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**ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA**

**ASSESSMENT OF PRIVATIZATION OF THE ELECTRIC  
POWER SECTOR IN SELECTED ESCWA  
MEMBER COUNTRIES**

**VOLUME IV**

**CASE-STUDY OF YEMEN**



**UNITED NATIONS**  
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## Foreword

The importance of the role of electrical energy in socio-economic development cannot be overemphasized. Electrical energy can be easily converted to any other form of energy, transmitted long distances and distributed over large areas. It can cross countries without being subjected to any border-crossing formalities. It is therefore a tradable commodity as well as a service rendered to consumers.

However, the provision of electricity requires large investments in establishing, operating and maintaining electric power generation, transmission and distribution systems and the related facilities. A projected investment of about US\$ 1,500 billion will be needed between 1995 and 2010 to finance the electric power expansion projects in developing countries. The share of the ESCWA region<sup>1</sup> in this investment is estimated at US\$ 90 billion. It is clear that the required investment in the power sector is huge. The ability of the concerned Governments to provide this funding in the amount required is severely limited and the international funding institutions have neither the will nor the capability to provide soft loans for power projects. Therefore, the only viable option is to involve private investment in the power sector. Consequently, new financing modalities are needed to pool all available resources to ensure an acceptable level of risk. Different modalities are evolving worldwide, and countries should select carefully the modality most appropriate for their requirements.

In spite of the fact that there are growing efforts in most of the ESCWA member countries to promote more involvement of the private sector in various economic activities and infrastructure projects, the privatization of the power sector is still an evolving process and its logistics need to be more carefully studied.

Some ESCWA member States have already taken steps to privatize the electric power sector. The ESCWA secretariat has assumed the responsibility of studying the experiences in the region and of presenting a synthesis of these studies to the other member States so that each ESCWA member can benefit from the experience of the others. To that end, the ESCWA secretariat commissioned a group of experts to prepare four studies on the project. The experts have different backgrounds and work experience in both the public and private sectors. The first study is an overview of the whole issue of privatizing the electric power sector, including a summary of the present situation, projected future developments in the power sector and the approaches of the three selected countries to privatization of this sector. The other three studies commissioned are case-studies of three selected member countries: Egypt, Jordan and Yemen. The four experts and the ESCWA regional adviser on energy held a two-day round table discussion in Cairo on 28 and 29 November 1996, to exchange views in order to coordinate the content of the four studies and to discuss the conclusions of the studies.

The four studies have been revised by ESCWA secretariat staff and are presented in separate volumes:

1. **Volume I. *Assessment of Privatization of the Electric Power Sector in Selected ESCWA Member Countries, An Overview.*** This volume depends mainly on the contributions of Salah Afifi, the ex-Regional Director of Westinghouse Company and the present Chairman of the International Business Network (IBN) Egypt and Emad El-Sharkawi, the former Chairman of the Egypt Electricity Authority.

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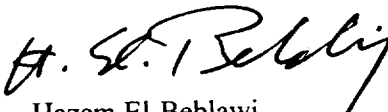
<sup>1</sup> The ESCWA members are Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Oman, Palestine, Qatar, Saudi Arabia, the Syrian Arab Republic, the United Arab Emirates and Yemen.

2. **Volume II.** *Assessment of Privatization of the Electric Power Sector in Selected ESCWA Member Countries, Case-study of Egypt.* This volume was prepared by Emad El-Sharkawi, the former Chairman of the Egypt Electricity Authority.

3. **Volume III.** *Assessment of Privatization of the Electric Power Sector in Selected ESCWA Member Countries, Case-study of Jordan.* This volume is based mainly on the study prepared by Mohammed Azzam, Director of Planning of the Jordanian Electricity Authority/National Electricity Power Company.

4. **Volume IV.** *Assessment of Privatization of the Electric Power Sector in Selected ESCWA Member Countries, Case-study of Yemen.* This volume is based mainly on the study prepared by Abdel Moati Al-Jonaid, Deputy Director of Technical Affairs of the Yemeni Public Electricity Cooperation.

Finally, on behalf of ESCWA, I am pleased to acknowledge the valuable contributions made by the four consultants and the ESCWA staff members to the present publication.



Hazem El-Beblawi  
Executive Secretary

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## ABBREVIATIONS

ACK	Yemen Limited (joint venture between Al Gaid International-CAED/KE Yemen Development)
BOO	Build-own-operate
GDP	Gross domestic product
GIA	General Investment Authority
PCEP	Public Corporation for Electrical Power
PEC	Public Electricity Corporation
YGEC	Yemen General Electricity Corporation
YPC	Yemen Petroleum Company

## ENERGY UNITS

Kilowatt (kW)	1,000 watts
Megawatt (MW)	1,000 kilowatts
Kilowatt-hour (kWh)	1,000 watt-hours
Gigawatt-hour (GWh)	1,000,000 kWh
Kilovolt (kV)	1,000 volts
Megavolt-ampere (MVA)	1,000,000 volt-amperes

## CURRENCY EQUIVALENTS

(October 1996)

1 Yemeni rial (Yrl) = 100 fils  
Yrl 130 = US\$ 1

## INTRODUCTION

The supply of electricity is often interrupted in the main cities and towns of Yemen, raising production costs and inhibiting economic development. While the Government has introduced some measures to restrain the growth of electricity demand, it has become obvious that the problems can only be alleviated by the construction of new powerplants. However, since sufficient funds are unavailable and international donors are unwilling to finance large public sector powerplants, the Government has decided to privatize power production through new build-own-operate (BOO) projects. For the next five years, the Ministry of Electricity and Water intends to add 360 megawatts (MW) to its current capacity of 681 MW.

Because of Yemen's convoluted mountainous terrain, only 25 per cent of the population is supplied with publicly produced electricity, and it is unlikely that the national grid will reach the majority of rural residents during the next five years. However, optimal sunlight and wind conditions in various regions of the country facilitate the utilization of alternative power sources for rural electrification.



# I. ECONOMIC CONDITIONS IN YEMEN AND POLICIES FOR ECONOMIC SPECIAL REFORM, WITH EMPHASIS ON PRIVATIZATION

## A. GENERAL BACKGROUND

Since 1990 Yemen has been confronted with serious economic problems, the most important of which are associated with the following:

(a) The reunification of the country in 1990 led, among other things, to a sharp increase in the number of civil servants, resulting in a sharp increase in wage bills, which now account for more than 50 per cent of the Government's total expenditures;

(b) The Gulf war in 1991 resulted in the return of about 1 million Yemenis from the Gulf area, and the huge inflow of remittances, which were the main source of hard currency for the country, ceased. For many years, remittances had helped to improve the country's balance of payments, reduce deficits and maintain stable prices;

(c) The events which occurred in 1994 led to a sharp drop in the value of the Yemeni rial (hyperinflation) and a consequent decline in the standard of living.

## B. CORRECTIVE MEASURES

The Government introduced the following measures during the first quarter of 1995 in an effort to stabilize the economy:

(a) The removal of subsidies on certain basic food commodities and the reduction of subsidies on others;

(b) An increase of almost 100 per cent in the prices of oil derivatives and certain services such as electricity, water, and public transport;

(c) The establishment of a floating exchange rate to reflect free-market prices;

(d) The removal of most tariff barriers and the simplification of import-export procedures.

These measures, along with others taken by the Government within the last year, have already begun to have a positive effect on the country's economy.

## C. THE FIRST FIVE-YEAR PLAN (1996-2000)

As a complement to the economic reform programme, the Government introduced the First Five-Year Plan (1996-2000). Among other things, the Plan aims for an annual growth rate of 7.2 per cent in gross domestic product (GDP) through the investment of about Yrls 429 billion during this period. Foreign investment of around \$4.4 billion in connection with gas and oil production and the development of the Aden free zone is expected as well.

## D. PRIVATIZATION

The Government considers privatization an integral part of the economic reform programme, not only because it relieves the heavy financial burden associated with the subsidization of the public sector, but also because it ensures that the available resources are used effectively, contributing to economic development.

Under the First Five-Year Plan, 140 major projects will be carried out by the public sector, including 37 in agriculture, 26 in industry, 12 in commercial fields, and 11 in services, and will create over 76,000 new jobs. The remaining 54 projects will be carried out in the construction, transport and communications, electricity and water, petroleum and minerals, and fisheries sectors (see table 1). At the moment there are over 100 public sector projects, representing about 70 per cent of the total investment of the public sector, ready for privatization.

TABLE 1. GROWTH RATES FOR DIFFERENT SECTORS IN YEMEN

Sector	Average annual growth rate at the 1990 fixed price		Expected average annual growth rate
	1990-1995	1995	
Agriculture, forests and fisheries	6.46	11.69	7.0
Crude oil, gas and metals	9.80	16.25	0.55
Manufacturing	2.83	16.69	8.0
Construction and building	7.80	18.00	8.0
Commerce and hotels	5.63	5.63	14.72
Transport and communications	8.87	16.94	10.0
Finance, insurance and real estate	-(0.58)	-(11.20)	8.0
Social and personal services	4.51	1.72	8.0
Electricity and water	2.11	0.73	4.0
Government services	-(8.74)	-(13.32)	10.0
Gross domestic product	3.71	9.34	7.2

*Source:* Yemen, Ministry of Planning and Development, The First Five-Year Plan (1996-2000), 13 July 1996 (in Arabic).

## E. THE ROLE OF THE PRIVATE SECTOR

In recent years the private sector has increased its role in all economic activities; its contribution to GDP (excluding oil) amounted to 71 per cent in 1994. It is expected to play an even greater role in the economy in the future.

According to the General Investment Authority (GIA), 742 new projects were approved during the period 1992-1995, valued at an estimated Yrls 132.4 billion, as shown in table 2.

TABLE 2. NEW PROJECTS APPROVED DURING THE PERIOD 1992-1995

Sector	Number of projects	Estimated cost (millions of YRIs)	Estimated number of employees
Industry	412	45 425	18 535
Agriculture	46	4 757	1 937
Fisheries	11	4 358	2 170
Services	194	53 144	12 377
Tourism	79	24 675	3 984
<i>Total</i>	<i>742</i>	<i>132 360</i>	<i>39 003</i>

## F. THE FUTURE OF THE ECONOMY

Yemen is rich in natural resources and has a hard-working population. The era of government involvement in all economic sectors and activities is now past, and the prospects for developing a healthy economy through the efforts of the Yemeni people, the participation of local and foreign investors, and sensible government regulations are very promising.

## II. THE ELECTRIC POWER SECTOR IN YEMEN

The Ministry of Electricity and Water is currently responsible for the electric power sector in Yemen. The organizational structure of this sector and the definition of the roles and responsibilities of the entities involved are described in the General Electricity Law.

Between 1984 and 1991, the Yemen General Electricity Corporation (YGEC) was responsible for the generation, transmission and distribution of electrical energy throughout the northern part of the country, the former People's Democratic Republic of Yemen, during which time power generation was characterized by a high average annual growth rate of 15.6 per cent. The Public Corporation for Electrical Power (PCEP) was responsible for carrying out the same functions in the southern region (the former Yemen Arab Republic). In 1991, the two companies merged to form one entity called the Public Electricity Corporation (PEC), which is now responsible for generating, transmitting and distributing electric power throughout the country. The organizational structure of the PEC is shown in figure I.

The PEC currently supplies about 25 per cent of the electricity consumed in the country. The rest is produced independently by industries, by private producers (which generate enough electricity to sell to others), and by households. At present, there are acute shortages in the electrical energy supply. Tables 3 through 8 show the gross maximum demand, the installed and effective capacities, the energy generated and transmitted, and the electrical energy sold between 1993 and 1995.

TABLE 3. GROSS MAXIMUM DEMAND (1993-1995)  
(Megawatts)

Description	1993	1994	1995
Interconnected system	261	274	316
Aden system	117	106	120
Isolated systems	61	62	66
<i>Total</i>	<i>439</i>	<i>442</i>	<i>502</i>

TABLE 4. INSTALLED CAPACITY (1993-1995)  
(Megawatts)

Description	1993	1994	1995
Interconnected system :			
thermal	435	435	435
diesel	154	154	154
Subtotal	589	589	589
Isolated systems	106	106	110
<i>Total</i>	<i>695</i>	<i>695</i>	<i>699</i>

TABLE 5. EFFECTIVE CAPACITY (1993-1995)  
(Megawatts)

Description	1993	1994	1995
Interconnected system :			
thermal	375	335	340
diesel	135	98	121
Subtotal	510	433	461
Isolated systems	76	73	79
<i>Total</i>	<i>586</i>	<i>506</i>	<i>540</i>

Figure I. The organizational structure of the Public Electricity Corporation in Yemen

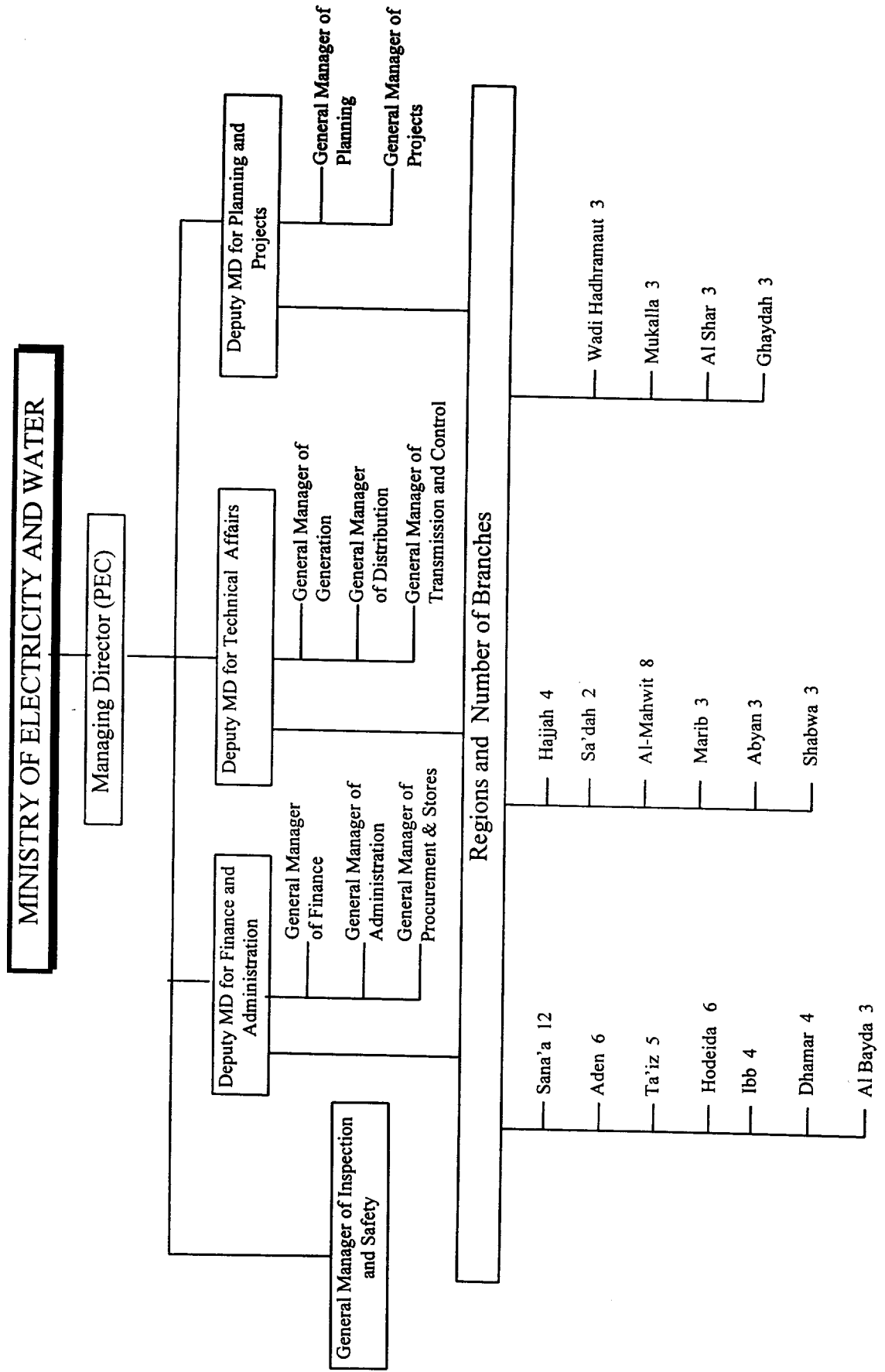


TABLE 6. UNITS GENERATED (1993-1995)  
(Megawatts)

Description	1993	1994	1995
Interconnected system	1 455	1 386	1 538
Aden system	606	489	591
Isolated systems	290	282	275
<i>Total</i>	<i>2 351</i>	<i>2 157</i>	<i>2 404</i>

TABLE 7. UNITS TRANSMITTED (1993-1995)  
(Gigawatt-hours)

Description	1993	1994	1995
Interconnected system	1 337	1 274	1 417
Aden system	516	429	508
Isolated systems	269	272	250
<i>Total</i>	<i>2 122</i>	<i>1 975</i>	<i>2 175</i>

TABLE 8. UNITS SOLD (1993-1995)  
(Gigawatt-hours)

Description	1993	1994	1995
Interconnected system	987	933	1 020
Aden system	392	335	375
Isolated systems	207	212	194
<i>Total</i>	<i>1 586</i>	<i>1 480</i>	<i>1 589</i>

The share of the various economic sectors in electrical energy consumption is shown in table 9. The table indicates that between 1993 and 1995 the domestic sector accounted for the highest share in electricity consumption; the industrial sector had a lower share owing to the lack of finance for establishing transmission and distribution networks for new industries. Financial circumstances and the unreliability of the PEC power system have forced industrial companies to instal their own private power-generation units.

TABLE 9. SALES BY CONSUMER CATEGORY (1993-1995)  
(Gigawatt-hours)

Description	1993	1994	1995
Domestic	831	827	905
Commercial	358	298	318
Industrial	250	217	225
Public building	65	51	49
Street lighting	9	13	10
Agriculture	63	47	53
Other	10	27	29
<i>Total</i>	<i>1 586</i>	<i>1 480</i>	<i>1 589</i>

The level of consumption has also been affected by the difficulties the PEC has faced in building new transmission and distribution networks. Average annual per capita consumption is noticeably higher in urban areas than in rural areas (2,900 kWh as opposed to 600 kWh). One way to limit the migration from rural to urban areas is to provide incentives to increase consumption in the former, including more reasonable electricity prices.

The generation plants currently connected to the main PEC-Sana'a system include two large steam power stations—one at Ras Katenib (5x31.5 MW) and one at Al Mukha (4x40 MW)—and a number of medium-speed diesel units. The map in figure II shows the location of the main powerplants in the PEC system, as well as the transmission line routes and the main substations. A number of small, scattered diesel plants serving isolated systems in the northern governorates of the country also fall under the control of the PEC. In the southern governorates, power is generated mainly by steam units and diesel units which form part of the interconnected system for that part of Yemen. There are also a number of diesel powerplants serving isolated power systems in the south.

Table 10 shows the installed capacity of the existing PEC power system.

TABLE 10. INSTALLED CAPACITY OF THE PUBLIC ELECTRICITY CORPORATION  
POWER SYSTEM IN YEMEN  
(Megawatts)

Powerplants	Name-plate capacity	
	PEC-Sana'a system	PEC-Aden system
Steam power stations	317.5	125
Diesel units	72.5	161
<i>Total</i>	<i>390.0</i>	<i>286</i>

In the northern governorates, the transmission system is characterized by relatively strong and adequate 132-kilovolt (kV) double-circuit interconnected overhead transmission lines. This transmission system currently comprises 1,154 kilometres (km) of 132-kV overhead lines and 11 substations (132/33 kV) with a total capacity of 600 megavolt-amperes (MVA). The southern governorates of the country have only one 132-kV double-circuit overhead line interconnecting Aden with Abyan.

A 132-kV overhead power line between Ta'iz and Al Hiswa is currently being constructed to interconnect the two parts of the system (PEC-Sana'a and PEC-Aden) and will be operational in 1997.

The distribution system consists of 33-kV, 11-kV, 6.6-kV and 0.4-kV lines. The low level of investment in the distribution networks (owing to the lack of finance) has resulted in unacceptably high technical and non-technical losses and has left the PEC unable to connect industrial and other high-revenue loads. Substantial parts of the urban distribution networks need to be rehabilitated.





## A. LOAD CHARACTERISTICS

### 1. *The PEC-Sana'a system*

#### (a) *Daily load curve*

The typical daily load curves shown in figures III and IV are characterized by a sharp evening lighting peak which is about 37 per cent higher than the morning peak. In winter, the evening peak starts at 6 p.m., reaches its maximum at 7 p.m. and ends at 10 p.m., while the morning peak occurs between 8.30 a.m. and noon. In summer, the evening peak starts at about 5 p.m., reaches a maximum point at 7 p.m. and ends at about 10 p.m. (The evening peak starts one hour earlier in summer but still ends at the same time.) The daily load curve indicates that a load management programme can be applied which involves shifting some of the load from peak periods to other periods.

The evening peak occurs mainly as a result of the simultaneous demand for lighting, commercial and industrial loads. The sharp rise in the evening illustrates the high share of lighting loads in the system peak. The morning peak mainly reflects industrial and commercial activities. The minimum load includes the essential domestic and commercial loads (refrigerators and so on) as well as the basic industrial loads.

#### (b) *Seasonal load fluctuations*

The annual system peak occurs in summer; however, it is only 17 per cent higher than the winter peak, indicating the absence of any significant seasonal variation.

### 2. *The PEC-Aden system*

The daily peak load curves for the PEC-Aden system are shown in figures V and VI. In summer, the system peak occurs at around 11 p.m., mainly because a large number of consumers switch on air conditioners before going to bed. In the winter, the daily peak occurs at 7 p.m.

Figures VII and VIII show the typical daily load curves for the whole PEC system. It can be seen that the morning peak is about 90 per cent of the evening peak in summer and 85 per cent during the winter; this peak occurs at 11 a.m. during both seasons.

## B. POWER SYSTEM LOSSES

### 1. *The PEC-Sana'a system*

In 1995, total PEC-Sana'a system losses amounted to 30.3 per cent of total system generation (very little change from the 30.1, 27.9 and 30.2 per cent losses experienced in 1988, 1989 and 1990 respectively). These system losses are considered high in comparison with international standards.

Figure III. PEC-Sana'a system: typical daily load curve (summer)

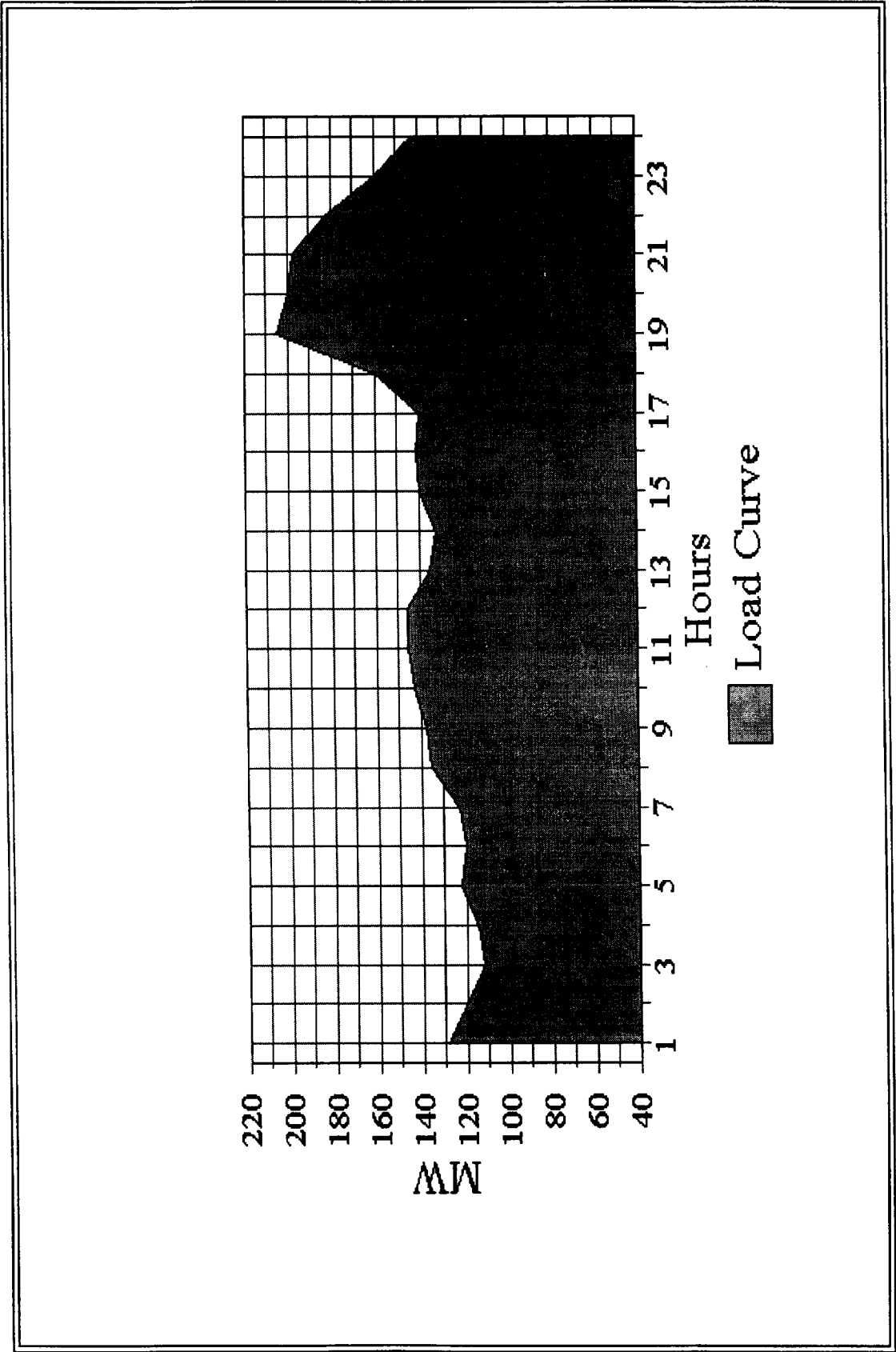


Figure IV. PEC-Sana'a system: typical daily load curve (winter)

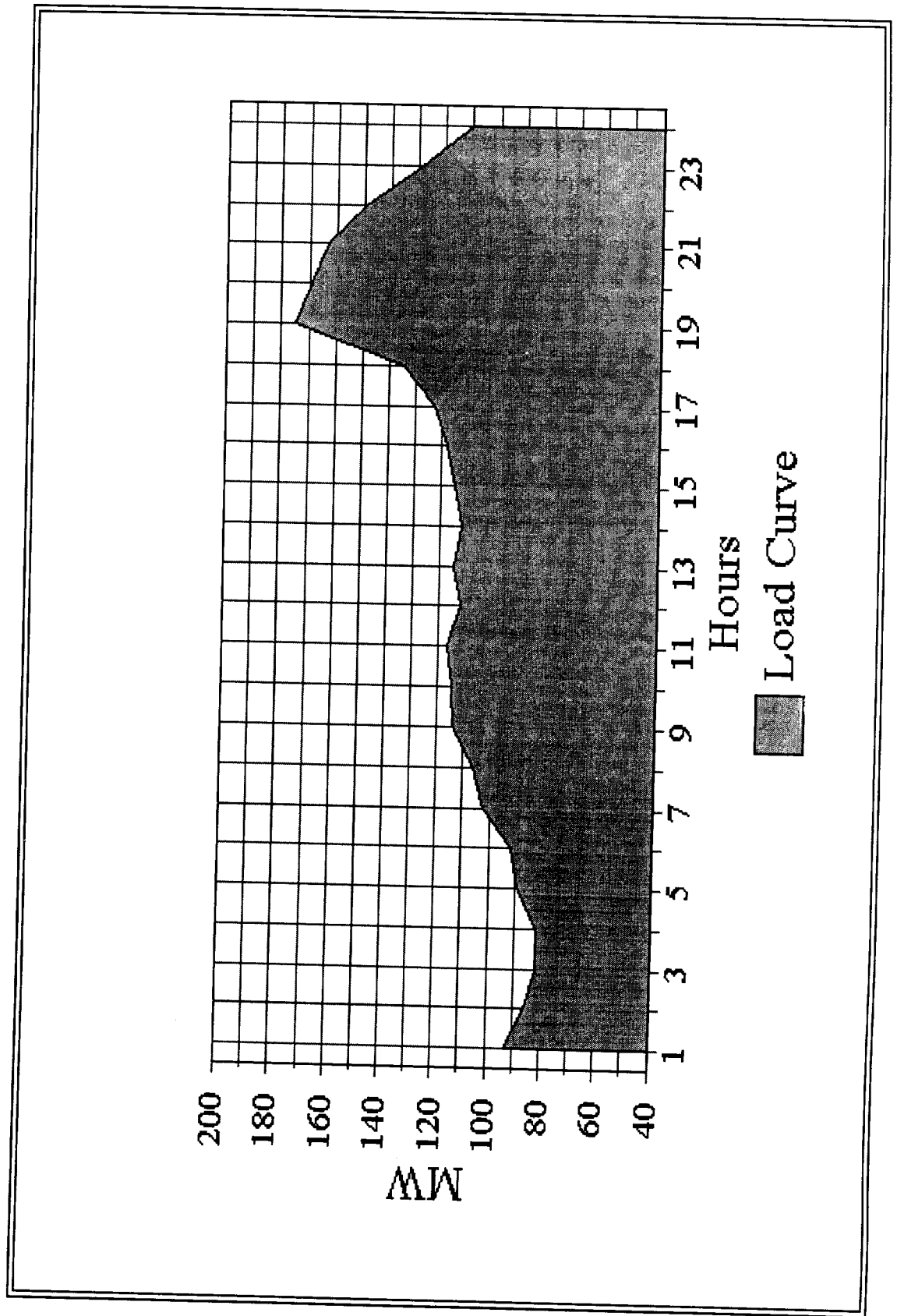


Figure V. PEC-Aden system: typical daily load curve (summer)

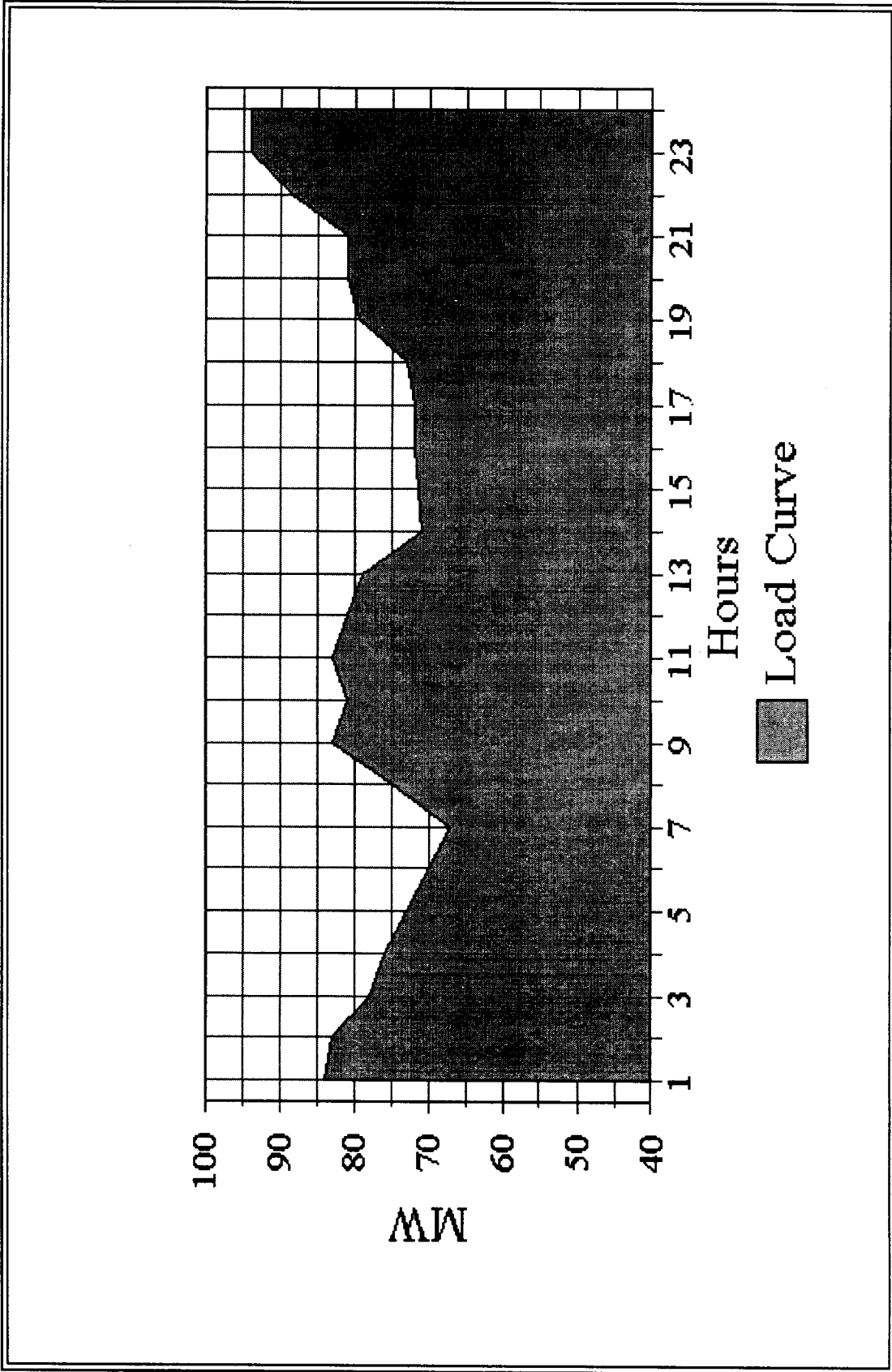


Figure VI. PEC-Aden system: typical daily load curve (winter)

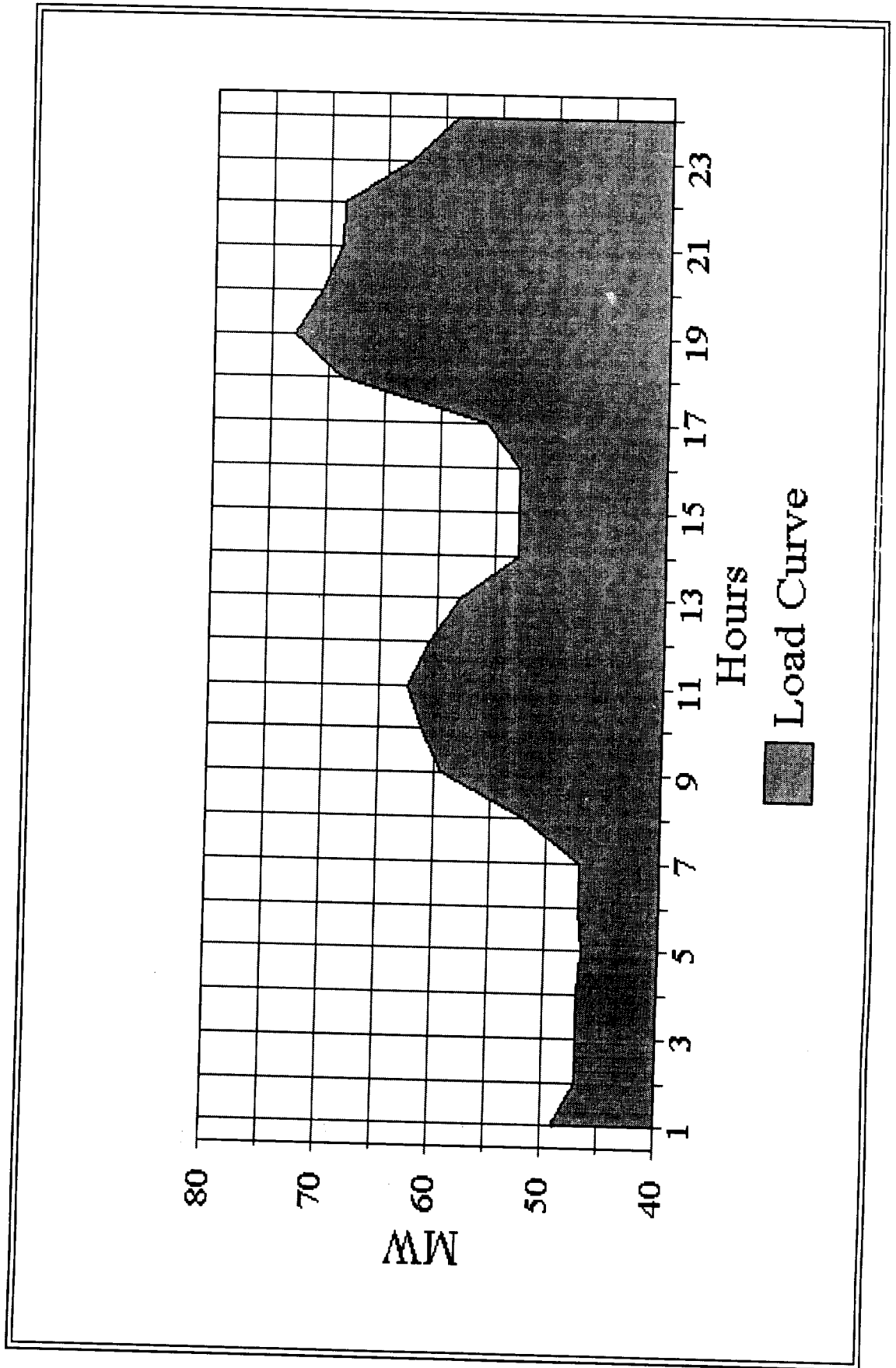


Figure VII. PEC system: typical daily load curve (summer)

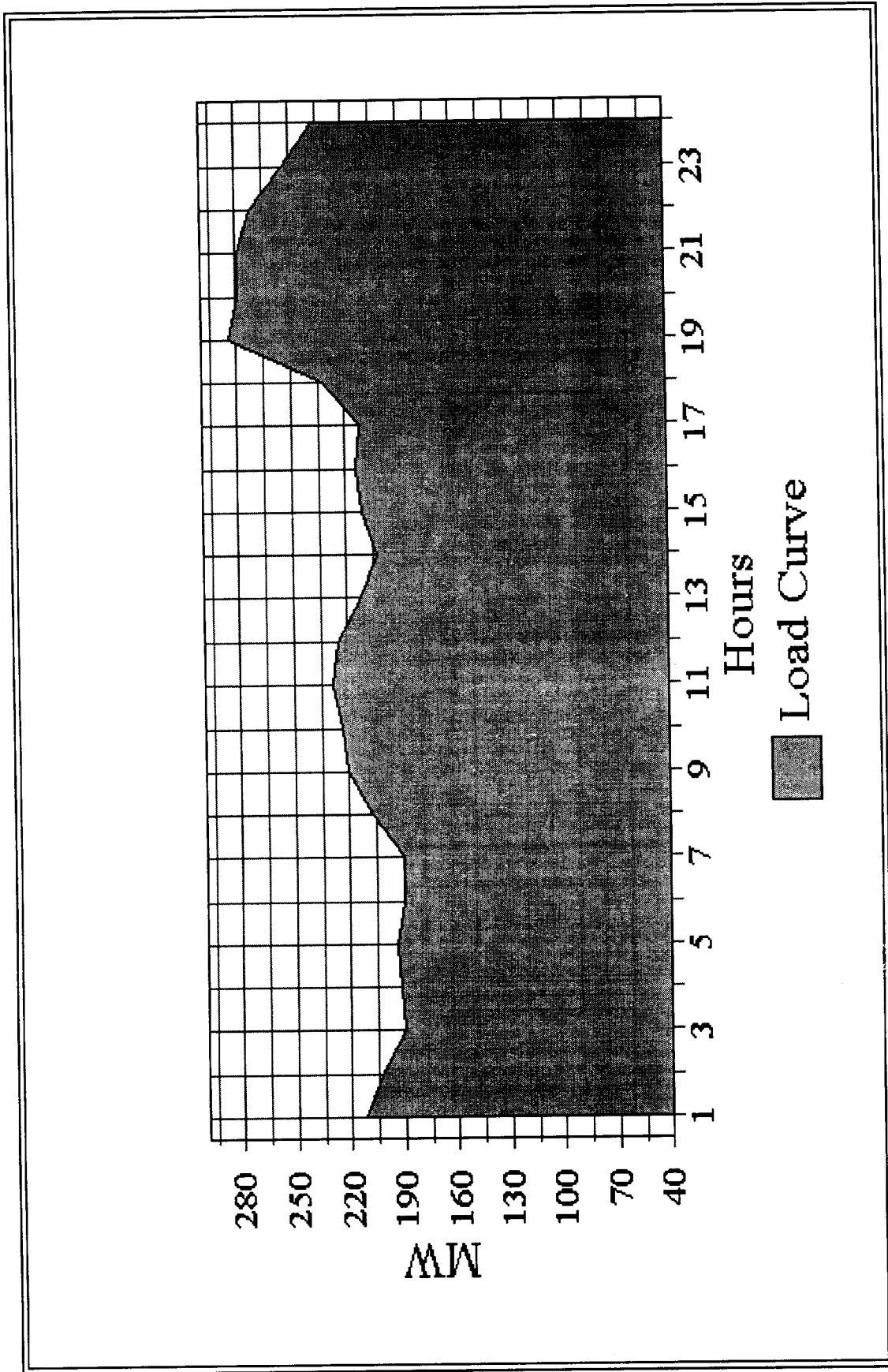
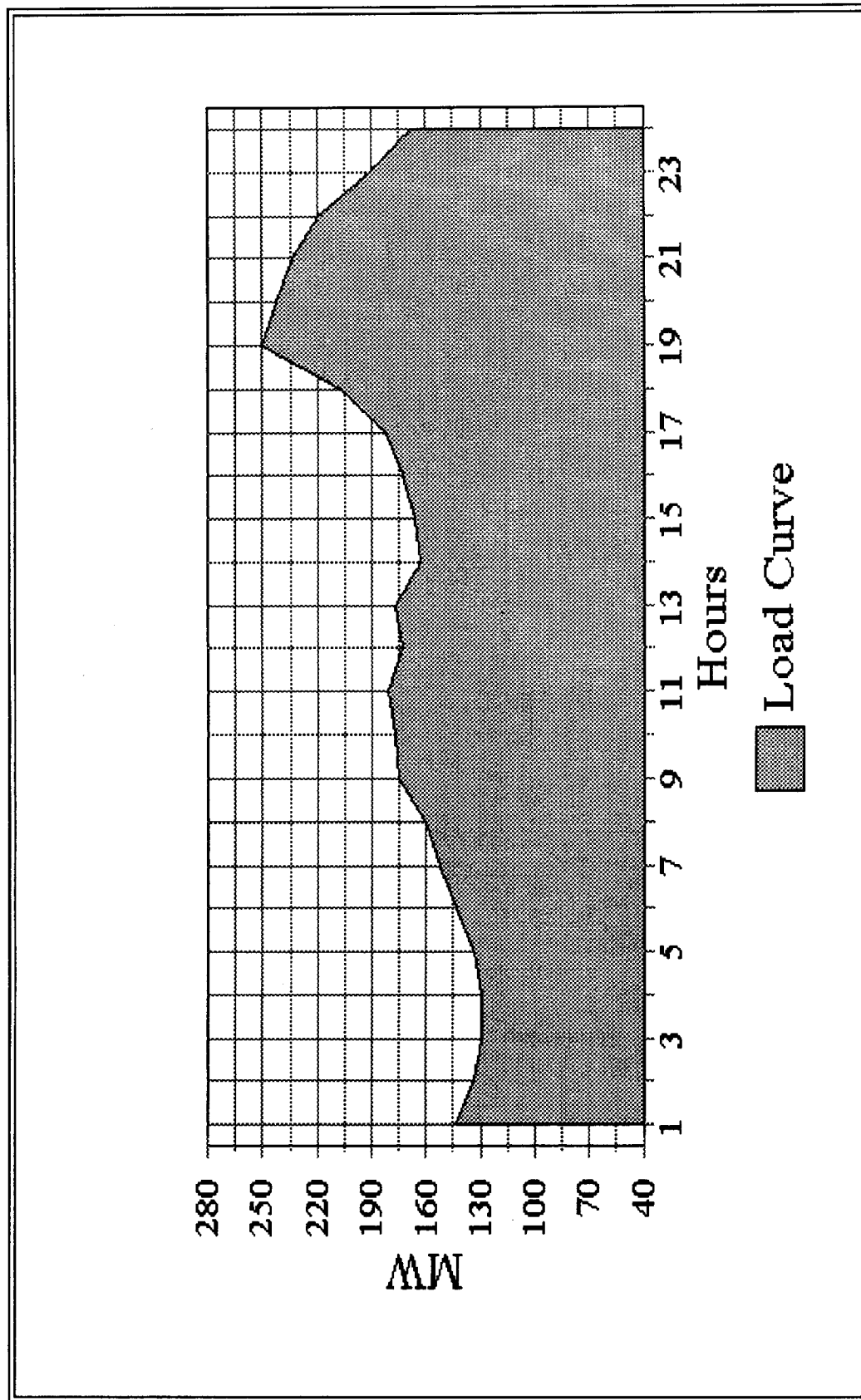


Figure VIII. PEC system: typical daily load curve (winter)



In 1991, the percentage of auxiliary consumption amounted to 8.16 per cent at the Ras Katenib Power Station, 8.6 per cent at Al Mukha Power Station, and 7.6 per cent at the diesel plants connected to the system. This high auxiliary consumption may be attributed to the partial loading of the generating units. For the same year, the transmission line losses were estimated at about 5 per cent, and distribution system losses amounted to around 17 per cent. The high percentages of loss in the distribution system are mainly the result of inadequate sub-transmission and distribution networks, inaccurate metering, billing errors and theft.

## 2. The PEC-Aden system

In 1991, PEC-Aden system losses amounted to 28.3 per cent of total system generation, compared with about 30 per cent in 1990. Auxiliary consumption was about 9 per cent, while transmission losses were 3.2 per cent.

Distribution losses were also high, at 21 per cent, for the same reasons as those listed above for the PEC-Sana'a system. It should be noted that losses in medium voltage networks are not distinguishable from the losses in the low voltage network owing to the lack of metering equipment at the MV level.

Tables 11 and 12 show the system losses in both the northern and the southern governorates of Yemen.

TABLE 11. CONSUMPTION BY AUXILIARIES  
(Percentage)

Description	1993	1994	1995
Interconnected system	8.1	8.1	7.9
Aden system	14.9	12.3	14.0
Isolated systems	7.2	7.5	7.5
<i>Total auxiliary consumption</i>	<i>9.7</i>	<i>8.4</i>	<i>9.5</i>

TABLE 12. LINE LOSSES  
(Percentage)

Description	1993	1994	1995
Interconnected system	26.2	26.8	28.0
Aden system	24.3	24.9	26.3
Isolated systems	31.3	26.0	25.5
<i>Total line losses</i>	<i>25.3</i>	<i>25.1</i>	<i>16.9</i>

## 3. Reduction of losses

The PEC recently undertook a line loss reduction study to investigate the reasons for high system losses and to recommend measures and procedures for reducing these losses and for improving system efficiency.



### III. POWER SECTOR REFORMS IN YEMEN

#### A. FUTURE PLANS FOR THE DEVELOPMENT OF THE POWER SECTOR

A number of studies have been carried out in connection with generation and transmission expansion plans and related investments in the light of the new demand forecast for the PEC, with the aim of developing ways to make optimum use of the natural gas discovered at the Marib site. The studies have concluded the following:

- (a) The generation mix should include both gas turbine and combined cycle units;
- (b) The least-cost solution is to utilize the natural gas reserves close to the load centres for power generation;
- (c) The following gas turbine powerplants should be constructed to enhance the security of the supply to Sana'a and to meet the expected generation deficit identified in future demand projections:
  - (i) 6x60-MW gas turbine units at the Marib site;
  - (ii) 6x50-MW gas turbine units at the Sana'a site;
  - (iii) 6x60-MW gas turbine units at the Bilhaf site;
  - (iv) 6x50-MW gas turbine units at the Aden site.
- (d) Some of the existing steam and diesel power stations should be rehabilitated and new transmission lines established.

A single master plan for country-wide generation and transmission expansion over the next 20 years will soon be prepared to update the existing plan.

#### B. REGULATIONS GOVERNING THE ROLE OF THE STATE IN THE POWER SECTOR

The role of the State in the power sector is being regulated by the General Electricity Law referred to above. The Law has recently been modified to encourage the private sector to play an active role in power generation.

#### C. THE PRESENT ROLE OF PRIVATE INVESTMENT IN POWER GENERATION

The power sector in northern Yemen was wholly owned by shareholding companies until 1975, when the Government established the Yemen General Electricity Corporation. This new entity was authorized to compensate the shareholding companies and take over their electricity networks and installations in every major town in the country. The power sector operated as a State monopoly for 20 years; by 1995, however, the Government recognized the necessity of allowing the private sector to play a role in the electricity and other sectors.

D. NEW POLICIES FOR INCREASING THE INVOLVEMENT OF PRIVATE INVESTORS  
IN POWER GENERATION

Under Law No. 22 of 1991 (the Investment Code), the General Investment Authority was established, and foreign investors are accorded national treatment and receive investment incentives. Republican Decree No. 14 of 1995 amended the Investment Code to reduce government control, providing for the privatization of power generation. Investment in electricity, air transport and other sectors of national importance usually require 25 to 30 per cent participation by a Yemeni partner.

Yemen is just beginning to privatize a wide range of State-owned enterprises, and there are clear signs that foreign investment will be welcomed. The Ministry of Industry handles industrial privatization, and the Ministry of Planning and Development deals with other areas.

E. THE PARTICIPATION OF PRIVATE INVESTORS IN POWER GENERATION:  
FORMS AND MODALITIES

Following the amendment of the Investment Code in 1995 to allow private investors to participate in the power sector and in recognition of the urgent need to meet the growing demand for electricity, the Government of Yemen, represented by the Ministry of Electricity and Water, invited a group of qualified investors to carry out a pilot project in the Sana'a area involving the construction of power stations with a primary capacity of 40 MW on the basis of build-own-operate arrangements.

With the assistance and advice of the World Bank, and following negotiations which lasted for about a year, the three agreements described below were signed with the selected firm (Al Gaid International-CAED/KE Yemen Development, later known as ACK Yemen Limited) in October 1996.

1. *The Power Purchase Agreement*

The main provisions of the contract are as follows:

- (a) ACK is to design, build, own and operate two 55-MW gross ISO-rated 50-hertz self-contained electric power generating packages (Westinghouse 251B11 units) at Dhaban (hereafter referred to as the Complex). ACK is also to design, build and transfer to the PEC, in parts and at its own expense, the interconnection facilities necessary to connect the Complex to the PEC grid;
- (b) The term of the Power Purchase Agreement is 20 years;
- (c) The time allotted for the construction of the Complex is 153 to 180 days. ACK must pay damages at a rate of \$20,000 per day for delays in commissioning and will provide a performance bond in the amount of \$1,450,000 as security for such damages;
- (d) From the date commercial operations commence, ACK is obliged to make available from the Complex at least 29,000 kWh of electricity daily; the maximum deliverable quantity is based on ambient temperature conditions and humidity;
- (e) The PEC will pay: (i) \$0.025 per kWh of electricity purchased up to 58,000 kWh per day and \$0.020 for each kWh per day above this amount (fixed-cost component); and (ii) the actual cost of the No. 2 diesel oil used in generating such electricity based on actual consumption and actual heat rates.

Natural gas will be used as it becomes available and will be paid for in the same way. ACK may utilize alternative fuels only with the consent of the PEC;

(f) Subject to limited exceptions, the PEC must take or pay for a minimum of 29,000 kWh per day on a weekly basis. Therefore, even if the PEC does not require 29,000 kWh daily (on a weekly basis), it is obliged to pay for the whole amount at \$0.025 per kWh;

(g) Subject to limited exceptions, ACK must pay the PEC liquidated damages at a rate of \$0.05 per kWh of the shortfall if it cannot deliver 29,000 kWh of electricity daily;

(h) Both ACK and the PEC must provide letters of credit or escrow agreements as security for their payment obligations to one another. The PEC letters of credit or escrow accounts must be in the amount of or be credited with a sum of two months' energy payments (approximately \$2 million), to be split between a US dollar letter of credit/escrow account and a Yemeni rial letter of credit/escrow account; the PEC is not obliged to provide the rial letter of credit until it ceases to be the fuel supplier. The ACK letter of credit or escrow account must be in an amount of or be credited with a sum of \$600,000.

## 2. *The Implementation Agreement*

### Executive summary:

(a) The Republic of Yemen grants ACK the right to design, finance, insure, contract, own and operate an electric powerplant known as the Sana'a Dhaban Powerplant (hereafter referred to as the Complex) to supply electric power to the PEC;

(b) ACK is simultaneously entering into a Power Purchase Agreement, a Diesel Oil Supply Agreement and an Implementation Agreement with the PEC;

(c) The Government of Yemen is providing ACK with a guarantee, pursuant to the Implementation Agreement, of the payment obligations of the PEC under both the Power Purchase Agreement and the Diesel Oil Supply Agreement;

(d) If, upon the occurrence of any *force majeure* listed in the Implementation Agreement, either ACK or the Government of Yemen cannot perform its obligations as specified under said Agreement, the party in question will not be liable for the non-performance of such obligations for the duration of the *force majeure*. If such a *force majeure* results in repairs or modifications to the Complex being required that cost below a specified amount, then ACK is authorized to carry out such repairs or modifications in accordance with an agreed schedule. If the *force majeure* results in repairs or modifications to the Complex being required that cost in excess of a specified amount, the Government of Yemen has the option of either terminating the Implementation Agreement or authorizing the repairs or modifications to be carried out in accordance with an agreed schedule. The Government of Yemen shall pay compensation to ACK while any such repairs or modifications are being carried out by the latter;

(e) If the Government of Yemen defaults for any of the reasons specified in the Implementation Agreement, ACK can terminate this Agreement and receive compensation from the Government calculated in accordance with a specified formula;

(f) If ACK defaults for any of the reasons specified in the Implementation Agreement, the Government of Yemen can terminate said Agreement and, if it wishes, purchase the Complex from ACK for an amount calculated in accordance with a specified formula.

### 3. *The Diesel Oil Supply Agreement*

Executive summary:

(a) ACK is to purchase No. 2 diesel oil from the PEC as feed-stock for the electric powerplant known as the Sana'a Dhaban Powerplant (hereafter referred to as the Complex);

(b) The Diesel Oil Supply Agreement will be in effect for the 20-year term of the Power Purchase Agreement to be entered into between the PEC and ACK, and for any extension of such term;

(c) The price of No. 2 diesel oil shall be the same as Yemen's official declared price for local consumption;

(d) Prior to the commencement of Complex operations, the parties shall agree to a set of written operating procedures to facilitate the parties' performance under the Diesel Oil Supply Agreement;

(e) The fuel supplier must deliver No. 2 diesel oil that complies with the specifications provided in the Diesel Oil Supply Agreement; ACK is entitled to reject any fuel that does not meet such specifications;

(f) If the fuel supplier does not comply with its delivery obligations, it will be liable to ACK for any loss or damage suffered by ACK as a result of such non-compliance. ACK must make every effort to mitigate any such *force majeure*;

(g) If any *force majeure* listed in the Diesel Oil Supply Agreement occurs, then the affected party shall be relieved of its obligations under this Agreement during the course of such an event;

(h) The Complex will switch to natural gas feed-stock as soon as it is available;

(i) The PEC will have the right to require the Yemen Petroleum Company (YPC) to fulfil the terms of the Diesel Oil Supply Agreement at any time, provided the YPC agrees;

(j) So long as the PEC is the fuel supplier it will not be required to provide a letter of credit.

#### F. BENEFITS, CONSTRAINTS AND OBSTACLES RELATED TO PRIVATE SECTOR INVOLVEMENT IN POWER GENERATION AND PROPOSED SOLUTIONS

The benefits expected from this type of investment may be briefly outlined as follows:

(a) The Government will no longer have to invest huge amounts of its scarce hard-currency resources in the power sector. Such resources can be used for other purposes such as the improvement of health and education;

(b) With a better electricity supply, increasing demand can be met for both domestic and non-domestic purposes;

(c) Electricity consumers will be charged the real cost, without subsidy, encouraging electricity conservation;

(d) Better equipment, organization, administration, efficiency and discipline will be introduced.

People are not always ready to accept new economic, organizational, management or investment ideas which are likely to affect their daily lives, even if the new ideas seem more beneficial. Thus, since this sort of investment will be introduced in Yemen for the first time, some opposition can be expected from those whose personal interests are likely to be adversely affected and from those who are not sure what benefits are to be gained by society, especially in the long run. The appropriate solution for such opposition is simply to educate and convince all of those concerned regarding the expected benefits, as outlined above.

#### IV. RECOMMENDATIONS

The Government has recognized that having monopolistic control over the power sector no longer serves the interests of the country, and that the private sector is essential. When a decision is made to involve the private sector on the basis of build-own-operate or similar arrangements, the following steps should be taken:

1. The advice of a consultant specializing in this type of investment should be sought.
2. The experiences of other countries should be studied.
3. Detailed feasibility studies and cost-benefit analyses should be carried out.
4. Donors such as the World Bank should be consulted and technical and legal assistance requested.
5. The experience, financial position and reputation of prospective investors should be carefully studied and evaluated.
6. The obstacles which are likely to hinder the investors' tasks should be outlined and the necessary precautionary measures taken.
7. The mass media should be used to enlighten the general public and enlist their support.
8. Special attention must be given to the training of local manpower.

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