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MEMORANDUM

TO : THE BOARDS OF DIRECTORS

FROM : Cheikh I. FALL
Secretary General

SUBJECT : EGYPT : REVIEW OF BANK GROUP ASSISTANCE TO ELECTRICITY
SECTOR*

Please find attached hereto, the above-mentioned document.

Attch.

Cc : The President

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EGYPT

**REVIEW OF BANK GROUP ASSISTANCE TO ELECTRICITY
SECTOR**

OPERATIONS EVALUATION DEPARTEMENT

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ABBREVIATIONS AND ACRONYMS

ADB	African Development Bank
AFSED	Arab Fund for Social & Economic Development
ADF	African Development Fund
BOOT	Build-Own-Operate-Transfer
CIDA	Canadian International Development Agency
CSP	Country Strategy Papers
DAG	Donor Assistance Group
DRC	Democratic Republic of Congo
EDF	Electricite de France
EEA	Egyptian Electricity Authority
EEHC	Egyptian Electricity Holding Company
EIB	European Investment Bank
ESW	Economic and Sector Work
EETC	Egyptian Electricity Transmission Company
EUCPRA	Electric Utility and Consumer Protection Regulatory Agency
GDP	Gross Domestic Product
GOE	Government of Egypt
GTZ	German Technical Co-operation
HDI	Human Development Index
LRMC	Long Run Marginal Cost
IPP	Independent Power Producers
ISDB	Islamic Development Bank
IRR	Internal Rate of Return
MIC	Ministry of International Cooperation
MSEA	Ministry of State for Environmental Affairs
NBI	Nile Basin Initiative
OPEV	Operations Evaluation Department
PCR	Project Completion Reports
PPA	Power Purchase Agreement
PPER	Project Performance Evaluation Report
RMC	Regional Member Country
RPT	Regional Power Trade
SME	Small and Medium Enterprises
TOR	Terms of Reference
UA	Unit of Account
UNDP	United Nations Development Programme
UPS	Unified Power System
USAID	United States Agency for Development
US EPA	United States Environment Protection Agency

PREFACE

The main objective of this review is to assess the contribution of the Bank, through its lending and non-lending operations, towards the development efforts of the Government of Egypt in improving and developing the electricity infrastructure in the country. The standard evaluation benchmarks: relevance, efficacy of Bank assistance, efficiency of implementation, institutional development impact and sustainability including impact on crosscutting issues were applied in assessing the outcomes and development effectiveness of the interventions in the electricity sector.

The evaluation is based on desk review of documents such as appraisal reports, project completion reports, project performance evaluation reports, policy documents and other relevant references as well as field mission findings.

The review has documented the Bank's experience of its assistance in the sector highlighting strengths and shortcomings, drawn lessons and made recommendations for future interventions in the sector.

The Bank expresses its appreciations to the Government officials of Egypt and the various development partners for their cooperation and collaboration that immensely helped in compiling the background information and data for the review.

EXECUTIVE SUMMARY

1. The Bank Group has been an active partner in the Government of Egypt's priority development of the energy sector in general and electricity sub-sector in particular through extending several loans and grants over the years. The Evaluation assesses the relevance, achievement of objectives (efficacy), effectiveness, impact and sustainability of Bank Group assistance strategy and also draws lessons for improving development impact of the Bank's future operations.
2. The Bank's programming priorities for the sector were in line with the policy goals and development programmes of the country. The Bank Group's interventions were within the planned generation development programme envisaged for supporting various development plans of the time, and therefore *relevant*.
3. The Bank financing in the electricity sub-sector in Egypt commenced in 1974. From 1974 to 2002 (the last intervention in the sector), the Bank intervened in 13 projects (13 loans and 1 supplementary loan) and 2 studies with financing amounting to UA 870.93 million. The Bank was also continuously engaged in supporting tariff reforms in EEA/EEHC in line with its Framework for Public Utility Tariff Policy.
4. The projects' main objectives were to support government's efforts to meet largely peak demand through increasing the electricity generation capacity, expanding and strengthening the transmission lines for the unified system and providing rural electrification to a number of villages. The objectives of the projects were consistent with the country's overall development plans and the Bank's lending programming papers of the time. All the projects were *relevant and achieved their objectives to meet basic infrastructure needs*. The relevance of the Bank's investment in the country's electricity system is evident when it is noted that currently the 3,884 MW capacity financed by the Bank constitutes about 31% of the installed capacity of 10,919 MW in the country. The extension of the rural electrification network of the country under the Bank's Rural Electrification I & II projects has also achieved its objectives by providing electric power for domestic lighting and for industrial, commercial and agricultural for close to 200 villages in the rural areas.
5. Most of the generation plants are equipped with dual firing system that facilitated the use of natural gas that helped lower the cost of generation. In totality, the projects have been effective in making a significant contribution to the country to meet the ever-increasing demand, which rises by about 6 percent per annum. Current coverage is reported to be 100% in urban areas and almost 95% in the rural areas (much of the efforts are now to meet the annual increase and improve the transmission and distribution systems).
6. Even though time delays and cost variations were recorded in many projects, overall *implementation efficiency* was satisfactory. A competent executing agency and the Bank's long-term presence in the sector spanning almost two decades helped achieve satisfactory implementation. *One of the principal and common reasons for the time over-runs was the delay in achieving loan effectiveness in time, which has been a perennial problem for Bank Group interventions in Egypt as a whole*. The cost variations were either over or under when compared with the appraisal estimates. Cost under-runs ranged from 16.8 % to 48.24 % whilst cost over-runs were in a narrower range of 4.87% to 23.77%. Cost under-runs were mainly caused by favorable currency regimes and international market conditions.
7. In projects where post-completion re-estimates have been made, FIRR and EIRR exceed the cut-off rate of 10% and the projects were financially and economically justified. However, in general, the quality of economic analyses in the past appraisal reports and the post-completion reports such as the PCRs and PPERs were inadequate. EIRR calculation and analysis were by and large carried out

based on inconsistent parameters and inadequate economic pricing that makes recalculation and comparison difficult.

8. The electricity tariffs in Egypt had been substantially below the economic cost of producing and supplying energy in the country. Bank's covenants on introducing tariff and accounting reforms were relevant to the restoration of the financial health of the utilities. The Bank's long-term intervention in the sector had helped introduction of some financial improvement in the electricity sector utilities; and the sector reforms carried out by the Government in recent years have made the sector more attractive for private sector involvement particularly in power generation. However, since 1994 there has been disruption in tariff reforms. The low tariffs and the devaluation of the Egyptian Pound have contributed to EEA/EEHC's low level of net income. At their current levels customer categories such as Very High Voltage users, small agriculture landholders as well as low-income domestic consumers have been paying far below the cost of supply. The utilities have also abandoned the Long run Marginal Cost (LRMC) approach for tariff settings.

9. The Government and other government controlled offices owe a large part of the current liabilities of utilities. The high receivables and low tariffs have led to an unsatisfactory short-term liquidity position of EEA/EEHC. Government's efforts made in 2002 to clear the past receivables have not been sustained. The financial viability of the utilities is again likely to be seriously jeopardised.

10. The *Bank's performance* has generally been satisfactory. Its supervision had depended largely on reports of engineering consultants, whose performance had been highly satisfactory. It is, however, noted that since 1992, the last interventions of the Bank in the sector, the Bank did not have an engagement on broader sector reforms.

11. EEA/EEHC was the *executing agency*. Its performance in project implementation had been satisfactory. Even while there were delays in implementation, it has generally executed and operated the projects well. It has also been able to implement private sector power generation projects by three independent power producers (IPPs). *Delays in timely fulfillment of conditions of loan effectiveness and other conditions remained a perennial problem with the Borrower.*

12. The Bank's non-lending activities included studies, co-financing and aid coordination. Only two studies were financed in the sector. EEHC has in house capacity to carry out feasibility studies including for those projects financed by the Bank. A Donor Assistance Group (DAG) coordinates Egypt's external aid. The Bank co-financed its power projects with a number of other bilateral and multilateral agencies. No major problems of *donor co-ordination* were noted in PCRs/PPERs of the reviewed projects. The recent establishment of a resident office in Egypt is reported to have strengthened the outlook for Bank Group coordination with other donors.

13. The *socio-economic impact* of the projects was dealt with qualitatively. This is largely due to lack of base line data at appraisal and difficulty in obtaining disaggregated data during the preparation of PCRs and PPERs. Nevertheless, there is no doubt that there is direct benefit to consumers who switched over to electricity from other costlier sources of energy such as kerosene. It is also generally recognised that the supply of adequate and reliable electricity contributes to the development of the served areas due to increasing socio-economic activities and attendant job creation. In totality, it can safely be stated that the projects (which accounted for 31% of the total generation capacity) have made a significant socio-economic impact, although disaggregated attribution of benefits by income groups was not possible.

14. The appraisal reports selectively elaborated the positive and negative *environmental impacts* and the related measures to mitigate the latter but there were no requirements of environmental assessments at the time of appraisal of the reviewed projects. Nonetheless, the large generation units installed under the Bank projects are environment friendly as they now mainly operate on natural gas with complete in-built emission monitoring and control systems. The plants have also been noted to

have efficient industrial and wastewater treatment plants. *Gender issues* were not an area of focus in the design of the projects at the time. Due to data limitations and problem of attribution, it was not possible to determine quantitatively the contribution of the interventions to women or poverty reduction.

15. Between 1999 and 2001, the government has introduced three international IPP operators. There is however a temporary setback and a virtual halt to the *privatisation* programme because of the high cost of generation at the recently installed private sector plants. This has been caused by a devaluation of Egyptian pound adversely impacting on the terms of the Power Purchase Agreement (PPAs) with the Independent Private Producers (IPPs), which pass the entire foreign exchange risk to EEHC, the purchaser of electricity.

16. At EEA/EEHC, *institutional development* and *capacity building* had been a continuing exercise, which the Bank pursued through conditionalities in the past. However, much of the achievements in this area have been carried out with internally generated funds and other donors' assistance. The unbundling of generation, transmission and distribution companies has facilitated the various companies to introduce commercial norms in their management and operations.

17. There is major *sustainability issue in the energy sector in general and electricity sub-sector in particular*. The biggest challenge to the government now is to correct the distortions in the prices of inputs and to relate the tariffs to cost of supply to improve the financial viability of the utilities and provide appropriate price signals in the use of resources. A major part of past investments for generation in the power sector in Egypt was made for meeting the peak demand, which is partly a product of price and tariff distortions in the economy. The gap between the normal and the peak demand has been large. Any reduction in the peak demand (through effective demand management) can bring down the need of capacity addition as well as fresh investments, thereby reducing the financial burden on the utilities.

18. As a whole, energy pricing, tariffs, mounting outstanding bills and local debts of utilities, demand management and delays in loan effectiveness have been identified as *key issues for sustainability and development effectiveness* in the sector. There is need: to periodically make upward revision of tariffs towards achieving the Long Run Marginal Cost (LRMC) of supply with due consideration of affordability for the disadvantaged and vulnerable groups; to review the PPAs with IPPs; and to develop pricing mechanisms for both the inputs and outputs of utilities. The lack of autonomy for EEHC in tariff fixation and the absence of an effective institutional mechanism for government entities with the system of incentives and penalties (including disconnection option) are also noted.

19. Some of the main *lessons* are (i) the need for the Bank to engage more with the Government on broader sector policies and strategies to effectively address issues of energy pricing, tariffs, infrastructure development and financing options; (ii) the importance of addressing the perennial delays in fulfilment of conditions for loan effectiveness and other conditions; (iii) the need to improve the depth and quality of FIRRS & EIRRs at all stages of the project cycle to effectively measure costs and benefits; (iv) the importance of demand management to minimize the untimely need of carrying out generation expansion plans to meet peak loads; and (v) the significance of better identification and collection of base-line and post-completion indicators and data on project socio-economic impacts.

20. The principal *recommendations for the Bank* are to (i) focus on broader sector reforms; (ii) enhance dialogue to resolve perennial problems relating to energy pricing, tariffs, mounting outstanding bills and local debts, delays in meeting conditionalities in particular delays in loan effectiveness; (iii) prepare FIRRS and EIRRs at all stages of the project cycle with greater care and

rigour; and (iv) empower country offices to carry out, with the assistance of local consultants and universities, rapid socio-economic surveys as appropriate to facilitate actual impact studies;

21. The main *recommendations for the government* are to (i) deal effectively with the issues of energy pricing, tariffs, and mounting outstanding bills and local debts as well as delays in loan effectiveness and fulfilment of conditions; (ii) entrust tariff revision responsibilities to the utilities and empower the independent regulatory body to oversee tariff revisions; (iii) review the PPAs to make the risk sharing between the electricity utilities and IPPs more equitable; and (iv) carry out effective demand management measures that contribute to reduce the peak demand on which the generation expansion plans are generally based.

1. BACKGROUND

1.1 Introduction

The power sector has been acting as the engine of growth for the Egyptian economy. The Government of Egypt has given high priority to the development of the energy sector and electricity sub-sector in the country and over the last three decades has constructed several new power generation and transmission facilities mainly with financial assistance from multilateral financial institutions and bilateral donors. The Bank Group has been an active partner in this effort through its lending and non-lending operations in the electricity sub-sector.

1.2 Objective, Scope and Methodology of the Evaluation

1.2.1 This evaluation assesses in depth the relevance, achievement of objectives (efficacy), efficiency, institutional development impact and sustainability of Bank Group assistance to the electricity sector in Egypt. It also examines the performance of the development partners and draws lessons for enhancement of development impact of the Bank Group future operations. A with and without evaluation approach has also been applied to underscore the contribution of the Bank's interventions.

1.2.2 This evaluation covers the electricity sector projects shown in Annex 1. The evaluation was carried out based on available documents and reports such as PCRs and PPERs¹ and through discussion with some selected staff from the operations complexes. The field mission findings of OPEV on the Bank operations in the electricity sector of Egypt have also been considered.

2. COUNTRY CONTEXT AND GOVERNMENT STRATEGY

2.1 Country and Sector Economic Context

2.1.1 A policy of economic liberalism since 1970s and introduction of major structural reforms in 1990s in Egypt resulted in deregulation, opening many sectors to foreign operators, restructuring public sector companies and encouraging privatisation. The country managed the shocks of Luxor attacks, falls in the price of oil and the effects of the Asian crisis in 1998 fairly well. However, the country has now moved into a difficult period, as a result of the worsening of the international economic and political environment. The country is currently suffering a slowdown in its rate of growth, a new surge in its budget deficit, pressures on the external accounts and problems in maintaining the stability of its currency, the Egyptian pound. Economic growth has already slowed down since the beginning of the year 2000, and has not yet recovered.

2.1.2 The main constraints to economic development are the low and stagnant domestic savings, the significant and persistent trade deficit in the balance of payments due to stagnation in earnings from traditional exports, and slippages in the implementation of structural reforms and financial sector privatisation and trade liberalisation. The economy continues to be vulnerable to external shocks as a result of its considerable dependence on receipt from international private and official resource transfers, tourism, Suez Canal revenues and exports of oil and gas. In addition, the country's export earnings are derived mainly from products and services with limited growth potential.

¹Project Completion Reports (PCRs) or Project Performance Evaluation Reports (PPERs) have been prepared for 8 projects while no such reports were prepared in four of the early projects.

2.1.3 The energy sector continues to play a major role in the country's economy. Though it represents just 8 per cent of GDP, oil revenue is important to the government, with oil taxes contributing about 3 per cent of the national budget. Petroleum and refined products represent 8 percent of GDP and are an important source of foreign exchange. Crude oil exports provide about 52 percent of foreign exchange receipts from commodity exports. Crude oil production averaged about 830,000 barrels/day in 1998. About 72 percent of oil output was refined domestically. Gas discoveries have encouraged the substitution of gas for oil products in domestic households, industry, and power generation.

2.2 Government Strategy for the Sector

2.2.1 Government strategy considered the energy and power sectors as an engine of growth and as such adequate priority has been given to the development of these sectors. The energy sector in Egypt, in particular the electricity sub-sector, has been expanding rapidly. In the last thirty years, electric power supply has recorded a sustained high annual growth rate of 6.0 to 7.0 per cent as a result of growing electricity demand in industry, agriculture and tourism sectors. In order to ensure that the demand for electricity is met, the Government constructed several new power generation and transmission facilities with financial assistance from multilateral financial institutions, including the Bank, and bilateral donors.

2.2.2 During the past 15 years, power distribution has been extended to most parts of Egypt. The country has also embarked on a program of interconnection with the electricity networks of the neighboring countries.

2.2.3 The demand for electricity is forecast to increase from 68 billion kwh in 2002 to 105 billion kwh in 2005 i.e., at an annual rate of 6%. In order to meet this rising demand, the Egyptian Electricity Holding Company (EEHC) formerly called Egyptian Electricity Authority (EEA) has an ambitious plan of augmenting its current installed capacity of 10,919 MW by another 11,619 MW from 2004 to 2012, with a projected investment of US \$ 7,860 million. The increased capacity is to be set up through public and private sector generation plants operating with natural gas and liquid fuels; and renewable sources such as hydro, solar and wind power.

2.2.4 For meeting the growing demand, the Government's current policy in the electricity sector is two pronged: first to open up generation and distribution to private participation and second to maintain the transmission network as a public monopoly. Thermal power generation projects in the private sector will be provided through Build-Own-Operate-Transfer (BOOT) schemes. It is now also recognized that the expected private sector investments for power generation will by themselves not be adequate to meet the projected power demand growth rate of 6 percent and supplementary public resources may also have to be committed.

3 BANK GROUP POLICY, STRATEGY & ASSISTANCE

3.1 Bank's Sector Policy

3.1.1 The primary objective underlying all Bank Group interventions in the energy sector is to assist member countries in their efforts to provide adequate energy for all economic and social activities at the least possible economic and environmental cost. The Bank Group interventions in the electricity sector in Egypt were all approved in the 1970s and 1980s and were guided by its programming documents of those years and its policy documents such as the Framework for Public Utility Tariff Policy issued in 1983.

3.1.2 Since then, several policy documents, relating to energy sector, environment, gender and poverty reduction, have been issued by the Bank to guide its interventions towards achieving sustainable development in its RMCs. All the electricity projects were financed before 1992, and as such not guided by the many policy documents issued since then.

3.2 Strategy and Assistance in the Power Sector

3.2.1 The Bank strategy during the years when the reviewed projects were approved was to support the government in its high priority for the development of the electricity sector. For the last three decades, the sector has been expanding rapidly. The Bank Group's lending strategy of the time fitted well with that of the Government development programs. They were within the planned generation development programme, covering both the Unified Power System (UPS) as well as the isolated areas, envisaged for supporting various development plans including irrigation, housing and construction of medium and small scale industries and tourism development.

3.2.2 The Bank Group started its lending operations in Egypt in 1974 and has so far approved 44 operations. As at 31 December 2004, the cumulative Bank Group commitments net of cancellations amount to UA 1,166.73 million. These include UA 977.95 million from ADB resources, UA 175.86 million from ADF resources, and UA 12.92 million from TAF resources. In addition, a multinational study grant of UA 3.046 million was granted to the Governments of Egypt and Democratic Republic of Congo, to carry out a Power Interconnection Study. The Bank's intervention in the electricity sector accounts 52% of the Bank's operations.

3.2.3 The Bank Group's interventions in the power sector also started in 1974. To-date, 12 projects (13 loans including 1 supplementary loan) and two studies with a total value of UA 870.93 million were approved (Annex 1). In the past, the Bank supported the expansion of the electricity sector in Egypt through co-financing the development of five power stations (Shoubrah El Khiema, Dameitta, Cairo West, El Arish and El Kureimat), one transmission project (El Kheima Transmission Network) and two Rural Electrification projects (Rural Electrification I and II). The Bank also provided grant funds for the studies of Solar Heat and Conservation and Egypt-Zaire Interconnection. A loan of UA 103.05 million for the Ayoun Moussa Power project was, however, cancelled before the loan became effective. After accounting for other cancellations in implemented projects, the net commitment was UA 628.49 million, of which UA 591.19 million (94.07 %) was disbursed. A total of 12 projects (13 loans) and one of the studies were completed.

3.2.4 The projects were for new generation capacity both for Unified Power Supply (UPS) and for the isolated systems, for augmenting the high voltage transmission network and for rural electrification projects. They have significantly improved the supply capability of the UPS. The construction of the power stations has provided close to 4,000 MW to the UPS while the Rural Electrification projects connected three towns and close to 200 villages.

3.2.5 The Bank was continuously engaged in supporting tariff reforms in EEA/EEHC in line with its Framework for Public Utility Tariff Policy as part of its non-lending activities. Covenants were included in all the loans to initiate tariff reforms and increase tariffs to bring them in line with the cost of supply.

3.2.6 Bank's Country Strategy Papers (CSPs) have been initiated only in the late 1990s and these are revised periodically. The main objective is to support the country's priority implementation of structural reforms that will consolidate the gains of the past and increase the real GDP growth rate to levels required to reduce poverty and the unemployment rate as well as to improve international competitiveness. The

Government's priority areas for structural reforms are privatization, liberalization of the external sector and financial sector reforms.

3.2.7 In the current strategy, assistance will be directed to support the Government's development program of financing activities whose overall objective will be fostering economic growth and sustainable poverty reduction and for creating employment. The strategy in the public utilities sector is to assist the government's efforts in expanding the infrastructure i.e., electricity transmission network expansion, power generation and mini-hydropower development needed to support the fast growing economy. As a part of this strategy, the Bank is presently looking at government's request to finance the El Kureimat extension project with a generation capacity of 750 MWs.

4. EVALUATION OF BANK ASSISTANCE

4.1 Relevance and Quality at Entry

4.1.1 The objectives of the projects were consistent with the country's overall development plans and the Bank's assistance strategy for the country at the time. Most of the projects were based on in-house feasibilities by EEHC, which were acceptable.

4.1.2 Since most of the projects were implemented to meet peak demand, off-peak hours demand have limited capacity utilization to half the load for some of the projects. This situation suggests the need to carry out effective demand management measures that contribute to reduce the peak demand on which the generation expansion plans are based and projects are designed. The interconnection with neighboring countries could also help in exporting the off-peak supply to enhance optimization of the generation plants.

4.1.3 All the projects are *relevant* as they aimed at meeting the basic infrastructure needs for the country. The relevance of the Bank's investment in the country's electricity system is evident when it is noted that when the Shoubra El Kheima Power IV financed by the Bank was completed in 1988, Bank financed capacity constituted 25% of the total steam plant generation capacity in Egypt.² Again, in 2003, a total of 3,884 MW capacity financed by the Bank constituted about 31% of the installed capacity of 10,919 MW in the country. *This clearly shows the counterfactual outcome of the interventions that underscores the importance of the Bank's interventions, without which, the country's power shortage would have had negative impact on the socio-economic development of the country.*

4.2 Achievement of Objectives (Efficacy)

4.2.1 The main aim of the Bank's long-term association since 1974 with the government was to support the government's efforts to make electricity available with high reliability of supply to meet the growing demand for electricity for development of other key areas of the economy. The objectives of the projects were to enhance the generation capacity, to augment transmission and distribution lines and to extend rural electrification to uncovered areas. The Bank financing was largely for the creation of physical assets. The Bank also aimed to introduce tariff and accounting reforms through continued dialogue as part of its non-lending activities.

4.2.2 The specific objectives of the projects are noted in Annex 1. The projects cumulatively aimed to provide 3884 MW of largely peaking electricity generation capacity, and expansion/ strengthening

² Proposal for a Supplementary Loan of UA 42.10 million for the Cairo West Power Extension Project. Board Note ADB/BD/WP/91/149 of 14 November 1991.

of some transmission and distribution lines. The two rural electrification projects comprised construction of 1,632 km of 33kv/11kv/0.4kv overhead lines and 84 km of underground cable, besides installation of 136,000 single phase and 3,550 three-phase house service meters.

4.2.3 The objectives of physical creation of assets for generation, transmission and distribution of electricity and meeting the increasing electricity demand were fulfilled and in some cases, such as the Damietta Power Plant, exceeded. The plants are also producing electricity in comparatively cost-effective manner through the use of modern state-of-the-art generating base-load units and an increasing use of natural gas (local product) as a fuel.

4.2.4 The Bank's continued engagement in the sector for a period of over almost two decades had been instrumental in bringing the tariff levels close to Long Run Marginal Cost (LRMC) by 1994, which helped to introduce some financial robustness in the electricity sector utilities and made them more attractive for private sector participation in power generation. However, since then, coinciding with the withdrawal of Bank and other donors from financing public sector generation projects, there has been disruption in the policy of tariff reforms and the receivables from government entities have again risen as a result of lack of full autonomy for tariff revision and institutional mechanism for timely payments.

4.3 Efficiency of Implementation

Cost of Generation and Transmission

4.3.1 The generation projects were effective in producing electricity in a cost-effective manner, notwithstanding the distortions in energy prices. All the project plants, being capable of dual firing with *mazout* oil and natural gas, facilitated the increasing switch over and use of natural gas that helped lower the cost of generation. All the base-load stations i.e., Shoubra El Kheima, Damietta, Cairo West Extension and El Kureimat power plants are now mostly using natural gas. Substitution of natural gas for *mazout* results in cost savings of generation of about 10-15%.

4.3.2 The PPER for the El Arish Power project notes that "energy generation efficiency as measured by fuel used per kwh produced and overall cost of production per kwh has been constantly improving over the years. In particular, there has been a saving in fuel cost since Natural Gas has been used instead of *mazout*. The overall production efficiency has been enhanced over the years through cost reduction measures and using Natural Gas. The saving in using Natural Gas is about LE 144,121 (about US\$25,000) per month per unit. Besides, the use of Natural Gas has the added advantage of enhancing longevity of the life of the plant and is pollution free. ..." In addition, the new plants incorporating the most modern and state-of-the-art technology available at the time are fuel efficient and result in substantial cost savings through more economical use of gas.³

4.3.3 The Power II and the Shoubra El Kheima Power Interconnection projects were efficient in evacuating the power generated from their respective generating stations. The extension of the rural electrification network of the country under the Bank's Rural Electrification I&II projects was also efficient in bringing electricity to the masses. These projects have facilitated provision of cheap

³ For example, at the Damietta Power plant, the recorded specific fuel consumption at the combined cycle project plant in 1993 and 1994 was 185 g/kwh and 170 g/kwh respectively, compared with the average specific fuel consumption of thermal power stations in the UPS in 1992-1993 of 241g/kwh and least consumption at any of the other plants was 216g/kwh. In view of its fuel economy, this plant operates as a base load plant. Similarly, the Shoubra El Kheima, Cairo West Extension and El Kureimat power stations also operate at a high efficiency with a fuel consumption of 210 to 225 g/kwh.

electric power for domestic lighting, industrial, commercial and agricultural use in the 3 towns and close to 200 villages they helped electrify.

4.3.4 In totality, the projects have been efficient in making a significant contribution to the country. Egypt is reported to have achieved 100% electricity coverage in urban areas and almost 95% coverage in the rural areas. The planned expansion program is to meet the increasing electricity demand, which stands at 6 per cent per annum.

Implementation Schedules

4.3.5 Implementation has been satisfactory in spite of delays particularly for loan effectiveness. A competent executing agency and the Bank's long-term presence in the sector helped achieve satisfactory implementation. Except the Shoubra El Kheima power I, II and III project that was completed 10 months ahead of schedule, all the other projects suffered delays ranging from 8 months to 37 months (Annex 2).

4.3.6 *One of the principal reasons for delays in virtually all projects in Egypt was the difficulty in achieving loan effectiveness in time.* In Egypt, loan effectiveness has to be preceded by parliamentary ratification for each loan, and this being a prerogative of the People's Assembly is beyond ministerial control. The Bank has taken up this matter as a countrywide issue applicable to all sectors. The Bank has agreed with the government that for future projects, timetables will be prepared based on experience gained and setting out a realistic target for loan effectiveness.⁴ Apart from the delays in loan effectiveness, the other reasons for delay included delays in procurement and design, in start-up of activities and in arranging substitute donor financing in lieu of withdrawn pledges of such assistance.

Cost and Loan Variations

4.3.7 The two loans for the two Rural Electrification I & II projects of UA 8 million each were financed from the ADF. All other loans were from the ADB resources. Significant loan savings were recorded in the projects as shown in Table 1.

Table 1: Loan savings in projects

Project	Loan Savings	
	Amount (UA)	Percentage
El Kureimat Power	132.46 million	52.98 %
Cairo West Power Station Extension Supplementary loan	14.87 million	35.32 %
Shoubhra El Kheima IV	11.824 million	27.18%
Damietta Power	10.719 million	10.41%
Rural Electrification II	4.918 million	61.48%
Shoubhra El Kheima Interconnection	4.732 million	22.12%

4.3.8 Variations in project costs, both over and under runs, are shown in Annex 3. Cost over-runs were minor, ranging between 4.87 % and 23.77 %. Cost under-runs were larger ranging from 16.8% to 48.24%, mainly caused by favorable currency regimes and international market conditions and substantially lower costs of most project components. It is also interesting to note that in the Damietta Power plant, substantial savings could have been achieved due to the favorable conditions encountered

⁴ EGYPT: 2000-2002 Country Strategy Paper, November 2000.

in international competitive bidding. The EEHC, however, chose to instead get a third unit, which was an almost 50 % extra capacity financed from its own savings. This resulted in an overall project cost overrun of only about 16-17 % but as the third unit was financed by the borrower's own resources there was a saving of UA 10.719 million in the Bank loan. As a consequence, the unit cost estimated at appraisal at UA 506.37 per installed KW actually amounted to only UA 313.97 per installed KW i.e. a saving of UA 192.40 per KW or 38 % of the original estimate.

Internal Rates of Return

4.3.9 Financial & Economic Internal Rates of Return estimated at the time of appraisal and after project completion are shown in Annex 4. In all the projects in which re-estimation has been done, the IRRs exceed the cut-off rate of 10% and are financially/ economically viable. However, in general, the calculation of the rates particularly the economic internal rate of return (EIRR) in the earlier appraisal reports and the post-completion reports was not rigorous. The EIRR calculations did not fully apply shadow-pricing methodology; and even when applied, it was very arbitrary and all parameters were not provided to facilitate validation. To provide clarity, improve quality of EIRR assessments and also facilitate comparability of results at different stages of the project cycle estimation of EIRR and risk and sensitivity analyses at appraisal, PCRs and PPERs must be carried out with greater care and rigor and must also include and indicate in the reports all parameters used for the calculation of the rates.

Financial Performance

4.3.10 The overall financial performance of EEA/EEHC has been marginally positive over the years. The low tariffs and the devaluation of the Egyptian Pound have contributed to the low level of net income after interest. The tariff rates were increased five times between 1987 and 1992; there was also a small increase of 4% in 1993/94. Moreover, the short-term liquidity position of EEA/EEHC has by and large been unsatisfactory. Ministry of Finance and other governmental offices owe a large part of the current liabilities. EEA/EEHC's debt/equity ratio had also been very poor and had been deteriorating since 1998/99. Government had engaged itself in 2002 to clear the accumulated receivables over a period of two years. This had been achieved. But bills are again accumulating since then. The financial viability of the utilities is again likely to be seriously jeopardised. Internally generated funds have been short of EEA/EEHC's debt service requirements over the years. EEA/EEHC has continued to depend heavily on borrowings for its capital investment.

4.4 Overall Outcomes

Formal rating has been recorded only in the post-completion reports of El Kureimat and El Arish power projects. The aggregate ratings of 3.0 and above in both the projects indicates overall satisfactory outcomes for these projects. Field findings revealed that the overall outcomes of the Bank's interventions in the electricity sector have been satisfactory.

5. PERFORMANCE OF DEVELOPMENT PARTNERS

5.1 Bank Performance

5.1.1 Bank performance has been satisfactory in providing the needed finance and engaging through its conditionalities to bring about tariff increases. Significant improvement in tariff levels was achieved as a result of Bank's long-term engagement in the sector. However, Bank's field supervision was inadequate in latter years and depended largely on the reports of the projects' engineering and supervision

consultants. It is also noted that: *“in the power sector, the Bank was generally detached from broader sector reforms, which were being implemented with the help of other bilateral donors such as the USAID and KFW. There was little involvement by the ADB in the development of the electricity sector strategies, in the prioritization or selection of the projects for which funding was sought or in the upgrading of management and planning capabilities in the various national power utilities”*.⁵

5.1.2 Until 1992, in the absence of a Logical Frameworks (which was not mandatory at the time), appraisal reports had not identified performance indicators to evaluate the achievement of the appraisal objectives of making electricity available in a cost-effective manner. There were also no indicators identified to measure the impact of the projects in the development of key areas of the economy.

5.1.3 In the past, other donors such as the World Bank, USAID, etc have largely driven the policy dialogue and sector reforms in Egypt. At this stage when the Bank is now likely to return to financing power projects in Egypt after an interregnum of 12-13 years, the Bank needs to be more proactive in these non-lending activities. This would enable the Bank to develop its own effective strategies to underpin its Vision and also assist the countries to design appropriate development and poverty alleviation strategies and participate in sector reforms. It needs to be noted that the *lack of non-involvement of the Bank in sector reforms should not be viewed in isolation in assessing Bank performance. If others, such as the World Bank are strongly engaged in sector reforms, it does not follow that the Bank should be engaged with no value addition. Instead, what is more important for the Bank is to have the capability and a clear mechanism to actively collaborate to express its views on the reforms and contribute effectively in areas that best address its Vision.*

5.2 Borrower Performance

5.2.1 EEA/EEHC was the executing agency. Its performance in project implementation had been satisfactory. Managerial and technical competence of EEHC is high. It has an effective and ongoing training program for its staff at all levels. It has generally executed and operated the projects well. In recent years it has successfully carried out significant sector reforms with the assistance of the World Bank, USAID and other bilateral donors. It has also been able to implement private sector power generation projects by three IPPs.

5.2.2 Delays in timely fulfillment of conditions of loan effectiveness have been a perennial problem with the Borrower. The Bank has taken this matter as a part of its country dialogue. Another major area of concern of the Bank was the delayed or non-fulfillment by the Borrower of loan conditions such as tariff increase, outstanding receivables, conversion of local debts into equity, etc.

5.3 Co-financing & Donor Co-ordination

5.3.1 The Ministry of International Cooperation (MIC) is the main representative of the Government of Egypt as Borrower. It is responsible for coordinating external assistance. It is also responsible for ensuring compliance with loan conditions and covenants. The Ministry of Foreign Affairs meanwhile is responsible for coordinating assistance from UNDP and the United Nations system, while technical cooperation under regular programs of the United Nations specialized agencies is coordinated by the respective sector ministries.

5.3.2 A Donor Assistance Group comprising both bilateral and multilateral institutions represented in Egypt coordinates Egypt's external aids. In the past, the Bank co-financed its power projects with a number of other bilateral and multilateral donors such as the Arab Fund for Social & Economic

⁵ The Bank's Energy Sector Study in Egypt, Morocco and Tunisia (March 1998)

Development (AFSED), Canadian International Development Agency (CIDA)/ EDC (Canada), COFACE (France), Electricite de France (EDF), European Investment Bank (EIB), Government of Italy, Islamic Development Bank (ISDB), OECF (Japan), Saudi Fund (SF), USAID and the World Bank.

5.3.3 The major power projects financed by donors in Egypt are: Ayoun Moussa Power Plant financed by Arab Fund; Sidi Krir I Power Plant financed by Arab Fund and Kuwait Fund; Cairo North I and II Power Plant financed by EIB, Arab Fund, Islamic Development Bank and OPEC Fund; Nobaria I and II Power Plant financed by EIB, Arab Fund and Kuwait Fund; Talkha Power Plant (750 MW) by EIB, Arab Fund and Kuwait Fund; and El Kureimat Power Plant (Module I) by EIB and OPEC Fund. El Kureimat Power Plant (Model II) is now being considered for financing by the Bank. Several bilateral donors, such as the Government of Japan, have been providing financial assistance for the development of new and renewable energy resources in recent years. Donors such as CIDA, GTZ and USAID have been supporting institutional capacity building at EEHC on long-term basis. The World Bank, KfW, and EIB have been mainly engaged in sector reforms of the energy sector and electricity sub-sector. Regarding the main sector issues the donor community, including the Bank, generally agree on the need for GOE to rationalize energy prices and enhance private sector participation in the sector.

5.3.4 In the past, Bank coordination with other donors was not strong and it was mainly in the form of exchange of views with them during ADB missions to Egypt. The presence of a resident office in Egypt is reported to have improved the outlook for Bank Group coordination with other donors. No major problems of donor co-ordination were noted in PCRs/PPERs of the reviewed projects.

6 IMPACT OF BANK ASSISTANCE

6.1 Socio-economic Impact and Poverty Alleviation

6.1.1 Linking socio-economic change specifically to electricity projects is difficult since electricity demand is a derived variable and variety of other factors and inputs are usually involved in cases where electricity demand is increasing. Nevertheless, there is no doubt that there is direct benefit to consumers who switched over to electricity from other costlier sources of energy such as kerosene. It is also generally recognised that the supply of adequate and reliable electricity contributes to the development of the served areas due to increasing socio-economic activities and attendant job creation first in the utilities and later as a result of new economic opportunities arising from establishment/expansion of industrial units and growth of tourism and agriculture activities. Farmers benefit from implementation of land reclamation programme for agriculture development. Availability of electricity also improves the quality of life of many people including the poor adding convenience to everyday life and access to work, education, health and recreation.

6.1.2 A few of the PCRs/PPERs have qualitatively noted specific socio-economic development that has likely been facilitated by supply of electricity from the projects. For example, it is noted in the PCR for the El Kureimat Power project, that the area, which was a desert has been transformed into agricultural fields spawning further increase in activities related to agriculture and commerce. Agricultural and dairy farming activities in the surrounding areas would almost certainly contribute to employment generation and alleviation of poverty. Similarly, it is noted in the PPER of the El Arish Power project that a lot of progress has been made to transport water from the Nile for purposes of irrigation following implementation of this project. In addition, setting up or expansion of industries such as (granite and marble) quarries, cement, and paper factories; olive oil extracting and wheat processing

mills etc. and services for activities such as workshops, garages, gas stations facilitated by availability of electricity is again contributing to employment generation and poverty alleviation.

6.1.3 The EEHC's uniform lifeline tariffs for small domestic consumers and a low tariff for smallholder agricultural consumers (to encourage fresh graduates and small holders to carry out farming activities) that involved cross-subsidization for the benefit of the weaker sections of the society also helped in the poverty alleviation efforts through out the country.

6.1.4 Estimation of benefits at the macro level has been attempted in the Bank's Energy Sector Study for Egypt, Morocco and Tunisia. It has conservatively estimated the cost of unmet demand representing hypothetical economic losses as \$ 0.20/kwh (UA 0.14/kWh) for industry and \$ 0.05/kwh (UA 0.034/kWh) for domestic users. The Energy Sector Study sums up the socio-economic benefits of all power projects in Egypt as follows: *"the total economic impact of the ADB-supported projects, in terms of economic losses avoided, can therefore be estimated at nearly UA 1.2 billion per year. This is about 4% of the total GDP⁶. The precise degree of credibility which should be attached to any of these figures is debatable; it can nevertheless be safely said that if the power stations supported by ADB loans had not been built, Egypt would have been subject to chronic and economically damaging power shortages with extremely large economic losses."* In totality, it can safely be stated that the projects have made a significant socio-economic impact, although disaggregated attribution of benefits between beneficiaries is not possible in the absence of any base-line data or post-completion economic and impact surveys to effectively assess the contribution to poverty alleviation.

6.1.5 One of the major hindrances to the preparation of a more specific and quantitative assessment of socio-economic impacts is a lack of databases and actual data not only in Egypt but also in all RMCs. The tight time schedule for most of the appraisals and self and independent evaluation on or after project completion does not permit any serious effort to collect and analyse the available statistics or to conduct sample studies for some primary data collection. Thus, absence of reliable baseline and post-completion data is hampering conduct of meaningful impact evaluations for credible assessment of Bank's past operations. It is recommended that until such data becomes available from more contemporary and better prepared appraisal reports and PCRs/PPERs, some of the important impact studies should be carried out in a two-stage process. In the first stage collection of data, including carrying out of rapid socio-economic surveys, where appropriate, need to be entrusted to selected qualified local consultants/ universities. Such first-stage data collection reports would then be more comprehensive and would be able to better fill the data gaps and provide credible information that could form the cornerstone of the actual impact studies to be carried out in the second stage. To better focus on the impact of Bank interventions in its core area of concern of poverty alleviation and devise measures to improve and enhance it, the Bank may like to undertake such two stage impact assessments in some selected countries and sectors.

6.2 Impact on Gender

No specific baseline or post-completion data (other than general and qualitative indications or assessments) about the impact of the projects on women is available in the appraisal reports or PCRs/PPERs. Appraisal and PCRs/PPERs in general state EEHC's practice of giving job opportunities to women affording them also opportunities to rise up the leadership ladder. The PPER for the El Arish Power project noted that female employees represent about 15 percent of the total work force in the holding company and the affiliated companies. With respect to the projects, there is clear assertion that the availability of electricity has improved the quality of life of the population, including the women

⁶ The actual contribution, as opposed to this hypothetical loss, is very much lower at about 0.6% of annual GDP.

adding convenience to their everyday life and access to work, education, health and recreation. It helps in reducing the drudgery of some daily chores and manual activities through use of motive power and home appliances such as pumps, washing machines, freezers and refrigerators, mixers, electric ovens etc., of which women are the major beneficiaries. Similarly electricity improves quality of life at home through availability of electric lighting, televisions, audio systems, air conditioners etc. where again the women are equal beneficiaries.

6.3 Environmental Impact

6.3.1 The government has renewed its commitment to tackling environmental problems related to development projects. In 1997, an independent ministry, the Ministry of State for Environmental Affairs (MSEA) was created to take over responsibilities widely spread out over a large number of ministries and government bodies. This Ministry promulgates environmental legislations and enforcement is being ensured at various levels.

6.3.2 At appraisal of the first generation projects (in the 1970s and early 1980s), comprehensive environment impact assessment and preservation was not of major concern at Bank and international community level. The appraisal reports of late 1980s did selectively elaborate on the positive and negative environmental impacts and the related measures to mitigate the latter.

6.3.3 The large generation units installed under the Bank projects are environment friendly as they now mainly operate on natural gas with in-built emission monitoring and control systems. The environmental impact at the stations and the incremental concentration of pollutants with regard to SO₂ and NO₂ attributable to the new units is generally reported to be below required norms of Egyptian, US EPA and World Bank ambient air quality standards.

6.3.4 The PCRs/PPERs note that the plants have efficient industrial and wastewater treatment plants. Oil/ water separators have also been installed to prevent any oil spilling into the Nile. Temperature difference in water discharged back into the Nile is kept within low limits to prevent any harm to aquatic life in the river.

6.3.5 The plants generally operate on a very low noise level, below the accepted standards. Sound attenuation is achieved by inlet, exhaust and generator silencers. The noise levels are within the standards of the US Environmental Protection Agency.

6.4 Private Sector Participation

6.4.1 The Bank's long term lending activities and conditionalities on tariff and accounting reforms have paved the way for private sector participation in the electricity sector. This has been reinforced further by the Government's reform efforts over the years that help prepare the electricity sector to be operated on commercial lines and some degree of autonomy. Already, the government has introduced BOOT projects in the generation segment of the electricity sub-sector activities. Under this arrangement, there are currently three international independent private power (IPP) operators.

6.4.2 Ambitious generation expansion plans of EEHC were developed for private sector plants until the year 2012 (Table 2). Three BOOT private sector power stations of a total generation capacity of 975 MW have already become operational between 1999 and 2001. There are plans to set up another 6,550 MW of generation capacity in the private sector between 2004 and 2012 with an estimated investment of US \$ 4,900 million.

Table 2. Generation Expansion Plans of EEHC

	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Proposed capacity through private sector (MW)	850	900	-	1050	500	300	2300	200	450	6550
EEHC financed capacity (MW)	30	700	714	-	500	1300	325	500	1000	5069
Total planned capacity (MW) addition	880	1600	714	1050	1000	1600	2625	700	1450	11619

6.4.3 There is however a temporary setback and a virtual halt to the privatization programme in the sector. This is because of the high cost of generation at the recently installed private sector plants caused by a devaluation of Egyptian pound and the entire risk on this account having to be borne by EEHC (the purchaser of electricity) in accordance with the terms of power purchase agreements (PPAs). The risk-sharing pattern between the utility and the private operators will need a very critical scrutiny to make the generation costs more competitive.

6.4.4 The separation of the regulatory body from executive functions as well as the limited removal of subsidies in the electricity sub-sector have made it easier for the various electricity utilities (generation companies, transmission company and distribution companies) to operate on full cost recovery basis. This has also created a sense of competition among the companies to deliver their services more efficiently and cost effectively than it used to be in the past when only one public service provider was involved. However, the fact that tariffs are still controlled by the government and no clear mechanism for periodic tariff increases even to take account of inflation has yet been approved, the enabling business environment could not be considered to have been realized fully.

6.5 Regional Economic Integration

6.5.1 The Government is very active in economic integration and regional co-operation particularly in the electricity sub-sector. The Bank's interventions have contributed in particular in enhancing the power interconnection efforts of the Government with neighbouring countries. Works on the interconnection of the power grid to link Egypt to Jordan were commissioned in July 1999. The country is also linked to Sudan. Its link with Syria and Turkey allows the country's power transmission system to be interconnected to the European electricity network. A Bank financed feasibility study of a Direct Current Very High Voltage transmission line linking Egypt to Inga Dam facilities in Democratic Republic of Congo (DRC) has been completed sometime ago. DRC-Egypt interconnection line has the potential of becoming the backbone of a trans-African power interconnection network. However, there is no indication that this project would be realised in the foreseeable future.

6.5.2 Recognizing their common concerns and interests, the Nile riparian countries⁷ have cooperated in the establishment in 1999 of the Nile Basin Initiative (NBI). The \$ 12 million Initiative is partly

⁷ The NBI currently includes nine Nile riparian countries: Burundi, Democratic Republic of Congo, Egypt, Ethiopia,

funded by the Bank and has also received funding/ pledge from the Governments of Norway and Sweden. The initiative is guided by a Shared Vision “to achieve sustainable socio-economic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.”

6.5.3 The Shared Vision Program comprises seven thematic projects including a regional power trade project (RPT). The long-term goal of the RPT is to improve access to reliable and low-cost power in the Nile Basin in an environmentally sustainable manner. An important element in achieving this goal is to create an effective institutional mechanism to promote and develop power trade opportunities among the countries participating in the NBI. The creation of a regional electricity market can play a key role in furthering cooperation among the Nile Basin states and in ensuring that the hydropower resources of the Nile Basin are developed and managed in an integrated and sustainable manner.

7 INSTITUTIONAL DEVELOPMENT IMPACT

7.1.1 At appraisal of the Bank projects under review, none of the on going far reaching institutional reforms were foreseen or included as components of Bank projects. The Bank pursued institutional development through its conditionalities while other donors were involved in financing most of the soft technical components as part of the sector reform efforts.

7.1.2 EEHC has carried out, in recent years, significant institutional reforms with the assistance of other donors such as USAID, CIDA and GTZ. GOE’s institutional policy orientation in the electricity sector was two pronged: first to open generation and distribution to private participation and second to maintain the transmission network as a public monopoly. With these reforms, the government intends to streamline electricity sector’s contribution to the socio-economic development of the country and create adequate conditions for private sector involvement in power generation and distribution in Egypt. As a result of these efforts, the energy sector has undergone significant changes. Legal and regulatory framework of the sector is improving and state monopoly is now limited to power transmission activity. Major restructuring of the sector has been achieved by unbundling of the erstwhile Egyptian Electricity Authority (EEA) into Egyptian Electricity Holding Company (EEHC) (a joint stock company), Egyptian Electricity Transmission Company (EETC), 5 Generation companies and 8 Distribution companies.

7.1.3 The unbundling has facilitated the various companies to introduce commercial norms in their management and operations. Generation and transmission projects are approved and loans for such projects are secured by EEHC and loans from external donors are guaranteed by the Central Bank. The power generation is now open to private investors through BOOT. Although currently, the full ownership of the various companies, except the three IPPs, is with the holding company/government, the production and distribution companies have been given some level of autonomy. No more Government subsidy is provided but the utilities cannot increase tariff to meet the cost of supply. This unbalanced autonomy is adversely affecting their financial viability.

7.1.4 Further restructuring is foreseen for the other authorities such as Rural Electrification, Hydro Power Projects, Atomic Energy, Nuclear Power, Nuclear Material and New and Renewable Energy.

7.1.5 Electric Utility and Consumer Protection Regulatory Agency (EUCPRA) has also been established as a regulatory agency in 2000. The Agency is responsible for regulating, monitoring and controlling all matters related to electricity supply and support lawful competition in the generation,

transmission, distribution and supply of electricity. The Agency will also facilitate consumer protection as it aims at investigating consumer complaints to ensure protection of their interests and settlement of any disputes that may arise among the parties involved in the activity. This is likely to particularly protect the vulnerable segments of the population. The Agency needs to be fully empowered to oversee tariff revisions proposed by the utilities.

8 SUSTAINABILITY

8.1.1 There have been no issues of the technical quality and capacity of plants and accessories. Most of the plant units at the major projects are all state-of-the-art technology and efficient units and functionally well. Their technical sustainability is assured all the more with the availability of qualified manpower. All projects also have satisfactory operation and maintenance regimes in place and no serious problems have been faced in this regard. EEA/EEHC is a competent and sound utility and has more than forty years of experience in operating thermal power stations. It has a pool of well-trained technical, commercial and administrative staff. Their skills are continuously updated through regular training programmes at all levels. Raw materials, particularly fuel oil and natural gas supplies are domestically assured. Energy coverage ratio for Egypt continues to show surplus. Technical and operational sustainability is not, therefore, an issue.

8.1.2 The projects are generally environmentally friendly and this has been enhanced due to the progressive use of natural gas instead of *mazout*. Regular monitoring of the level of emissions and wastewater discharges is required to ensure the environmental sustainability of the project.

8.1.3 The biggest challenge to the government is now to correct the distortions on the prices of inputs and electricity tariffs for improving the financial viability of the utilities. Similarly the issue of unsettled Government bills for electricity consumed continues to undermine the financial health of the utilities. Since clearance of most of the bills in 2002, bills are again accumulating. Timely payment has not been institutionalised.

8.1.4 In general, the issues of energy pricing, tariffs, and outstanding bills and mounting local debts (mainly resulting from cross indebtedness) have yet to be dealt with. The Bank needs to be proactive to take up these issues with the Government while considering new interventions in the electricity sector. Unless these issues are addressed as a matter of urgency, the utilities will continue to have serious constraints to financial sustainability.

9 KEY ISSUES FOR ENHANCEMENT OF DEVELOPMENT EFFECTIVENESS

9.1 Tariff and Energy Pricing

9.1.1 All the projects had covenants requiring the utilities to revise their tariffs and generally relate them to costs. The utilities were, however, able to only partially meet this requirement and the tariff adjustments were generally inadequate.

9.1.2 It is noted from PCRs and PPERs that in the past tariff increases were slow in enforcement and were inadequate. Since 1992 (coinciding with the discontinuation of the Bank's financing of power projects in the country), except for an increase of about 5% in 1994, there has been no revision of tariffs and even the past gradual increases have stopped. It was reported that in 1994 the tariffs were close to long run marginal cost (LRMC) but discontinuance of donor financing in major power projects have acted as disincentive to the Government to increase tariffs.

9.1.3 Any increase in tariffs to bring them closer to the cost of service lay with the Government. The issue of increasing tariffs has always been sensitive. The Government's willingness was usually constrained by political sensitivity in the matter. There was general reluctance or hesitancy and delay in granting tariff increases. By the time new tariff rates were applied, the inflation in the intervening period would render the tariff increases inadequate. The continuing devaluation of the Egyptian currency has substantially increased the cost of investment and debt servicing liability in the books of the utilities, thereby jeopardizing the utilities' financial health and long-term sustainability.

9.1.4 There are also distortions in the actual tariff levels. The most recent PPER for the El-Arish Power project (May 2004) noted that at their current levels some major customers such as Very High Voltage users (large scale industries) and agriculture (small holders up to 500 kwh) and small domestic consumers (there is a lifeline rate for the first 200 kwh) all pay below cost. In addition, inexplicably, there is no levy of a capacity charge for the high voltage consumers. Only the Medium and High voltage consumers however pay the full cost of supply.

9.1.5 In June 2002, EEHC had undertaken a comparative tariff study comparing Egypt's electricity tariff with some Asian, European, Middle Eastern and African countries. The current average tariff rate in most African countries ranges from 3.4 US cents per kwh to 6.8 US cents per kwh. Egypt's average tariff rate currently at 2.23 US cents per kwh is relatively low. The study also highlights the irrational cross-subsidization pattern in Egypt between different classes of consumers. There is a need to revisit and study the tariff structure and relate tariffs to the cost of production as a matter of urgency not only in Egypt but also in other RMCs. There should be a return to the principle of LRMC in the setting of tariffs. In Egypt, as an immediate measure there is room to raise the tariff rates particularly those for the Very High Voltage consumers so that EEHC's financial health and long-term sustainability is not jeopardized.

9.1.6 It is also essential that public sector entities in the electricity sector be allowed autonomy in their ability to timely adjust tariffs in accordance with their business needs and with automatic in built adjustments for inflation. Since an independent regulatory authority that can protect the interests of all stakeholders, including the consumers, has already been set up, the requirement of a government approval for every increase needs to be dispensed with.

9.1.7 In developing countries, the tariff structure for the poorer and weaker sections of the society has to be designed not for reasons of economic efficiency alone but has also to factor in equity considerations so that the level of tariffs for the disadvantaged and vulnerable groups is not beyond their capacity to pay. The inevitability of cross-subsidization for provision of lifeline-subsidized rates of electricity to select disadvantaged groups has to be fully recognized. EEHC's lifeline tariffs for small domestic consumers and a low tariff for smallholder agricultural consumers (to encourage fresh graduates and smallholders to carry out farming activities) involving cross-subsidization to benefit the weaker sections of the society were in pursuance of this objective. However, the subsidy to very high voltage consumers both in terms of lower-than-cost tariff and non-levy of capacity charge and support to other than the non-disadvantaged consumers is unsustainable. It is important that the cross-subsidization and lifeline tariffs are provided only for the deserving categories of consumers while economic efficiency considerations guide the fixation of tariffs for all others.

9.1.8 The privatization programme in the sector has had a major setback because of the high cost of generation at the recently installed private sector plants. It has been caused by a devaluation of Egyptian pound and the entire risk on account of currency fluctuation having to be borne by EEHC (the purchaser of electricity) in accordance with the terms of PPAs. At the generation level, there is a marked disparity in the rates allowed to the private independent power producers (IPPs) and the public generation companies, which has put the public utilities in a situation of unfair competition. At present, three IPPs are operating under the BOOT scheme. Based on the relevant power purchase agreements

(PPA), the IPPs are allowed both a Capacity Charge and an Energy Charge.⁸ About US \$ 100 million is paid every year to the IPPs (US\$40 million for Energy despatched and US\$60 million for Capacity charge). At the start of private operations in 1999, the dollar-designated tariff paid to the IPPs was under 9 piesters (US cents 2.37 to 2.54) per kwh. But now with considerable depreciation of the Egyptian pound over the last few years, the rate in Egyptian currency has gone up to 14 piesters/ kwh, even while the dollar designated rate remains the same. With payment to IPPs at such a rate, the distribution and transmission utilities have to actually pay more for buying electricity than what they realize from customers. In a depreciating exchange rate regime, the designation of tariffs in dollars, even without dollar price escalation, will inevitably involve local currency rates becoming unviable over time.

9.1.9 In addition, 70% of the fuel requirement has to be supplied at all times to ensure the minimum despatch. The fuel portion of the cost is a pass through in PPAs. The IPPs purchase the fuel from domestic petroleum companies in Egyptian currency denominated prices. Nevertheless, the PPAs provide for a currency-fluctuation-related price escalation in fuel cost to the IPPs even though no such cost is incurred. In the circumstances there would appear to be little justification for a currency-fluctuation-related price escalation in fuel costs that lead to payment of inflated tariffs to IPPs. There is clearly a need to jointly review the PPAs with IPPs and rationalize and revise the payment terms therein.

9.1.10 Another major issue in the energy sector is the question of heavily subsidized input prices, which are well below the economic world market levels. There is continued distortion in both input and output prices, which inhibits the efficient allocation of resources and also impacts the financial performance of the electricity companies. As an example, both the heavy fuel oil, called Mazout, and natural gas are sold at prices far lower than their respective economic prices. The concern on pricing is all the more important and a matter of urgency in view of interconnection of Egyptian system with the Middle East and European systems. For an efficient utilization of resources and fixation of cross-border tariff rates, it is important that input prices reflect the border prices and the correct economic cost to the economy.

9.2 EEHC Receivables and Local Debts

9.2.1 The financial woes of the utilities arising from inadequacy of tariffs are further compounded by the heavy amounts of receivables, largely from the government and government controlled entities, payable by the Ministry of Finance. The short-term liquidity position of EEA/EEHC has been by and large unsatisfactory. The overdue from government and its controlled offices constitutes a very substantial part of the current liabilities. It needs to be recognized that ignoring the liability of payment of electricity bills for months and years not only affects the financial health of the utilities but also engenders in the concerned offices a sense of irresponsibility towards electricity consumption and encourages wasteful consumption.

9.2.2 A large part of the operating costs and capital investment are covered through short, medium and long term loans and heavy receivables necessitate larger loans and greater interest charges adversely affecting the financial health of the utilities. Concerted efforts were made in 2002 to clear the past backlogs relating to receivables and local loans by settling them and converting the latter into equity. But bills and local loans have again been accumulating since then because the effort to clean up the old dues was not accompanied by any institutionalized mechanism for timely payment of government and government-controlled entities. One-shot actions being reversible are not sustainable and can never be

⁸ The Investment Guarantees and Incentives Law, Law No. 8 of 1997, incorporates certain benefits of Tax Exemption, Currency Conversion, Repatriation of Profits, Protection against Nationalization or Expropriation... etc., to the developers, contractors and investors.

substitutes for organizational and process strengthening. Strong mechanism on par with the system of incentives and penalties (including disconnection option) applicable for private consumers is required to be institutionalised for government entities as well to ensure timely payment and avoid a rebuild up of arrears and wasteful consumption.

9.3 Demand Management

9.3.1 A major part of past investments for generation in the power sector in Egypt was made for meeting peak demand because of a large gap between the normal and the peak demand. For full demand satisfaction, system capacity has to match the total of peak demand plus the reserve margin. It follows that reductions in the reserve margin and peak demand would correspondingly bring down the quantum of capacity addition and fresh investments, thereby reducing the financial burden on the utilities.

9.3.2 EEHC has initiated a number of steps for demand management to reduce the gap between peaking and average demand. There is also a lot of improvement in maintenance to reduce the reserve margin. The interconnection with Middle East and Europe will also help to reduce the reserve margin and export off peak supply.

9.3.3 In order to decrease wasteful consumption, a committee has been set up to study energy conservation in lighting in Government buildings -such as type of building, distance of poles, height of poles, etc. Ministry of Finance is actively involved in this since it is the one that picks up the bills for electricity consumption of the public sector.

9.3.4 A number of initiatives noted above have already been taken. However, transmission and distribution (T&D) losses in UPS are still high. In 2000-2001, the T&D losses were about 16 percent. The transmission losses at 5.2 percent are high and the benchmark has been set at 2 percent. Similarly even though the overall distribution losses stand at 10.8 percent, these are considerably higher in Cairo and Alexandria metro areas at 14.4 and 14.0 percent respectively. A target of 10 percent has been set for these metro areas. In order to bring down the gap between peak and off-peak demand, it is critical that the demand management efforts need to be buttressed and intensified and the programme of technical reinforcement and upgrading of both transmission and distribution systems is expedited. Besides, the installation of universal tamper-proof house service meters could bring down the non-technical losses. Introduction of a number of additional steps such as (i) energy efficient equipment in industry and commercial activities, (ii) stricter building codes and load management devices for large domestic consumers and industrial and commercial establishments, (iii) mandatory energy audits in industry, and (iv) appropriate pricing policies that provide incentives for energy efficiency will also help in effective demand management and reduction in peak demand.

9.3.5 Time-of-day tariff is now being applied for selected consumers through double circuits for use during peak and off-peak period. This helps in shifting some peak load to off-peak hours. Priority steps should be taken to extend the time-of-the-day tariffs to the entire system to bring down the gap between the peak and off-peak loads and reduce energy intensity and to improve energy efficiency and conservation.

10 CONCLUSION, LESSONS AND RECOMMENDATIONS

10.1 Conclusion

10.1.1 The objectives of the projects were consistent with the country's overall development plans and the Bank's development assistance for the country at the time. Most of the projects were *relevant* as they were within the development plans and aimed at meeting the basic infrastructure needs of the country.

10.1.2 Significant tariff and accounting reforms and improvement in tariff levels were achieved, albeit slowly, as a result of Bank's long-term engagement with the sector. However, since 1994 when Bank financing stopped, there was disruption in the policy of tariff reforms and the problem of mounting receivables from government entities has surfaced again.

10.1.3 The development objectives were met and the projects have all been efficacious in meeting their planned outputs and deliverables. The Bank's projects accounted for about 31% of the total generation capacity in Egypt in 2004. In totality, the projects have been effective in making a significant contribution to the development of the main infrastructure considered to be an engine for socio-economic development of the country. This is evidenced by the fact that the country has achieved 100% electricity coverage in urban areas and almost 95% coverage in the rural areas. Future expansions are envisaged largely to meet the increasing demand of electricity, which is estimated at 6% per annum.

10.1.4 There are no issues of the technical quality and capacity of the plants and accessories. The projects are also generally environmentally friendly.

10.1.5 Overall sustainability of the sector is, however, at stake due to non-financial viability of the utilities. The main sustainability issues relate to the distortions on the prices of inputs and electricity tariffs; mounting receivables and local debts; and demand management. These have to be effectively addressed to improve the sector's performance and enhance development effectiveness of the overall interventions of the Bank Group as well as other development partners.

10.2 Lessons

10.2.1 Some of the main *lessons* are (i) the need for the Bank to engage more actively with the Government on broader sector policies and strategies to effectively address issues of energy pricing, tariffs, infrastructure development and financing options (paras. 4.2.5; 5.1.3; 8.1.4); (ii) the importance of addressing the perennial delays in fulfilment of conditions for loan effectiveness and other conditions (para. 4.3.6); (iii) the need to improve the depth and quality of FIRRS & EIRRs at all stages of the project cycle to effectively measure costs and benefits (para. 4.3.10); (iv) the importance of demand management to minimize the untimely need of carrying out generation expansion plans to meet peak loads (para. 9.3); and (v) the significance of better identification and collection of base-line and post-completion indicators and data on project socio-economic impacts (para.6.1.6).

10.3 Recommendations

10.3.1 The principal *recommendations for the Bank* are to (i) focus on broader sector reforms (para. 5.1.1); (ii) enhance dialogue to resolve the perennial problems relating to energy pricing, tariffs, mounting outstanding bills and local debts, delays in meeting loan conditions particularly loan

effectiveness (paras 4.3.6, 4.3.11, 5.1.3, 9,1); (iii) prepare FIRRs and EIRRs at all stages of the project cycle with greater care and rigour (para. 4.3.10); and (iv) empower country offices to carry out, with the assistance of local consultants and universities, rapid socio-economic surveys as appropriate to facilitate actual impact studies (para. 6.1.6).

10.3.2 The main *recommendations for the government* are to (i) deal effectively with the issues of energy pricing, tariffs, mounting outstanding bills and local debts, as well as delays in loan effectiveness and fulfilment of loan conditions (para. 4.3.6); (ii) entrust tariff revision responsibilities to the utilities and empower the independent regulatory body to oversee tariff revisions to ensure that the economic efficiency and equity considerations are well factored in the tariff structure and rates (paras. 9.1.6, 9.1.7); (iii) review the PPAs to make the risk sharing between the electricity utilities and IPPs more equitable (paras. 9.1.8,9.1.9); and (iv) carry out effective demand management measures that contribute to reduce the peak demand on which the generation expansion plans are generally based (para. 9.3).

10.4 The Way Forward/Feedback

10.4.1 The detailed Findings/ Lessons and Recommendations are presented in the Matrix presented below.

KEY LESSONS AND RECOMMENDATIONS

No.	Findings/Lessons	Recommendations	Action By
1.	The Bank's disengagement in financing since 1992 has made it all the more detached from broader Sector Reforms (paras.4.2.5, 5.1.1)	In its future lending to countries such as Egypt who have strong capacity to manage the project portfolio, the Bank should focus more on broader sector reforms policies and strategies to effectively address issues of energy pricing, tariffs, infrastructure development and financing options.	Bank's Operations Department
2.	There is a perennial delays in fulfillment of loan effectiveness and other conditions (para. 4.3.6)	Enhance dialogue to resolve the perennial problems relating to loan effectiveness and other conditions	Bank's Operations Department
3	At the PCR and PPER stages, identification of costs and benefits of projects is hindered by lack of base-line data and effective monitoring systems. Economic analyses in PCRs/PPERs generally lack rigor, depth and comparability (4.3.10)	To provide clarity, improve quality of IRR assessments and also facilitate comparability of results at different stages of the project cycle, estimation of EIRR and risk and sensitivity analyses at appraisal, PCRs and PPERs must be carried out with greater care and rigor and must also include and indicate all parameters used.	Bank's Operations Department
4.	Key performance and impact indicators were not clearly identified, documented and monitored thus making re-evaluation after project completion difficult. This hinders compilation/ assessment of the socio-economic costs/benefits of the projects (para. 6.1.6).	It is important that in future projects the appraisal reports identify key performance indicators. It should be mandatory that the sources and the data and the selected indicators for project monitoring and benefit measurement are clearly identified and included in the appraisal reports. Carry out through the country offices and the assistance of local consultants and universities impact survey studies to serve as inputs for the main socio-economic impact study.	Bank's Operations Department OPEV
5.	Since approval of tariff increase is under Government's jurisdiction, the recommended proposals of the utilities for rate increases came after considerable time lag and even when granted were only partial and inadequate (para. 9.1)	The public sector entities in the electricity sub-sector should be allowed autonomy in their ability to timely adjust tariffs in accordance with their business needs and overall supervision of the regulatory body. Since an independent regulatory authority has already been set up, the requirement of a government approval for every increase needs to be dispensed with.	Government of Egypt/EEHC
6.	A June 2002 EEHC tariff study highlights the low level of electricity tariffs in Egypt and most other RMCs (para. 9.1.5)	There is a need to revisit and study the tariff structure as a matter of urgency. There should be a return to the principle of LRMC in the setting of tariffs. In Egypt, as an immediate measure there is need to raise the tariff rates including those for the Very High Voltage consumers and relate tariffs to the cost of production. There is need to carry out impact study on tariff structure and rates on electricity supply and demand in selected RMCs	Government of Egypt/EEHC OPEV
7	The tariff structure for the poorer and weaker sections of the society has to be designed not for reasons of economic efficiency alone but has also to factor in equity considerations. The inevitability of cross-subsidization for	The tariff structure and rates needs to be reviewed based on economic efficiency as well as equity considerations	Government of Egypt/EEHC

	provision of lifeline-subsidized rates of electricity to select disadvantaged groups has to be fully recognized. (para. 9.1.7)		
8.	<p>In a depreciating exchange rate regime, the designation of tariffs in dollars, even without dollar price escalation, will inevitably involve local currency rates becoming unviable over time. (para. 9.1.9)</p> <p>The PPAs provide for a currency-fluctuation-related price escalation in fuel cost to the IPPs even though no such cost is incurred. (para. 9.1.10)</p>	There is clearly a need to jointly review the PPAs with IPPs and rationalize and revise the payment terms and risk sharing formulae therein.	Government of Egypt/EEHC
9.	There is continued distortion in both input and output prices in the electricity sector, which inhibits the efficient allocation of resources and also impacts the financial performance of the electricity companies. (para. 9.1.11)	For an efficient utilization of resources it is important that input prices reflect the border prices and the correct economic cost to the economy.	Government of Egypt
10.	<p>The financial woes of the utilities arising from inadequacy of tariffs are further compounded by the heavy amounts of receivables, largely from the government and government-controlled entities. It also engenders in the concerned offices a sense of irresponsibility towards electricity consumption and encourages wasteful consumption (para. 9.2.1)</p> <p>The past effort to clean up the old dues was not accompanied by any institutionalized mechanism for timely payment of government and government-controlled entities. (para. 9.2.1)</p>	Strong institutional mechanism on par with the system of incentives and penalties (including disconnection option) applicable for private consumers is required to be institutionalised for government entities as well to ensure timely payment and avoid a rebuild up of arrears and wasteful consumption.	Government of Egypt/EEHC
11.	<p>A number of demand management initiatives have already been taken by EEHC (para. 9.3.2)</p> <p>Transmission and distribution (T&D) losses in UPS continue to be high (para. 9.3.4)</p>	<p>Demand management efforts of EEHC need to be buttressed and intensified.</p> <p>In order to bring down the gap between peak and off-peak demand, it is critical that the programme of technical reinforcement and upgrading of both transmission and distribution systems is expedited. Besides, the non-technical losses should be brought down by installing universal tamper-proof house service meters in addition to the ongoing measures to reduce the gap between the peak and off-peak loads</p>	Government of Egypt/EEHC
12	Time-of-day tariff that is now being applied for selected consumers through double circuits helps in shifting some peak load to off-peak hours. (9.3.5)	Priority steps should be taken to extend the time-of-the-day tariffs to the entire system. (9.3.5)	Government of Egypt/EEHC

PROJECT OBJECTIVES AND DESIGN ASPECTS OF POWER PROJECTS FINANCED BY THE BANK

	Project Name	Approval Date	Amount Approved (UA million)	Objectives and Components
1	Power I Project	11/22/74	5.00	To replace the 3 sets destroyed during 1967 hostilities in the canal zone cities of Port Said (2) and Ismailia (1) and a set at Marsa Matrouh to meet urgent and serious shortage of electricity in that area. Each of 4 new gas turbine power generating units with a maximum rating of 23.45 MW in the canal zone cities of Port Said (2) and Ismailia (1) and Marsa Matrouh.
2	Power II Project	10/14/75	5.00	To distribute power generated by generating sets installed as a part of Bank's Power I project. Construction of four 66/11 KV capacity transformer sub-stations each with two 10 MVA transformers in the cities of Kantera, Fayed, Port Foud and Port Said; laying of submarine cables between Port Said and Port Foud (10 km) and between Ismailia East and Ismailia West (5 km), and construction of 2 double circuit transmission lines between Ismailia and Kantera (45 km) and Ismailia and Fayed (40 km).
3	Power III Project	12/31/77	5.00	The project was conceived as a part of the EEA's post-war reconstruction effort for the coastal and desert towns on the Mediterranean and Red Sea. It was expected to inter-alia provide electricity to people who had never had it or who had been deprived of it because of hostilities from 1967 to 1973. It comprised of 5 MW Gas turbine power stations each at 3 towns of Ghurghada, Safaga and Wad El Natroun as the first of 2 phases of installation of one more unit each was to come in a second phase. In actual practice, because of delay in the take-off of the first phase, both phases got implemented simultaneously.
4	Rural Electrification Project	09/26/79	8.00	The project aimed at providing cheap electric power for domestic lighting, industrial and commercial use and operation of irrigation schemes from integrated hydrothermal sources, instead of the more expensive isolated diesel power stations. It was expected to correct the disparity in living conditions existing between population in large metropolitan cities such as Cairo and Alexandria and those in poor urban centers i.e. small towns and rural areas. Rural electrification was expected to foster industrialization and lead to creation of jobs that would attract skilled manpower thereby reducing migration of population from rural to urban areas. Its components comprised erection of 1200 km of 11 KV and 380/220 V distribution lines, construction of 1000 power distribution kiosks type sub-stations and pole mounted transformers of 25 to 250 KVA, installation of 120000 single phase and 2600 three phase meters.
5	Shoubra El Kheima Power-I,II,III	09/23/80	10.00	To cover a part of increased demand for power as identified by 1979 forecast (later revised in 1983 and again in 1985). It comprised procurement and installation of 3 steam power-generating units of 300 MW each at Shoubrah El Kheima Power station, 4 km of double circuit transmission line to connect the power station to UPS and other associated items.

6	Rural Electrification II	06/25/81	8.00	<p>The project was a part of Govt's National Rural Electrification program designed to bring electricity to masses. It was expected to electrify 91 villages and attachments surrounding the towns of Nag Hamadi and Dshna whose networks were also to be rehabilitated. The resultant increase in productivity in the mainly sugar producing area of Quena Governarate by introduction of cheaper power was expected to raise the standard of living of 400000 inhabitants of the project area.</p> <p>The project components comprised construction of 432 km of 33 KV, 11 KV and 0.4 KV overhead lines and laying of 84 km of underground cables; construction of a plant house with 11 KV distribution panels; installation of 31 500 KV A and 79 300 KVA pad-mounted transformers and 114 pole-mounted transformers; and installation of 950 three phase and 16000 single phase house service meters.</p>
7	Shoubra El Kheima Power Interconnection	05/26/83	21.39	<p>To evacuate the power produced at Shoura El Kheima through an interconnection by an underground cable from the Shoura El Kheima Power station to UPS and to strengthen the power distribution system in the Cairo area. It comprised five 220 KV High Pressure oil-filled (HPOF) pipe-type underground transmission circuits; 91 km double-circuit 220 KV overhead transmission lines; one each of 500 and 220 KV sub-station facilities and</p> <p>feasibility, design, supervision and project coordination consultancy services.</p>
8	Shoubra El Kheima Unit Power IV	08/28/85	43.50	<p>The basic objective was to economically meet part of the power shortfall in Egypt' UPS that was expected to reach 400 MW or 6 % of the total peak demand in 1986/87. It comprised procurement and installation of a fourth 315 MW steam generating power station at Shoura El Kheima to increase the generating capacity of the existing 945 MW station.</p>
9	Damietta Power Plant	12/19/86	103.00	<p>The basic objective of the project was to economically meet part of power shortfall in Egypt's UPS expected to reach 978 MW or 13% of peak power demand. It comprised a 600 MW combined cycle natural gas/ distillate oil-fired power station including transmission line to evacuate power to the UPS and 45 km long gas supply pipeline from the Abu Madi gas fields.</p> <p>As actually constructed, the plant has a capacity of 1125 MW by addition of a third module. Each individual module capacity was also increased to 2X125 MW gas turbines of simple cycle and 1X125 steam turbine for the steam cycle. The Government financed the third module in view of the critical shortage of power in Egypt and encouraged by the results of the international competitive bidding.</p>
10	Cairo West Power Station Extension	08/23/88	210.00	<p>The goal was to make electricity available at economic cost and with high reliability of supply as a basis for development of industrial and agricultural sectors as well as the social development and raising of standard of living.</p> <p>It comprised installation of 2 dual-fuel (natural gas/ oil) 350 MW each steam generating units (5 and 6) in the existing Cairo West Power station complete with water treatment plant and switchyard.</p>
11	El Arish Power Extension	12/18/89	53.53	<p>To provide electric energy to Northern Sinai peninsula in general and El Arish town in particular to meet the growing demands of the agriculture, industry and tourism sectors. The main components included 2X30 MW steam turbine generation units complete with controls, construction of civil works and transmission works and provision of consultancy services for engineering and supervision.</p> <p>The project was originally conceived to be a barge mounted power plant to operate with mazout oil and Maghara coal. Until funding was secured, the power need in the area was eased by the installation of smaller diesel units and gas turbines. With time, the study was revised and it was recommended to construct 2X30 MW steam power plant in El Arish City. This was considered least cost option and superseded the original option of Barge Mounted Power plant since the Barge plant</p>

				was appropriate where there is acute shortage of land; whereas Northern Sinai was not yet populated. In addition, the expected coal extraction in Maghara did not materialize. Moreover, from environmental point of view, as the possibility of using natural gas was not distant at the time, the study was revised to make the power plant burn both mazout and natural gas.
12	El Kureimat Power	12/17/90	250.00	The basic objective was to provide electric power supply to the unified power system by installing 2X600 MW gas/oil fired units to increase the generating capacity of EEA to meet the demand of the whole grid by late 1995 and to promote rational investment and consumption decisions throughout the economy. The PCR noted that “ while the capacity of each unit installed in the station is 627 MW, during off-peak hours the units operate at half the load. Normally at this level of operation the efficiency is low. The lesson learnt is that if smaller but more units had been installed it would have been possible to allow complete shutting of some units during off-peak hours such that the functional units operate at or near their rated capacity and maximum efficiency. EEHC has acknowledged this problem and most of its new power stations have units that are in the 300 MW range.”
13	Cairo West Power Station Extension (supplementary)	01/27/92	42.10	See item 10 above
14	Solar Thermal Energy Study	01/06/93	1.57	In order to: (i) conserve Energy in Egyptian industries, (ii) produce advanced solar technologies for the production of industrial process heat in the medium temperature range, (iii) implement solar industrial process heat pilot project at one selected factory site, and (iv) promote and market solar technologies in the country, the Study involves evaluation of the technical & economic feasibility of Solar Water and Waste Heat recovery technologies for meeting the energy demand of process heat Egyptian industries. It comprises (a) Phase I: Feasibility study designed to identify and investigate appropriate solar water heat and waste technologies to replace the conventional energy sources for industrial process heat and upgrade their efficiencies, (b) Phase II: Preparation of detailed engineering design and tender documents for the pilot plant, (c) Phase III: Construction and testing of pilot plant, and (d) Phase IV: Formulation of methodology for application and dissemination of the technology.
15	Ayoum Moussa Power	12/15/93	103.05	Cancelled
16	Egypt/Zaire Interconnection Study	06/12/90	3.05	A Bank financed feasibility study of a Direct Current Very High Voltage transmission line linking Egypt to Inga Dam facilities in Democratic Republic of Congo (DRC) has been completed sometime ago. DRC-Egypt interconnection line has the potential of becoming the backbone of a trans-African power interconnection network. However, there is no indication that this project would be realised in the foreseeable future. Study completed but the recommended project not taken up.

PROJECT COMPLETION DATES OF POWER PROJECTS FINANCED BY THE BANK

	Project Name	Approval Date	Loan Amount Approved (UA million)	Project Completion Date at appraisal	Actual Completion Date	Variation in months	Reasons
1	Power Project I	11/22/74	5.00	mid- 1975	1977*	-	The sets had already been ordered in September 1974 prior to loan approval.
2	Power Project II	10/14/75	5.00	August 1978	20.1.85*	-	-
3	Power Project III	12/31/77	5.00	01/ 79	February 1982	37	The delays were attributed to difficult work conditions after war devastation in the area. The pace of work during construction was also slow.
4	Rural Electrification Project	09/26/79	8.00	April 1982	31.3.86*	-	-
5	Shoubra El Kheima Power-I,II,III	09/23/80	10.00	01.09.86	01.11.85	(10)	the units were completed 10 months ahead of schedule
6	Rural Electrification II	06/25/81	8.00	End 1984	31.12.89*	-	-
7	Shoubra El Kheima Power Interconnection	05/26/83	21.39	Nov 1985	The information in the PCR and PPAR is contradictory.		The AR noted that to enable power to be transmitted from the first 2 units of Shoubra El Kheima underground connections to the Saptia and Cairo North substations were to be completed by Nov 1984. The PCR however notes that because of delay in completion of the interconnection in time to transmit power from the first 2 units of Shoubra El Kheima, other temporary arrangements had to be made at Shoubra switch-yard and the Bassous (new) substation to connect the first 2 power units to UPS.

8	Shoubra El Kheima Unit Power IV	08/28/85	43.50	01.01.88	06.09.88	8	No reasons noted. The PPAR noted: "A review of the critical path method an early issue of important tenders recaptured the time lost."
9	Damietta Power Plant	12/19/86	103.00	December 1990	December 1992	24	The delay was mainly in the procurement and design of the Integrated Control System by contractors of the steam portion of the combined cycle plants. There were also some technical problems that were ultimately well rectified by the suppliers.
10	Cairo West Power Station Extension	08/23/88	210.00	December 1992	August 1995	32	Delay in start up activities, problems with turbine blades that required opening of the unit and re-blading and some other equipment. failures and prolonged period needed for optimization during trial run. Because of slower than anticipated growth of demand, the delay in commissioning of the plant was not harmful to the national grid.
11	El Arish Power Extension	12/18/89	53.53	September 1995	December 1996	15 (in commissioning of the 2 nd and final unit)	
12	El Kureimat Power	12/17/90	250.00	September 1995	July 1998	31 (in commissioning of the 2 nd and final unit)	Late withdrawal of IBRD from financing some project components. Other implementation delays due to design problems that took time to rectify. Delays in tendering and supply of components. The multiple package approach requiring intense interfacing between the multiple parties while contributing to substantial savings led to implementation delays.
13	Cairo West Power Station Extension (supplementary)	01/27/92	42.10				See item 10 above

14	Solar Thermal Energy Study	01/06/93	1.57	December 1996	Ongoing. In May 2001 Phases I & II had been completed and in Phase III evaluation of bids submitted by suppliers of the pilot plant equipment was in progress. It was understood that the pilot plant is now under installation.		
15	Ayoum Moussa Power	12/15/93	103.05	Cancelled			
16	Egypt/Zaire Interconnection Study	06/12/90	3.05		Not available		

*In the absence of PCRs, information noted from "Proposal for a Supplementary Loan for the Cairo West Power Station Extension Project" of 11 November, 1991.

PROJECT COST VARIATIONS OF POWER PROJECTS FINANCED BY THE BANK

	Project Name	Approval Date	Loan Amount Approved (UA million)	Loan Amount Disbursed (UA million)	App. Project Cost (UA million)	Est. Project Cost (UA million)	Actual Project Cost (UA million)	Variation in Project cost %	Causes for variation
1	Power I Project	11/22/74	5.00	No PCR	14.00	No PCR	No PCR	-	-
2	Power II Project	10/14/75	5.00	No PCR	12.827	No PCR	No PCR	-	-
3	Power III Project	12/31/77	5.00	4.90	13.402	24.02 (represents 50 % of actual cost of 6 units)	79.25		The PCR and PPER have come to different figures and conclusions and it is not clear whether actual costs as recorded in PPER are comparable. The PCR records a cost under run in both foreign and local currencies.
4	Rural Electrification Project	09/26/79	8.00	No PCR	29.34	No PCR	No PCR	-	-
5	Shoubra El Kheima Power- I,II,III	09/23/80	10.00	9.49	672.52	559.22	(16.8)		Project revisions, and cost savings as a result of favorable currency regimes and international market conditions
6	Rural Electrification II	06/25/81	8.00	No PCR	11.809	No PCR	No PCR	-	-
7	Shoubra El Kheima Power Interconnection	05/26/83	21.39	14.07	154.10	114.86	(25.5)		Project revisions, and cost savings as a result of favorable currency regimes and international market conditions
8	Shoubra El Kheima Unit Power IV	08/28/85	43.50	30.63	43.50	30.63	(29.58)		The major savings were due to lower buying prices and favorable currency developments.
9	Damietta Power Plant	12/19/86	103.00	99.96	303.82	353.22	16.26		Due to favorable conditions in the international competitive bidding, it was possible to get almost 50 % extra capacity with a cost overrun of only about 16-17 %. The unit cost at appraisal was estimated at UA 506.37 per kw while the actual cost amounted to UA 313.97 per kw i.e. a saving of

								UA 192.40 or 38 % of the original estimate. The tariff increases have been at much higher rates than projected in appraisal calculations.	
10	Cairo West Power Station Extension	08/23/88	210.00	210.00	283.27	297.07	4.87		
11	El Arish Power Extension	12/18/89	53.53 (ADB)	49.50	71.40	88.37	23.77	The cost overrun was on the Generators, Switchyard and Interconnection as well as the cost of insurance (which was not estimated at appraisal). There was some savings on Civil Works and Consulting Services	
12	El Kureimat Power	12/17/90	250.00	117.54	856.14	443.17	(48.24)	Substantially lower costs of most project components. An unusually large provision of 23.6 % of cost for contingencies.	
13	Cairo West Power Station Extension (supplementary)	01/27/92	42.10	27.23	344.30	297.07	(13.72)		
14	Solar Thermal Energy Study	01/06/93	1.57						
15	Ayoun Moussa Power	12/15/93	103.05	Cancelled					
16	Egypt/Zaire Interconnection Study	06/12/90	3.05						

ANNEX 4

RATES OF RETURN OF POWER PROJECTS FINANCED BY THE BANK

	Project Name	Approval Date	Loan Amount Approved (UA million)	FIRR at appraisal %	FIRR at Completion %	EIRR at appraisal %	EIRR at Completion %	Remarks
1	Power I Project	11/22/74	5.00	Not calculated (nc)	No PCR	nc	No PCR	
2	Power II Project	10/14/75	5.00	Nc	No PCR	nc	No PCR	
3	Power III Project	12/31/77	5.00	Nc	nc	11.30	nc	Not calculated in PCR because basis of appraisal assumptions and calculations were not clear, there was no reference data source such as a feasibility study and the project as implemented was very much bigger.
4	Rural Electrification Project	09/26/79	8.00	6.00	No PCR	17 to 31	No PCR	
5	Shoubra El Kheima Power- I,II,III	09/23/80	10.00	Nc		nc		
6	Rural Electrification II	06/25/81	8.00	4.00	No PCR	5.00	No PCR	
7	Shoubra El Kheima Power Interconnection	05/26/83	21.39	10.6	31.79, 20.38 and 5.11 based on ADB, Egypt Central Bank exchange rates or original appraisal tariffs resp.	-	-	
8	Shoubra El Kheima Unit Power IV	08/28/85	43.50	14.00	26 if ADB exchange rate is used and 16 if Egypt Central Bank rate used.	-	-	The PPAR re-estimates the FIRR and EIRR for the consolidated Shoubra El Kheima project at 15.9 and 14.9 respectively. The assessment is however an overstatement as the investment costs are stated at their values in the year of incurrence and have not been converted into current

								costs	
9	Damietta Power Plant	12/19/86	103.00	14.3	30.0	13.59	36.00	Improvement in FIRR because of savings in unit cost of equipment and higher level of tariffs of millimes 129 per kwh as against a maximum of 25.22 millemes assumed at appraisal. EIRR better because of better unit prices and fuel savings afforded by Damietta plant.	
10	Cairo West Power Station Extension	08/23/88	210.00	12.24	10.12	13.59	11.12		
11	El Arish Power Extension	12/18/89	53.53	12.0	10.0 (at PCR)	9.6	7.0 (at PCR) 11.09 (at PPER)		
12	El Kureimat Power	12/17/90	250.00	12.55	12.47	15.55	11.07		
13	Cairo West Power Station Extension (supplementary)	01/27/92	42.10					See results in item in item 10 above	
14	Solar Thermal Energy Study	01/06/93	1.57	Not applicable	Not applicable	Not applicable	Not applicable		
15	Ayoun Moussa Power	12/15/93	103.05	Cancelled					
16	Egypt/Zaire Interconnection Study	06/12/90	3.05	Not applicable	Not applicable	Not applicable	Not applicable		