices drop below 18 US$ per barrel. Differential taxation is also used as a demand side management tool primarily in the form of higher consumer taxes on gasoline relative to that on diesel fuels.

2.14 The current system of petroleum price determination and taxation is recognized to be deficient in that: a) it does not foster the least cost supply options through refinery optimization and/or the importation of products, b) does not provide adequate incentive for the refineries, c) the system is difficult to administer, d) lacks transparency and does not give the necessary signals to the petroleum sector, and e) induces distortions in the price between petroleum products and between petroleum and competing energy sources such as coal. A critical analysis of the system, operation and the alternative solutions was carried out in the mid-eighties with the assistance of the World Bank. At that time it was recommended that a pricing system be adopted that would link domestic petroleum product ex-refinery prices to international based border prices, and that taxation induced distortions between crude oil and products and between heavy fuel oil and coal be eliminated. Because of the processing configuration of the existing Moroccan refinery and the market requirements (characterized by a high heavy fuel oil demand), it was suggested at that time (1986) that a degree of protection be provided to the domestic refining subsector through the application of an indexed pricing system. Opposition to the adoption of this system hinged primarily on the fear that this would result in a loss of revenue to the Government. The adoption of this Indexation system is still under discussion and reevaluated in view of the current environment.

Table 2.1
Petroleum Product Taxes and Revenues

	1992		1993	
	Million Dh	%	Million Dh.	%
Refining				
Import Duties	178	2.0	187	1.9
Special Import Duties	407	4.5	151	1.6
Excise Tax	890	9.8	936	9.7
Special Excise Tax	2,033	22.4	757	7.8
Domestic Consumption Tax	1,688	18.6	2,941	30.3
Excess Earnings	1,050	11.6	1,264	13.1
Total Refining Operations	6,246	68.9	6,237	64.4
Distribution				
Domestic Consumption Tax	2,084	23.0	2,275	23.5
Credit de Droit	10	0.1	11	0.1
Value Added Tax	1,130	12.5	1,256	13.0
Compensation Fund	299	3.3	251	2.6
Refunds and Subsidies	(700)	(7.7)	(350)	-3.6
Total Distribution	2,823	31.1	3,443	35.6
Total Petroleum Sector	9,069	100.0	9,680	100.0

Price Level and Structure

2.15 The price structure of the major petroleum products sold in Morocco are based on a fixed pricing structure. Starting with an fixed ex-refinery price, allowances are made for the addition of fixed costs and margins for distribution and marketing for each individual product to establish a base price. Government determined transportation costs are then allowed on top of the base price to arrive at the allowable retail and wholesale prices in the different geographical regions. The buildup of allowable marketing and distribution costs for the major petroleum products is shown in Table 2.2 and for the LPG products in Table 2.3.

2.16 A comparison of end user price levels in Morocco with the corresponding prices in some European countries in 1993 is shown in Table 2.4. In 1993 the prices in Morocco for gasoline were approximately 80% of the average price for the selected European countries. Diesel oil prices, the main transportation fuel in Morocco, was about 30% lower than the average price in European countries. Heavy fuel oil prices in Morocco were significantly higher (160%) than corresponding oil prices in Europe. This difference in price is due to a) the different levels of taxation and b) the distorted of inter-product prices at the ex-refinery level in Morocco. A comparison of the tax rates on petroleum fuels for the main products in Morocco and selected European countries is shown in Table 2.5. In absolute terms, in 1993 the tax burden on gasoline and diesel in Morocco was comparable to that in Europe, but substantially higher on HFO.

Table 2.2
Price Structure of Major Products

	Premium Gasoline (d=0.739) (DH/HL)	Regular Gasoline (d=0.722) DH/HL)	Illuminating Kerosene (d=0.792) (DH/HL)	Gas Oil (d=0.832) (DH/HL)	Fuel No.2 (DH/T)
1. Ex-Refinery Price	404.92	367.61	291.84	278.11	1,607.80
2. Domestic Consumption Tax	130.38	126.70	59.81	64.05	16.50
3. VAT (7% 1+2)	37.47	34.60	24.62	23.95	113.70
4. Credit de Droit (0.34% 2+3)	0.57	0.55	0.29	0.30	0.44
5. Losses (1.25% 1 to 4)	7.17	6.62	4.71	4.58	
6. Distribution Costs and Margins	14.70	13.70	8.50	8.60	90.00
7. Special Allowance for Inventory	4.00	4.00	4.00	4.00	25.00
	599.21	553.78	393.77	383.59	1,853.44
Less VAT (3)	37.47	34.60	24.62	23.95	113.70
	561.74	519.18	369.15	359.64	1,739.74
8 Caisse de Compensation	70.57	89.51	(43.91)	1.02	13.06
9 Wholesale Price ex VAT	632.31	608.69	325.24	360.66	1,752.80
10. VAT (7% of 9)	44.26	42.61	22.77	25.25	122.70
11. Wholesale Price inc. VAT.	676.57	651.30	348.01	385.91	1,875.50
12. Retail Losses (0.3% 11)	2.03	1.95	1.04	1.16	
13. Retail Margin	17.40	16.75	8.95	9.93	
14. Retail Sales Price (Base Price)	696.00	670.00	358.00	397.00	

Table 2.3
LPG Price Structure
(DH/MT)

		Containers over 5kg	Containers Below 5 kg	Bulk Quantities
	Filling			
1.	Ex Refinery (Import) Price	1,950.00	1,950.00	1,950.00
2.	Domestic Consumption Tax	46.00	46.00	46.00
3.	VAT (7% of 1+2)	139.72	139.72	139.72
4.	Filling Losses (2% of 1 thru 3)	42.71	42.71	42.71
5.	Cost and Margin	200.00	200.00	200.00
6.	Special allowance for Inventory	30.00	30.00	30.00
7.	Bulk Transportation	50.00	50.00	-
8.	Bottling Cost	20.00	50.00	-
9.	VAT (7% of 4 thru 8)	23.99	26.09	16.01
10.	Sales Price to Distributors	2,502.42	2,534.52	2,380.44
	Distribution			
11.	Purchase Price from Filling	2,502.42	2,534.52	2,380.44
12.	Cost and Margin Distributor	278.33	346.67	432.00
13.	Cost and Margin "Depositary"	278.33	346.67	-
		3,059.08	3,227.86	2,812.44
	Last VAT (3+9)	163.71	165.81	155.73
		2,895.37	3,062.05	2,656.71
14.	Compensation Fund	(224.03)	(351.77)	(39.89)
15.	Wholesale Price ex VAT	2,671.34	2,710.28	2,616.82
16.	VAT (7% of 15)	186.99	189.72	183.18
17.	Wholesale inc. VAT	2,858.33	2,900.00	2,800.00
18.	Retail Margin	100.00	150.00	-
19.	Retail Price (Base Price)	2,958.33	3,050.00	-

Table 2.4
Energy End-Use Prices - 1993

Country	Gasoline (US$/Litre)	Diesel (US$/Litre)	Fuel Oil (US$/MT)
Germany	0.922	0.565	118.76
Belgium	0.962	0.597	104.18
Spain	0.821	0.555	118.17
France	0.959	0.546	104.99
Italy	1.027	0.658	152.15
Portugal	0.941	0.610	165.98
U.K.	0.807	0.625	98.61
Average	0.920	0.594	123.26
Morocco	0.733	0.418	197.42
% of Average	79.7	70.4	160.2

Source: 1) IEA Statistics, 1994
2) MEM
Exchange Rate: Dh/US$ = 9.5

Table 2.5
Tax on Petroleum Product - 1993
Percentage on Consumer Prices

Country	Gasoline	Diesel	Fuel Oil	
			Industry	Power
Germany	73.5	59.0	15.3	26.1
Belgium	71.8	54.9	20.8	20.8
Spain	68.2	54.6	23.0	12.0
France	78.6	59.9	24.5	n.a
Italy	74.6	64.0	18.8	n.a
Portugal	73.2	59.2	39.8	0.0
U.K.	70.6	59.2	15.7	n.a
Average	72.9	58.7	21.0	14.7
Morocco	66.3	60.2	53.8	53.8
% of Average	90.9	102.5	256.2	365.0

Source: 1) IEA Statistics, 1994
2) MEM
Exchange Rate: Dh/US$ = 9.5

2.17 Under the current system it is difficult to accurately estimate the actual level of taxation on each of the individual products due to a) the complexity of the tax structure, b) the distortions in pricing mechanism between petroleum products and between crude oil and products, and c) the cross subsidization and compensation mechanism. The direct taxes and duties imposed on the importation of crude oil and products are shown in the following table:

Table 2.6
Import Duties and Taxes on Petroleum (as per March 1994)

	Crude Oil	Product	Coal
Normal Customs Duty	2.5%	35%	2.5%
Normal Excise Tax	15%	15%	15%
Special Customs Duty	500 Dh/T		
Domestic Consumer Tax	2.5%*6*(1445-VI)		
Special Excise Tax	15%*6*(1445-VI)	-	
VAT		7%	19%

OPTIONS

2.18 Morocco has started to move in the direction of a more liberal and open petroleum economy under the impetus of the privatization and foreign trade laws. The ultimate stage of liberalization, the timing of implementation, and the intermediate steps taken are not yet well defined. The focus of these options is to a) clearly define the long term objectives for the restructuring of the petroleum sector and to b) focus on the actions, decisions and options needed to implement the current laws consistent with the long term objectives for the sector. There are many components and options that will have to be implemented in achieving the goal of a

liberalized petroleum sector. Most of these actions are inter-related and must be carried out at the same time if the ultimate saving are to be realized. The timing of such decisions is also important if the lowest cost option of supply to the consumer is to be achieved. A list of the main areas that have to be addressed and decisions made, either by the Government and/or private enterprise is shown in Table 2.7.

Table 2.7
Decision Areas

1. Privatization
   - Distribution Companies
   - Refining Companies
2. Import Restrictions
3. Price Controls
   - Ex Refinery Prices
   - Consumer Prices
   - Price Volatility
4. Taxation
   - Government Revenue
   - Distortions
5. Investment Requirements
   - By the Government
   - By Private Enterprise
6. Security of Supply

2.19 To illustrate the inter-relationship and impact of the various decision options listed in Table 3.1, three hypothetical scenarios have been postulated and will be analyzed. These span a wide range of policy options, potential saving and risk, not necessarily all desirable or feasible, but are presented for illustrative purposes. These scenarios and their goals are:

- Scenario 1: Liberalization of the Petroleum sector in the shortest practical time, consistent with the implementation of the privatization law.
- Scenario 2: Progressive decontrol with longer term retention of a domestic refining capability.
- Scenario 3: Deregulation, following a transition period to allow the industry to adapt to the competitive requirements.

A. Scenario 1.

2.20 This scenario envisages the rapid and extensive liberalization of the Moroccan petroleum sector resulting in unrestricted import or export of petroleum products; a domestic industry unrestricted by price or margin controls, and/or taxation distortions. This would meet the immediate objectives of the foreign trade and privatization laws; and establish a free market system where decisions at the supply and consumer levels are set by border prices for tradeable petroleum products.

Actions

2.21 The major decisions that would be needed in this scenario are:

- the privatization of the two refining companies;
- import/export decontrol
- the abolishment of differential taxation and/or import duties on crude oil, products and coal;
- the decontrol of ex-refinery prices and the retail price controls;
- The restructuring of the taxation structure to generate the same Government revenue.

Results

2.22 The abolishment of import restrictions over a period of time would require the implementation of new import management mechanism consistent with the implementation of the law of privatization and foreign trade, i.e. a tariffs differentiating between crude oil and products. SCP, SAMIR and the retail distribution companies would then become importers of petroleum products based on the strength of their port facilities, storage and infrastructure. Longer term viability for the two refineries could depend on them integrating into marketing and distribution and/or upgrading their refining processing capabilities.

Savings

2.23 Based on the historical experience of the petroleum sector in the eighties, the average savings in importing all petroleum products rather than refining crude oil domestically would amount to some 6% of the wholesale petroleum product cost. This amount translates into a saving of 540 million Dh per year at current prices. Longer term savings would be realized in demand side optimization between gasoline and diesel utilization in the transportation sector, and HFO and coal in the power sector. Short term Government revenues would be enhanced through the sale of the SNPP, SCP and SAMIR. On the negative side the social cost implications would have to be considered.

Risks

2.24 There is a high degree of probability that the refineries would close with the phase out of controls. The security of supply of petroleum products based on imports rather than the domestic refining of imported crude oil is the major question. This has been studied extensively without any clear-cut conclusion. It is the Government position that the closing of the refineries would decrease the flexibility of source of supply for Morocco both in normal times as well as during disruptions. Secondly, it would eliminate the single point responsibility, for assuring the countries supply of petroleum products now assigned to the refineries.

B. Scenario 2.

2.25 The objective of this scenario is to provide the lowest cost supply of petroleum products to the country based on internationally dictated border prices, while at the same time retaining the flexibility of supply afforded by maintaining the most efficient domestic refining capability. This scenario explores the operational and investment options that should be considered if the decision is made to retain a long-term domestic refining capability.

Short Term Actions

2.26 The immediate (one to three year) options that could be considered to improve sector efficiency are as follows:

- Progressive decontrol of import restrictions, allowing access to imports by both distributors and refiners.
- Completion of the privatization of the Distribution companies.
- Abolition of differential taxation and/or import duties on crude oil, products and coal;
- Protection of refinery viability through ex-refinery price control (Indexation System), direct subsidy or other control mechanisms.
- Deregulation of distribution price and margin controls.
- Optimization of Refinery Operations with the objectives of optimum short term efficiency and long term viability.

Long Term Actions

2.27 The longer term options to be considered include:

- Investment in upgrading the Refineries to remove the current rigidities of processing capability.
- Privatization or progressive private participation in the refining sector.

- Optimization of Demand Side Management of Petroleum Market (Diesel/Gasoline, LPG, and Natural Gas/Coal/Oil use).

- Phase-out of Refinery protection.

Refinery Options

2.28 The current refining sector economic inefficiencies result from (i) the restrictions and dictates of the domestic pricing and taxation system, and (ii) the technical inflexibility of the refineries, especially that of SAMIR. The first can be diminished by short term actions including the following:

- The current taxation system and country to country agreements favors the import of crude oils from certain sources (Saudi Arabia, Kuwait, and Iraq). This results in the importation of relatively heavy crude oils which prevents the expansion of the gasoil market. Solutions to these imbalance are (i) the importation of reconstituted or spiked crudes more suited to the Moroccan market and/or (ii) more aggressive net-back pricing on existing crude oils.

- Removal of the dictate that the refineries be responsible for the supply of the domestic market, allowing refiners to optimize their product slate by balancing refinery runs with imports.

- Allow the refineries to enter into joint venture/tolling agreements with distributing companies.

2.29 Secondly, if a longer term perspective is assured for the refineries, they will be in a position to contemplate the necessary investment alternative to modify their processing capability to meet future petroleum market requirements. Options for consideration include:

- Maximization of Diesel Fuel through Heavy Oil upgrading through the cat cracking, hydrocracking or coking of the bottom of the barrel. Options currently being considered in similar situations around the world are both captive facilities and stand alone private equity participation cracking facilities (Cresent Hydrockracker Project in Pakistan, and Valero Oil in the US).

- Facilities to maximize the efficiency of utilization of residual fuel oil in power generation. The options include cogeneration; the integration of flexicoking; coking and fluid bed combustion (Chile, Mexico); and/or gasification and combined cycle IPP (Italy, China) facilities.

Savings

2.30 The Task Force study estimates that subsidy for SAMIR could be eliminated once the necessary processing investments are made. This could also be the case for SCP. The savings realized are estimated to be at least 6% of border refinery sales. Hence in this scenario the net savings realized by the country above today's operations would amount to approximately 540 million Dh per year, in addition to the amount realized from the sale of the SNPP.

Risks

2.31 This scenario would retain the flexibility of refining crude oil domestically or importing oil while at the same time retaining the core refining complex for future expansion. The technical investments required to upgrade the refineries are very significant if the hydrocracking route were to be taken of the order of $300-400 million. Private funding of the project should be considered.

C. Scenario 3.

2.32 The third scenario falls between Scenario 1 and 2, in that refineries are protected from excessive competition for a very limited transition period. After some period of the refining sector would be decontrolled and expected to fend on the open market. One variant currently being studied entails the implementation of the indexation system, readjustment of the taxation system, and continued control of distribution margins and consumer prices. Imports would be limited through differential tariffs on crude oil and products. The advantage of this scenario over scenario 1 is that it would give the refiners a longer period of time to adapt to their new role. The disadvantages are: (i) a complicated system of controls has to be implemented only to be soon abandoned, and (ii) unless the transition period is well defined and it's demise is perceived to be real there will be a tendency to avoid the hard decisions that have to be made in the long term.

PLAN OF ACTION

2.33 During the December 1993 seminar a number of options were discussed related to the future development of the petroleum subsector. From the many options discussed a number of specific and strategic measures were recommended to implement a plan of action for the petroleum subsector. The recommended measures are summarized in Table 2.9.

A. Specific Measures

2.34 Morocco currently imposes a larger tax on the consumption of motor gasoline than on that of diesel fuels, on the basis that diesel is used for essential agricultural and heavy transportation purposes, while gasoline is primarily used for personal and non-essential needs. This lead to distortions in fuel use in Morocco where much of the automotive pool is now diesel based. This further leads to product imbalances at the refinery level, necessitating the export of excess naphtha into Europe at a substantial economic loss to the country. The seminar recognized the need to harmonize the taxation structure of gasoline and diesel to reverse this dieselification trend and recommended that this be done through the application of a vignette tax on private diesel-fueled automobiles. The Bank considers that this would be a step in the right direction in that it will equalize the tax burden for the two fuels in the private automotive sector. However it would leave the distortion in place for the agricultural and heavy transportation sector which account for a major portion of these fuels in Morocco, and considers that the long-term objective should be equal tax treatment for both fuels in all applications, so that consumers can make the least cost choice for their particular application.

2.35 The price of different fuels (coal, gas and heavy fuel oil) vary substantially at the consumer level due to different levels of taxation and distortions through price control. It was recommended that all fuels should bear the same tax so that the consumer would be faced with

prices free of fiscal distortions, resulting in the least cost choice for all consumers. The need to implement tax harmonization for the three fuels has unanimous agreement.

Table 2.8: Restructuring of the Petroleum Sector - Options

	Scenario 1	Scenario 2	Scenario 3
Objective	Liberalize Petroleum sector in shortest time consistent with the Law of Privatization and Exterior Trade.	Progressive decontrol while investing in Refinery upgrading	Progressive decontrol without commitment to Refinery Sector
Actions	1. Decontrol of imports/Exports 2. Abolish differential taxes on coal/oil/ products.	Short Term (1 year) 1. Progressive decontrol of import restrictions. 2. Abolish differential taxes on coal/oil/ products. 3. Protect Refinery viability through ex-refinery price control, direct subsidy, or other means. 4. Deregulation of distribution prices and margins. 5. Complete privatization of Distribution. 6. DSM of petroleum sector. Long Term (3 years) 1. Invest in upgrading Refineries 2. Phaseout refinery protection. 3. Privatize Refineries.	Short Term (1 Year) 1. Progressive decontrol of import restrictions. 2. Abolish differential taxes on coal/oil/products. 3. Protect Refinery viability through ex-refinery price indexation, and differential tariffs between crude oil and product imports. 4. Deregulation of distribution prices and margins. 5. Complete privatization of Distribution. 6. DSM of petroleum sector. Long Term (5 Years) 1. Phase out refinery protection after 5 years. 2. Integration of refineries up and downstream. 3. Privatize Refineries. 4. Create regulatory agency out of SNPP.
Risks	Possibility that refineries would shut down.	None.	Could result in a 5 year transition period with status quo at the end of period.
Savings	Minimum saving of 540 million Dhs per year based on imported product prices	Minimum saving for three year period, maximum savings thereafter.	Minimum saving for five year period. Savings thereafter unknown
Seminar Conclusion	Rejected by Seminar participants, which concluded need for transition period prior to privatization of refineries.	Did not address upgrading refineries.	Advocated transition period, did not address privatization of refineries.
World Bank Position	Immediate privatization of refineries should be considered	Bank should consider viability of investment in refineries prior to privatization	Transition period excessive and should consider decreasing to 1 year for implementation of policies, and 2 years for privatization. Direct subsidy to the refineries from Treasury preferred over indexation system and differential tariffs during transition period

2.36 Currently the import of petroleum products is strictly controlled by the MEM which issues limited import authorization to the two domestic refiners. Several import taxes are imposed on crude oil and products, and further distortions between individual products result from the application of the existing pricing structure. The reform of the petroleum regime to

comply with the new trade liberalization law is necessary. However, a transition period between the existing system and complete decontrol was recommended, during which the domestic refineries would be protected from excessive foreign competition by imposing a differential tariff between crude oil and products. The imposition of an ad valorem tariff on product imports and duty-free imports of crude oil, was recommended. The Banks considered that the country would be better served by immediately decontrolling ex-refinery prices and liberalizing imports so that the two domestic refineries would have to compete with oil imports at world prices without any import barriers. If the refineries were to suffer losses as a result of decontrol, these should be covered by payments directly from the Treasury. This would ensure the least cost supply of petroleum products for the domestic consumer; continue to provide the country with the security of supply associated with the operation of a domestic refining sector; while at the same time providing a transparent system of refinery subsidy.

2.37 The seminar recommended that the current system of controlling ex-refinery prices, which has been in effect for twenty years, be replaced with an indexation system. The indexation system proposed would fix ex-refinery prices equal to border prices plus a fixed percentage or coefficient. This increase would make allowance for the disparity of Moroccan product slate, and the domestic refineries lack of flexibility to respond to changing product prices. Based on prior analysis a coefficient of 6.5% was considered adequate to allow the refineries a reasonable rate of return on their operations. Border prices, under the indexation system, would be calculated from Rotterdam petroleum product prices, adding the necessary freight and other import costs. A comparison of the indexation system with the current pricing system was carried out in the mid 1980's with the Banks assistance. The conclusion was that, under the then prevalent conditions, the indexation system had some advantages over the current pricing mechanism. The advantages were not sufficiently attractive to result in the systems immediate adoption. It is not expected that the relative merits of the two systems will be significantly changed during the transition period now proposed.

2.38 The seminar recommended that consideration be given to establishing an off-shore zone treatment for the two domestic refineries in effect giving the refineries tariff-free access to petroleum product imports. This would allow the refiners to optimize their processing operations without distortion of differential crude oil/petroleum product tariffs. A review of this recommendation indicates that the treatment of the refineries as off-shore installations would negate the protective mechanism intended by establishing a differential tariff protection for the refineries in the first place. Alternatively, the establishment of a special tariff free import situation for the refineries would be counter to the intent of the liberalization law. The Bank suggests that the import tariffs be equally applied to all importers, including the refineries, consistent with the requirements of the statute of importers.

Table 2.9
Petroleum Sector Restructuring Policy and Program

	Seminar Recommendations	World Bank Position	MEM Position
Specific Measures			
1	Eliminate fiscal distortions between gasoline and gasoil by taxation of diesel (vignettes)	Vignette considered an impractical solution; target should be to apply equal taxation for diesel and gasoline for all applications	Same as World Bank
2	Fiscal harmonization for all fuels (fuel oil/coal and gas)	Agreed	Agreed
3	Introduce indexation system in parallel with the application of new law on trade liberalization	Decontrol ex-refinery prices, eliminate tariff differentials between products and crude oil	
4	Extend Off-shore zone to refinery product and profit	Import tariffs on products should be equally applied to all importers, including refineries	A new scheme considered consisting of an "off-shore platform" which includes SAMIR's refinery, storage and port receiving facilities
5	Define a statute for importers regulating the right to import	Agreed, but contingent on acceptable definition of importers	To be revised according to the MEM's proposal (see 4.)
6	Address the issue of special tariff agreements with selected supplier countries	Eliminate special treatment of both crude oil and petroleum products from all sources	Same as World Bank
Strategic Measures			
1	Gradually eliminate import monopoly	Eliminate import licenses; phase out progressively differential tariff between crude oil and products during transition period	Same as World Bank Recommendations under implementation effective (1/1/95)
2	Allow a five year transition period for refineries to adapt to a competitive, unprotected environment	Limit transition period to three years	5 year transition period
3	Diversify and vertically integrate refinery upstream and downstream	No objection	Agreed
4	Strengthen anti-dumping measures	Implement anti-dumping measures as defined by Trade Liberalization Law	Same as World Bank
5	Establish regulatory body for petroleum distribution industry using SNPP	MEM should continue oversight under existing laws; abolish margin control	Same as World Bank
6	Regulate import, storage and distribution of LPG	After decontrol, LPG trade should be treated identically to all other products. Any subsidy should come directly from the Treasury and go to the benefit of the consumer	Same of World Bank

2.39 The recommendations of the seminar called for the establishment of a statute regulating the right to import petroleum products into Morocco. Four specific conditions were considered important in defining a qualifying importer. The regulations would require that the importer a) imports products with product specifications consistent with Moroccan standards; b) has the capabilities and infrastructure to handle petroleum products; c) has port facilities capable of handling petroleum products and d) maintains a defined level of strategic storage of the imported product. The Bank agrees with these requirements contingent on the final definition of the qualifying importer, which should be sufficient to safeguard the safe operations of petroleum product imports into the country, while at the same time not being excessively restrictive and resulting in an import monopoly.

2.40 Morocco has special agreements with a number of Middle East and North African countries on the preferential duty-free import of crude oil and petroleum products. In complying with the new law governing exterior trade, and the optimum operation of the refining subsector, it is recommended that the tariffs for crude oil and products be made identical regardless of origin.

B. Strategic Measures

2.41 The seminar proposed the elimination of the current import licensing restrictions on the import of petroleum products as a means of eliminating the domestic refiner's effective import monopoly in line with the new law; and the establishment of a differential tariff system between crude oil and products for a transitionary period, and subsequent decontrol of imports and prices. The Bank suggests that if this route is taken that all non-tariff restrictions on the import of crude oil or petroleum products be eliminated; and that the differential tariff imposed on petroleum products at that time be progressively decreased during the duration of the transition period.

2.42 A five year transition period was proposed to allow the domestic refineries to adapt to a competitive unprotected environment resulting from the eventual decontrol of petroleum imports and prices. The Bank recommends limiting the transition period to three years, a period having proved to be adequate to make the transition in other countries.

2.43 The seminar recommended that the domestic refineries be allowed and encouraged to integrate their operations vertically upstream into oil exploration and downstream in marketing and distribution.

2.44 The seminar proposed that a new regulatory body be established to regulate the petroleum distribution industry once the remaining portions of SNPP are privatized. This proposed regulatory body could be an independent agency; or operate within the SNPP structure. The Bank questions the need for such an additional regulatory body; and whether the continued oversight of petroleum distribution would not be better handled under the existing MEM structure. Furthermore, the need to decontrol distribution and marketing margins should be addressed.

2.45 The regulation of LPG imports storage and distribution is considered to be separate from the other petroleum products due to the special position of LPG as a subsidized fuel in the Moroccan market. The Bank suggests that after petroleum product decontrol that the

GPL trade should be treated identically to all other products. If any subsidy is deemed necessary then it should come directly from the Treasury and go to the benefit of the ultimate consumer.

RECENT DEVELOPMENTS

2.46 The Government objective is to arrive at the complete decontrol of the petroleum sector and thus ensure the optimizaiton of the petroleum market supply. The privatization of the SAMIR refinery is considered within this global context. The object is to open the sector to private investors, both national and international.

2.47 The following measures have been taken:

- privatization of SNPP's distribution companies;
- implementation of the indexation of petroleum product prices and the related fiscal reforms (January 1, 1995);
- Government's decision to privatize SAMIR.

III. THE NATURAL GAS SECTOR

INTRODUCTION

3.1 Morocco will soon embark on a new energy era with the completion of the Maghreb European Gasoduc (North Africa Gas Pipeline). Because the pipeline from Algeria to Europe transits through Morocco, the country will be able to purchase gas on a commercial basis from Sonatrach. The introduction of natural gas into the economy will help achieve broader economic goals, including increasing the competitiveness of domestic industries, stimulate economic growth and attract foreign investment.

3.2 To maximize the benefits to the energy sector and the economy, key issues must be addressed. They include institutional decisions on the structure of the industry as well as the legal framework and creation of a regulatory authority to oversee the industry. Care must be taken to prevent the abuse of monopoly power and protect the interests of all parties, including investors as well as consumers. Commercial gas purchase contracts, rules on access to the pipelines, pricing and tariff mechanisms have to be decided and implemented. The Government needs to develop and continually revise market strategies to enable the economic expansion of the pipeline system and increased use of gas by the electric power utilities in order that they become more cost efficient and environmentally sound with the reduction of harmful emissions caused by fuels that are not as clean burning as natural gas. The World Bank, through its loan and technical assistance programs, is assisting the Government to address these issues.

ISSUES AND OPTIONS FOR THE DEVELOPMENT OF NATURAL GAS

A. Global Approach to a New Energy Policy

3.3 The introduction of large quantities of natural gas into Morocco will introduce major structural changes in the country's energy sector. It implies inter-fuel substitution and increased inter-fuel competition. It brings more flexibility, less pollution, regulation of the industry, and new forms of organization. Therefore, the introduction of natural gas into the economy must be planned carefully, taking into account natural gas' characteristics and the role that this new energy source will play in the national energy policy.

Characteristics of Natural Gas

3.4 Natural gas is a primary energy resource which has very unique characteristics: it is close to oil at the upstream level because exploration activity and risks are similar; it is close to power at the downstream level because a fixed link or a dedicated line is needed to transport the gas from the field to the final users. Natural gas' characteristics may be summarized as follows:

- Gas has relatively low energy density but high volatility. As a consequence, gas must be transported by pipelines (LNG is an exception).

- Western European energy transportation costs (by large pipeline or high-voltage cables) are as follows:

  - Gas is more expensive than oil by a factor of five to ten.
  - Electricity is more expensive than gas by a factor of about ten.

- Gas transportation has large economies-of-scale.

- The share of transportation/distribution costs to the gas end-user in overall supply costs is large.

- Storage costs of natural gas are high and are economic only for medium and large volumes, except in specific cases.

- Environmental and efficiency advantages can be realized in burning gas, compared with oil products and coal. Gas is particularly efficient in terms of power generation.

- Nevertheless, gas can often be substituted by other fuels at costs that may be higher but not prohibitive. Gas is not an indispensable fuel.

Natural Gas and Energy Policy in Morocco

3.5 The development of natural gas, as a new energy source in Morocco, appears to be consistent with the national energy policy aimed at (i) least cost energy supply, (ii) encouraging the most economic inter-fuel substitutions (iii) mobilizing the domestic resources (transit fee gas can be considered as a domestic resource), (iv) enhancing efficiency in energy consumption.

3.6 Beyond these goals, the energy future of Morocco as in many countries, is marked by a number of uncertainties:

- the economic cost of new energy technologies, (for example shale oil, which exist in large quantities in Morocco, and clean coal technologies),
- the world price of energy fuels in terms of level, trends, and stability,
- the expected level of energy consumption,
- the potential for domestic discoveries of oil and gas, and
- environmental constraints.

3.7 In the process of defining an energy policy, meeting these goals and challenging these uncertainties, the introduction of a new source of energy such as natural gas, offers a number of advantages:

- Allow more diversity in the energy balance, i.e. less dependency on each fuel and less vulnerability to uncertainties.

- Introduce more flexibility due to inter-fuel substitution options which may be modified as necessary in the future.

- Improve energy efficiency through the implementation of technologies such as gas turbines, combined cycles and combined heat and power production (CHP)or co-generation. These new technologies, coupled with a demand-sided management which can reduce the additional power capacity requirements under a traditional approach thereby reducing substantially the financial resource requirements.

- Indicate increased commitment of the country to protect and improve the environment.

- Foster economic development by attracting investment in industries that need a reliable and fairly priced source of energy.

- Stimulate job creation in the new natural gas industry

The Organization of Natural Gas Monopolies

3.8 The transmission and distribution of natural gas are generally considered as natural monopolies in a given area, subject to various forms of regulations. Gas transmission over long distance necessitates large investments and a natural monopoly stems from the fact that no more than one (or a few) transmission lines can be economically justified. A number of countries have given a national monopoly over the transmission business, while other countries have granted concessions to a number of companies (Table 2). Generally a geographic monopoly (sometimes for the entire country) is granted to gas distribution companies. This monopoly covers all gas sales, with the exception of some specified consumers (e.g. power plants). Natural monopolies call for Government regulation in order to:

- Protect investors against the occurrence of competing investments and assume adequate compensation for their investments,

- Protect consumers against discrimination, abuse of monopoly power, and predatory practices.

- Ensure the public interest in terms of safety and stability of supply.

3.9 Various models for the organization of the gas industry have been set up in different countries (Table 2). Among these different models, not one has proven to be the most efficient. Today, in both developed and developing countries, including east Europe - the gas sectors are undergoing great structural changes. The main trends of evolution are (i) the increasing role of the private sector and private investors, (ii) changes in regulation to promote more competition and more efficiency, (iii) challenging legal monopolies over imports/exports and transmission, (iv) emergence of open access procedures to transmission networks (v) changes in regulation to encourage independent power production and cogeneration, (vi) increased attention to gas value at the burner's tip, inter-fuel substitution, gas-to-gas competition and the resulting level of prices, (vii) emphasize on demand side management, and (viii) environmental considerations.

Table 3.1
FORMS OF ORGANIZATION OF THE GAS INDUSTRY

A) STATE OWNERSHIP	
BELGIUM	DISTRIGAZ, 50 % State owned, has a monopoly over transmission, imports and exports. Distribution by local companies.
DENMARK	DONG, a State owned company, has a monopoly over transmission, imports and exports. Distribution by 5 municipal companies. Regulation by the Danish Parliament.
FRANCE	GAZ de FRANCE, a State owned company, has a monopoly over imports, 85% of the gas transmission business, 95% of the gas distribution (Joint distribution of gas and electricity with EDF). Regulation by the Ministry of Industry (Tutelle) through a Contrat d'Objectif which includes an efficiency factor (close to the British formula).
GREECE	DEPA, a State owned company, has a monopoly over imports and transmission. Distribution by municipal companies. Control of tariffs by the Government.
IRELAND	BOARD GAS EIREEN (BGE) a State owned company has a monopoly over imports and transmission. Distribution by local companies controlled by BGE. Control of tariffs by the Government.
ITALY	SNAM, a State owned company of ENI group has monopoly over imports, exports and transmission. 55% of gas distributipn by ITALGAS (controlled by SNAM). Local distribution companies.
SPAIN	ENAGAS, a State owned company, has a monopoly over imports and exports and a dominant position in transmission. Gas distribution is made by ENAGAS or affiliates (55% of the market) and by local companies. Control of tariffs by the Government.
B) PRIVATE OWNERSHIP	
GERMANY	Production of natural gas by oil companies. Imports and transmission by private transmission companies : RUHRGAS (57% of imports) THYSSENGAS, VEW, BEB, VNG. Most of the distribution by municipal companies. No price controls. Regulation through the Federal Cartel Office.
UNITED KINGDOM	BRITISH GAS, created as a State owned vertically integrated monopoly, was privatized in 1986. BGC keeps a dominant position in transmission (with open access) distribution and sales of appliances. Regulation by an independent authority (Ofgas) and through retail prices index.
UNITED STATES	More than 7 000 companies are involved in the natural gas business. Most of them are private. A few of them are vertically integrated (Columbia Gas System, ENRON, Consolidated Natural Gas). Federal and State regulatory bodies introduced in the 80's price deregulation with a very competitive situation including direct sales and open access.

3.10 Regardless of the organizational model, some form of regulation covering the major elements gas activity is required (granting of the pipeline, authorizations, conditions of access to the network, and tariffs and pricing principles). Among these issues, price regulation is a major element to check monopoly power.

3.11 Three major types of price regulation of natural monopolies are found. Sometimes they are combined:

- Price cap regulation is a regulatory system aimed at encouraging efficiency and technical progress and reducing costs. An example is given by the formula implemented in the UK in 1987, with the privatization of British Gas, which links gas tariffs to the cost of gas supply but also to an efficiency factor (X), negotiated between the regulator and the company. The price must increase less than the Retail Price Index (RPI -X formula) if the cost of supply is constant. In other countries, price monitoring with an agreement on costs that may be included in the rate base is frequently used.

- Rate of return regulation limits the profit of the company to a "fair rate of return" computed on value of assets or on equity. The objective of the system is also to avoid monopoly profits but its basic default is to encourage over-investment and inefficiency unless costs are strictly monitored.

- Objective contracts are most frequently (but not exclusively) signed between State-owned companies and their shareholder (The State). On a negotiated basis, they tend to formalize, over a period of 3 to 5 years, major objectives in terms of performances, investments, employment, tariffs, and financial structure of the industry or company.

- Regulation of natural monopolies is ensured either by the Government (representing the State interest) or by an independent entity which is given regulatory power. Each of these types of regulation have their own costs, advantages and disadvantages. In theory, price cap regulation is the most efficient but its implementation and operation is not easy. In the case of Morocco, regulation of the gas industry will be ensured by the Government. The form of price regulation to be adopted has not yet been decided.

Major Requirements for the Development of Natural Gas

3.12 The experiences of various countries demonstrate that some factors determine the successful introduction and the gradual development of natural gas as a new energy source:

- The political willingness to develop gas is the key element, because a number of decisions have to be made concerning the organization of industry, the role of present and potential participants, and the implication of gas development for the rest of the economy.

- A gas market study which reviews systematically potential markets for gas and assesses the range of costs which would be acceptable to major groups of consumers. In most cases, a large base load, such as power production, is

needed to justify the pipeline and infrastructure investment (Portugal, Thailand, Malaysia).

- The existence of well defined "rules of the game" which provides the gas industry with the technical, legal, economic and financial regulations. These rules may be defined within a Gas Code or by individual statutes. Their purpose is to establish the initial rules but also to take into account new developments such as local gas discoveries, new sources of supply and new markets. Having well defined rules of the game is a prerequisite for attracting private investments.

3.13 In the case of Morocco, the political willingness to develop gas as a new fuel, has been clearly demonstrated. A gas market study and the legal framework for the natural gas industry are presently under review.

B. The Supply of Natural Gas in Morocco

Transit Fees

3.14 According to the Record of the meeting of the Moroccan and Spanish Energy Ministers, April 30, 1991 (Procès Verbal de la réunion des Ministres Marocain et Espagnol chargés de l'énergie du 30 avril 1991), the transit fee which has to be paid to Morocco represents a fair compensation for the constraints imposed by the pipeline and reasonable profit sharing. In the spirit of *proces verbal*, this transit fee represents compensation for a favorable fiscal regime given to the companies, Moroccan and foreign, involved in the construction and the operation of the pipeline.

3.15 Several important issues concerning this transit fee have to be clarified. The decision-making process between cash and payment in-kind has not yet been agreed upon (to the World Bank's knowledge). Several elements must be taken into consideration:

- The results of the Gas Development Plan Phase 2 will show the volume of gas needed for the domestic market and the expected build-up of the market. One possibility would be to utilize the gas earned as the transit fee for the build-up of the market until additional volumes are required. This gas can be considered equivalent to domestic energy resource but it is not free. It belongs to the Moroccan State and must be paid by the user to the Treasury at a price which covers its opportunity cost.

- If the fee is taken in-kind, the question of transit cost has to be settled. As agreed at the ministerial meeting, transit is free for the royalty gas, if gas is taken from the GME, not further than the Fès-Méknès area. Since the meeting, the initial route has changed. The place of off-take will be west of Meknes. Therefore, transit costs must be clarified.

- The Moroccan Treasury should examine carefully how it may maximize its take by shifting between payment in-kind and cash. This decision is based upon a comparison between the value of the transit fee and the market value of the gas on the Moroccan market. The process involves: the Moroccan Treasury (who

owns the gas); ENAGAS, who may propose to buy the gas; SODUGAZ, who may buy the gas but not be obliged to take it; and end-users. The decision should be directly related to the degree of flexibility which is given to Morocco to take cash or in-kind payment but may be limited by the technical rigidity of the end-users or by the commercial rigidity of SODUGAZ.[1]

- If the Moroccan Government wishes to keep the possibility of choosing the method of payment between kind and cash, and if a commercial contract is needed for the domestic market, the negotiation of this commercial contract must take into account the agreed conditions on which payment is decided. Conflicting interests may arise between the purchaser of commercial gas (SODUGAZ) and the Moroccan State.

Commercial Contract of Gas Supply with Algeria

3.16 The Gas Development Plan Phase 2 has established the volume of gas which can be used by the Moroccan market with the appropriate build up of the market. The mission's recommendation is that a commercial contract with Algeria should be negotiated once the results of the study are known.

3.17 A gas contract is the result of a negotiation whereby each party is legally committed and bound by the terms and conditions of the contract. The main elements of a long-term gas contract are:

3.18 In the negotiation of a commercial gas purchase contract with Algeria, the following elements must be considered:

- It had been postulated that the contract would be signed before December 31, 1993, but this posed too much of a time constraint to clarify and reach agreement on the elements. A delay is recommended. It is important to keep in mind that the projected combined cycle can be perfectly started with the royalty gas as a fuel.

- In the price negotiations, special attention must be given to the competition and inter-fuel substitution in the Moroccan market. If industrial boilers are converted from fuel oil to natural gas, they may remain technically flexible to burn both fuels. Initial contractual price, index clause, price revision and flexibility must be taken into account. In other words, the commercial terms, including the possibility of interruptible volumes, must accommodate both the buyer's and seller's needs.

- The Algerian contract is the first link of a series of contractual arrangements. To sign a gas purchase contract (with take-or pay provisions) with SONATRACH,

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[1] The experience of Tunisia on this matter is interesting. By excersising its flexibility to shift from cash to in-kind payment, the country is making substantial cost savings because over 80% of its installed power generation capacity may use natural gas or fuel oil, and the flexibility allowed enables a rapid switch to the cheapest fuel.

the purchaser (SODUGAZ or another company) must have a contract with the transmission company (EMPL) and a take or pay contract with the principal customer (s). The owners of the combined cycle plant must have a contract concerning the sale of power to ONE. Since private capital is involved, all these contractual arrangements have to be clearly stated and will require review by financial authorities.

- The mission emphasizes the necessity of setting out the guidelines for resolution of these problems for negotiation. All of these intricate elements will reveal conflicting interests between project participants: EMPL, SODUGAZ, ONE and other potential users, as well as private investors, national and foreign, and the Government. Arbitration at the highest level might be needed to reinforce the stated political willingness to develop gas.

Table 3.2
MAIN ELEMENTS FOR A LONG TERM GAS CONTRACT

PARTNERS
- Balance of interests between the partners
- Financial and technical capability of the partners to carry out the deal

RULES FOR HANDLING THE CONTRACT
- Start and duration of the contract
- Changing the rules of the contract
- Interpretation of the contract (definition, language, applicable law)
- Dispute settlement

VOLUMES
- Seller's commitment to making supply available
- Buyer's commitment to take the gas
  - Annual/Quarterly/Monthly/Daily Volume
  - Flexibility - Nominations Process
  - Take-or-Pay obligations
  - Make up provisions
  - Force majeure

PRICE
- Determination of initial price
- Review of price formula or price index
- Payment terms
- Default penalties

Source: World Bank (ESMAP. Long Term Gas Contracts Principles and Application. Report N° 152/93, 1993.

Tariffs

- The question of transmission fees between the Algerian border and the off-take to the Moroccan grid needs to be clarified. In the *procès verbal* of the ministerial meeting of April 1991, it is stated that quantities of gas bought for the needs of the Moroccan market will support a transmission fee calculated "upon the most favorable conditions".

- Tariffs for gas transmission between the Algerian frontier and various off-take points should be clearly known, because there is a danger to have a downstream domestic gas industry which is regulated but which depends for its supply of an unregulated upstream gas transmission business. Tariffs should cover the transmission cost on a non discriminatory basis.

- The tax regime of the gas sold on the domestic market has to be elaborated (import duty, excise, VAT) see below).

Other Potential Sources of Natural Gas

3.19 In the establishment of a domestic gas industry, and the design of the gas network, the long-term future of the industry must be taken into consideration, including supply, market options, the possible development of new routes (other lines from Algeria), domestic discoveries, and the possibility of an LNG terminal. Therefore, the institutional framework must carefully define the conditions of access to transmission lines and distribution networks.

C. Institutional Issues

The Organization of the Industry

3.20 Following the World Bank's recommendation, a Moroccan gas company, SODUGAZ, has been created for the transmission, from the GME, of natural gas that will be used in the domestic market. SODUGAZ would be allowed to sell gas to large volume customers, such as ONE as well as to distributors. A second company (or group of companies), would handle local distribution. It is clear that under the recent law on the liberalization of foreign trade, SODUGAZ has no monopoly over gas imports. The actual limitations on SODUGAZ' activities are not completely clear because the *Arrêté* of April 8, 1993 states that the company is created for the development and operation of the domestic network (high and medium pressure) without explicit reference to transmission and gas sales to various categories of customers.

3.21 In the opinion of the mission, SODUGAZ should be a gas transmission company submitted to the common law and, more specifically, submitted to the gas legislation which is being prepared. This clear separation between the transmission and distribution companies will give a greater degree of transparency to the sector. In the long run, this will ensure a higher degree of competition in the industry. However, it should be possible for SODUGAZ, after the appropriate authorizations, to take equity in local distribution companies. This possibility could be necessary for boosting the development of downstream gas activities.

The Preparation of the Gas Legislation

3.22 Being natural monopolies, the transmission and distribution of natural gas need a precise legal and institutional framework in order to be efficiently and fairly operated. The basic philosophy of the framework, as indicated above, is to find and to maintain an equilibrium between conflicting interests, to impede potential exercise of monopoly power, to promote technical and management efficiency, to encourage inter-fuel competition and also, when sustainable, gas-to-gas competition. Within the institutional organization of Morocco, three categories of legal texts are needed :

- A law (The Gas Law) establishing the general principles which will govern the industry.
- One or several decrees to set forth the rules of the business.
- A series of orders to regulate technical matters.

3.23 The technical orders (*arrete*) being prepared but a time constraint is being imposed by the ongoing construction of the GME: all the technical norms and specifications are to be indicated by orders, but the Gas Law and one decree must be passed to enable their insuance. The Law, the decrees, and the technical orders should follow the same logic and philosophy; the *arrêtés* belong to the same logical approach; they cannot contradict each other. A time constraint shouldn't jeopardize the overall rationality of these legal instruments.

3.24 This legal framework, which is being elaborated, applies to the Moroccan gas industry, but for the GME, only technical and safety specifications apply. Other rules governing the pipeline are in the 1992 Convention.

The Gas Law

3.25 The content of the Gas Law was discussed for the first time in June, 1993 between the Task Force and the Mission. An agreement has been reached between the members of the group on preliminary items to be included in the Law and definition of the main terms. These items are listed below, in general terms. A final version will be incorporated in the final report when the ongoing legal work will be completed.

- Statement of Service Public for the transmission and the distribution of natural gas by pipelines.
- Gas transmission and gas distribution are operated through a concession granted to a private entity or under current forms of delegation to a public company. Distribution concessions are granted through public tenders.
- Gas transmission and distribution are subordinated to a Government authorization.
- Gas transmission and gas distribution are operated according to rules which provide:

- Equality of treatment for a same category of users.
- Continuity and reliability of service.
- Payment of a fee by consumers

- The gas price paid by each category of users must:

  - cover the supply price of the gas at the border or from a reference point (e.g., local field).
  - cover the cost of transmission.
  - cover the cost of distribution.

3.26 Tariffs must enable the operators to cover their full costs, i.e., the reasonable costs incurred by a prudent and efficient company, and provide a fair remuneration for the service to the operator.

- Concessionaires are submitted to technical and financial administrative control.

- Construction of pipelines and related installations may require a permit of public use.

- Distribution companies have the right of access to the gas transmission network.

- A distribution company is not allowed to delegate its business, or part of it, without authorization from the Government.

- In case of default, the pipeline concession may be terminated, subject to prudent measures to remedy the default.

- Security areas may be created around the gas installations.

- Free access to the pipeline by a third party is allowed, on a non-discriminatory basis, for available uncommitted capacity, under certain terms and conditions, and with payment of a transportation tariff.

- A funding network needs to be created in order to enable the regulatory system to be financed by the industry itself.

The Decrees

3.27 One or several decrees have to be issued in order to make applicable the general principles inscribed in the Law. The following items should be included; this enables the designated authority to issue subsequent orders covering all technical aspects:

- Designation of the authorities which grant concessions and authorizations for gas transmission, gas distribution, and connection to the GME.

- Designation of the Regulatory Authority and its procedures.

- Tariffs and pricing principles for high pressure, medium and low pressure customers.

- Procedures for insuance of all technical rules and specifications for the construction of pipelines.

- Conditions of issuance of authorizations for construction and completion.

- Rules for the establishment of maintenance programs, control, and safety inspections.

- Information to be issued by the operators.

- Specifications: transmission and distribution.

- Protection perimeters for gas facilities.

- Right-of-way.

3.28 Two major institutional problems are covered by these decrees: tariffs (see below) and the pipeline service concession or authorizations. In many developing countries, a concession for a pipeline or natural gas distribution system is for a fixed maximum term, with the grantor of the concession having a right to succeed to ownership of the fixed assets (i.e., the full system in operating order) at the end of the term of the concession if the grantor elects to have such assets. The concessionaire amortizes the capital cost of the system over the term of the concession and is allowed to recover under its tariff a fair return on its equity. Should the term of the concession be extended there would be a zero amortization base for purposes of the tariff, unless there have been improvements and extensions. On this matter, the World Bank Mission suggested:

- At the end of the term of the concession, all fixed assets would pass to the State, free of charge, and in working order, if the State elects to have such;

- If the State does not elect to accept the assets, the concessionaire would have an obligation (i) to remove all surface installations and restore the surface as closely as possible to the condition in which it existed prior to installation of the assets, (ii) to abandon any onshore subsurface installations in a safe and environmentally acceptable manner and (iii) to abandon any marine lines in a manner that will not interfere with navigation and that will comply with internationally accepted norms.

- If the State elects to succeed to the fixed assets, the preferable approach would be for the State to auction off a new concession for such pipeline or distribution system, on the basis of an up-front cash payment to be made to the State (with such payment forming the new basis for amortization for tariff purposes) or an annual rental fee for use of the asset (which would then form part of operating costs for purposes of calculating the tariff). In some cases the original concessionaire is given a right to match the highest offer received from a third party or otherwise negotiate for concession rights.

3.29 The question of exclusive rights and access has also to be examined. City distribution networks have historically developed only when the distribution concessionaire has the exclusive right, at least for eight to ten years, to supply all customers within the geographical area covered by its concession, except perhaps for power utilities and large petrochemical plants or industrial users.

The Orders

3.30 An order concerning the technical rules that are needed for the building of the GME, has been prepared by the Ministry of Energy and Mines.

Institutional Issues Concerning An Independent Power Production Using GME Natural Gas

3.31 The IPP related issues are fully examined in the chapter on power. If the planned gas turbine combined cycle, which will be the first user of Algerian natural gas, is built with the participation of foreign investors, the institutional situation concerning ONE's monopoly position, terms, and conditions of sale of power to ONE (Power Purchase Agreement) and other legal issues have to be clarified. Further development of independent power production raises the need for a total revamping of the legal and institutional framework concerning power production and distribution.

Gas Authority

3.32 According to the reorganization plans of the *Direction de l'Energie* at the MEM, the creation of a division concerning natural gas is proposed. Such a creation would probably facilitate the sound development of natural gas. Furthermore, the regulatory process that is to be established for natural gas constitutes a very new approach in the traditional energy context, requiring new expertise, methods, forms of regulation and a possible independent financing of the regulatory authority. It means that the gas authority, although remaining part of the Ministry, will have its own budget and independence. The operational structure of this unit has to be thoroughly examined, in line with the establishment of the legal framework. Its responsibilities will cover the following elements:

- Economic regulation: price and/or profit oversight. Control of costs and investments. Tariffs' structure and level and revision.

- Administrative regulation: authorizations, concessions, and conditions of access.

- Technical regulation: establishment of norms, authorizations, control, and safety.

- Promotion of natural gas: the gas authority has a strategic function, independent from private interests, to demonstrate and carry out the political willingness to develop natural gas. More precisely, this function will:

    - Ensure that the development of natural gas remains in line with the national energy policy in terms of price, safety, security of supply, taxation, and protection of the environment. This implies a number of negotiations with other ministries.

- Promote the most efficient uses of natural gas.

- Collect and disseminate information to ensure that potential private sector and other national and international investors at the various levels of the industry are informed of the opportunities and that no administrative or bureaucratic impediments prevent their entry into the market or their supply of natural gas.

- Organize and facilitate the availability of the most suitable gas equipment and gas technologies. This will become a key factor for gas development and needs to be addressed.

D. Economic Issues

3.33 The first step in studying the feasibility of natural gas in Morocco was the Joint UNDP/World Bank (ESMAP) Natural Gas Development Plan. The results of the study will provide key elements for making investment decisions. The main objectives of this study are to:

- Delineate what should be the share of natural gas in ONE's optimal investment plan.

- Evaluate the future demand for natural gas in Morocco.

- Evaluate the impact of natural gas substitution on the economy, particularly the refining industry, if natural gas replaces fuel oil in certain industries.

3.34 An ESMAP mission to Morocco in June and July, 1993 updated the Gas Development Plan. Special attention was given to ONE's investment plan since power generation would be the first major user of natural gas.

3.35 Six scenarios have been developed which concern the location of the combined cycle plant (near the GME in the North, or Kenitra and Mohamedia in the South) and the conversion to natural gas of ONE's thermal plants located in Kenitra and Mohamedia. For each scenario, the Net Present Value has been calculated, taking into account all capital and operating costs and the volume of gas consumed.

3.36 In the comparison between a North scenario (combined cycle plant near the GME) and South scenarios (Kenitra or Mohamedia), special attention must be given to the fact that the first scenario delays substantially the development of natural gas in Morocco on a large scale. South scenarios involve the conversion to natural gas of large industrial users. Estimates of their potential consumption need to be refined.

3.37 Based on a 20 year plant life, a 12% discount rate and an average rate of efficiency, for the combined cycle plant, preliminary estimates (July 1993) of the gas netback values at the burner tip for a gas turbine combined cycle are:

- US $ 3.90 / GJ for a new 300 MW thermal plant (fuel oil).
- US $ 3.64 / GJ for a new 300 MW coal thermal plant.
- US $ 4.20 / GJ for the re-powering of a plant (Kenitra).

3.38 This means that any price of gas for the new combined cycle plant below these values is economically profitable and a superior solution to other fuel alternatives.

3.39 It also means that the participants are eager to capture a portion of the spread, economic rents: SONATRACH in raising its export prices, EMPL and SODUGAZ, in raising their tariffs, and the Moroccan Treasury in increasing its revenues, while the end-users, on the other hand, seek to realize these savings in the form of lower prices.

E. Pricing, Tariffs, Taxation

Pricing principles

3.40 The ESMAP study on the natural gas plan has stated some general principles which should apply to energy pricing in Morocco :

- Economic efficiency implies setting tariffs that promote an efficient allocation of resources, which means tariffs that signal how much it costs in real terms to supply them. The application of this principle leads to a tariff structure based on marginal costs and which reflect the cost of expanding and operating the system under least-cost conditions.

- Economic equity means charging consumers no more and no less than what it costs to supply them. The application of this principle leads to the elimination of cross subsidies. When any subsidies are judged necessary, the subsidy should be direct, transparent, and provided by the interested entity.

- Financial sufficiency means that the utilities should recover the costs for the services they provide. However, the application of this principle should be in conjunction with the previous two principles to avoid the perpetuation of past inefficiencies. The cost recovery principle should be based on the efficient operation of the utility, as least-cost expansion plans and, wherever possible, competitive conditions.

3.41 Discussion concerning the implementation of these principles have progressed but the present energy pricing system is still far from efficient.

3.42 For natural gas, a proposal has been made to include general pricing principles within the Gas Law (above). Under these principles, each price, for each category of customer, must recover its own cost, i.e. the price paid at the border (or at a reference point of a domestic gas field), the cost of transmission and the cost of distribution. These principles call for transparency in transmission tariffs (in the GME and in domestic gas lines).

3.43 Demand characteristics influence these infrastructure costs. Costs per unit of delivered gas are lowest for consumers with large demands with low variation (high load factor). Customers with large variation in their demand pattern impose larger infrastructure cost. This is because capacity (transmission / distribution or storage) must be built to accommodate peaks, but this capacity is then underutilized part of the time. Economic efficiency argues that the customer's tariff should reflect the differing supply cost burden resulting from such customer

demand characteristics. Good management is needed to optimize volume commitments by the purchaser.

3.44 In order to meet these technical constraints, the concept of "useful cost" has been proposed; it refers to what is needed to be spent on sound operating practices with no charge on unnecessary invested capacities. These principles exclude cross subsidies; they are not incompatible with negotiated prices between the gas transmission company and large industrial users, but a more elaborate tariff policy has to be proposed for small industrial users, and for residential and commercial sales.

3.45 The price at which natural gas may be sold on the Moroccan market to end-users must be such that consumers will find natural gas at least as attractive as other fuels available to them. This is determined by reference to the full costs of using competing fuels in various consumption sectors reflecting the relative efficiencies, investment costs, operating costs and premium characteristics for natural gas relative to the competing fuels.

The Need for a Tariff Study

3.46 The Mission of the World Bank recommended that a tariff study should be undertaken because it is essential in assessing the economic viability and competitiveness of natural gas in the end-user market. The tariff study should be comprehensive and:

- Estimate the economic value of gas for alternative uses (industry, residential, commercial) in target areas and its sensitivity to the assumptions made and prepare sectoral and geographical economic rankings; the value should be found both for investments in new and for conversion of existing equipment to the use of natural gas. For the industrial sector the netback value of gas will be estimated by carrying out a detailed study and, if necessary, a survey among, but non limited to, the following industries: construction materials, agrobusiness, and refining.

- Examine the range of choice for different policies of gas penetration and the associated fiscal frameworks.

- Propose gas pricing and tariffs for each consumer class which takes into account economic efficiency, financial viability, and load factors.

- Recommend whether there is a need for peak/off-peak differential pricing and the advantages of uniform versus different geographic gas miles.

- Recommend appropriate tariffs for gas transmission and distribution based on the transmission/distribution costs, supply/demand scenarios, load factor, and consumption patterns.

- Recommend pricing and tariff systems which emphasize transparency, ease of administration, and an effective mechanism for price adjustment.

- Propose and quantify appropriate measures within proposed regulations, to induce consumers to switch to natural gas.

Price Regulation

3.47 The system of price regulation will be defined in a specific decree. During the first phase of gas development, it seems appropriate that the prices/tariffs between SODUGAZ and the users will be negotiated without regulation. Thereafter, tariffs for transmission and distribution will be submitted to regulation. A proposal of the Mission is that these tariffs should not be based on profit margins. Rather they should encourage efficiency and allow recovery of reasonable costs. A reasonable return investment on equity should be tied to the type of return that an investor could expect to achieve from investment of comparable risk and magnitude.

3.48 The form of regulation is still an open question, to be discussed at the seminar. It remains a key point for attracting financial resources.

Taxation

3.49 Taxes on energy represent a substantial amount of revenue for the Moroccan Treasury. Most of it (over 90%) comes from the taxation on petroleum products: 6.6 billion Dh in 1990, 7.7 in 1991, 9,0 in 1992. These figures represent 13%, 14% and 14.3% respectively of the Government's total current revenues. Of this amount, based on 1988 figures, 44% comes from gas oil, 29% from gasoline, 22% from fuel oil.

3.50 Fuel oil has been taxed more heavily than coal to encourage fuel oil substitution by coal. This is now considered a market distortion to be eliminated. The principle of fuel oil and coal taxation on an equal thermal basis has been accepted by the administration and should be implemented (see Chapter II. Petroleum Sector).

3.51 The issue of taxation of natural gas poses a problem because it may distort the results of economic calculations and high taxation may impede development. In liberalizing the economy it should be highly desirable to have a zero taxation on energy sources that are important inputs to industry : fuel oil, coal and natural gas. This is the case in many European countries and it would be an important element to attract private investors and to sustain Moroccan industry competitiveness. The resulting loss to the Treasury could be recuperated in taxes on light products and other taxation.

Financing, Risk, Guarantees

3.52 Private capital is concerned with the development of natural gas in Morocco at three different companies and stages of development: the GME, SODUGAZ and, independent power sponsors. The GME is an international offshore investment which is entirely financed through EMPL. SODUGAZ and the independent power production involve foreign investment in equity and additional financial resources such as commercial loans, export credits, and institutional loans from the IFC or the World Bank. These investments bear a number of risks; some are specific to the projects, others are country specific. For the mobilization of financial resources, the risk has to be segregated in order to determine the risk sensitivity of each partner and the various possibilities of risk mitigation.

3.53 Project risks include cost overrun, delay due to technical or administrative difficulties, reservoir development, operating performance and commercial risks. These risks are

generally accepted by private investors with a number of appropriate contractual arrangements involving the supplier, the purchasers, pipeline transporters, the equipment suppliers, and the construction company.

3.54 Political and commercial risks encompass security of gas supply, timely payment, availability of foreign exchange for payment to external lenders and investors. They also refer to the effectiveness of the institutional and administrative framework and to the possibility of unilateral changes in some contractual provisions. Private investors and commercial banks are concerned by these risks and their coverage is more difficult. The World Bank is able to propose contractual compliance guarantees which are issued only to private lenders. They are callable only if the Government or enterprise fails to live up to contractual obligations spelled out in the contract between the enterprise, the Government and the private company. A World Bank guarantee may have a catalytic impact; it could help the project to mobilize large amounts of non guaranteed lending that might not otherwise be available.

3.55 The International Finance Corporation (IFC), which is the private sector branch of the Bank could play an active role in promoting private sector investment in the Moroccan IPP or pipeline projects. By lending to the private sector partner in a project, it helps mobilize and stimulate the flow of domestic and foreign capital into private sector projects by raising financing either directly through syndication of its loans, or by virtue of its participation in the project. Another branch of the World Bank, The Multilateral Investment Guarantee Agency (MIGA), provides insurance coverage to private investors for developing country projects. It provides extensive coverage on non-commercial risks at rates which are competitive with those of private insurers. Both IFC and MIGA can participate in a World Bank co-financed loan, and increasing large, complex energy projects necessitate co-financing or financial participation by a number of institutional and private sector lenders in addition to the World Bank.

PLAN OF ACTION

3.56 A number of important issues have been raised in the review and recommendations have been made. Below are summarized strategic as well as specific measures to be addressed by the Moroccan authorities in order to finalize the institutional, financial and legal management that will implement and expedite the use of natural gas into the Moroccan economy.

A. Specific Measures

- Define gas tariff principles which allow cost recovery (transport and distribution) and fair profit margins to the investors while protecting the interests of the consumers;

- Ensure a fair fiscal regime, by considering the impact on fuel diversification, environment infrastructure and industrialization);

- Promulgate the gas code (under preparation).

B. Strategic Measures

- Prevent state monopoly and abuse of monopoly power;
- Grant pipeline concessions for a limited period;
- Ensure free access to the transmission line;
- Regulate prices and tariffs;
- Establish a regulatory body financed by the gas industry itself.

RECENT DEVELOPMENTS

3.57 The draft Gas Code - prepared under the supervision of the Bank Legal Department has been recently completed, and will soon be submitted to the Government. As a follow up of the ESMAP institutional study, ESMAP has launched a Gas Tariff Study, with the active participation of the Task Force and SNPP staff.

3.58 MEM is in favor of the Wold Bank Group participation in the financing of the domestic Gas Network which should be built with private partners, following the construction of the Gas Maghreb-Europe Pipeline (GME). In line with the conclusions of the ESMAP Gas Development Study (Phase II), MEM would like to promote gas utilization in the industrial sector. The expected development of the future gas industry implies gas supply to industrial installations along the major economic axis Kenitra-Mohammedia-Casablanca.

IV. ENERGY EFFICIENCY, RENEWABLE ENERGY AND ENERGY PLANNING

CURRENT SITUATION

A. Insufficient Energy Supply

4.1 Morocco's energy supply is not sufficient to meet demand, presenting a major impediment to economic and social development.

Limited Natural Resources

4.2 Primary consumption of commercial energy (petroleum, coal, gas, hydroelectricity) was 6.9 million t.o.e. in 1992, a 2.5% increase over 1991 levels (6.7 million toe). Petroleum accounted for 80% of 1992 consumption; this represents an increase due to the "explosion" in LPG consumption. By contrast, the national production of primary commercial energy was only 0.68 million t.o.e in 1991 and decreased by 17% to 0.57 million t.o.e. in 1992. This relatively low level of production is comprised primarily of carbon (50%) and hydroelectricity (45%). The country's dependence on imported commercial energy thus is considerable: 92% of 1992 energy consumption was covered by imports.

4.3 Non-commercial or traditional energy plays an important role in the country's energy consumption: woodfuel and charcoal represent an estimated annual consumption of 2.5 million t.o.e., equivalent to 40% of primary consumption of commercial energy. These statistics emphasize the vulnerability of Morocco's energy system and explains the associated costs. The slightest increase in petroleum prices results in major growth of the energy bill (see chapter II. Petroleum Sector), which currently is equivalent to more than half of revenues flowing from mining production, including phosphates.

Low, Imbalanced Energy Consumption: Site for Potential Crises

4.4 Morocco has a population of 25 million inhabitants. The per capita consumption of primary energy, 0.28 t.o.e. per annum is quite low not only relative to consumption levels in Europe (3.5 toe in 1990), but also in comparison with neighboring Algeria. Nonetheless, Algeria's annual per capita consumption of 1 toe is due to its large, energy-intensive industrial base and low efficiencies in energy utilization.

4.5 The distribution of final energy consumption among the different sectors, both with and without taking into account traditional energies (wood), for 1990 is given in Table 4.1. The data indicates the relative importance of wood in the household sector (which includes small-scale urban productive uses such as hammam and bakeries). Wood is used for cooking, and in mountain areas also for heating. The level of electrification is correspondingly low (about 50% of all households do not have electricity), whereas electricity consumption is increasing at a steady rhythm: 6.5% to 7% per annum.

Table 4.1
ENERGY CONSUMPTION BY SECTOR, 1990

Sector	Excluding Traditional Energy		Including Traditional Energy	
	('000 toe)	(percent)	('000 toe)	(percent)
Industry	1655	33.5	1655	18.7
Agriculture	524	10.6	524	5.9
Tertiary	297	6	297	3.3
Household	839	17	4775	53.8
Transportation	1619	32.8	1619	18.3

Source: MEM/DE/SPD.

4.6 The low level of total energy consumption is characterized by sizable inequities in consumption and in quality of energy related services:

- the "modern" sector (affluent households, modern tertiary, industry, transportation) generally uses energy very inefficiently (relative to its economic cost) and frequently wastes it;
- the rural and peri-urban sector is largely deprived of commercial energy and consumes wood and charcoal, thus contributing to deforestation.

4.7 The economic and political constraints of energy dependence are joined by social and environmental constraints. Resource and financial constraints, as well as the increasing difficulty of managing the entire energy system (supply and demand) during a period of transition and uncertain future, could turn the current critical situation into potential crises:

- power supply disruptions and load shedding, with severe economic production and social repercussions;
- woodfuel deficit and environmental consequences, which stress the issue (economic, social and political) related to rural electrification and in general to energy supply to rural communities;
- potential crisis due to rapid, uncontrolled increases in LPG consumption (which is the only credible short-term alternative for woodfuels).

B. Crucial Short- and Medium-Term Energy Issues

4.8 The current critical energy situation, which has been exacerbated by the power supply shortages, is largely structural and calls for major decisions. A number of issues relate to the supply and production of commercial energy. These problems are discussed in detail in the following sections. It should be emphasized that from the consumer's point of view, the introduction of natural gas will be extremely positive, both because of its ease in use and its environmental "cleanliness". Natural gas however would have to be imported. Thus it is essential

to develop other parallel solutions to attenuate, or even totally erase in the long term, the energy supply/demand imbalance. This would require the development of sustained, voluntary action in two areas:

- improve efficiency in energy uses. This means obtaining the same level of benefits from energy services (industrial production, household comfort, ease of substitution) at a lower level of consumption and through consumption of more appropriate fuels. In other words, an economic and environmental optimum must be realized in the overall system of energy demand and supply.

- develop renewable energy resources, both in the "new energy" sector (such as thermal solar, photovoltaics, wind-power generators and mini-hydro) which are particularly useful for decentralized electrification, and in the use of biomass, through more modern and efficient techniques.

4.9 Renewable energy is the way to go in the short term for power supply in rural areas. In the medium to long term, coupled with energy efficiency, it is the *sine qua non* condition for reducing Morocco's energy dependence. Although decision-makers have taken a renewable energy orientation quite seriously for several years, implementation of wide-ranging programs and especially creation of necessary institutional, organizational, legislative, regulatory and financial frameworks has not exceeded as well as could have been expected, especially given the high risks, potential and urgency of the situation. Nonetheless, a number of positive elements exist from which it is possible to construct a more favorable framework and a more ambitious action plan. These will be examined in the subsequent section.

C. The National Energy Management Program

Energy Efficiency Promoters

4.10 The Energy Department within the Ministry of Energy and Mines (MEM) is responsible at the Government level for promoting the rational use of energy. Activities are implemented by the Department's Planning and Development Service (SPD), which also is responsible for energy planning.

4.11 The Energy Management Project for Moroccan Enterprises (GEM) was developed in 1989 within the MEM as an administratively independent research center. It is financed under a bilateral agreement with USAID. The recently created (mid 1992) Moroccan Association for Energy Management (AMGE) already counts 300 companies among its members (including the largest in the country). The AMGE has proven extremely effective as an information and training center (seminars, meetings, etc.) and as a potential lobby group.

4.12 The Center for the Development of Renewable Energy (CDER) has increased its role in energy management activities, due to the inherent association between energy efficiency and renewable energy in rural electrification programs, its agreements with the Ministry of Interior for activities with local communities, and the linkages it has created in this area with international agencies.

4.13 There most definitely is a "movement" towards energy efficiency ensuing from initial ventures by early promoters, especially those within the Energy Department. Of particular

note are the growing interest of the business community and specific residential districts, and the proposed creation of private research centers specializing in energy efficiency (i.e. the project financed by the Canadian Cooperation for establishing a third investor system with the ADS society).

What Has Been Done

4.14 In the aftermath of the oil price increase of 1979, Government authorities undertook a certain number of actions to promote the rational use of energy:

- a few national informational and educational campaigns (in 1979/80 and in 1983/84) and seminars on energy efficiency in the industrial sector, energy and forestry and bioclimatic habitat;

- regulatory measures: tax credits, tax abatement, incentives in the 1983 industrial investment codes;

- energy audits in sectors with heavy energy consumption (mines, cement, energy sector, brick making, sugar, canneries, paper, textiles, hotels, transportation) which were financed by various aide agencies (the World Bank, bilateral agencies). In addition, several analyses were undertaken by the "*Bus-Energie*" of the MEM (financed by the EEC);

- several studies which have been completed: sector studies and energy audits to identify potential energy savings by large industrial consuming sectors (MEM-World Bank, 1982; MEM-France, 1983-84; MEM-USAID, 1986-89); and inclusion of the national energy efficiency policy in energy demand projections (UNDP-World Bank Energy Planning Program).

4.15 The most effective action program has been the GEM which began in 1989 and is expected to last until 1995. Financed by USAID, its initial budget of US$ 3.5 million was increased to US$ 5 million, then to US$ 8.6 million. The program's objective is to help Morocco save foreign exchange expenditures for energy imports by promoting rational energy usage. There are four specific action components in the program:

- Information and education: a newsletter is distributed to 100 industrial companies and articles are published in the local press.

- Training: four training sessions are held annually (once every three months) with a basic curriculum covering energy management, power management, boilers and steam. User-specific training sessions can be requested in conjunction with the energy audits. An ongoing cooperation has been organized with the ENIM (Ecole Nationale Superieure des Mines).

- Technical support: energy audits in hotels, cement factories, and agricultural and food processing industries; retrofitting process furnaces and boilers; optimizing the electric bill; demonstration projects, planned for 1994.
- Energy Policy: There has been no development of this component, which is needed to support the activities of the Energy Department.

4.16 Finally, the recent, very positive activities of the AMGE deserve particularly recognition. The AMGE organized two seminars in 1993 - one on cogeneration in January and the other on third-party financing in June - both of which received positive comments from participants.

4.17 With regard to international assistance, the Energy Department and the SPD service have established important linkages in addition to those already cited: planning assistance under the UNDP-World Bank Program (1990-91); institutional assistance with AFME (recently renamed ADEME); project and analytic assistance from IDAE (Spain); and third-party financing assistance from the Canadian Cooperation. Other bilateral assistance was obtained from the Canadian International Development Agency (CIDA), the Scientific and Technical Assistance Agency (ACCT) and the Italian Institute for Innovation Assistance (ICIE).

4.18 The Energy Department thus has been able to complete a major part of the work necessary for preliminary program design, assistance and promotion activities for energy efficiency. The Department has had no real authority to implement effective programs (nor this should be the role or mission of the Department).

The National Energy Management Program

4.19 A National Energy Management Program (PNME) was designed in 1990 (by the SPD within the Energy Department) based on the evaluation of potential short-term energy conservation, estimated at 15% by 1996. The first phase of the program was implemented within the GEM framework and comprised the components which are presented in para 4.15. A simultaneous program, "*Bus-Energie*" (small audits to educate companies about energy efficiency), was carried out by a team of two engineers and two technicians from the Ministry.

4.20 A series of regulatory measures, both general and sector-specific, were defined and proposed, as well as fiscal and financial incentives. Institutional aspects were studied in detail within this framework and resulted in a proposal to create a public institution responsible for promoting and implementing the PNME: the National Energy Management Agency (Agence National de Maîtrise de l'Energie). The Government did not proceed with the final project plan, which was presented at end 1990/beginning 1991.

D. Clear Direction for Renewable Energy

4.21 Due to its geographic and climatic features - Atlantic coast location, intensive solar radiation, hydraulic resources and forests - Morocco possesses a considerable renewable energy potential. The only renewable energy with any significance to date in the energy balance is firewood, with an annual consumption of 2.5 Mtoe. Since the end of the 1970s, the Moroccan Government has acknowledged the high stakes surrounding the need to develop renewable energies and thus has taken advantage of numerous opportunities to receive assistance in this area and even has created an institutional framework to advance the rise in prominence of these energy sources.

Inventory of National Renewable Energy Resources

4.22 A census of renewable energy installations in Morocco (other than wood) was implemented by CDER. The end of 1992 showed the following totals:

- 1500 kW (peak) of photovoltaic applications;
- 18,720 m^2 of solar collectors for providing sanitary hot water;
- 200 wind generators used for lighting and recharging batteries;
- 320 small digesters (family-based) to produce biogas for cooking and lighting and 6 medium-sized digesters whose output is used to generate power for pumping and lighting;
- 3 micro-hydro generators.

4.23 The use of renewable energy in Morocco is diversified by both energy source and technology. What is particularly striking, however, is the relatively low level of development in the use of thermal solar collectors for water heating, given the country's level of solar radiation.

The Center for Developing Renewable Energy (CDER)

4.24 CDER Evolving Role. The Government's commitment to develop renewable energy was made official by the creation in 1982 of the Center for Developing Renewable Energy (CDER). The CDER is a "public industrial and commercial agency", supported by the State budget (annual allocation) and by national and international assistance.

4.25 Initially, the CDER was based only in Marrakech, where it had a very favorable site for its well-outfitted headquarters. The agency found itself both physically and administratively isolated, however. With its objectives defined to evaluate the potential and study the scientific and technical conditions for their implementation, the CDER thus remained on the edge of actual project implementation. In 1992, the Government updated the CDER's objectives, installed a new management team and created a new headquarters in Rabat within the MEM. This allowed for greater contact with Government teams and sector administrators, rather than with their large partners. The objectives of the "renewed" CDER are to:

- implement and monitor wide-scale projects and programs in areas such as rural electrification, energy production and energy management. CDER also must set-up financing mechanisms for the projects;

- introduce mature products adapted to local conditions into commercial and industrial market;

- serve as a means for strengthening the public sector's role in research, scientific development, promotional efforts and training;

- undertake engineering and feasibility studies for third parties.

4.26 Organization. The CDER in April 1993 had a staff of 77 employees. It is divided into four Bureaus under the authority of a General Director:

- The Bureau for Programs and Projects (3 employees), which develops programs linked to rural and urban planning;

- The Scientific and Technical Bureau (about 25 employees), which includes labs and workshops organized according to form of energy usage --power, mechanical energy, thermal energy -- rather than by form of energy production. This organizational design is rather unique, efficient and highly responsive to actions "arising from energy demand";

- The Bureau for Planning and Scheduling (about 25 employees) which determines the operating plans for the various programs (ongoing and new), evaluates the expected results, and facilitates the development of the organization's work plan;

- The Finance and Administration Bureau (about 25 employees), which is responsible for managing personnel and financing the projects.

4.27 The CDER has autonomous management and has its own personnel statutes. There is a 25-member administrative council (Government, large organizations, trade associations) headed by the Prime Minister, who has delegated his authority to the Minister of Mines and Energy. The Council meets once a year. The Center's activities are monitored more closely by a Management Council headed by the Director of Energy. The CDER's 1993 budget comprises 8 million dirhams for investment and 10 million dirhams for operations (80% personnel costs). This budget is based on the Government's subsidy, and does not include receivables from loans or international assistance funds for the projects.

4.28 Ongoing Projects . The scope of projects prepared or implemented in 1993 include fulfilling the energy needs in the rural sector, developing technical expertise in supply options, and mobilizing local energy, financial and human resources:

- The National Program for Decentralized Electrification (PNED) which is being implemented in conjunction with the National Program for Rural Electrification (PNER), under the jurisdiction of ONE. Its design is based on the Pre-Electrification Pilot Program (PPER) implemented by the Ministry of Mines and Energy and the Ministry of the Interior (General Bureau for Local Communities) and is financed through a French-Moroccan bilateral agreement. The objective of the program is to rapidly install power services adapted to *douars* located far from the grid and not included in the PNER (about 25,000 *douars*). The first phase, slated for 1993-1994 and financed by 8 million ECU from the EEC, targets 180 *douars*. Technically, this objective will be accomplished by: (a) distributing power through battery arrays which are recharged either using photovoltaic collectors or wind-generators; (b) self-standing photo-voltaic kits; (c) distributing power via local mini-grids supplied by micro-hydro plants (up to 50 kW).

- National Program for Increased Usage of Photo-voltaics, whose objective is to provide photo-voltaic kits to isolated locations,. It is based on the success of the "Special Energy in Morocco" program carried out by the German technical assistance program (GTZ) in the Kenitra province. It is financed by a revolving fund (10 million DM from the GTZ) which grants credits to beneficiaries (the consumers pay 20% of the initial investment). In 1992, 1.5 MW of photo-voltaics were imported and purchased under the program.

- Rural Renewable Energy Promotion Program. The program's objective is to develop a market for renewable energy in rural areas by means of simple and affordable small systems (lighting, mechanization, pumping) and by creating a "Pilot Group for Promoting Renewable and New Energy". This pilot group would be linked to the CDER but have separate management supervised by a joint Moroccan-Belgian management committee (with funding by Belgian assistance).

- Micro-Hydro Project. for which four sites have been designated in 1993.

- Thermal Solar Power Project for which feasibility studies were financed by the EEC and presented to a project steering committee composed of CDER and the Spanish power utility, ENDESA. The project foresees constructing an 80 MW solar-thermal power station. Estimated cost is 0.75 Dh per generated kWh.

- Wind-Generated Power Park in Northern Morocco. A 5 MW wind-generator park (two 2.5 MW sites with 150 MW wind generations) would be established in the Tetouan region. Generated power would be fed into the existing power grid. Estimated cost is 0.70 Dh per generated kWh.

- Elaboration of an Analytic Methodology for Woodfuel Consumption in Morocco.

4.29 Energy Management Activities The CDER increasingly finds itself involved in issues related to the efficient use of energy:

- Development of renewable energy must necessarily be associated with high efficiency, low consuming energy appliances (compact fluorescent light bulbs, for example);

- The CDER is a member of the Gem's Administrative Council; is a signatory of the General Management Plan for Local Communities (a contractual framework governing energy conservation); is the North African and Middle East coordinator for the PRISME program (International Energy Management Program) of the Cultural and Technical Assistance Agency, organized by the Institute for Francophone Countries (Institut ayant en commun l'usage du français, IEPF);

- From its beginnings, the CDER has had an agreement with the French Agency for the Environment and Energy Efficiency (ADEME, formerly AFME). The

agreement, renewed in 1992, currently provides support for renewable energy studies and could easily be extended to energy management.

MAIN ISSUES

A. Energy Efficiency Strategy

Basis for an Energy Efficiency Strategy: Integrated Optimization of Consumer's End-Use

4.30 The amount of energy required to satisfy a given end-use varies according to the utilization method, the equipment or appliance used and the way that the energy product is utilized. For example:

- Cooking: A pot of soup (a single end-use) will demand vastly different energy requirements and financial expenditures depending on the fuel and cooking method: open fire, charcoal used in an improved stove, bottled gas or natural gas.

- Comfort level in buildings: A well-designed (taking into account orientation, solar radiation, doors/windows) and well-insulated building will consume less energy for standard HVAC needs than an ordinary building.

- Lighting and Household Appliances: A compact fluorescent light bulb consumes five-times less electricity than an incandescent light bulb for the same level of illumination. A good quality refrigerator consumes half the energy of a normal refrigerator.

- Industrial Processes and Products: In the case of industrial production, two factors combine to reduce energy consumption relative to a given demand. On the one hand, technical progress has made it possible to produce the same product with fewer inputs or with different inputs: a well-known example is the high-resistance steel girders used to repair the Eiffel Tower which weigh only one third of those which were replaced. This is also true for cars, trucks, machines, etc. On the other hand, for the same production level, improvements or modifications in industrial processes easily generate energy savings of 30% to 50%.

- Transportation: The transportation example is without doubt the most revealing, since it demonstrates well how different levels of energy efficiency which can be attained:

4.31 First level: Type of Demand. A large portion of energy consumed for transport by individuals corresponds to travel between residences and workplaces (also a considerable cost in terms of time). Thus the first level of consideration for urban and space planning is to reduce the daily travel distances in order to minimize the loss of time and energy consumption, thus generating complementary benefits to the quality of life and the environment.

4.32 Second Level: Type of Transportation. What type of transport should be utilized to move people or merchandise, both of which are necessary in a modern world? Collective urban transportation such as trams and subways consume less energy, cause less pollution and reduce the number of highway accidents. In some countries, bicycles can easily navigate city streets and this type of locomotion is commonly used. In many others, bicycle transportation is dangerous because of lack of proper bike paths or lanes. Finally, walking short distances rather than taking the car is also possible. Similarly, rail transport can be used for merchandise instead of trucks.

4.33 Third Level: Vehicle Characteristics and Driving Habits. If one drives a car - often because there is no other option - gasoline consumption and generated pollution levels would vary based on the vehicle model, size, weight, power, engine performance, maintenance and driver.

4.34 All of the necessary economic activities (production, conversions, distribution, trade) and social needs (food, comfort, personal transport, leisure activities) which require energy can be considered as "services". The receipt of an energy-consuming service "S" in response to a given demand is a combination of three factors:

- Utilization (U), which is the means by which one desires or is obliged to obtain the service: for example, the type of transport used, the type of industrial production, the type of dwelling (apartment buildings, detached housing;

- Appliance (A), which denotes the type of equipment which is used (heater, housing stock, care, refrigerator, boiler, light bulb, etc.);

- Amount of energy product (E) used to obtain the service.

4.35 The E factor is the final energy consumption for a given service received. The U and A factors denote conditions for utilizing this energy. An energy-consuming service, whether economic production or social need, is obtained by a combination of utilization practices (U), use of one or more technologies or appliances (A) and a certain quantity of energy (E).

$$S = U * A * E$$

4.36 The amount of energy consumed can vary considerably depending on the utilization and the appliance. If both utilization and appliance were "energy efficient" in Morocco, energy consumption could be much lower than current levels, which are marked by waste and irrational utilization.

4.37 Classic energy sector activities such as product production, supply, and distribution are included in the E factor. The primary stated objective is to supply a certain amount of energy to the consumer under the best possible economic terms. Nevertheless, the real objective to be reached is not the supply of energy but rather the supply of means for obtaining a certain number of services. Thus searching for an optimal solution not only must comprise energy supply but also must address the interaction between energy supply, consumption equipment and utilization practices.

4.38 The energy efficiency approach requires elaborating and implementing the actions related to the U and A factors which will lead to receipt of S under optimal conditions. The E factor comes into play in the choice of energy product which is simultaneously best adapted to use and satisfies economic and environmental criteria (for example, use of local and renewable energy). The energy efficiency strategy is thus the package of policies and the economic, industrial and energy actions which will allow the consumer to receive optimal service at the least economic and environmental cost.

The Role of Energy Efficiency in Morocco

4.39 Because overall energy consumption levels are low relative to other countries, many authorities reject the notion of rational energy use and energy conservation. Many still consider it a priority to increase total energy consumption before conservation is to be considered. This particular analysis does not seek a reduction in total energy consumption, as must be done in industrialized countries. Rather, the objective is to show that successful economic and social development can be pursued with lower levels of energy consumption than were used in the past by the currently industrialized countries, thanks to energy efficiency strategies. This allows more financial and human resources to be committed to other components of economic development. An active energy efficiency strategy, one that is integrated with the development process, allows for increases in the standard of living and the production of goods and services without proportionate increases in energy consumption. In addition, there are corresponding indirect benefits for environmental protection.

4.40 Despite low total energy consumption, there is a very definite pattern of inefficient energy utilization in Morocco: in urban areas and industrial plants, energy is often wasted and used poorly. Affluent populations have developed energy consumption habits identical to - and often even more wasteful than - those of industrialized countries. The lack or weaknesses of public transportation infrastructures and trains leaves the field open for greater energy consumption and pollution by cars and trucks. Industries are often inefficient and polluters; substantial energy savings potential have been identified in industrial zones and plants. In rural and peri-urban areas, where total energy consumption is very low, wood and charcoal are used with low conversion efficiencies, leading to dramatic detrimental impacts on the environment. Several million individuals lack "minimum basic" energy supply. They could be supplied via resources released through savings gained from correcting poor utilization practices, use of decentralized energy production systems (notably use of renewable energy), and adoption of high-efficiency equipment and appliances.

4.41 Spurred on by rapid population growth, Morocco has seen tremendous growth in its housing stock, transportation park and service sector. For new installations, in all sectors and for all usage, there is an enormous variance in energy consumption depending on whether or not the imperative for rational energy utilization is taken into account. When it is, benefits are realized throughout the life of the installation. The potential for rational energy utilization in new factories, buildings and transportation systems is considerable. Tapping into this potential from the start is much less expensive than having to "renovate" several years later.

4.42 It should be emphasized that energy consumption management strategies are still much more important for the economic health of a country such as Morocco than for the western industrialized countries. On the one hand, this is because the potential energy savings is quite large due to ongoing growth of the infrastructure and basic equipment. On the other hand,

investment expenditures and foreign exchange requirements linked to energy supply are much higher relative to total revenues.

4.43 The experiences of western industrialized countries can be quite useful for ascertaining successful energy efficiency and conservation methods and technologies, as well as those which have failed. Nevertheless, there are many areas in which Morocco can implement original, adapted solutions specific to the country's climate and geography. This would require the Moroccans to adopt a certain level of innovative effort which exceeds technology transfer. In addition, in many cases it is possible to "skip stages" by introducing more rapidly methods and technologies which industrialized countries have not or are not using: low-consumption light bulbs, solar hot-water heaters, climatically based architecture, energy efficient refrigerators, economic micro-computers, etc.

The Role of Public Sector Intervention

4.44 It is often in countries which have most need for an energy efficiency policy that one hears the argument that energy efficiency activities should be allowed to develop with only the impetus of market forces. The principle of Government non-intervention asserts that all activity can and should be regulated by the level of final energy prices to the consumer. It is true that setting consumer prices at a level which reflects the costs of production and supply (not including taxes) is a necessary condition for a well-functioning energy system. This will limit some of the need for public sector intervention and subsidies, which are a heavy burden on the public finances of many countries. However pricing actions alone are far from sufficient.

4.45 Implementation of a policy for efficient energy consumption requires several large and diverse tasks beyond setting pricing levels:

- establish an integrated policy which gives equal billing to demand and supply;
- establish a legislative, regulatory, institutional and incentive framework for the energy efficiency policy;
- establish coherent programs, promote them and create conditions for their realization;
- inform, train, and mobilize a network of partners and economic agents;
- promote, follow-up and evaluate the activities.

4.46 The secret to the success of an energy efficiency strategy is a clear distinction between public sector action (energy prices, legislative and regulatory framework, institutions, incentives), mobilization of partners and economic agents, and efficient operations of the market. All participants in the implementation of the policy must be consulted as early as possible in its preparatory stage: final users, regulators, designers and builders, public partners (such as local communities) and private partners. Likewise, they must also be involved during implementation and, more importantly, during evaluation phases.

4.47 All countries have strong institutions, organizations and companies responsible for energy production and supply. Even when these companies are private, the State has a very

important regulatory role to play: it exercises authority with regard to pricing, investments, and international negotiations because energy supply is considered a strategic element of the country's economic and social development. This preoccupation with collective and strategic responsibility also should focus on the efficiency of energy consumption. However, while the definition and coordination of a supply policy which requires involvement of only a few large actors, generally those close to the State, proves to be relatively easy, the same cannot be said on the demand side. In the case of demand, investment decisions and utilization behaviors are very decentralized and dispersed throughout all levels of society. Still, incentives for energy efficiency are critical for the long term. They cannot be left to the whims of market forces, and especially not to the international market, over which the country has absolutely no influence.

Public Agency for Promotion and Advancement

4.48 Implementation of actions targeting improved energy utilization efficiency currently is very decentralized and diversified. It is the task of companies - whether by managing their own energy consumption or by the manufacture or sale of energy efficient equipment - local communities, service providers and households. These "final actors" in energy efficiency need information, training, advice (all in technical, economic, and financial areas), a legislative and regulatory framework, and financial incentive facilities. Networks of operators and key energy sector participants - research centers, engineering firms, trade and civic associations - could provide these services. These are the "network partners", which include energy companies who themselves have a stake in seeing that their energy products are consumed rationally (if not, they are subject to production crises).

4.49 There is a certain public service element to energy efficiency which can only be assured by a public sector institution: areas of public sector intervention, mobilization of partner networks, design, coordination and implementing programs. The mission of a public sector energy efficiency organization will not be to actually run programs itself; rather, the organization will create the conditions under which projects can be realized and assure their maximum impact in terms of technical, economic, social and environmental efficiency. Specifically, the organization will promote, provide incentives and facilitate the decentralized implementation of energy consumption management. This is a somewhat new public sector function relative to the traditional role of the State, a function which requires strong abilities for mobilization, networking, rapid intervention, and comprehension of the problems and constraints of extremely diverse partners. In particular, the decision making process must be decentralized if this type of intervention is to be successful.

B. Integrated Energy Planning

4.50 All countries have an energy policy, whether explicitly declared by and administered in part by State or resulting from the strategies and decisions of the various energy sector participants. The practiced energy policy is a (sometimes complex) mixture of decisions, public sector intervention, and behavior by economic agents acting within national and international markets.

4.51 Until recently, as is still the case in many countries, Morocco's energy policy addressed only the policies of supply: resources allocated to production, transmission and distribution of energy. Although policies are proclaimed by the Government, they are developed and implemented by energy producers, either within a competitive market framework, or within

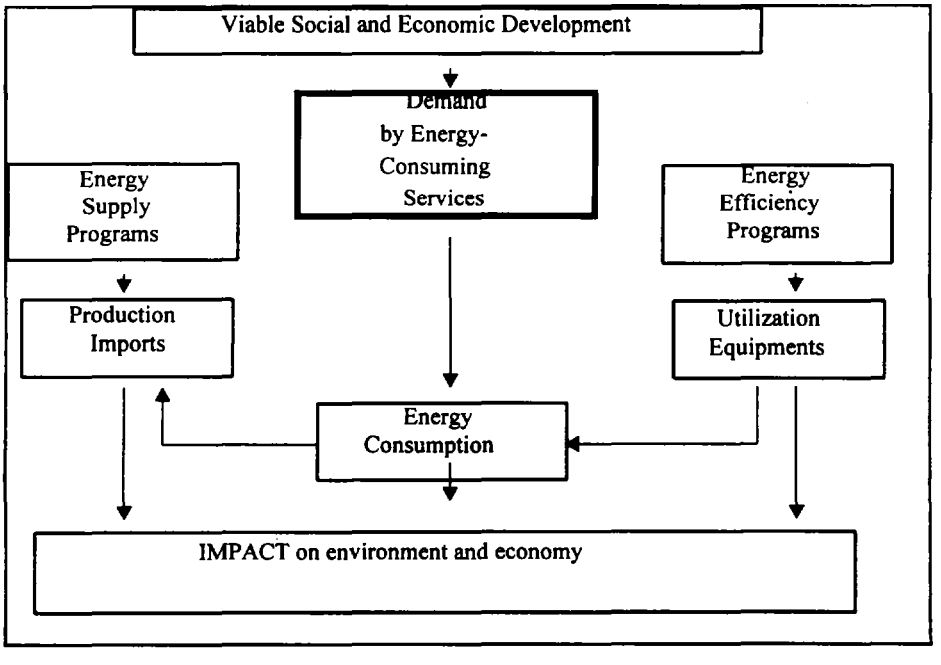
an oligopolistic market. The energy producers' influence in the development of energy policy can be seen in the energy consumption projections, which reflect the marketing and development strategies of energy producers. The consumer, with his/her real needs and economic and social interests, traditionally has had no role in defining options and contributing to decisions. Environmental impacts are treated as inevitable consequences of the country's energy needs, and addressed only by corrective actions within the production infrastructure.

4.52 When an integrated energy efficiency framework is adopted, energy supply policy is addressed as part of a broader plan which gives at least as much importance to actions and resources devoted to improving conditions for energy consumption as to those devoted to supplying energy products. The integrated approach results in rather profound modifications to energy planning and policies concerning energy production and distribution investments, both at the State level and among energy companies (especially power generation and/or distribution).

4.53 The following diagram illustrates the work needed to:

- define and schedule actions to address the energy consumption system;
- determine the energy requirements to which the energy production and distribution system must respond;
- compare the options for addressing demand and supply issues.

INTEGRATED ENERGY PLANNING



4.54 The initial step for integrated planning acknowledges economic and social development objectives. These objectives are established based on the country's current situation and its desired or projected evolution. This is the stage at which the objectives of viable development are defined.

4.55 Within this development scenario, energy productive and consuming activities all have distinct evolutionary paths. These include industrial production, transportation of people and merchandise, living quarters comfort, and other tertiary sector activities. Each activity - or each "service" - is characterized by a utilization (means of transportation, for example), a type of equipment (a particular type of car, for example) and by one or more energy products for specific (electricity for lighting) or substitutable (different fuels for heating) uses.

4.56 Energy efficiency projects intervene on the level of utilization and equipment. Depending on their size and the resources committed to them, different levels of final energy consumption are obtained. Demand for different energy products helps define the supply: production and/or import, transport and distribution. The production system requires investment and operations expenditures in local currency or foreign exchange, thus impacting the economy (investment capacity, loans, foreign trade balance). There also are environmental impacts. For a given country, the environmental and economic impacts of the production system are, for an identical structure, generally proportional to national energy demand levels. These vary if there are a lot of energy imports and exports.

4.57 The consumption system also has economic impacts (consumer and current expenditures such as appliance/equipment purchases) and environmental impacts. Components of energy efficiency programs which target the consumption system (utilization and equipment) attempt to reduce energy consumption and thereby decrease the negative impacts of this consumption, either directly (expenditures related to over-consumption, environmental attacks) or indirectly through the production system. These components also have an impact on the economy (investments, potential equipment imports) and on the environment. The latter are generally rather limited, which is the great advantage of exercising energy efficiency via energy production.

4.58 The objective of integrated planning is to move through the conceptual design described above and to find the optimum economic and environmental equilibrium between energy efficiency programs and energy supply/production programs. Their economic and environmental impacts in turn have an influence on the evolution of development and its viability.

4.59 This presentation shows that if the objective of the implemented strategy truly is to provide an energy service (comfort, production, etc.) at least economic and environmental cost, the consumption-based activities have exactly the same strategic, political (reduce energy dependence, risks of conflicts), economic (capital savings, competitiveness), ecological (reduced accidents and pollution), and social (employment, quality of home and work life) importance as production-based activities. Thus it is reasonable that consumption-based activities be given comparable resources (structural, financial, human, technical and scientific).

ORGANIZATIONAL RECOMMENDATIONS

A. Introduction

4.60 The institutional, legislative and conceptual frameworks for the Moroccan economy have evolved considerably in recent years. Therefore, priority should be given to how the objectives and activities of energy efficiency agencies will be organized. This will assure that optimal conditions are in place for an energy efficiency strategy and a global energy policy based on integrated energy planning which takes into account both demand and supply.

4.61 Since there is a trend towards greater institutional autonomy, more competition, open markets and greater private sector involvement, the country must strive to create appropriate conditions for developing energy efficiency and renewable energy which stimulate participation by economic agents, yet restrain public sector management of these activities. Two modifications to the current situation will facilitate this objective:

- the energy planning unit in the Energy Department should be strengthen so that the Government has access to all factors essential to developing an energy policy;

- CDER should be given the responsibility to promote and provide incentives for energy efficiency, in conjunction with its mission to develop renewable energy.

4.62 These modifications are fundamental to providing a new dynamic within the energy sector, yet will not require a complete overhaul of the existing organizational structure. In fact, they are a logical extension of past activities conducted primarily by the Energy Department. This arrangement makes the Authorities' willingness to advance in the areas of energy efficiency and renewable energy more concrete.

B. Strengthening the Energy Planning Unit in the Energy Department

Public Sector Responsibility

4.63 In the preceding chapter, the importance of integrated energy planning was discussed. Emphasis was given to its usefulness for defining and comparing consumption-based (demand) and production-based (supply) efficiency options relative to alternative supply options.

4.64 Integrated planning is an essential tool for making energy policy decisions: thus development of this policy instrument should be given priority. This is especially important for the Moroccan Government, as it currently faces numerous important, strategically sensitive decisions concerning:

- introducing natural gas;
- power generation;
- rural electrification;
- energy efficiency programs;
- development of renewable energy.

4.65 Each of these issues has been addressed in isolation, either by its promoters or the responsible agency or company. However, the optimal individual option is not necessarily the optimal collective solution for the system. Projection scenarios and analyses underlying energy policy choices most frequently are made by individual energy producers concerned about the optimal choice for their particular company. Options developed in this manner are not necessarily optimal for the final consumer or for the nation, as energy utilization and substitution are not taken into account in the analyses.

4.66 In order to facilitate policy-related debates and decisions related to legislation, institutions and finance, all data and analysis results should be aggregated with the Energy Department to be summarized into a critical analysis. This synthesis is possible with integrated energy planning and will allow the Government to respond more appropriately to the economic, social and environmental imperatives. Integrated energy planning allows different combinations of demand-side (energy efficiency programs) and supply-side (production investments, imports) actions to be compared with regard to risks and uncertainties (international prices, security issues) and environmental impacts (improvement or destruction), as well as standard economic criteria.

4.67 Particular care should be given to preparing national energy policy decisions given that:

- for the most part, these decisions must be taken "in the dark" with regard to future developments affecting economic growth and the international situation, for example, and there is a large selection of options which must therefore be explored;

- in the future, the management of energy enterprises must become more autonomous and thus will have more independence of choice. This strengthens the State's obligation to develop its internal resources for defining national strategy and for exercising its supervisory functions.

Creating a Planning and Analysis Division within the Energy Department

4.68 In response to the need to strengthen energy planning functions within the Department of Energy, new organizational plans call for the creation of a Planning and Analysis Division. It is important that this Division be staffed with high quality analysts specializing in economics, finance and legislative/legal matters.

4.69 The planning process is simultaneously continuous, iterative and interactive. Continuity addresses the need for periodic adjustments to energy consumption projections (which depend on data from the previous year and on current economic conditions), for evaluating more precisely planning and implementation requirements for related projects, for taking into account the evolution of international economic conditions, and for incorporating technical progress. The iterative nature of planning arises in the comparison between the cost of supply-based and demand-based projects and between the different supply alternatives needed to change or strengthen specific programs. Interactive planning is required because the results of various planning stages influence each other. The influence of energy demand management programs on energy demand projects; and the influence of supply options (for example degree of market penetration for natural gas) on demand management must be actively considered.

4.70 In one regard, planning activities must rely on basic tools: statistical data for the annual energy balance, demand indicators and techno-economic features of the energy system, as well as methods and models for estimating and projecting energy demand and investment options. Concerning energy demand, use of the "MEDEE" method is recommended. To advance further, planning also will need to be based on an established dialogue between the Planning and Analysis Division and the Energy Planning Group, all representatives of other concerned ministerial departments, energy production and distribution companies, the organization responsible for implementing the energy efficiency policy, and consumers (industries, regional cities, households, all represented by unions and trade and/or civic associations such as the AMGE, for example). A crucial element of the process for transforming energy planning into energy policy decisions is transparency of data, assumptions, and calculation methods. The proposed alternatives for policy options should be expressed clearly.

C. Energy Efficiency: Broaden the CDER's Role

4.71 The development and implementation of an energy efficiency policy involves collaboration at four levels, three of which are currently well identified:

- the final consumers level, where behavior and investment changes are possible;
- the level of network partners - energy sector associations and institutions - which provide advisory and technical support for corresponding operations;
- the public administration level, which defines overall policy, establishes and enforces legislation and regulations, and decides on public financial incentives.

4.72 AMGE is a network partner of particular note, due to its energy company contacts, its information acquisition abilities, and its ability to bring the issues, needs and concerns of consumers before appropriate decision-makers. The authorities listened to and support the AGME's activities and recommendations. Additionally, in general terms, the system of small civic associations - town associations, village associations, consumer associations - should be accessed in order to bring the consumers' point of view into the planning colloquy and to establish dialogues with authorities. These associations are integral actors in all national energy efficiency actions. Therefore, it is recommended that:

- AMGE participate in the Energy Planning Group;
- AMGE participate in the Administrative Council of the institution given responsibility for implementing the energy efficiency policy;
- a regular subsidy be granted to AMGE (without threat to its autonomy) so that it can better fulfill its mobilization mission and so that it is not obliged to submit proposals for financing its basic operations.

4.73 The Planning and Development Service (SPD) of the Energy Department currently is the nominal institution responsible for implementing the energy efficiency policy (National Energy Management Plan). More significant energy efficiency activities have been carried out by the GEM (Energy Management in Moroccan Enterprises), a private organization

financed by international assistance under the supervision of the Energy Department. This has led to considerable confusion with regard to areas of expertise and responsibility, and to inefficiencies due to staffing and scope of activity constraints. Furthermore, the Energy Department has felt compelled to take over the *"Bus-Energie"* project (financed by international assistance; four staff members assigned to this task) as a result, although it should more appropriately be contracted to a research center as part of an arrangement to develop an intervention program for industrial and tertiary sector companies.

4.74 The need for an interfacing organization to bridge the gap between final consumers and network partners on the one hand, and the Administration on the other was discussed in the preceding chapter. Based on experiences in many other countries, Morocco has outlined plans to create an Energy Management Agency (similar to the one created in Tunisia, for example). There has been no follow-up for several reasons, key among them the resistance to creating a new public sector institution, and a certain lack of understanding of the Agency's role in mobilization, promotion and incentives, and the fear of further bureaucratization. However all parties, especially the public authorities, recognize that there is a "missing link" in the chain and that it is not the obligation of the Government to fill this void, nor is it within the Government's abilities to do so.

4.75 There are several favorable elements for resolving this dilemma in a manner which would allow implementation of worthwhile efficiency programs without major institutional dislocations:

- The public authorities are well aware that if left unchecked, Morocco's current energy situation, especially for power supply, could devolve into a state of emergency.

- There are networks and participants such as AMGE which are ready to mobilize large consumers to participate in the programs, as long as they are assured of the Government's willingness to support the policy. This willingness can be demonstrated in concrete terms by the establishment of a public sector agency to promote and provide incentives.

- Some of the important components already exist: a "National Energy Management Program" developed by the Energy Department; projects for training, data collection and audits (GEM); and several international assistance projects targeting efficiency with the Energy Department.

- There is a critical complementarity between energy efficiency and development of renewable energy, both in relation to priority short-term issues, such as rural electrification, and to Morocco's long-term energy future:

    - low-consumption, energy efficient equipment are requisite accompaniments to decentralized power generation (wind, solar, micro-hydro) for reasons of overall cost optimization;
    - technology such as passive solar (or bio-climatic architecture) and solar hot water heaters are situated at the interface between energy efficiency and renewable energy;

- biomass and fuelwood issues also are tightly linked to efficient energy utilization and to energy substitution;
- large-scale development of renewable energy offers an important opportunity for Morocco to relax some of its energy constraints: this will only be possible if energy efficiency is used to reduce consumption relative to the same levels of service.

- There is a renewed dynamism within CDER and it increasing is engaged in energy efficiency actions, including those funded by international assistance.

4.76 It is recommended that the Government assign CDER the mission to implement a national energy efficiency program, through means of promotion and incentives, in concert and cooperation with both public sector and private sector partners. These would potentially include GEM, AMGE, energy companies, local collectives, research centers, etc.

4.77 CDER itself would not necessarily have to be reorganized, however it is further recommended that:

- all concerned parties be clearly and officially notified of the broadened mission of CDER so that no ambiguities will arise concerning its responsibilities vis-a-vis the overall group of national and international partners;

- CDER be provided with sufficient staffing, especially in the areas of economics, finance, program implementation, so that it can carry out its broaden responsibility under the best possible conditions.

4.78 It is recommended that the GEM program's activities gradually be integrated with CDER energy efficiency actions. This will allow there to be continuity once the GEM is disbanded (scheduled for 1995) and will strengthen Moroccan follow-up abilities. The CDER's General Director's presence on the GEM Administrative Council should facilitate this synergy.

4.79 The Energy Department's proposal for re-organization suggests that an Energy Management and Development Division be created along side the Planning and Analysis Division. The former would have primary responsibility for energy efficiency and renewable energy policy. This Division would be granted a supervisory role over the CDER and other partners. In other words, it would provide maximum support on the ministerial level through preparation, promotion and control of necessary legislation and regulation; update and improve the energy management program; and create or strengthen the incentive system (fiscal or financial).

4.80 Implementation of these recommendations would legitimize institutionally the public authorities' willingness to develop an energy efficiency policy and also will legitimize the Energy Department's efforts of the last several years. With a clear definition of the functions and responsibilities of each - ranging from definition of the energy policy and its implementation framework up to the realization of the projects, in which the private sector should play an increasing role - the public powers and the promotion agencies will be able to perform their functions more effectively. This will create a new dynamic for energy efficiency in service to development.

RECENT DEVELOPMENTS

4.81 The planning and studies division has been recently reorganized. Its new responsibilities include formulating energy policies and representing the MEM in its interaction with the institution operating outside the energy sector. Energy efficiency and renewable energy will be one of the main areas of responsibility of this new division.

ANNEXES

ANNEX 1
ELECTRICITY SUB-SECTOR

KEY FINDINGS AND MAIN TRENDS

A. The Players

1.1. The ***Office National de l'Electricité*** (ONE) is a publicly-owned financially autonomous corporation[1] which generates almost 90% of electricity produced in Morocco, excluding imports from Algeria. It is also responsible for high voltage transmission of electricity and bulk sales to 10 municipal *Régies*, which deal with electricity and water distribution as well as sewage. ONE also distributes electricity in areas not served by the *Régies*. Roughly half of final customers are served by *Régies* and the other half directly by ONE.

1.2. There are ten Municipal *Régies*, which cover the following major cities: Casablanca, Rabat-Salé, Fès, Tetouan, Tanger, Marrakech, Kénitra, Safi, Meknès and El Jadida. Casablanca accounts for almost half, and Rabat for 15%, of the total electricity purchased in bulk by the *Régies* from ONE.

1.3. Although the law which established ONE in 1963 gave it a legal monopoly over the supply of generation above 300 kW, autogenerators in fact accounted for about 12% of generation in Morocco in 1992. The principal autogenerators are companies in the mining, phosphate, sugar, petroleum refining and paper industries. The autogenerators sell very little electricity to the public system (ONE). There are also small isolated systems owned by the Ministry of the Interior and Information, whose diesel stations are maintained by ONE.

B. Regulation (Supervision)

1.4. Regulation of ONE and the *Régies* is dispersed among many different Ministries. On technical matters, the Ministry of Energy and Mines (MEM) supervises ONE, and the Ministry of the Interior and Information supervises the *Régies*. The Ministry of Finance is responsible for financial supervision.

1.5. Control over tariffs is the responsibility of the *Comité Interministériel Permanent des Entreprises Publiques* (CIPEP), which considers proposals from the MEM. On tariffs, CIPEP is advised by another Interministerial Committee presided by the Ministry of Economic Affairs and including representatives from the Ministries of the Interior, Energy and Mines, Finance, Public Works, Agriculture, as well as the *Régies* of Casablanca and Rabat.

1.6. Investment is supervised by a number of different Ministries, including the CIPEP and the Interministerial Committee studying tariff proposals. Investment is also reviewed

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1 "ONE, un établissement a caractère industriel et commercial, dote de la personnalité civile et de l'autonomie financière". Titre Premier, Article Premier, Dahir no. 1-63-226 of 5 August 1963, the law which established the ONE.

and approved by the Boards (*Conseils d'Administration*) of ONE and the *Régies*, and by the relevant Ministries drawing up Economic and Social Development Plans and Finance Laws.

1.7. Since 1987, a new form of supervision has been introduced for ONE, which signs a 3-year renewable *Contrat Programme* (referred to hereafter as a contract) with the state, represented by MEM and the Ministry of Finance. The contract defines the aims and obligations of both sides and the means of attaining them. For instance, in the first 3-year contract, ONE undertook to satisfy its supply obligations at least cost within specified financial and economic parameters, and the Government undertook, *inter alia*, to raise tariffs to permit a minimum level of self-financing (30% after 1990), to grant greater financial autonomy and to contribute to the financing of ONE investments. The aims of this contract were not in fact achieved, in part because the government did not raise tariffs as planned. A new contract is now being finalised.

C. Supply and Demand

1.8. The most pressing problem facing ONE is a power supply shortage, which is the result of three factors: an extended period of dry weather affecting hydroelectric plant availability; delays in the completion of a major new hydroelectricity station (Matmata); and forced outages that have resulted from over-use and postponement of maintenance on gas turbine plants. Although estimates of the size and likely duration of the shortage vary, the system was shedding load at peak of 150-200 MW for four or more hours a day in the spring of 1993, even though ONE was importing 100 MW from Algeria. The shortage is expected to continue until the end of 1994 and could reach as high as 300-400 MW before then. This compares with an estimated peak demand of about 1800-1900 MW on the interconnected system, excluding autogenerators. The supply cuts are rotated, but are obviously inconvenient and costly, especially for industry, which bears a heavy proportion of the cuts.

1.9. In 1993, total ONE installed generation capacity is approximately 2200 MW. Of this, one thermal plant (Mohammedia) accounts for over 40% of ONE's thermal capacity and over 40% of total energy generated by ONE. In addition to the ONE capacity, the Algerians currently supply approximately 100-150 MW of capacity to Morocco through the interconnection, and autogenerators provide an additional 300-400 MW. In 1992, total generation, including imports and autogeneration, was 11,174 GWh, of which ONE accounted for 81%, the Algerians 8% and the remainder was produced by autogenerators and isolated generators.

1.10. Morocco relies less on hydroelectricity than was previously the case. In 1963, of total electricity generation of 1161 GWh, 91% was from hydroelectric stations. By 1992, ONE generated 9001 GWH, of which 90% was produced by thermal plant. Of ONE's total installed hydroelectric generating capacity of 687 MW, only 315 MW are considered "guaranteed" in a dry year, and in fact as little as 60 MW have been available at times. Although hydroelectricity generation has been disappointing as a result of the dry weather, hydroelectricity production gradually increased, albeit erratically, between 1982 and 1991.

1.11. While generation capacity has grown 6-fold since Independence in 1957, annual electricity consumption has grown approximately 10-fold. For over 15 years, consumption of electricity has grown at an average rate of 6.7% per year and is expected to continue growing at approximately 7% at least until the year 2000.

1.12. Total final consumption in 1992 was approximately 8200 GWh excluding autogenerators. In 1991, industry accounted for 45% of final consumption, the residential sector 28%, tertiary sector 15%, agriculture 8% and transport and communication 4%.

Table 1
ONE GENERATION AND SALES, 1980-1991

YEAR	1980		1985		1991		1992	
	GWH	%	GWH	%	GWH	%	GWH	%
Hydro Generation	515	31.8	486	7.5	1,266	13.5	981	9.8
Thermal Generation	3,217	67.6	6,017	92.5	7,397	78.7	8,020	79.8
Purchases	29	0.6	23	0.4	736	7.8	1,054	10.4
Total generated + Purchased	4,761	100.0	6,526	100.0	9,399	100.0	10,055	100.0
Losses	664	14.0	1,025	15.7	1,298	13.8	1,328	13.2
Total Sales	4,097	86.0	5,520	84.6	8,101	86.2	8,727	86.8
of which:								
Sales to own custom.	1,809	44.1	2,630	47.6	3,677	45.4	4,050	46.4
Sales to *Régies*	2,289	55.9	2,890	52.4	4.424	54.6	4.677	53.6
of which:								
Casablanca	1,151	50.3			2,036	46.0		
Rabat	300	13.1			625	14.1		

Note: Some of the numbers do not add up due to rounding and reporting errors.
Sources: World Bank Staff Appraisal Report, *Second Rural Electrification Project*, # 8426-MOR, August 30, 1990; ONE's 1991 *Rapport d'Activité*; ONE's *Tariffs de l'Electricité*, June 1992

D. Investment

1.13. ONE is committed to a major investment programme, mainly in new generation plant, in order to overcome the current shortages and avoid their reappearance later in the decade. Their planning assumption is that average demand will grow at 7% per annum until 2000, and 5% thereafter.

1.14. In the short-term (1993-96), ONE plans to commission about 200 MW of gas turbines (Tetouan and Tit Mellil), 240 MW of hydroelectric capacity (Matmata), and 660 MW of thermal plant (Jorf Lasfar I and II). ONE expects the gas turbines to be on stream in early 1994, Matmata at the end of 1994 and Jorf Lasfar I and II at the end of 1994 and mid 1995, respectively. There is some doubt about whether Jorf Lasfar I will be connected to the system by that time. In total, by the end of 1995, the additional installed capacity will be approximately 1,100 MW, but approximately 130 MW of old gas turbines will be retired and the Algerian exports will no longer be guaranteed. In terms of "guaranteed" hydro and thermal capacity to meet peak demand in 1995/96, ONE anticipates that there will be a surplus of about 100 MW.

a total installed capacity of 549 MW, as well as the first combined cycle gas turbine (350-450 MW) and Jorf Lasfar III (330 MW). According to ONE, this building programme will leave a capacity shortage of about 50-100 MW in 1996-1998, and a surplus of a similar size in 1999-2000.

Table 2
ONE LOAD HISTORY AND FORECASTS

YEAR	PEAK (MW)	ENERGY (GWH)
1989	1,447	8,217
1990	1,560	8,864
1991	1,680	9,399
1992	1,750	10,054
1993	1,850	10,750
1995	2,100	12,300
2000	2,900	17,300
2005	3,700	22,000

Sources: ONE's 1990 and 1991 *Rapport d'Activité*; ONE's *Perspectives d'Equipement en Moyens de Production à Moyen et Long Terme*, May 1993.

1.14. Even on ONE's estimates, this ambitious building programme is barely sufficient to meet expected demand growth, when taking account of the uncertainty of hydro and the need to assume an operating margin for plants which are out for maintenance or due to forced outages (breakdown).

E. Tariffs

1.15. Morocco follows a unified national tariff policy, according to which end-users with similar demand characteristics face the same tariffs regardless of the customer's location or supplier (ONE or *Régie*). This brief analysis of tariff policy will concentrate first on the level of final tariffs and then on tariff structure, and will conclude with comments concerning connection charges.

1.16. End-user tariff levels rose steadily between 1975 and 1988. In 1990, the World Bank concluded that 1988 tariff rates were greater than long run marginal costs (LRMC) for all voltage levels and tariff categories. This was largely due to the difference between the domestic price of heavy fuel oil (which is heavily taxed) and the much lower economic cost of heavy fuel oil used in the calculation of the LRMC. Since 1988, tariffs have risen twice: 4.5% in 1990 and 6% in April 1993. Tariffs still reflect high fuel oil costs.

1.17. In a UNIPEDE study of electricity tariffs (as of January 1 1992) in Morocco and other Mediterranean countries, UNIPEDE concluded that residential tariffs in Morocco were relatively low compared to neighbouring countries, and that tariffs to the very largest industrial customers in Morocco were relatively high. This reflects a policy of favouring residential

customers. According to the MEM, for instance, tariffs to low voltage customers are 40% lower than medium voltage tariffs. Certainly, it is fair to say that tariffs do not reflect the economic costs of supplying different customers, either by reference to their location, time of consumption or their other demand characteristics.

1.18. The structure of most end-user tariffs is relatively simple. Low voltage tariffs are one-part tariffs, rising in block steps with the level of kWh consumption and varying by the type of end use (residential, public lighting, etc). For these customers, there is no reflection of time of day or season. Medium, high and very high voltage customers face two-part tariffs reflecting respectively capacity (kW) and energy (kWh) consumed. For these customers, the energy component of the tariff is lower at night (24.00 to 07.00) than at other times of the day. There are special tariffs for Agriculture, which for instance distinguish summer from winter and Sundays from working days when setting the kWh price. This tariff structure favours the Agricultural Sector by setting lower tariffs in the summer, when most pumping for agriculture occurs. The most serious defect in the tariff structure is the absence of peak tariffs that would discourage consumption in peak periods and reduce the need for capacity.

Table 3
EVOLUTION OF ELECTRICITY TARIFFS, 1980 - 1993

YEAR	AVERAGE PRICE OF THE KWH (CONSUMERS AND DISTRIBUTORS AMALGAMATED)		
	C/KWH	PERCENTAGE INCREASE	INDEX (1980 = 100)
1980	30.48		100
1981	38.59	26.6	127
1982	45.07	16.8	148
1983	49.68	10.2	163
1984	54.65	10.0	179
1985	60.12	10.0	197
1986	62.40	3.8	205
1987	65.52	5.0	215
1988	68.80	5.0	226
1989	68.80	0.0	226
1990	71.90	4.5	236
1991	71.90	0.0	236
1992	71.90	0.0	236
1993	76.21	6.0	250

Source: ONE's *Tariffs de l'Electricité*, June 1992.

1.19. The *Régies* pay a bulk supply price to ONE for power supplies. However, whereas end-user tariffs for customers with similar demand characteristics are fixed on a national basis, this is not true for bulk sales. According to a study of Moroccan tariffs by *Electricité de France* (EdF), the level of bulk tariffs to each *Régie* reflects history and a "no-win, no-lose" policy.

Electricité de France (EdF), the level of bulk tariffs to each *Régie* reflects history and a "no-win, no-lose" policy.

1.20. In its 1990 Report, the World Bank assessed the connection charges collected by ONE and the *Régies* from new customers. That report pointed to the importance of high connection charges as a source of revenue for the ONE and the *Régies*, but also noted that the inability to spread these charges over time probably discouraged new customers in urban and rural areas. This problem remains to be solved.

1.21. The Government is currently considering whether to introduce a number of changes in tariff level and structure (for end-use and bulk supply) which were proposed by EdF. These are considered later in this Chapter.

F. Financial Picture

1.22. The sector faces a serious financial problem: how to finance the substantial ONE investment programme described above, estimated to cost approximately 24,000 million dirham for the 1993-97 programme, and an additional 11,000 million dirham for the 1997-2001 programme.

1.23. ONE is currently in a poor financial position. As of March 1993, it had over 5,000 million dirhams of unpaid bills, about half of which were accounted for by the *Régies* (mainly Casablanca). ONE has a large tax credit from Value Added Tax (VAT) which, if not paid to ONE, could amount to 1,500 million dirham by 1997. Its tariffs have not risen with inflation over the past five years. It has a large debt compared with its repayment capability. The State has indicated its wish to minimise financial contributions to future ONE investments. And ONE must continue to meet the social obligations of a public service company and to pay substantial taxes (e.g. directly in import taxes and customs duties, and indirectly by purchasing very heavily taxed fuel oil).

1.24. The CIPEP has approved a plan which ostensibly achieves the aim of meeting ONE's finance gap. The most important features of the plan include a 6% annual increase in tariffs in 1993, 1994 and 1995, and a 4,000 million dirham participation of the state in ONE's investment plan between 1993 and 1997. These and other commitments are, we understand, included in the new contract to be signed between ONE and the State. It is of utmost importance to the country that the State and ONE meet these commitments. Even if they do, Morocco still faces a serious problem over financing the substantial investment programme and this is one reason for the interest in private sector participation in independent generation.

TABLE 1

Electricity Sales, Losses, and Generation
(GWH)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989 (a)	1990 (a)	1991 (a)	1992
ONE interconnected system sales															
To own customers	1,421	1,644	1,805	1,934	2,078	2,305	2,405	2,604	2,783	2,977	3,102	3,313	3,563	3,678	4050
To Régies	1,970	2,105	2,289	2,390	2,528	2,668	2,735	2,890	3,092	3,276	3,543	3,820	4,091	4,424	4677
Subtotal	3,391	3,749	4,094	4,324	4,606	4,973	5,140	5,494	5,875	6,253	6,645	7,133	7,654	8,102	8727
Losses and own use															
ONE's dist. network	62	50	52	86	63	91	87	110	101	62	81	115	139	169	172
Transmission	275	302	310	379	404	393	418	413	450	454	452	428	478	538	552
Power stations	258	266	301	351	415	442	462	498	511	532	533	541	593	590	605
Subtotal	595	618	663	816	882	926	967	1,021	1,062	1,048	1,066	1,084	1,210	1,297	1328
% of Gen. & Purchases	14.9%	14.2%	13.9%	15.9%	16.1%	15.7%	15.9%	15.7%	15.3%	14.4%	13.8%	13.2%	13.7%	13.8%	
Generation and purchases															
Hydro	1,416	1,582	1,515	1,024	573	481	367	486	643	825	936	1,157	1,220	1,266	981
Thermal	2,551	2,744	3,213	4,068	4,880	5,384	5,719	6,005	6,273	6,418	6,582	6,976	7,398	7,397	8020
Purchases (b)	27	41	29	39	26	22	8	5	21	57	192	84	246	736	1054
Total	3,994	4,367	4,757	5,131	5,479	5,887	6,094	6,496	6,937	7,300	7,710	8,217	8,864	9,399	10055
Isolated Systems															
Sales	2	3	4	12	15	18	19	26	28	30	30				
Losses	1	1	1	3	3	4	3	4	5	7	8				
Purchases	-	-	-	8	9	12	13	18	21	23	23				
Generation	3	4	5	7	9	10	9	12	12	14	15				
Ministry of Interior															
Sales	10	12	12	17	18	18	19	18	18	19	19				
Losses	3	3	4	4	4	4	5	4	5	6	6				
Generation	13	15	16	21	22	22	24	22	23	25	25				
Autoproducers															
Own use	351	398	441	512	586	721	760	777	858	1,016	1,210				
Supply to ONE	27	41	29	48	35	34	21	23	42	57	197	84	143	94	501
Generation	378	439	470	560	621	755	781	800	900	1,073	1,407	84	143	94	122
Total Generation	4,361	4,784	5,219	5,680	6,105	6,652	6,900	7,325	7,851	8,355	8,965	8,217	8,761	8,757	

(a) The figures corresponding to Isolated Systems, Ministry of Interior and Autoproducers are not available. As a result, the Total Generation figures from 1989 onwards are not comparable to the total from previous years.

(b) The 1988 includes net purchases from Algeria of 18,2 GWH in 1988, 103.4 GWH in 1990, and 641.4 GWH in 1991.

Source: ONE

TABLE 2

SALES BY ECONOMIC SECTOR, 1978 - 1991
(ONE and Régies)
(GWH)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1990 as %
Medium and High Voltage														
Agriculture, Fisheries	121	130	164	253	247	292	295	318	347	369	364	393	431	5.87%
Potable water distribution	48	162	188	205	201	230	226	243	250	267	254	274	299	4.07%
Coal mining	47	44	47	47	51	53	61	67	70	71	70	68	76	1.04%
Phosphate mining	286	301	299	309	313	319	327	337	354	377	415	397	406	5.53%
Other mining	122	128	137	141	165	168	191	203	160	160	217	222	236	3.22%
Mechanical and elect. uses	67	71	78	92	97	100	103	110	147	151	188	192	201	2.74%
Cement industry	324	322	340	347	358	386	376	391	402	430	451	537	543	7.40%
Other material industry	73	89	103	103	98	91	94	102	106	107	146	163	176	2.40%
Chemical industry	142	201	216	206	210	220	251	254	336	343	254	275	294	4.01%
Canning and preserving industry	221	238	248	261	247	261	272	279	326	341	338	344	377	5.14%
Textile industry	224	244	273	272	282	320	357	344	359	374	418	442	459	6.25%
Woodworking, plastic industry	156	170	182	191	186	216	228	215	233	239	252	259	280	3.81%
Railways	103	97	106	109	104	114	115	150	153	165	133	177	201	2.74%
Communication, other transport	50	50	53	53	65	71	72	74	90	90	75	79	84	1.14%
Hotels, catering	178	175	203	187	239	269	223	253	276	292	292	205	226	3.08%
Radio, TV, gvt.	154	173	188	206	209	234	250	288	287	288	334	418	452	6.16%
Subtotal	2,316	2,595	2,825	2,982	3,072	3,344	3,441	3,628	3,896	4,064	4,201	4,445	4,741	64.59%
Annual Growth	9.0%	12.0%	8.9%	5.6%	3.0%	8.9%	2.9%	5.4%	7.4%	4.3%	3.4%	5.8%	6.7%	
Low Voltage														
Domestic use, private and administrative lighting	823	888	983	1,027	1,197	1,276	1,326	1,461	1,555	1,745	1,893	2,106	2,269	30.91%
Public lighting	72	77	80	86	92	108	111	128	139	158	168	190	217	2.96%
Power	66	65	67	64	73	77	77	87	94	87	93	99	113	1.54%
Subtotal	961	1,030	1,130	1,177	1,362	1,461	1,514	1,676	1,788	1,990	2,154	2,395	2,599	35.41%
Annual Growth	9.2%	7.2%	9.7%	4.2%	15.7%	7.3%	3.6%	10.7%	6.7%	11.3%	8.2%	11.2%	8.5%	
Total Final Sales: ONE and the Régies	3,277	3,625	3,955	4,159	4,434	4,805	4,955	5,304	5,684	6,054	6,355	6,840	7,340	100.00%
Annual Growth	9.0%	10.6%	9.1%	5.2%	6.6%	8.4%	3.1%	7.0%	7.2%	6.5%	5.0%	7.6%	7.3%	
Total sales by ONE excluding sales to Régies	1,424	1,647	1,809	1,939	2,085	2,313	2,413	2,613	2,783	3,007	3,123	3,314	3,563	6,40%
Total sales by Régies	1,853	1,978	2,146	2,220	2,348	2,492	2,543	2,691	2,900	3,050	3,273	3,619	4,091	8,74%
Losses Régies	117	127	143	170	179	176	193	199	220	226	270	290	311	9,37%
Losses Régies as % of ONE Sales to Régies	5.9%	6.0%	6.2%	7.1%	7.1%	6.6%	7.1%	6.9%	7.1%	6.9%	7.6%	7.4%	7.1%	

Source: ONE

TABLE 3

SALES OF ONE TO DISTRIBUTION REGIES FROM 1963 TO 1992 IN GWH

REGIES	1963 GWH	1970 GWH	1980 GWH	1991		1992	
				GWH	%	GWH	%
RAD Casa	324,625	562,137	1,151,220	2,035,992	46.0	2,112,300	45.1
RED Rabat	76,076	131,827	299,636	624,882	14.1	667,600	14.3
Raid Tanger	-	62,220	151,624	361,058	8.2	377,800	8.1
Radeef Fes	38,717	70,550	174,462	360,480	8.1	371,900	7.9
RDE Tetouan	-	30,888	125,456	264,491	6.0	292,800	6.3
Radeema Marrakech	30,201	52,786	115,509	251,099	5.7	275,600	5.9
Radeem Meknes	38,542	67,148	132,147	237,859	5.4	251,500	5.4
RAK Kenitra	19,584	31,514	72,824	148,589	3.3	167,100	3.6
Rades Safi	14,044	18,206	42,157	79,320	1.8	85,700	1.8
Radeej El Jadida	5,295	8,442	23,827	60,240	1.4	74,500	1.6
TOTAL	547,084	1,035,718	2,288,862	4,424,004	100.0	4,424,004	100.0

TABLE 4

SALES OF ONE TO DIRECT USERS, 1991

CUSTOMERS CATEGORIES	SALES O.N.E.	
	NUMBER OF CUSTOMERS	KWH
- VERY HIGH VOLTAGE	2	239,038,925
- HIGH VOLTAGE	60	1,295,190,160
TOTAL VHV-HV (1)	62	1,534,229,085
MEDIUM VOLTAGE		
- MV4- Agrculture	738	321,391,635
- Other Uses	4,551	1,031,332,691
TOTAL MEDIUM VOLTAGE (2)	5,289	1,352,724,326
LOW VOLTAGE		
- Private	631,551	433,894,073
- Domestic	162,880	198,978,898
- Administration	10,970	41,213,170
- Public	3,541	69,160,474
- Motive Power	13,252	47,276,045
TOTAL LOW VOLTAGE (3)	822,194	790,522,660
TOTAL (1) + (2) + (3)	827,545	3,677,476,071

ONE SALES TO ITS MAIN DIRECT USERS, 1963- 1991
(GWh)

CUSTOMER	1963	1970	1980	1991	1991 in %	1992	1992 in %	1993
OCP	87,360	139,949	291,925	369,581	20.1%	369,019		192,047
ONCF	59,470	69,410	98,976	166,731	9.1%	175,699		103,869
CIOR	-	-	89,472	142,417	7.8%	144,391		76,280
CINOUCA	-	-	-	126,542	6.9%	128,112		79,750
SNEP	-	-	90,805	106,349	5.8%	122,240		71,764
ORMVAL	-	-	-	89,809	4.9%	871,114		42,539
ONEP	8,610	5,872	41,090	87,559	4.8%	96,289		55,758
CNA	21,760	31,925	46,806	79,758	4.3%	80,024		44,520
Ciments d'Agadir	-	-	42,188	72,301	3.9%	83,298		41,753
ASMENT	-	-	41,622	63,872	3.5%	64,521		35,475
ASMAR	-	-	34,705	50,873	2.8%	40,823		35,236
Cellulose (*)	10,903	21,260	54,615	48,396	2.6%	54,959		28,445
SONASID	-	-	-	47,542	2.6%	44,598		25,327
ICOZ	-	-	27,293	38,592	2.1%	36,998		22,290
SMD	16,920	28,479	35,995	31,704	1.7%	31,099		17,887
SCP	1,720	1,607	16,335	31,331	1.7%	30,385		16,898
RTM	-	-	10,709	27,990	1.5%	31,291		18,030
CMT	19,405	18,625	22,907	25,443	1.4%	25,450		13,809
SOMIFER	-	-	-	21,938	1.2%	21,078		11,451
Fond. P. Zellidja	5,101	5,209	11,006	21,651	1.2%	22,078		13,114
FAR	-	-	12,680	18,379	1.0%	18,083		10,409
Djebel Aouam	5,150	9,370	14,561	17,452	1.0%	15,320		7,436
Maroc Chimie (*)	-	6,978	47,507	16,994	0.9%	16,922		4,563
FACEMAG	-	-	-	16,885	0.9%	19,838		11,312
SMI	-	-	-	15,575	0.8%	9,046		8,238
SMOA	-	-	-	15,508	0.8%	13,790		7,999
MP I et II (*)	-	-	8,106	14,094	0.8%	22,582		10,502
Samine	-	-	-	10,013	0.5%	11,837		5,665
MP III et IV (*)	-	-	-	8,386	0.5%	6,946		5,277
SEFERIF	5,070	8,515	5,690	7,292	0.4%	6,361		3,865
others	51,641	30,370	46,429	44,925	2.4%	54,962		110,670
TOTAL	293,110	377,569	1,091,422	1,835,882	100.0%	1,885,153		1,132,785

Source: ONE

(1) January-July

EVOLUTION IN THE NUMBER OF ONE CUSTOMERS, 1963 - 1991

CUSTOMER CATEGORY	1963	1970	1980	1990	1991
DISTRIBUTORS	9	16	26	32 (*)	32
CONSUMERS					
VERY HIGH VOLTAGE			1	2	2
HIGH VOLTAGE	27	27	47	60	60
MEDIUM VOLTAGE	631	1,118	2,199	4,930	5,289
LOW VOLTAGE:					
Private	} 83,668	} 152,605	} 275,984	472,946	512,966
Commercial	}	}	}	111,315	118,585
Administration	2,491	4,689	7,081	10,485	10,970
Public	135	616	1,243	3,267	3,541
Domestic	7,663	24,626	84,339	153,292	162,880
Motive power	2,598	5,166	9,060	13,007	13,252
LOW VOLTAGE TOTAL	96,555	187,702	377,707	764,312	822,194
Total distributors & consumer	97,222	188,863	379,980	769,336	827,545

(*) 10 Régies performing their own distribution with 32 connections to ONE's network in 1992.

Source: ONE

TABLE 7

BULK SUPPLY ELECTRICITY TARIFFS
(for Sales to the Régies)[1]
(Effective from April 1, 1993)

	DEMAND CHARGE[2] (DH/KVA/YEAR)	ENERGY CHARGE (DH/kWh)	
		DAY[3]	NIGHT
Casablanca	107.12	0.76929	0.61550
Fes	106.17	0.76232	0.61985
Kenitra	104.14	0.74774	0.59820
Tetouan	103.15	0.74049	0.59245
Meknes	102.85	0.73834	0.59072
Safi	102.75	0.73783	0.59027
Marrakech	98.25	0.70526	0.56422
Tanger	97.50	0.70000	0.56005
Rabat	96.65	0.69359	0.55489
El Jadida	88.38	0.63444	0.50762

[1] Some Regies buy electricity under several tariffs. The tariffs included here are representative.

[2] Excludes value added tax equal to 7% of revenue.

[3] For subscribed or actual demand in excess of 2,000 kVA. Every one of the Regies has a demand far in

excess of 2,000 kVA. There are different and higher rates for each of five blocks of consumption less than 2,000 kVA.

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1 Some Régies buy electricity under several tariffs. The tariffs included here are representative.

2 Excludes value added tax equal to 7% of revenue.

3 For subscribed or actual demand in excess of 2,000 kVA. Every one of the Régies has a demand far in excess of 2,000 kVA. There are different and higher rates for each of five blocks of consumption less than 2,000 kVA.

TABLE 8

VERY HIGH AND HIGH VOLTAGE TARIFFS FOR SALES BY ONE [1]

(Effective April 1, 1993)

NORMAL TARIFFS

Normal tariffs are applied to most direct users and are, for the most part, uniform across the kingdom.

Subscribed Demand Charge (DH/kVA/year)	Energy Charge (DH/kWh) Peak	Off-Peak
262.00	0.75493	0.60399

SPECIAL TARIFFS

Special tariffs are applied exclusively to the following three users:

- Maroc Chimie
- Maroc Phosphore
- Société Nationale d'Eléctrolyse et de Pétrochimie (SNEP)

Special Tariffs	Energy Charge (DH/kWh) [2]
Maroc Chimie	0.76066
Maroc Phosphore	0.76066
SNEP	0.67622

[1] Includes value added tax equal to 7% of total revenue

[2] No distinction is made between peak and off-peak carges. These users do not pay any subscribed demand charge.

TABLE 9

MEDIUM VOLTAGE TARIFFS (ONE AND REGIES) [1]
(Effective April 1, 1993)

NON-AGRICULTURAL CUSTOMERS

Subscribed Demand Charge (DH/kVA/year)	Energy Charge (DH/kWh) Peak	Off-Peak
273.00	0.93822	0.75059

AGRICULTURAL CUSTOMERS

	Reference Fixed Charge (DH/kW/year)	Winter		Summer [2]	
		Peak [3]	Off-Peak	Peak	Off-Peak
Very long use of subscribed demand [4]	1803.17	0.51523	0.41073	0.48288	0.41073
Medium use	811.40	1.03511	0.48956	0.58149	0.41073
Short use	360.57	1.55484	0.52824	0.67996	0.41073
Coefficient of reduced demand [5]		1	0.05	0.25	0.05

[1] Includes value added tax equal to 7% of total revenue.

[2] Summer extends from April 1 to October 31.

[3] Peak time is from 7 a.m. to midnight on working days, and from 5 p. m. to midnight on Sundays.

[4] Very long use: >5,500 hours per year; medium use: 2,500-5,500; short use: <2,500.

[5] Subscribed demand for periods other than winter peak in excess of subscribed demand during winter peak is charged at reduced rates.

TABLE 10

LOW VOLTAGE TARIFFS (ONE AND REGIES) [1]
(Effective April 1, 1993)

PRIVATE LIGHTING (DH/kWh)

	0 - 500 kWh/month	>500 kWh/month
Normal tariff	0.822	1.009
Tariff without minimum consumption	0.986	1.211

HOUSEHOLD TARIFF (DH/kWh)

Fixed charge (DH/month)	0 - 200 kWh/Month	200 - 500 kWh/Month	> 500 kWh/Month
2.23	0.723	0.822	1.009

COMMERCIAL LIGHTING (DH/kWh)

Normal tariff	1.009
Tariff without minimum consumption	1.211

ADMINISTRATIVE LIGHTING (DH/kWh)

Normal tariff	1.009
Tariff without minimum consumption	1.211

PUBLIC LIGHTING (DH/kWh)

Normal tariff	0.851

AGRICULTURAL AND INDUSTRIAL MOTIVE POWER USES (DH/kWh)

Normal tariff	0.958
Tariff without minimum consumption	1.147

[1] Includes value added tax equal to 7% of revenues

[2] Available to consumers justifying a substantial demand for non-lighting uses. The fixed charge varies with the numbers of room dwelling. The charge shown is for dwellings with 1-4 rooms.

TABLE 11

EVOLUTION OF ELECTRICITY TARIFFS

YEAR	DATE	VERY-HIGH AND HIGH VOLTAGE			
		Subscribed Demand Charge	Energy Charge		Average increase in tariffs (%)
			Peak	Off-Peak	
1983	1.9.83	202.00	0.4610	0.36880	6.50
1984	1.5.84	202.00	0.5276	0.42210	13.40
1985	1.4.85	202.00	0.5856	0.46850	10.09
1986	1.8.86	212.00	0.6150	0.49200	5.00
1987	1.5.87	223.00	0.6460	0.51680	5.00
1988	1.8.88	235.00	0.6783	0.54264	5.00
1989		"	"	"	-
1990	1.6.90	247.00	0.7122	0.56980	5.00
1991		"	"	"	-
1992		"	"	"	-
1993	1.4.93	262.00	0.75493	0.60399	6.00
AVERAGE INCREASE 1983 - 1993		2.63%	5.06%	5.06%	4.95%

TABLE 12

EVOLUTION OF ELECTRICITY TARIFFS

YEAR	DATE	MEDIUM VOLTAGE			
		Subscribed Demand Charge	Energy Charge		Average increase in tariffs (%)
			Peak	Off-Peak	
1983	1.9.83	150.00	0.62000	0.49600	13.30
1984	1.5.84	190.00	0.67000	0.53600	9.84
1985	1.4.85	225.00	0.73000	0.58400	10.06
1986	1.8.86	236.25	0.76650	0.61320	5.00
1987	1.5.87	248.00	0.80500	0.64400	5.00
1988	1.8.88	248.00	0.85105	0.68084	5.00
1989 [1]		"	"	"	-
1990	1.6.90	258.00	0.88510	0.70810	4.00
1991		"	"	"	-
1992		"	"	"	-
1993	1.4.93	273.00	0.93822	0.75059	6.00
AVERAGE INCREASE 1983 - 1993		6.17%	4.23%	4.23%	4.49%

[1] A different tariff for agricultural customers was introduced on this date.

TABLE 13

EVOLUTION OF ELECTRICITY TARIFFS

YEAR	DATE	LOW VOLTAGE					
		Private lighting		Household			Average increase in tariffs (%)
		0-500 kWh/mth	> 500 kWh/mth	0-200 kWh/mth	200- 500 kWh/mt	> 500 kWh/mth	
1983	1.9.83	0.690	0.690	0.450	0.450	0.450	
1984	1.5.84	"	0.700	0.480	0.550	0.700	
1985	1.4.85	"	0.770	0.510	0.580	0.770	
1986	1.8.86	0.710	0.809	0.536	0.609	0.809	
1987	1.5.87	0.720	0.850	0.563	0.640	0.850	
1988	1.8.88	0.750	0.880	0.600	0.680	0.880	
1989		"	0.900	0.620	0.700	0.900	
1990	1.6.90	0.775	0.952	0.682	0.775	0.952	
1991		"	"	"	"	"	-
1992		"	"	"	"	"	-
1993	1.4.93	0.822	1.009	0.723	0.822	1.009	6.00
AVERAGE INCREASE 1983-1993		1.77%	3.87%	4.86%	6.21%	8.41%	

TABLE 13 (CONT.)

EVOLUTION OF ELECTRICITY TARIFFS

YEAR	DATE	LOW VOLTAGE			
		Commercial and administrative lighting	Public lighting	Agricultural and industrial motive power uses	Average increase in tariffs (%)
1983	1.9.83	0.700	0.550	0.520	
1984	1.5.84	"	"	0.620	
1985	1.4.85	0.770	0.610	0.682	
1986	1.8.86	0.809	0.641	0.717	
1987	1.5.87	0.850	0.673	0.752	
1988	1.8.88	0.880	0.710	0.790	
1989		0.900	0.730	0.820	
1990	1.6.90	0.952	0.803	0.902	
1991		"	"	"	-
1992		"	"	"	-
1993	1.4.93	1.009	0.851	0.958	6.00
AVERAGE INCREASE 1983-1993		3.72%	4.46%	6.30%	

TABLE 14

ONE'S ORGANIZATIONAL CHART

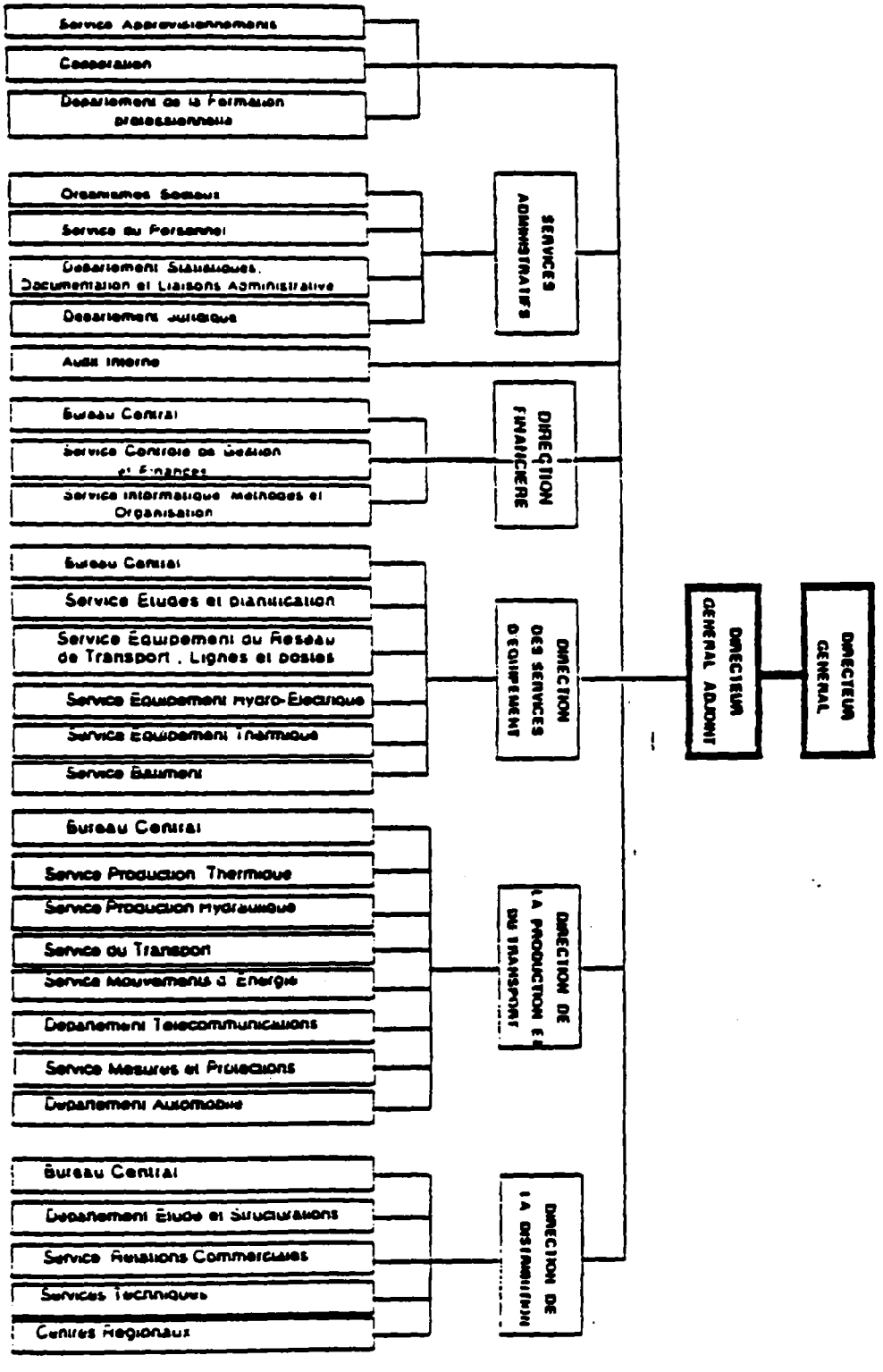

TABLE 15

Maximum Demand and Installed Capacity of Generating Plants (ONE)

	Year of commissioning	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
Maximum demand (MW)		785	827	882	903	994	1,014	1,049	1,148	1,246	1,277	1,383	1,383	1,580	1,680	1,750
Hydro Plants																
B. El Ouidane	1953/54	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135
Afourer	1955	94	94	94	94	94	94	94	94	94	94	94	94	94	94	94
Isf/Fout	1947/49	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
B. Bahi Malchou	1929	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Daourat	1960	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
El Kansera	1936	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Lau	1935/42	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
K. Zidania	1935/38	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Taourat	1951	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fès Aval	1934	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fès Amont	1925	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Taza	1929	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mekrès	1925	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mohammed El Khamis	1967	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
Bou Areg	1969	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Moulay Youssef	1974	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
M. ed Dahbi	1973	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Idriss 1er	1978	40	40	40	40	40	40	40	40	40	40	41	41	41	41	41
Oued Makhazine	1979	-	36	36	36	36	36	36	36	36	36	36	36	36	36	36
Al Massira	1980	- -		128	128	128	128	128	128	128	128	128	128	128	128	128
Taharhoust	1984/87	- -	-	-	-	-		6	6	6	12	12	12	12	12	12
Hassan 1er	1992	- -	-	-	-	-	-	-	-	-	-	-	-	-		67
TOTAL Hydro Plants		440	476	604	604	604	604	610	610	610	616	616	616	616	616	687
Thermal Plants																
Jorada (coal)	1971/72	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165
Casablanca																
(coal-60MW, fuel oil)	1968/75	152	152	152	152	152	152	120	120	120	120	120	120	120	120	120
Kenitra (fuel oil)	1978/79	75	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Oujda (fuel oil)	1949/51	17	17	17	17	17 -	-	-	-	-	-	-	-	-	-	-
Mohammedia																
(300 MW coal)	1981/85	- -	-		150	300	300	450	600	600	600	600	600	600	600	600
(300 MW fuel oil)		- -	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Steam Plants		409	634	634	784	934	917	1,035	1,185	1,185	1,185	1,185	1,185	1,185	1,185	1,185
Combustion Turbine																
Sidi Kacem	1967	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Agadir	1975/77	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Tangier	1975/77	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Tetouan 2	1975/77	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40
Mohammedia	1991	- -	-	-	-	-	-	-	-	-	-	-	-		90	90
Total Combustion Turbines		136	136	136	136	136	136	136	136	136	136	136	136	136	226	226
Total Thermal		545	770	770	920	1,070	1,053	1,171	1,321	1,321	1,321	1,321	1,321	1,321	1,411	1,411
Diesel (Interconnected grid)		21	21	18	18	18	10	9	9	11	11	11	11	11	11	11
Diesel (Isolated networks)		8	10	11	13	14	13	14	15	15	15	15	15	15	15	15
GRAND TOTAL		1,014	1,277	1,403	1,555	1,706	1,680	1,804	1,955	1,957	1,963	1,963	1,963	1,963	2,053	2,124

Source: ONE

TABLE 16

GROSS GENERATION AND FUEL CONSUMED BY ONE PLANTS ON INTERCONNECTED SYSTEMS, 1990 - 1991

	1990			
	PRODUCTION (kWh)	CONSUMPTION		
		GAS OIL	FUEL	COAL
STEAM TURBINES				
Casa Tr.II	241	-	65,731	-
Casa Tr. III	221	-	61,114	-
Jerada	1,085	-	7,461	603,976
Kénitra	1,637	-	427,563	-
Mohammedia	3,940	-	547,671	595,269
GAS TURBINES				
Sidi Kacem	5	1805	-	-
Agadir	13	98	4,891	-
Tanger	103	768	40,533	-
Tetouan	103	568	42,329	-
DIESEL GROUPS	30	479	7,314	-
EMERGENCY DIESEL	21	5530	-	-
TOTAL	7,398	9,248	1,204,607	1,199,245

TABLE 16 (CONT.)

GROSS GENERATION AND FUEL CONSUMED BY ONE PLANTS ON INTERCONNECTED SYSTEMS, 1990 - 1991 (CONT.)

	1991			
	PRODUCTION (kWh)	CONSUMPTION		
		GAS OIL	FUEL	COAL
STEAM TURBINES				
Casa Tr.II	248	-	69,728	-
Casa Tr. III	251	-	70,991	-
Jerada	1,084	-	24,761	587,158
Kénitra	1,646	-	427,251	-
Mohammedia	3,877	-	527,920	567,040
GAS TURBINES				
Sidi Kacem	7	2799	-	-
Mohammedia	3	337	674	-
Agadir	3	196	13,430	-
Tanger	33	481	33,550	-
Tetouan	87	962	44,985	-
DIESEL GROUPS	34	171	7,313	-
EMERGENCY DIESEL	19	5,990	-	-
TOTAL	7,397	10,936	1,220,603	1,154,198

TABLE 16 (CONT.)

GROSS GENERATION AND FUEL CONSUMED BY ONE PLANTS ON INTERCONNECTED SYSTEMS, 1990 - 1991 (CONT.)

	1992			
	PRODUCTION (kWh)	CONSUMPTION		
		GAS OIL	FUEL	COAL
STEAM TURBINES				
Casa Tr.II	127,7	-	34,263	-
Casa Tr. III	350.9	-	96,687	-
Jerada	1,032.0	-	26,194	560,016
Kénitra	1,900.8	-	497,176	-
Mohammedia	3,864.1	-	556,353	499,561
GAS TURBINES				
Sidi Kacem	34.9	13,205	-	-
Mohammedia	308.0	8,171	94,651	-
Agadir	74.3	347	28,794	-
Tanger	129.4	1,417	49,850	-
Tetouan	24.9	224	9,964	-
Tan-Tan	115.6	9,200	29,893	
DIESEL GROUPS	39.1	-	8,777	-
EMERGENCY DIESEL	17.8	4,915	-	-
TOTAL	8,020.1	37,479	1,432,602	1,059,577

TABLE 17

NETWORKS INVENTORY, 1981 - 1991

	1981	1984	1987	1988	1989	1990	1991
Transmission Lines (km)							
225 kV	2,186	2,436	3,069	3,143	3,142	3,142	3,393
150 kV	1,183	1,088	937	864	864	864	762
60 kV	5,697	6,122	6,537	6,800	6,903	6,985	7,699
30 kV	164	169	78	9	}12,018	} 13,140	}13,560
22 kV	7,855	9,019	10,386	10,854	}	}	}
Number of Transformers							
225/150 kV } 225/ 60 kV }	32	35	49	51	n/a	50	55
150/60 kV} 150/MV }	22	23	15	15	n/a	15	14
60/MV	224	232	254	262	n/a	277	289
Installed Capacity (MVA)							
225/150 kV} 225/ 60 kV }	2,855	4,595	4,855	4,995	n/a	4,895	5,235
150/60 kV} 150/MV }	810	830	570	570	n/a	599	559
60/MV	6,193	2,804	3,058	3,190	n/a	3,305	3,535
Length of Distribution Lines (km)	3,781	4,888	8,002	8,286	n/a	9,062	9,624
Length of Conections (km)	5,156	5,958	7,949	9,172	n/a	10,665	10,831

TABLE 18

Autoproducers' Capacity, Generation and Sales 1991

Autoproducer	Installed Capacity (MW)	Production (Mwh)	Supply to ONE (MWh)	Purchase from ONE (MWh)	Consumption (MWh)
Phosboucraa (Laayoune)	76.0	67,751	-	-	67,751
Somifer (Bou Gafer)	4.8	3	-	21,938	21,941
Samine (El Hammam)	2.1	-	-	10,000	10,000
CMT (Touissit)	-	-	-	25.443	2,443
SFPZ (Zellidja)	3.6	6,000	-	21,652	27,652
SACEM (Imini)	-	-	-	5,949	5,948
TIOUIT (BRPM)	-	4,000	-	4,436	8,436
AOULI (BRPM)	4.5	9,558	8,819*	17,890	18,629
CGM (Guemassa)	2.4	78	-	12,191	12,269
SMI (BRPM)	1.9	56	-	35,850	35,896
CDM (BRPM)	24	-	-	83,199	83,199
Subtotal Mining Industry	119.5	87,436	8,819*	238,547	317,164
Maroc Chimie	23.4	62,200	401	16,994	78,793
Maroc Phosphore 1 et 2	76.0	262,700	13,830	14,094	262,964
Maroc Phosphore 3 et 4	111.0	520,513	80,166	8,386	448,733
Cellulose	12.0	50,070	-	48,395	98,465
C.M.C.P.	7.0	45,171	-	-	45,171
SAMIR	19.0	57,338	-	49,241	106,579
SCP	-	-	-	31,300	31,300
Subtotal Other Industry	248.4	997,992	94,397	168,410	1,072,005
SUNAG (Sidi Allal Tazi)	6.0	7,052	-	1,328	8,380
SUNAG (Mechraa Ben Ksi)	6.0	10,851	-	1,305	12,156
SUNAB (Sidi Slimane)	-	-	-	-	-
SUBM (Beni Mellal)	6.0	8,883	-	986	9,869
SUTA (Beni Mellal)	6.0	9,760	-	3,034	12,794
SUNAT (Oulad Ayad)	6.0	8,710	-	1,917	10,627
Sucrafor (Zaio)	8.0	9,117	-	1,740	10,857
Sucrerie Des Doukkala	11.6	11,364	-	347	11,711
Sunabel (Loukkos)	8.7	7,324	-	1,092	8,416
Consumar	14.2	41,071	-	1,274	42,345
Subtotal Sugar Industry	72.5	114,132	-	13,023	127,155
Total	440.4	1,199,560	103,216	419,980	1,516,324

* Estimates

TABLE 19

THE CAPACITY GAP
(Assuming low hydro generation)

Annual rate of growth in electricity demand:
7% until 2000
5% beyond 2000

WINTER	92/3	93/4	94/5	95/6	96/7	97/8	98/9	99/0	010/1	01/2	02/3	03/4	04/5	05/6	06/7	07/8	08/9	09/10	10/11
1- PEAK DEMAND (MW)	1750	1850	1970	2100	2250	2400	2550	2730	2900	3040	3180	3330	3500	3700	3860	4050	4250	4470	4700
2- GUARANTEED HYDRAULIC SUPPLY BY ONE																			
2.1- HYDRAULIC PLANTS IN SERVICE AS OF 31-12	315	315	315	320	320	320	320	320	320	320	320	320	320	320	310	310	310	310	310
2.2- HYDRAULIC PLANTS IN PROGRESS	0	0	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224	224
2.3- PLANNED HYDRAULIC PLANTS																			
*ALWAHDA (Beg 1997/Mid 1998)	0	0	0	0	0	205	198	190	182	174	166	158	150	142	135	135	135	135	135
*SIDI DRISS (End 1997)	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
*D.E.O. A. MESSAOUD (End 1998)	0	0	0	0	0	0	65	64	63	62	61	59	58	57	56	55	54	54	54
*M'DEZ (End 1999)	0	0	0	0	0	0	0	35	35	35	35	35	35	35	35	35	35	35	35
*EL MENZEL (End 2000)	0	0	0	0	0	0	0	0	145	145	145	145	145	145	145	145	145	145	145
2.4- HYDRAULIC PLANTS PLANNED BEYOND 2000 (18 PLANTS)	0	0	0	0	0	0	0	0	0	46	92	118	140	150	185	185	185	195	212
3- TOTAL HYDRAULIC POWER GUARANTEED	315	315	539	544	544	750	808	834	970	1007	1044	1060	1073	1074	1091	1090	1089	1099	1116
4- THERMAL REQUIRED	1435	1535	1431	1556	1706	1650	1742	1896	1930	2033	2136	2270	2427	2626	2769	2960	3161	3371	3584
5- THERMAL PLANTS																			
5.1- Local coal (JERADA)	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165
5.2- Imported coal (MOHAMMEDIA)	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
5.3- Fuel																			
Steam	720	720	720	720	660	660	660	660	600	600	600	600	300	300	300	0	0	0	0
Gas Turbine: 20MW	135	135	120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Turbine: 33MW	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	100	0	0	0
- TOTAL THERMAL POWER FROM ONE	1520	1520	1505	1385	1325	1325	1325	1325	1265	1265	1265	1265	965	965	965	565	465	465	465
- ALGERIAN IMPORTS	100	150	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6- TOTAL THERMAL ONE + IMPORTS	1620	1670	1655	1385	1325	1325	1325	1325	1265	1265	1265	1265	965	965	965	565	465	465	465
7.- UNAVAILABLE THERMAL																			
For maintenance Steam plant	135	135	135	225	225	225	225	225	300	300	300	300	300	300	300	480	480	480	480
Gas Turbine	35	35	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
From breakdowns	150	150	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	600	600
8.- AVAILABLE THERMAL SUPPLY	1300	1350	1157	797	737	737	737	737	602	602	602	602	302	302	302	-278	-378	-648	-648
9.- THERMAL PLANTS IN PROGRESS																			
9.1- Gas Turbines																			
- Tetouan 3x33 MW (beg 1994)	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0
- Tit Melill 3x33MW (beg 1994)	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0
9.2- Thermal Steam																			
- JORF I:1x33 MW (end 94)	0	0	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330
- JORF II:1x330 (mid 95)	0	0	0	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330	330
10- DEFICIT PRIOR TO NEW PLANTS	-135	-185	256	101	-109	-53	-145	-299	-468	-571	-674	-808	-1265	-1464	-1607	-2378	-2679	-3359	-3572
11.- PLANNED THERMAL PLANTS																			
- Combined cycle (350MW beg 96/mid 98/beg 99)	0	0	0	0	0	0	250	350	350	350	350	350	350	350	350	350	350	350	350
-JORF III:1x330 MW (beg 2000)	0	0	0	0	0	0	0	0	330	330	330	330	330	330	330	330	330	330	330
-JORF IV:1x330 MW (during 2001)	0	0	0	0	0	0	0	0	0	330	330	330	330	330	330	330	330	330	330
-1x330 MW (mid 2003)	0	0	0	0	0	0	0	0	0	0	0	300	300	300	300	300	300	300	300
-1x300 MW (beg 2004)	0	0	0	0	0	0	0	0	0	0	0	0	300	300	300	300	300	300	300
-1x300 MW (beg 2005)	0	0	0	0	0	0	0	0	0	0	0	0	0	300	300	300	300	300	300
-2x300 MW (during 2006/beg 2007)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	600	600	600	600
-T.A.G. (2x100MW) (beg 2007/beg 2008)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	200	200	200
-1x300MW (beg 2008)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	300	300	300
-1x600 MW (during 2009)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	600	600
12- Margin after all plans (MW)	-135	-185	256	101	-109	-53	105	51	212	439	338	502	345	446	603	232	331	251	38
13- Margin in % of the required demand	-7.7%	-10.0%	13.0%	4.8%	-4.8%	-2.2%	4.1%	1.9%	7.3%	14.4%	10.6%	15.1%	9.9%	12.1%	15.6%	5.7%	7.8%	5.6%	0.8%

As of 15/03/93

Source: ONE

TABLE 20

THE ENERGY GAP
(Assuming low hydro generation)

Annual rate of growth in electricity demand:
7% until 2000
5% beyond 2000

YEARS	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1- ANNUAL DEMAND (GWH)	10055	10750	11500	12300	13170	14100	15100	16150	17300	18150	19050	20000	21000	22000	23200	24300	25500	26800	28200
2- GUARANTEED HYDRAULIC SUPPLY BY ONE														(1)					
2.1- HYDRAULIC PLANTS IN SERVICE AS OF 31	981	450	450	880	880	880	880	880	880	880	880	880	880	880	840	840	840	840	840
2.2- HYDRAULIC PLANTS IN PROGRESS	0	0	50	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210
2.3- PLANNED HYDRAULIC PLANTS																			
*ALWAHDA (Beg 1997/Mid 1997)	0	0	0	0	0	80	115	120	120	120	120	120	120	120	120	120	120	120	120
*SIDI DRISS (End 1997)	0	0	0	0	0	3	10	10	10	10	10	10	10	10	10	10	10	10	10
*D.E.O. A. MESSAOUD (End 1998)	0	0	0	0	0	0	15	143	143	143	143	143	143	143	143	143	143	143	143
*MIDIZ (End 1999)	0	0	0	0	0	0	0	5	26	26	26	26	26	26	26	26	26	26	26
*EL MENZEL (End 2000)	0	0	0	0	0	0	0	0	50	248	248	248	248	248	248	248	248	248	248
2.4- HYDRAULIC PLANTS PLANNED BEYOND 20 (18 PLANTS)	0	0	0	0	0	0	0	0	0	20	90	132	155	192	242	291	291	306	370
3- TOTAL HYDRAULIC POWER GUARANTEED	981	450	500	1090	1090	1173	1230	1368	1439	1657	1727	1769	1792	1829	1839	1888	1888	1903	1987
4- THERMAL REQUIRED	9074	10300	11000	11210	12080	12927	13870	14782	15861	16493	17323	18231	19208	20171	21361	22412	23612	24897	26233
5- THERMAL PLANTS																			
5.1- Local coal (JERADA)	1033	1100	1100	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
5.2- Imported coal (MOHAMMEDIA)	1412	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
5.3-Fuel																			
Steam	5045	5040	5040	5040	4620	4620	4620	4620	4200	4200	4200	4200	2100	2100	2100	0	0	0	0
Gas Turbine: 20MW	228	600	600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gas Turbine: 33MW	421	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	500	0	0	0
- TOTAL THERMAL POWER FROM ONE	8142	9540	9540	8840	8420	8420	8420	8420	8000	8000	8000	8000	5900	5900	5900	3300	2800	2800	2800
- ALGERIAN IMPORTS	932	1000	1000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6- TOTAL THERMAL ONE + IMPORTS	9074	10540	10540	8840	8420	8420	8420	8420	8000	8000	8000	8000	5900	5900	5900	3300	2800	2800	2800
7- THERMAL PLANTS IN PROGRESS																			
7.1- Gas Turbines																			
- Tetouan 3x33 MW (beg 1994)	0	0	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	0	0
- Tit Melill 3x33MW (beg 1994)	0	0	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500	0	0
7.2- Thermal Steam																			
- JORF I:1x33 MW (end 94)	0	0	300	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980
- JORF II:1x330 (mid 95)	0	0	0	900	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980
8- DEFICIT PRIOR TO NEW PLANTS	0	240	840	1510	1300	453	-490	-1402	-2901	-3533	-4363	-5271	-8348	-9311	-10501	-14152	-15852	-18137	-19473
9- PLANNED THERMAL PLANTS																			
- Combined cycle (350MW beg 96/mid 98/beg 99)	0	0	0	0	0	0	750	2100	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275	2275
-JORF III:1x330 MW (beg 2000)	0	0	0	0	0	0	0	0	1600	1980	1980	1980	1980	1980	1980	1980	1980	1980	1980
-JORF IV:1x330 MW (during 2001)	0	0	0	0	0	0	0	0	0	900	1980	1980	1980	1980	1980	1980	1980	1980	1980
-1x330 MW (mid 2003)	0	0	0	0	0	0	0	0	0	0	0	900	1800	1800	1800	1800	1800	1800	1800
-1x300 MW (beg 2004)	0	0	0	0	0	0	0	0	0	0	0	0	1500	1800	1800	1800	1800	1800	1800
-1x300 MW (beg 2005)	0	0	0	0	0	0	0	0	0	0	0	0	0	1500	1800	1800	1800	1800	1800
-2x300 MW (during 2006/beg 2007)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	900	3500	3600	3600	3600
-T.A.G. (2x100MW) (beg 2007/beg 2008)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	400	1000	1000	1000
-1x300MW (beg 2008)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1700	1800	1800
-1x600 MW (during 2009)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1700	3600
10- Margin after all plans (GWH)	0	240	840	1510	1300	453	260	698	974	1622	1872	1864	1187	2024	2034	1383	2083	1598	2182
11- Margin in % of the required demand	0.0%	2.2%	7.3%	12.3%	9.9%	3.2%	1.7%	4.3%	5.6%	8.9%	9.8%	9.3%	5.7%	9.2%	8.8%	5.7%	8.2%	6.0%	7.7%

As of 15/03/93

Source: ONE

TABLE 21

NEW PLANT DESCRIPTION AND SCHEDULE PERIOD 1993-2010

NAME OF PLANT	TYPE	FUEL	POWER (MW)	SCHEDULED START OF SERVICE
FROM 1994 TO 1996				
TETOUAN	Gas Turbine	Fuel	3 x 33	Beginning of 1994
TIT MELLIL	Gas Turbine	Fuel	3 x 33	Beginning of 1994
ALLAL EL FASSI	Hydraulic		3 x 80	2nd semester 1994
JORF LASFAR I	Thermal	Coal	1 x 330	End 1994
JORF LASFAR II	Thermal	Coal	1 x 330	Mid 1995
FROM 1996 TO 2000				
AL WAHDA	Hydraulic		3 x 82,5	Beginning of 1997
SIDI DRISS	Hydraulic		1 x 3,1	End 1997
DCHAR EL OUED	Hydraulic		1 x 92	End 1998
AIT MESSAOUD	Hydraulic		2 x 3,2	End 1998
SITE NORD	Combined cycle	Natural Gas	350 / 450	Mid 1997 / mid 1998
M'DEZ	Hydraulic		1 x 52	End 1999
EL MENZEL	Hydraulic		2 x 74	End 2000
JORF LASFAR III	Thermal	Coal	1 x 330	2000
FROM 2001 TO 2010				
JORF LASFAR IV	Thermal	Coal	1 x 330	2001
MERIJA	Hydraulic		2 x 15	2001
MECHRA SFAA	Hydraulic		2 x 15	2001
IMIZDILFANE	Hydraulic		1 x 62	2002
TAJEMOUT	Hydraulic		1 x 28	2003
TASKDERT	Hydraulic		1 x 37	2004
Location to be determined	Steam Thermal	Natural Gas or Coal	1 x 300	2003
	Steam Thermal	Natural Gas or Coal	1 x 300	2004
	Steam Thermal	Natural Gas or Coal	1 x 300	2005
	Steam Thermal	Natural Gas or Coal	2 x 300	2006/2007
	Gas Turbine	Natural Gas	2 x 100	2007/2008
	Steam Thermal	Natural Gas or Coal	1 x 300	2008
	Steam Thermal	Natural Gas or Coal	1 x 600	2009
Other Plants (10)	Hydraulic		335 total	After 2004

TABLE 22

INVESTMENT EXPENSES 1993-2010
(in thousands of Dirhams)

	GLOBAL	EXPENSES	PERIODE 1993 - 1997					TOTAL	BEYOND	OBSERVATIONS
	COST	END 1992	1993	1994	1995	1996	1997	93-97	1997	
I- PRODUCTION PROJECTS										
I.1- HYDRAULIC POWER	10529184	2746877	505307	580000	665000	1075000	1212000	4037307	3745000	
I.1.1.- HYDRAULIC PLANTS (1)	10350000	2638078	494922	570000	650000	1060000	1192000	3966922	3745000	(1): date of beginning of operations
*Hassan First (1*67MW) (September 91)	1300000	1290201	9799	-	-	-		9799	-	
*Matmata (3*80MW) (end 94)	1930000	1315664	414336	200000	-	-		614336	-	
*Sidi Driss (1*3 1MW) (end 97)	140000	-	-	-	30000	70000	40000	140000	-	
*Al Wahda (3*82,5MW) (beginning 97)	1350000	32213	70787	370000	470000	320000	87000	1317787	-	
*Dchar el Oued (1*92MW) (end 98) (2)	720000	-	-		120000	180000	260000	560000	160000	
*Ait Messaoud (2*3,2MW) (end 98) (2)	225000	-	-		30000	50000	90000	170000	55000	
*M'Dez (1*52MW) (end 99)	725000	-	-	-		110000	160000	270000	455000	
*El Menzel (2*74MW) (end 2000)	3015000	-	-	-		330000	555000	885000	2130000	
*Merija (2*15MW) (end 2001)	470000	-	-	-	-	-	-		470000	
*Mechraa Sfa (2*15MW) (end 2001)	475000	-	-	-	-	-	-		475000	
I.1.2.- HYDRAULIC STUDIES (2)	179184	108799	10385	10000	15000	15000	20000	70385	-	(2) Realisation to be confirmed.
I.2- THERMAL POWER (3)	21039665	4253023	4384642	2122000	528000	1133000	1749000	9916642	6870000	(3): Thermal program based on Hydraulic program
I.2.1- THERMAL PLANTS	20785000	4120187	4364813	2100000	500000	1105000	1725000	9794813	6870000	
*T.G Mohammedia (3*30MW) (Dec 91 - J. F92)	835000	740881	94119	-	-	-	-	94119	-	
*T.G Tan Tan (3*30MW) (J.Jul.Sep.92)	950000	829460	120540	-	-	-	-	120540	-	
*Jor. Las I-II (2*300MW) (end94 - end 95)	7300000	2542381	2557619	1500000	500000	200000	-	4757619	-	
*T.G. Tetouan (3*30MW) (Beginning 94)	1100000	7465	792535	300000	-	-	-	1092535	-	
*T.G Tit Melli (3*30MW - Beginning 94)	1100000	-	800000	300000	-	-	-	1100000	-	
*C.Combine (350a450MW) (beg.98 to beg.99)	3000000	-	-	-	-	580000	900000	1480000	1520000	
*Jorf Lasfar III(1*300MW (middle 2000)	3250000	-	-	-	-	325000	500000	825000	2425000	
*Jorf Lasfar IV (1*300MW) (middle 2001)	3250000	-	-	-	-	-	325000	325000	2925000	
I.2.2- THERMAL STUDIES	254665	132836	19829	22000	28000	28000	24000	121829	-	
TOTAL PRODUCTION INVESTMENT EXPENSES	31568849	6999900	4889949	2702000	1193000	2208000	2961000	13953949	10615000	
II- TRANSPORT INVESTMENT EXPENSES	6132000	204700	564700	1877800	1957600	935000	457800	5792900	134400	
* National Network	3714800	204700	529700	946000	898700	543500	457800	3375700	134400	
*Morocco - Spain Link	2417200	-	35000	931800	1058900	391500	-	2417200	-	(4): Including the strengthening of the associated network.
III- DISTRIBUTION INVESTMENT EXPENSES	1446456	371798	251358	164500	170800	160000	160000	906658	168000	
IV- OTHER INVESTMENT EXPENSES	3038268	1227524	284744	275000	290000	305000	320000	1474744	336000	
TOTAL GENERAL PROGRAM	42185573	8803922	5990751	5019300	3611400	3608000	3898800	22128251	11253400	
TOTAL SPECIAL FUNDS	1841460	605177	353483	295300	194600	119000	145200	1107583	128700	
TOTAL EXPENSES	44027033	9409099	6344234	5314600	3806000	3727000	4044000	23235834	11382100	

As of 28/05/93, based on a 7% growth rate of demand from the 1992 results (i e 10,055 GWh)

Source: ONE

TABLE 23

ONE'S ACCOUNTS RECEIVABLE AS OF MARCH 31ST, 1993
(in millions of dirhams)

		ACCOUNTS RECEIVABLE			
	Average Monthly Billing in 1992	Arrears before 31.12.93 (1)	Year 1993 arrears (2)	Total Arrears (1) + (2)	Months of delay
Administrations	-	378.4	48.4	426.8	
. Energy	159.6	307.3	48.4	355.7	27
. Works	-	71.1	-	71.1	-
Local Collectivities		308.7	24.4	333.1	
. Energy	89.9	188.5	24.4	212.9	28
. Works	-	28.0	-	28.0	-
. Deficit PNER	-	92.2	-	92.2	-
Distribution Régies		2,126.1	843.1	2,969.2	
. Energy	3,420.3	2,074.7	843.1	2,917.8	7
. Works	-	15.6	-	15.6	-
. Cession Réseaux	-	28.3	-	28.3	-
. RDE Tétouan (EMSA)	-	7.5	-	7.5	-
Offices		780.1	206.8	986.9	
. Energy	857.9	764.9	206.8	971.7	13
. Works	-	15.2	-	15.2	-
National Societies (including mines)		150.6	53.2	203.8	
. Energy	369.5	138.4	53.2	191.6	6
. Works	-	12.2	-	12.2	-
Other Public Establishments		13.1	2.3	15.4	
. Energy	8.8	12.7	2.3	15.0	20
. Works	-	0.4	-	0.4	-
Domestic		279.7	150.9	430.6	
. Energy	1,952.0	189.7	150.9	340.6	2
. Works	-	90.0	-	90.0	
SUBTOTAL		4,036.7	1,329.1	5,365.8	-
Payments without references	-	-35.1	-23.6	-58.7	-
Advances on works	-	-150.0	-29.2	-179.2	-
TOTAL		3851.6	1276.3	5127.9	-

ANNEX 2
PETROLEUM SUPPLY AND DEMAND

2.1 Energy Consumption. Total primary energy consumption in Morocco amounted to 7.22 million TEP in 1993. Petroleum accounted for 83.4% of this amount, coal contributed 14.5% and hydroelectric power was 1.8%. Natural Gas from domestic production accounted for only 0.3% of total demand. Over the last two decades energy demand growth has averaged at 5.1% p.a. following closely the growth in GDP. The contribution to the overall use of energy in Morocco has undergone some change during this period as shown in Table 1.1. During the seventies and early eighties the major contribution to the energy needs was provided by petroleum products which grew at 4.8% p.a. In response to the oil disruptions of the seventies, a concerted effort was made to diversify energy sources in the early eighties and resulted in the expansion of the role of coal at the expense of oil. Coals contribution increased from less than ten percent in 1980 to close to 20% of total demand today. The contribution of hydroelectric power has been inconsistent due to climatic conditions and suffered from a severe downturn during the mid eighties drought period. Overall, the contribution of hydroelectricity has declined from over 10% of total primary energy supply in the seventies to less than 5% today. Natural Gas has played a minor role in the total energy picture. Petroleum demand grew at 4.8% p.a. during the seventies and the early eighties and accounted for 83% of total energy demand in 1985. Since that time oil has continued to grow but at a lower rate of 4.5% loosing market share to coal.

Table 2.1
Energy Demand Patterns in Morocco
(000 TEP)

Year	Petroleum	Coal	Hydro-Elect.	Natural Gas	Total
1970	1,743	301	355	33	2,432
1975	2,699	427	268	54	3,448
1980	3,866	371	397	52	4,686
1985	4,296	662	126	73	5,157
1989	4,786	1,136	301	48	6,271
1990	5,030	1,096	317	43	6,486
1991	5,036	1,186	329	27	6,578
1992	5,643	1,107	255	30	7,035
1993	6,019	1,049	130	18	7,216
Growth Rates % p.a.					
75-85	4,8%	4,5%	-7,3%	3,1%	4,1%
85-93	4,3%	5,9%	0,4%	-16,1%	4,3%

Petroleum Product Demand Trends

2.2 Total consumption of the major petroleum products increased by an average 4.8% p.a. during the seventies and early eighties. Since 1985 petroleum consumption in Morocco has declined to 4.3% p.a. reaching at total consumption of 6.0 million MTA in 1993.

The three major consumption areas are (i) transportation; (ii) heavy fuel oil usage for power generation and industrial use and (iii) light fuels (primarily Butane LPG) used for domestic purposes. In 1993 the transportation sector consumed 1.2 million tons amounting to 33% of petroleum consumption; heavy fuel use amounted to 2.4 million tons (39.2%) and LPG and kerosene consumption was 0.8 million tons (13.8%).

2.3 Transportation Demand. Total transportation consumption grew at a modest 1.7% during the late seventies and early eighties but has shown a very strong upturn in growth pattern since 1985 when overall growth has averaged at 5.7% p.a., lead primarily by very strong diesel fuel consumption. Diesel oil is the predominant fuel in transportation due to lower tax rate relative to gasoline. Since 1977 diesel has increased its market share from 63.4 percent to over 78% in 1993. Gasoline consumption has rebounded from a negative growth in the late seventies and early eighties, to where it is now experiencing a modest growth of 2.7% p.a. Growth in gasoline is primarily in the super grade, growing at 4.9 percent p.a. at the expense of regular gasoline which is declining by 3% p.a. Super grade gasoline has increased its market share from 63% of the gasoline pool in 1977 to 79% today due to the higher octane requirements of the domestic automotive pool and that of the tourist trade.

Table 2.2
Demand Growth of Major Petroleum Products in Morocco

Year	1980	1985	Growth p.a 1990 (1,000 TM)	1992	1993	85-93
Propane	16	23	50	76	93	22,1%
Butane	270	355	543	639	693	10,0%
Super	234	229	291	316	330	5,4%
Regular	137	105	90	89	87	-2,7%
Kero	57	53	48	45	44	-2,6%
Jet Fuel	244	217	248	216	222	0,3%
Gasoil	1,110	1,220	1,706	2,024	2,190	8,7%
HFO	1,712	2,065	2,011	2,238	2,360	1,9%
Total	3,780	4,267	4,987	5,643	6,019	5,0%

Source: MEM

2.4 Heavy Fuel Oil Consumption in Morocco grew at an average of 6.5% p.a. in late seventies and early eighties reaching a total consumption of 2.1 million MTA in 1984. This accounted for close to 50% of the petroleum consumption in the country. Heavy Fuel Oil use for power generation by ONE accounts for 60% of total HFO consumption and was the main stimulus for HFO growth. Other major consumers are the phosphate producers (14%), and the sugar mills (7%). HFO consumption declined after 1985 due to the conversions of some facilities to coal from oil; with the drought of 1991, demand increased again and reached 2,340 million MTA in 1993.

2.5 Light Fuels. LPG and to a very minor degree kerosene are used in Morocco for domestic and commercial fuels and are the fastest growing consumers for petroleum fuels. LPG

consumption grew at a rate of 7.4% in the seventies and early eighties and has recently increased growth to in excess of 10% p.a. with total consumption amounting to 786 thousand MTA in 1993 accounting for 13.1% of all petroleum consumption. Kerosene consumption in declined by about 2% p.a. from at total of 65 thousand MTA in 1977 to 44 thousand MTA in 1992. It's share of the market has declined from 2% in 1977 to 0.7% in 1993. Butane LPG is the prime product in the domestic market and accounts for 90% of the market the balance made up by Propane LPG used primarily in commercial uses. This market is however expanding very rapidly at over 22% p.a. due to the favorable pricing of the product.

Petroleum Supply

2.6 Domestic Production. Morocco has limited domestic production of crude oil and natural gas. Production of crude oil has declined from a high of 90 thousand MTA to less than 15 thousand MTA in 1990 and thus Morocco must depend for most of it's requirements on imports of crude oil and/or petroleum products. In 1993 Morocco imported 6.5 million MTA. Importation of products have been restricted up till now, to products that cannot be produced from the local refineries in adequate amounts for domestic needs. The major product that has to be imported is LPG which in 1993 amounted to 530 thousand MT accounting for 67% of domestic consumption. Gasoil has also been imported to meet the growing demand, particularly in the Nothern part of the country.

2.7 Crude Oil Sources. In the past Morocco has relied heavily on Government to Government purchases of crude oil and barter agreements. In recent years the source of crude oil acquisition has been liberalized and the refineries are free to choose and purchase their own crude oil requirements, subject to the limitations of foreign currency and certain preferential tariff agreements. Morocco has consistently relied heavily on Arabian Gulf sources (Kuwait, Saudi Arabia, Iraq, UAE) for the major part of their crude requirements. For the last decade, the Middle East has consistently supplied over 75% of the country's crude oil needs.

Table 2.3
Petroleum Supply in Morocco
(Thousand MTA)

Imports	1990	1991	1992	1993
Crude Oil	5,705	5,160	6,469	6,372
Products				
LPG	355	416	474	550
Gasoline	2	n.c	n.c	n.c
Avgas	1	n.c.	n.c.	n.c.
Gasoil	44	115	112	216
Fuel Oil	124	312	-	-
Specialty Products	30	n.c.	n.c.	n.c.
Total Imports	6,261	6,003	7,055	7,138
Exports				
Naphtha	508	437	502	437
Lubes	29	33	38	36
Total Exports	537	470	540	473

Sector Organization

2.8 The supply and distribution of petroleum products is overseen by the Ministry of Energy and Mines (MEM), which supervises the state exploration company ONAREP, the two parastatal refining companies - SCP and SAMIR, and the distribution and marketing company SNPP. MEM is responsible for a) meeting the domestic demands for petroleum products, b) assuring security of supply, and c) managing efficient distribution and supply. This is achieved by a) controlling prices of petroleum products at the ex-refinery, wholesale and retail levels, and b) controlling and allocating the imports of finished products into the country. Operating margins are fixed by MEM for refining and distribution operations.

2.9 The petroleum sector is a major contributor to the state revenue accounting for 9.069 billion Dhs in 1992 and accounting for about 14 percent of total Government revenues. The major sources of revenue are through import duties on crude oil and products, consumer tax (TIC), excise tax, and a Value Added Tax. Because of the importance of contribution of the petroleum sector to the Governments revenues, in addition to the oversight responsibilities of the MEM, the management of the petroleum sector is closely watched and influenced by the Ministry of Finance, Customs and the Ministry of Economic Affairs.

Refining

2.10 Refining 45 Facilities. Morocco has two refineries with a total capacity of approximately 7.45 million MTA. The SAMIR refinery located on the coast at Mohammedia near Casablanca has a capacity of 6.25 million MTA and is predominately a hydroskimming configuration. The SCP refinery located inland at Sidi Kacem has a capacity of 1.2 million MTA and has cracking facilities. Together these two refineries have accounted for the supply of over 90% of the countries petroleum product demands, (the only major product being imported is LPG).

2.11 SAMIR the larger of the two refining companies is wholly Government owned. The refinery at Mohammedia was constructed in 1961, the processing configuration of the refinery is presented in Table 1.4. The refinery is basically a hydroskimming operation with a significant lube oil manufacturing facility. The orientation of the refinery is the maximization of diesel oil and LPG manufacture. The very significant heavy fuel oil production is a problem which is partially solved by supplying the adjacent ONE power facilities. SAMIR sells virtually all it's major products ex-refinery and is not currently integrated downstream in distribution or marketing of it's products. Lubricating Oils are the only exception that are sold under the SAMIR brand name.

Table 2.4
SAMIR REFINERY CHARACTERISTICS - 1990

Facility	Capacity Thousand MTA
Topping I,II,III	6,250
Vacuum Unit	850
Reforming I,II	930
Merox S.R. I,II	350
Merox Kero	200
C3/C4 Separation	350
Kero HDS	400
Lubes	120
Bitumen	200
Wax	25

2.12 SCP. The Government is the major shareholder in SCP owning 74% of the company, other participant being Elf with 20% and 5.6% held by local investors. The company's main activity is the operation of the refinery at Sidi Kacem. The refinery at Sidi Kacem was originally constructed in 1941. The details of the refinery processing capacities are shown in Table 1.5. The companies does not distribute or market major refinery products, with the exception of LPG. In recent years SCP has become a major factor in the LPG market (25 percent in 1990).

Table 2.5
SCP REFINERY CHARACTERISTICS - 1990

Facility	Capacity Thousand MTA
Topping	1,200
Vacuum Unit	400
Catalytic Reforming	120
TCC Cracking	280
C3/C4 Separation	210

Distribution

2.13 Under the 1974 Moroccanization Law , the GOM nationalized the petroleum distribution system through the creation of SNPP which became the holding and management company for the Governments holdings in the existing distribution companies. SNPP acquired at least 50% holding in each of the independent distribution companies, the balance being retained by the private company. The major companies were the major international oil companies (Shell, Mobil, Total, Agip). SNPP was given the responsibility for maintaining orderly distribution and marketing operations in the country. In 1990 the SNPP Group of Companies accounted for 76% of the petroleum product sales in the country. A number of private

companies, independent of SNPP have been formed, which accounted for the balance of 24% of sales. In addition, eleven of marketing companies specializing in the distributing of LPG have been created. These companies account for less than 5% of total sales but are a significant factor in the LPG market were they account for 40% of total LPG market.

2.14 Market Concentration. There were twelve companies involved in the sale and distribution of the major petroleum products (gasoline and diesel), of these three had a significant market share in excess of 10% of the domestic sales. These are Shell (24.1%), TOTAL (18.8%) and Mobil (14.1%). Collectively they account for 57% of the total petroleum product market; 53% of the diesel market and 66% of the gasoline market.

2.15 Privatization. In accordance with the 1993 Privatization act, the petroleum sector has started with the privatization of the SNPP companies. Three companies: CMH, Petrom and Shell have been privatized. Privatization of the remainder of the SNPP Group is under way.

ANNEX 3
THE AVAILABILITY OF NATURAL GAS IN MOROCCO

Domestic production and potentialities for natural gas development

3.1 Exploration for natural gas in Morocco began in 1965 and the first gas field was put into production in 1970. Even after natural gas production was firmly established, Morocco remained only a modest producer. Total annual production since 1970 has averaged between 40 and 90 MMCM/year. The two producing areas are the Gharb region, located in the northeast of Rabat, and the Essaouira region, located 300 km south of Casablanca. Gas production is absorbed by local industries close to the fields and thus there has been no need to establish a national gas grid to facilitate gas distribution. Only a small gas network has been built in each of these areas to gather gas (gathering lines) and transport it to the few industrial users.

3.2 In the Gharb region, reserves which have been developed have almost been exhausted. Cumulative production by the end of 1992 reached 712 MMCM from a total of 850 MMCM of initial reserves. ONAREP has estimated potential reserves in the region at approximately 1000 to 2000 MMCM. Given the small size of the deposits, development of these reserves conflicts with, on the one hand, the estimationan of the volumes which can be actually recovered and, on the other hand, the investment required because of the distance from the deposit to the existing pipeline network.

3.3 In the Essaouira region, six fields have been developed but only two of these, owned and operated by ONAREP, are still in production. Production in two of the remaining fields has been shut down because of lack of demand from the local industry, Office Cherifien des Phosphates (OCP), and the final two fields, owned by SCP are near exhaustion. Almost all current production from the region comes from the Meskala field where remaining estimated reserves approximate 745 MMCM. Estimated reserves of other Essaouira fields total 265 MMCM.

3.4 Other geological basins in Morocco show varying degrees of potential for natural gas development. Promising hydrocarbon reserves, probably liquids, have been discovered in the North Atlantic Tarfaya area. Although the Western Sahara coastal basin in the South Atlantic Tarfaya area has not been extensively explored, particularly offshore, conditions indicate a potential for liquid hydrocarbons rather than gas. Gas produced in these two areas would have to be transported over relatively long distances to supply potential markets. Potential development of the northern edge of the Tindouf basin does not look promising, despite signs of some pockets of gas. Results of tests in other areas such as the Rif and the high Atlas were not encouraging for further exploration.

3.5 In spite of this rather negative outlook, the occurence of future discoveries should not be discounted and this should be taken into account when addressing the institutional development of the Morrocon natural gas industry. The development of a domestic discovery, provided it is economic, should not be impeded by institutional barriers.

Construction of the Gazoduc Maghreb Europe (GME) (Magreb European Pipeline)

3.6 The project to build a high capacity gas pipeline from Algeria to Europe through Morocco was initiated in 1988 by the Governments of Morocco and Algeria (Table 1). It met the interests of both countries and the needs of Western Europe.

3.7 Algeria is the eighth largest country in the World in terms of proven reserves of natural gas (3650 BCM of reserves in 1993) and fifth for gas production (55.8 BCM in 1992). Algerian exports of natural gas accounted for 10% of total world exports and the Algerian share of LNG exports was 26% of total world exports. Around 90% of Algerian gas purchasers are west European countries; 40% through the Transmed pipeline (Algeria, Tunisia, Italy) and 60% in the form of LNG. Sonatrach's objectives are to raise its exporting capacity from 31 BCM/year in 1990 to 70 BCM/year by the year 2000. This increase in exports should be possible through: (i) the total revamping of LNG exports plants (31 BCM); (ii) increasing the capacity of the Transmed (24 BCM); and (iii) the construction of GME (16 BCM). The successful experience with the Transmed pipeline demonstrates that this type of project may be operated efficiently for the greatest benefit of the concerned parties.

Morocco's interests in the GME project are numerous:

- It gives the country, through the transit fee, the equivalent of a domestic gas field which can be freely utilized or exported.
- It provides the opportunity to utilize natural gas for the domestic market bringing more diversity in the energy balance.
- It reinforces the potential for economic cooperation between Algeria, other Maghreb countries, and western Europe.
-
- It enables access to new technologies and new expertise, through the construction and the operation of the pipeline.
- It opens up the possibility for the Morrocan gas industry to have more efficient energy systems and therefore to be more competitive internationally.
- Natural gas plays an increasing role in the energy supply of western Europe. It is considered a primary fuel enabling more efficiency in the energy system and less pollution. A number of reasons come together to explain this situation:
- In all European Community countries, with the exception of France, nuclear programs have been stopped. For building the power generation additional capacities, the combined cycle technology, fueled with natural gas, has become a major option, if not the sole option for economic, technical, environmental and strategic reasons.
- In the residential and commercial market, natural gas has a considerable advantage in terms of quality, price and efficiency. In urban areas it remains the most convenient fuel for individual heating systems. A large market for substitution does exist in many countries.

- In the industrial sector, there is large potential for gas substitution and for the combined production of heat and electricity. Natural gas is in many cases the most environmentally suitable and economically sound fuel.

- The increased share of natural gas in the energy balance brings far more diversity in terms of energy choice, flexibility (multi-fuel systems) and it enhances the security of supply through long-term contractual agreements.

3.8 For these reasons, west European countries need additional supplies of natural gas. The large European gas companies have adopted a concerted strategy of long-term security of supply. They search for additional volumes from (i) the EC producers (The Netherlands and the U.K.), (ii) the three traditional suppliers (Norway, Algeria, and Russia), and (iii) more remoted sources (Nigeria, Iran, and Qatar).

3.9 To achieve this global strategy of greater security of supply, new routes for bringing natural gas to Europe will be opened which will strenghten the European gas interconnection.

3.10 In this context, the construction of the GME appears to be a basic element of the future "single European gas grid" in that it will link Spain and Portugal to the rest of Europe. This project has been under consideration for 20 years, with the first proposal calling for a direct link between Spain and Algeria (the Segam project).

3.11 In the first phase of the project, natural gas will be supplied to Spain and Portugal and eventually to Morocco. In the second phase, France and Germany will buy additional quantitites. The economics of the project is based on netback pricing principle: natural gas delivered to the city-gate or the final consumer must be competitive with its substitutes. Actual conditions of competition at the burner's tip vary from country-to-country. They involve (i) various characteristics of fuel oil in each country (density, sulphur content); (ii) electricity generated from coal; (iii) nuclear electricity (France); and (iv) competitiveness from various sources of natural gas supply (gas-to-gas competition).

3.12 All of the above arguments constitute the basis for studying the GME project. In 1990, a service company, OMEGAZ-Etudes was created by six shareholders: SNPP (Morocco 19%), SONATRACH (Algeria 19%), ENAGAS (Spain 19%), GDF (France 19%), RUHRGAS (Germany 19%), and GDP (Portugal 5%) in order to undertake the feasibility study of the project. The study included basic engineering, route options, technical and economic studies on the Moroccan part of the line, and the sub-sea portion under Strait of Gibraltar.

3.13 OMEGAZ-Etudes presented the results of its studies in Novembre 1992. The first phase of the project involves a 1370 km pipeline: 530 km of 48" in Algeria, 525 km of 48" in Morocco, 45 km of 2 x 20" for crossing the Strait of Gibraltar, 270 km of 48" in Spain. The initial transit capacity is 10 BCM/year, increasing to 20 BCM/year for the second phase of the project.

3.14 In 1991, three agreements were signed:

- the intergovernmental agreement between Morocco and Spain concerning gas transit,
- the intergovernmental agreement between Morocco, Spain and Algeria on the GME project (accord tripartite)
- an inter-company agreement between SNPP and ENAGAS.

3.15 In 1992, an important accord was signed between the Government of Morocco, SNPP and ENAGAS. This convention, which is not a public document, establishes the conditions of construction and utilization of the pipeline, the conditions of gas transit and the organization of the corporate entities in charge of the gas industry in Morocco.

3.16 Construction within in Morocco began in 1993 with completion anticipated in October 1995. Several commercial long-term contracts have been signed or are being negotiated between SONATRACH and ENAGAS, Gas de Portugal, and Gaz de France.

3.17 The annual transit fee being accrued by the Government of Morocco in return for use of its territory for the transit of gas is reported by non-official sources, to be 6.5 percent of volume throughput volume, exclusive of fuel use (compressor fuel) of up to 12 BCM/year and 7.0 percent for volumes exceeding 12 BCM/year. The transit fee can be paid in currency or in-kind (natural gas), according to a procedures which are not known.

3.18 In addition, commercial quantities of natural gas for the Moroccan domestic market may be purchased under contractual conditions to be negotiated with SONATRACH.

Institutional organization of the gas industry resulting from the GME

3.19 The implementation of the GME project is organized through a tri-dimensional corporate structure for the financing, construction and operation of the gas line. Five companies are concerned with the project:

- EMPL (Europe- Maghreb- Pipeline- Limited) a Jersey (UK) corporation created in 1992 which is in charge of the financing of the pipeline. The initial capital stock of this company, US $ 200 Million, has been entirely subscribed by ENAGAS, but capital stock is open to other shareholders, provided they have subscribed for transportation capacity commitments. EMPL is responsible for all the expenses related to the construction and the operation of the gas line. The project manager and the operating company are working for EMPL on a contractual basis. EMPL is the owner of the pipe during the construction period. At the time of completion, its ownership (the land portion and the Moroccan sea portion) is transferred, free of charge, to the Moroccan government.

3.20 Thereafer, EMPL is granted an exclusive right of utilization of the pipe and of any additional equipment for the duration of the convention (25 years after the completion date).

EMPL pays the transit fee to the Moroccan government and is responsible for all costs related to the pipeline including debt service, operating costs and maintenance.

- METRAGAZ, a Moroccan company, created in 1992, is the project manager for EMPL for the construction and the extension of the line's land portion and its related equipment. METRAGAZ initial shareholders are ENAGAS (70%) and SNPP (30%). For the duration of the 1992 Convention (above), these two shareholders must keep a position of majority control and SNPP shares can not be lowered below 20%.

- An operating company X, acting for EMPL, will be in charge of current operation, maintenance and repair of the land portion. This Moroccan company is to be created in 1994, as a joint venture (50/50) between ENAGAS and SNPP. Five years after the completion of the work, SNPP is entitled to raise its share to 100%.

- A Moroccan company, Al Andalous, will be responsible before EMPL for the construction and the operation of the subsea portion of the line. The majority of its capital stock will be shared proportionally among EMPL's shareholders.

- SODUGAZ (Société de Developpement et d'Utilisation du Gaz) has been created for the transmission and distribution of natural gas (high and medium pressure) to the domestic market although its responsibilities and relations to other entities are not perfectly clear. SODUGAZ's shareholders are ENAGAS and SNPP (50/50). The percentage of the shares may be lowered in the future, not below 25.5 percent each, in order to open the capital to new shareholders interested in the gas business in Morocco.

ANNEX 4
A RAPID AND EFFECTIVE PROGRAM FOR IMPROVING THE EFFICIENCY OF ELECTRIC LIGHTING

A. Power Supply Crisis

4.1 For more than a year, Morocco has not been able to generate enough power to meet demand. The load shedding has been used to counter this deficiency, resulting in lower industrial production. There potentially are greater inconveniences on the horizon for the population at large. The drought and construction delays have reduced hydroelectric and thermal productivity, respectively. Unfortunately, although electricity consumption has grown at very sustained and rapid rates (7% per year), no action has been taken - either by the public authorities, the national power company, ONE, or by the managers controlling power distribution in various cities - to control growth through energy efficiency, especially in the tertiary and residential sectors. Demand side management is not the "order of the day" in the Moroccan power system.

4.2 The current response to generation deficiency is to load shed through service cuts. Power often is cut without warning; first to be deprived of supply generally are the industrial zones. This practice has major consequences for industrial production and is highly resented by the companies. The so-called "demand-side" actions presented in official documents are in reality "short term actions to manage power shortages by imposing demand reductions and power cuts". This unfortunately is necessary, but not sufficient. The immediate predicament caused by power shortages highlights the need for actions which target improved efficiency in electricity utilization. Such action should be designed not only to attenuate the immediate effects of the crisis, but to lay the foundation for long-term efficiency conversion throughout power consuming sectors.

4.3 Focus is needed also on efficiency related issues upstream from demand actions, where it is vital to develop autonomous power generating capacity in key industries (refining, sugar) which could be used for cogeneration. ONE's purchase price per kWh historically has proven a stumbling block for this option, which would alleviate somewhat the burden on the current system. Given the urgency of the current situation, it is essential that the Government take a decision:

- to proceed quickly with an inventory of resource supply and availability;
- to establish an ONE purchase price <u>with favorable terms for industrial cogenerators</u> (given that the industrial sector has borne disproportionately the consequences of the crisis);
- to have ONE agree to take on the investment expenditures necessary to establish connections with cogenerators, within technically appropriate bounds.

B. Energy Conservation for Lighting

4.4 For some widespread uses, it is technically possible to achieve considerable energy savings through use of high-efficiency appliances or equipment. The most noteworthy example is compact fluorescent light bulbs. These bulbs consume five times less electricity than incandescent bulbs to achieve the same level of illumination. Furthermore, the longevity is almost 10 times longer for a tube and five times longer for a basic bulb. Economic calculations show that compact fluorescents are preferable for daily usage of more than four hours. However, it may be difficult to encourage substitution due to the elevated cost of the compact fluorescent. Even though the consumer benefits from its longer life, he/she is hesitant to buy a light bulb which costs at least twenty times more than the corresponding incandescent light bulb.

4.5 There is an important reason to pursue this substitution potential: lighting represents a major share of peak electricity consumption. Thus replacing a 75 W incandescent tube with an 18 W compact florescent would produce a 52 W benefit (a 5 W benefit for the basic bulb) during peak periods. On a national scale, this would represent a potential benefit of several hundred peak MW: there are approximately 3 million electrified households with an average benefit of 100 MW per household. Thus the total theoretical benefit of substitution is close to 300 MW off peak load, if every electrified household were to switch. The potential in the hotel industry is even greater. There is also a considerable savings potential for public lighting and for well-lit public buildings. Tapping into this potential should be of interest to municipal Governments. The benefits of substitution are without question, given the current power shortages. ONE in particular should take an interest in exploring this option, since reductions in peak load are essential if current generating capacity is to meet demand.

4.6 A proposal for a large demonstration project for energy conservation in lighting based in one or two cities was discussed with Moroccan authorities. The project scope would encompass public lighting, lighting in religious, administrative and military buildings, tertiary sector buildings (especially hotels) and household lighting. The project will be implemented by CDER under the supervision of the Energy Department and in collaboration with the *Régies* (public distribution companies) of the cities of Rabat and Kenitra, and ONE. The ONE's cooperation is essential for evaluating potential energy savings.

4.7 The project preliminary phase, carried out by ESMAP/World Bank in September 1993, focused on analysis of the conditions required for the project implementation:

- technical conditions (substituting compact fluorescents for incandescent bulbs, for example);
- operational conditions: what are the practical concerns for project realization, which collaborators should be mobilized, which consumption sectors should be covered?
- economic conditions: what are the expected benefits (in power load and generation; in consumer expenditures; in postponed generating capacity investments); what is the operating cost (initial investment, substitution and replacement investments);

- financial conditions: how will the program be financed, what is the cost of low-consumption bulbs if ordered in bulk; can import taxes be reduced for these items; will it be necessary for consumers to reimburse all or part of the investment, is it possible to include this reimbursement in electricity bills, what are the financing mechanisms?

4.8 As part of the project proposal, it was suggested that the Government authorities intervene with the Customs Department to temporarily abate import tariffs for high-efficiency items (emergency situation); that a dialogue with local manufacturers be initiated and stimulated so that locally produced equipment can quickly supplant imports (at least for light fixtures); and that financing mechanisms be researched (grants or international assistance loans) for a wide-scale operation.

Joint UNDP/World Bank

ENERGY SECTOR MANAGEMENT ASSISTANCE PROGRAMME (ESMAP)

LIST OF REPORTS ON COMPLETED ACTIVITIES

Region/Country	*Activity/Report Title*	*Date*	*Number*
	SUB-SAHARAN AFRICA (AFR)		
Africa Regional	Anglophone Africa Household Energy Workshop (English)	07/88	085/88
	Regional Power Seminar on Reducing Electric Power System Losses in Africa (English)	08/88	087/88
	Institutional Evaluation of EGL (English)	02/89	098/89
	Biomass Mapping Regional Workshops (English)	05/89--	
	Francophone Household Energy Workshop (French)	08/89	103/89
	Interafrican Electrical Engineering College: Proposals for Short- and Long-Term Development (English)	03/90	112/90
	Biomass Assessment and Mapping (English)	03/90	--
Angola	Energy Assessment (English and Portuguese)	05/89	4708-ANG
	Power Rehabilitation and Technical Assistance (English)	10/91	142/91
Benin	Energy Assessment (English and French)	06/85	5222-BEN
Botswana	Energy Assessment (English)	09/84	4998-BT
	Pump Electrification Prefeasibility Study (English)	01/86	047/86
	Review of Electricity Service Connection Policy (English)	07/87	071/87
	Tuli Block Farms Electrification Study (English)	07/87	072/87
	Household Energy Issues Study (English)	02/88	--
	Urban Household Energy Strategy Study (English)	05/91	132/91
Burkina Faso	Energy Assessment (English and French)	01/86	5730-BUR
	Technical Assistance Program (English)	03/86	052/86
	Urban Household Energy Strategy Study (English and French)	06/91	134/91
Burundi	Energy Assessment (English)	06/82	3778-BU
	Petroleum Supply Management (English)	01/84	012/84
	Status Report (English and French)	02/84	011/84
	Presentation of Energy Projects for the Fourth Five-Year Plan (1983-1987) (English and French)	05/85	036/85
	Improved Charcoal Cookstove Strategy (English and French)	09/85	042/85
	Peat Utilization Project (English)	11/85	046/85
	Energy Assessment (English and French)	01/92	9215-BU
Cape Verde	Energy Assessment (English and Portuguese)	08/84	5073-CV
	Household Energy Strategy Study (English)	02/90	110/90
Central African Republic	Energy Assessement (French)	08/92	9898-CAR
Chad	Elements of Strategy for Urban Household Energy The Case of N'djamena (French)	12/93	160/94
Comoros	Energy Assessment (English and French)	01/88	7104-COM
Congo	Energy Assessment (English)	01/88	6420-COB
	Power Development Plan (English and French)	03/90	106/90
Côte d'Ivoire	Energy Assessment (English and French)	04/85	5250-IVC
	Improved Biomass Utilization (English and French)	04/87	069/87
	Power System Efficiency Study (English)	12/87	--
	Power Sector Efficiency Study (French)	02/92	140/91
Ethiopia	Energy Assessment (English)	07/84	4741-ET

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Ethiopia	Power System Efficiency Study (English)	10/85	045/85
	Agricultural Residue Briquetting Pilot Project (English)	12/86	062/86
	Bagasse Study (English)	12/86	063/86
	Cooking Efficiency Project (English)	12/87	--
Gabon	Energy Assessment (English)	07/88	6915-GA
The Gambia	Energy Assessment (English)	11/83	4743-GM
	Solar Water Heating Retrofit Project (English)	02/85	030/85
	Solar Photovoltaic Applications (English)	03/85	032/85
	Petroleum Supply Management Assistance (English)	04/85	035/85
Ghana	Energy Assessment (English)	11/86	6234-GH
	Energy Rationalization in the Industrial Sector (English)	06/88	084/88
	Sawmill Residues Utilization Study (English)	11/88	074/87
	Industrial Energy Efficiency (English)	11/92	148/92
Guinea	Energy Assessment (English)	11/86	6137-GUI
	Household Energy Strategy (English and French)	01/94	163/94
Guinea-Bissau	Energy Assessment (English and Portuguese)	08/84	5083-GUB
	Recommended Technical Assistance Projects (English & Portuguese)	04/85	033/85
	Management Options for the Electric Power and Water Supply Subsectors (English)	02/90	100/90
	Power and Water Institutional Restructuring (French)	04/91	118/91
Kenya	Energy Assessment (English)	05/82	3800-KE
	Power System Efficiency Study (English)	03/84	014/84
	Status Report (English)	05/84	016/84
	Coal Conversion Action Plan (English)	02/87	--
	Solar Water Heating Study (English)	02/87	066/87
	Peri-Urban Woodfuel Development (English)	10/87	076/87
	Power Master Plan (English)	11/87	--
Lesotho	Energy Assessment (English)	01/84	4676-LSO
Liberia	Energy Assessment (English)	12/84	5279-LBR
	Recommended Technical Assistance Projects (English)	06/85	038/85
	Power System Efficiency Study (English)	12/87	081/87
Madagascar	Energy Assessment (English)	01/87	5700-MAG
	Power System Efficiency Study (English and French)	12/87	075/87
Malawi	Energy Assessment (English)	08/82	3903-MAL
	Technical Assistance to Improve the Efficiency of Fuelwood Use in the Tobacco Industry (English)	11/83	009/83
	Status Report (English)	01/84	013/84
Mali	Energy Assessment (English and French)	11/91	8423-MLI
	Household Energy Strategy (English and French)	03/92	147/92
Islamic Republic of Mauritania	Energy Assessment (English and French)	04/85	5224-MAU
	Household Energy Strategy Study (English and French)	07/90	123/90
Mauritius	Energy Assessment (English)	12/81	3510-MAS
	Status Report (English)	10/83	008/83
	Power System Efficiency Audit (English)	05/87	070/87
	Bagasse Power Potential (English)	10/87	077/87
	Energy Sector Review (English)	12/94	3643-MAS
Mozambique	Energy Assessment (English)	01/87	6128-MOZ
	Household Electricity Utilization Study (English)	03/90	113/90
Namibia	Energy Assessment (English)	03/93	11320-NAM

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Niger	Energy Assessment (French)	05/84	4642-NIR
	Status Report (English and French)	02/86	051/86
	Improved Stoves Project (English and French)	12/87	080/87
	Household Energy Conservation and Substitution (English and French)	01/88	082/88
Nigeria	Energy Assessment (English)	08/83	4440-UNI
	Energy Assessment (English)	07/93	11672-UNI
Rwanda	Energy Assessment (English)	06/82	3779-RW
	Energy Assessment (English and French)	07/91	8017-RW
	Status Report (English and French)	05/84	017/84
	Improved Charcoal Cookstove Strategy (English and French)	08/86	059/86
	Improved Charcoal Production Techniques (English and French)	02/87	065/87
	Commercialization of Improved Charcoal Stoves and Carbonization Techniques Mid-Term Progress Report (English and French)	12/91	141/91
SADC	SADC Regional Power Interconnection Study, Vol. I-IV (English)	12/93	--
SADCC	SADCC Regional Sector: Regional Capacity-Building Program for Energy Surveys and Policy Analysis (English)	11/91	--
Sao Tome and Principe	Energy Assessment (English)	10/85	5803-STP
Senegal	Energy Assessment (English)	07/83	4182-SE
	Status Report (English and French)	10/84	025/84
	Industrial Energy Conservation Study (English)	05/85	037/85
	Preparatory Assistance for Donor Meeting (English and French)	04/86	056/86
	Urban Household Energy Strategy (English)	02/89	096/89
	Industrial Energy Conservation Program	05/94	165/94
Seychelles	Energy Assessment (English)	01/84	4693-SEY
	Electric Power System Efficiency Study (English)	08/84	021/84
Sierra Leone	Energy Assessment (English)	10/87	6597-SL
Somalia	Energy Assessment (English)	12/85	5796-SO
Republic of South Africa	Options for the Structure and Regulation of Natural Gas Industry (English)	05/95	172/95
Sudan	Management Assistance to the Ministry of Energy and Mining	05/83	003/83
	Energy Assessment (English)	07/83	4511-SU
	Power System Efficiency Study (English)	06/84	018/84
	Status Report (English)	11/84	026/84
	Wood Energy/Forestry Feasibility (English)	07/87	073/87
Swaziland	Energy Assessment (English)	02/87	6262-SW
Tanzania	Energy Assessment (English)	11/84	4969-TA
	Peri-Urban Woodfuels Feasibility Study (English)	08/88	086/88
	Tobacco Curing Efficiency Study (English)	05/89	102/89
	Remote Sensing and Mapping of Woodlands (English)	06/90	--
	Industrial Energy Efficiency Technical Assistance (English)	08/90	122/90
Togo	Energy Assessment (English)	06/85	5221-TO
	Wood Recovery in the Nangbeto Lake (English and French)	04/86	055/86
	Power Efficiency Improvement (English and French)	12/87	078/87
Uganda	Energy Assessment (English)	07/83	4453-UG
	Status Report (English)	08/84	020/84
	Institutional Review of the Energy Sector (English)	01/85	029/85
	Energy Efficiency in Tobacco Curing Industry (English)	02/86	049/86

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Uganda	Fuelwood/Forestry Feasibility Study (English)	03/86	053/86
	Power System Efficiency Study (English)	12/88	092/88
	Energy Efficiency Improvement in the Brick and Tile Industry (English)	02/89	097/89
	Tobacco Curing Pilot Project (English)	03/89	UNDP Terminal Report
Zaire	Energy Assessment (English)	05/86	5837-ZR
Zambia	Energy Assessment (English)	01/83	4110-ZA
	Status Report (English)	08/85	039/85
	Energy Sector Institutional Review (English)	11/86	060/86
Zambia	Power Subsector Efficiency Study (English)	02/89	093/88
	Energy Strategy Study (English)	02/89	094/88
	Urban Household Energy Strategy Study (English)	08/90	121/90
Zimbabwe	Energy Assessment (English)	06/82	3765-ZIM
	Power System Efficiency Study (English)	06/83	005/83
	Status Report (English)	08/84	019/84
	Power Sector Management Assistance Project (English)	04/85	034/85
	Petroleum Management Assistance (English)	12/89	109/89
	Power Sector Management Institution Building (English)	09/89	--
	Charcoal Utilization Prefeasibility Study (English)	06/90	119/90
	Integrated Energy Strategy Evaluation (English)	01/92	8768-ZIM
	Energy Efficiency Technical Assistance Project: Strategic Framework for a National Energy Efficiency Improvement Program (English)	04/94	--
	Capacity Building for the National Energy Efficiency Improvement Programme (NEEIP)	12/94	--

EAST ASIA AND PACIFIC (EAP)

Asia Regional	Pacific Household and Rural Energy Seminar (English)	11/90	--
China	County-Level Rural Energy Assessments (English)	05/89	101/89
	Fuelwood Forestry Preinvestment Study (English)	12/89	105/89
	Strategic Options for Power Sector Reform in China (English)	07/93	156/93
	Energy Efficiency and Pollution Control in Township and Village Enterprises (TVE) Industry (English)	11/94	168/94
Fiji	Energy Assessment (English)	06/83	4462-FIJ
Indonesia	Energy Assessment (English)	11/81	3543-IND
	Status Report (English)	09/84	022/84
	Power Generation Efficiency Study (English)	02/86	050/86
	Energy Efficiency in the Brick, Tile and Lime Industries (English)	04/87	067/87
	Diesel Generating Plant Efficiency Study (English)	12/88	095/88
	Urban Household Energy Strategy Study (English)	02/90	107/90
	Biomass Gasifier Preinvestment Study Vols. I & II (English)	12/90	124/90
	Prospects for Biomass Power Generation with Emphasis on Palm Oil, Sugar, Rubberwood and Plywood Residues (English)	11/94	167/94
Lao PDR	Urban Electricity Demand Assessment Study (English)	03/93	154/93
Malaysia	Sabah Power System Efficiency Study (English)	03/87	068/87
	Gas Utilization Study (English)	09/91	9645-MA

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Myanmar	Energy Assessment (English)	06/85	5416-BA
Papua New Guinea	Energy Assessment (English)	06/82	3882-PNG
	Status Report (English)	07/83	006/83
	Energy Strategy Paper (English)	--	--
	Institutional Review in the Energy Sector (English)	10/84	023/84
	Power Tariff Study (English)	10/84	024/84
Philippines	Commercial Potential for Power Production from Agricultural Residues (English)	12/93	157/93
	Energy Conservation Study (English)	08/94	--
Solomon Islands	Energy Assessment (English)	06/83	4404-SOL
	Energy Assessment (English)	01/92	979/SOL
South Pacific	Petroleum Transport in the South Pacific (English)	05/86	--
Thailand	Energy Assessment (English)	09/85	5793-TH
	Rural Energy Issues and Options (English)	09/85	044/85
	Accelerated Dissemination of Improved Stoves and Charcoal Kilns (English)	09/87	079/87
	Northeast Region Village Forestry and Woodfuels Preinvestment Study (English)	02/88	083/88
	Impact of Lower Oil Prices (English)	08/88	--
	Coal Development and Utilization Study (English)	10/89	--
Tonga	Energy Assessment (English)	06/85	5498-TON
Vanuatu	Energy Assessment (English)	06/85	5577-VA
Vietnam	Rural and Household Energy-Issues and Options (English)	01/94	161/94
Western Samoa	Energy Assessment (English)	06/85	5497-WSO

SOUTH ASIA (SAS)

Bangladesh	Energy Assessment (English)	10/82	3873-BD
	Priority Investment Program (English)	05/83	002/83
	Status Report (English)	04/84	015/84
	Power System Efficiency Study (English)	02/85	031/85
	Small Scale Uses of Gas Prefeasibility Study (English)	12/88	
India	Opportunities for Commercialization of Nonconventional Energy Systems (English)	11/88	091/88
	Maharashtra Bagasse Energy Efficiency Project (English)	07/90	120/90
	Mini-Hydro Development on Irrigation Dams and Canal Drops Vols. I, II and III (English)	07/91	139/91
	WindFarm Pre-Investment Study (English)	12/92	150/92
	Power Sector Reform Seminar (English)	04/94	166/94
Nepal	Energy Assessment (English)	08/83	4474-NEP
	Status Report (English)	01/85	028/84
	Energy Efficiency & Fuel Substitution in Industries (English)	06/93	158/93
Pakistan	Household Energy Assessment (English)	05/88	--
	Assessment of Photovoltaic Programs, Applications, and Markets (English)	10/89	103/89

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Pakistan	National Household Energy Survey and Strategy Fomulation Study: Project Terminal Report (English)	03/94	--
	Managing the Energy Transition (English)	10/94	--
	Lighting Efficiency Improvement Program Phase 1: Commercial Buildings Five Year Plan (English)	10/94	--
Sri Lanka	Energy Assessment (English)	05/82	3792-CE
	Power System Loss Reduction Study (English)	07/83	007/83
	Status Report (English)	01/84	010/84
	Industrial Energy Conservation Study (English)	03/86	054/86

EUROPE AND CENTRAL ASIA (ECA)

Eastern Europe	The Future of Natural Gas in Eastern Europe (English)	08/92	149/92
Poland	Energy Sector Restructuring Program Vols. I-V (English)	01/93	153/93
Portugal	Energy Assessment (English)	04/84	4824-PO
Turkey	Energy Assessment (English)	03/83	3877-TU

MIDDLE EAST AND NORTH AFRICA (MNA)

Morocco	Energy Assessment (English and French)	03/84	4157-MOR
	Status Report (English and French)	01/86	048/86
	Energy Sector Institutional Development Study (English and French)	05/95	173/95
Syria	Energy Assessment (English)	05/86	5822-SYR
	Electric Power Efficiency Study (English)	09/88	089/88
	Energy Efficiency Improvement in the Cement Sector (English)	04/89	099/89
	Energy Efficiency Improvement in the Fertilizer Sector(English)	06/90	115/90
Tunisia	Fuel Substitution (English and French)	03/90	--
	Power Efficiency Study (English and French)	02/92	136/91
	Energy Management Strategy in the Residential and Tertiary Sectors (English)	04/92	146/92
Yemen	Energy Assessment (English)	12/84	4892-YAR
	Energy Investment Priorities (English)	02/87	6376-YAR
	Household Energy Strategy Study Phase I (English)	03/91	126/91

LATIN AMERICA AND THE CARIBBEAN (LAC)

LAC Regional	Regional Seminar on Electric Power System Loss Reduction in the Caribbean (English)	07/89	--
Bolivia	Energy Assessment (English)	04/83	4213-BO
	National Energy Plan (English)	12/87	--
	National Energy Plan (Spanish)	08/91	131/91
	La Paz Private Power Technical Assistance (English)	11/90	111/90
	Natural Gas Distribution: Economics and Regulation (English)	03/92	125/92
	Prefeasibility Evaluation Rural Electrification and Demand Assessment (English and Spanish)	04/91	129/91
	Private Power Generation and Transmission (English)	01/92	137/91
	Household Rural Energy Strategy (English and Spanish)	01/94	162/94
	Natural Gas Sector Policies and Issues (English and Spanish)	12/93	164/93

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Brazil	Energy Efficiency & Conservation: Strategic Partnership for Energy Efficiency in Brazil (English)	01/95	170/95
Chile	Energy Sector Review (English)	08/88	7129-CH
Colombia	Energy Strategy Paper (English)	12/86	--
	Power Sector Restructuring (English)	11/94	169/94
Costa Rica	Energy Assessment (English and Spanish)	01/84	4655-CR
	Recommended Technical Assistance Projects (English)	11/84	027/84
	Forest Residues Utilization Study (English and Spanish)	02/90	108/90
Dominican Republic	Energy Assessment (English)	05/91	8234-DO
Ecuador	Energy Assessment (Spanish)	12/85	5865-EC
	Energy Strategy Phase I (Spanish)	07/88	--
	Energy Strategy (English)	04/91	--
	Private Minihydropower Development Study (English)	11/92	--
	Energy Pricing Subsidies and Interfuel Substitution (English)	08/94	11798-EC
	Energy Pricing, Poverty and Social Mitigation (English)	08/94	12831-EC
Guatemala	Issues and Options in the Energy Sector (English)	09/93	12160-GU
Haiti	Energy Assessment (English and French)	06/82	3672-HA
	Status Report (English and French)	08/85	041/85
	Household Energy Strategy (English and French)	12/91	143/91
Honduras	Energy Assessment (English)	08/87	6476-HO
	Petroleum Supply Management (English)	03/91	128/91
Jamaica	Energy Assessment (English)	04/85	5466-JM
	Petroleum Procurement, Refining, and Distribution Study (English)	11/86	061/86
	Energy Efficiency Building Code Phase I (English)	03/88	--
	Energy Efficiency Standards and Labels Phase I (English)	03/88	--
	Management Information System Phase I (English)	03/88	--
	Charcoal Production Project (English)	09/88	090/88
	FIDCO Sawmill Residues Utilization Study (English)	09/88	088/88
	Energy Sector Strategy and Investment Planning Study (English)	07/92	135/92
Mexico	Improved Charcoal Production Within Forest Management for the State of Veracruz (English and Spanish)	08/91	138/91
Panama	Power System Efficiency Study (English)	06/83	004/83
Paraguay	Energy Assessment (English)	10/84	5145-PA
	Recommended Technical Assistance Projects (English)	09/85	--
	Status Report (English and Spanish)	09/85	043/85
Peru	Energy Assessment (English)	01/84	4677-PE
	Status Report (English)	08/85	040/85
	Proposal for a Stove Dissemination Program in the Sierra (English and Spanish)	02/87	064/87
	Energy Strategy (English and Spanish)	12/90	--
	Study of Energy Taxation and Liberalization of the Hydrocarbons Sector (English and Spanish)	120/93	159/93
Saint Lucia	Energy Assessment (English)	09/84	5111-SLU
St. Vincent and the Grenadines	Energy Assessment (English)	09/84	5103-STV
Trinidad and Tobago	Energy Assessment (English)	12/85	5930-TR

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	GLOBAL		
	Energy End Use Efficiency: Research and Strategy (English)	11/89	--
	Guidelines for Utility Customer Management and Metering (English and Spanish)	07/91	--
	Women and Energy--A Resource Guide The International Network: Policies and Experience (English)	04/90	--
	Assessment of Personal Computer Models for Energy Planning in Developing Countries (English)	10/91	--
	Long-Term Gas Contracts Principles and Applications (English)	02/93	152/93
	Comparative Behavior of Firms Under Public and Private Ownership (English)	05/93	155/93
	Development of Regional Electric Power Networks (English)	10/94	--
	Roundtable on Energy Efficiency (English)	02/95	171/95

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