UNCLASSIFIED

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
Washington, D.C. 20523

PROJECT PAPER

Proposal and Recommendations
For the Review of the
Development Loan Committee

EGYPT - Urban Electric Distribution

AID-DLC/P-2265

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

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September 19, 1977

MEMORANDUM FOR THE DEVELOPMENT LOAN COMMITTEE

SUBJECT: EGYPT: Urban Electric Distribution

Attached for your review are recommendations for authorization of a loan to the Government of Egypt ("Borrower") of not to exceed Seventeen Million Two Hundred Thousand ($17,200,000) to assist in financing certain foreign exchange and local currency costs of goods and services required for this project. The purpose of the project is to provide equipment and engineering services to rehabilitate the existing electric distribution systems in several cities and to expand these systems as needed to meet increased demand.

No meeting is scheduled for this loan proposal. We would, however, appreciate your advising us of concurrences or objections as early as possible, but no later than the close of business on Monday, September 26, 1977. If you are a voting member, a poll sheet has been enclosed.

Development Loan Committee
Office of Development
Program Review

Attachments:
Summary And Recommendations
Project Analyses
Annexes:
A - W

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: A (A = ADD, C = CHANGE, D = DELETE) — PP.

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: EGYPT

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 263-0033

6. BUREAU/OFFICE: A. SYMBOL: NE; B. CODE: 03

7. PROJECT TITLE (Maximum 40 characters): URBAN ELECTRIC DISTRIBUTION

8. ESTIMATED FY OF PROJECT COMPLETION: FY 81

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 77; B. QUARTER 3 (Enter 1, 2, 3, or 4); C. FINAL FY 81

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	17,012		17,012	97,167		97,167
(GRANT)	( )	( )	( )	( )	( )	( )
(LOANS)	17,012	( )	17,012	97,167	( )	97,167
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY		2,722	2,722		22,384	22,384
OTHER DONOR(S)						
TOTALS	17,012	2,722	19,734	97,167	22,384	119,551

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 77 F. GRANT	E. 1ST FY 77 G. LOAN	H. 2ND FY 78 I. GRANT	H. 2ND FY 78 J. LOAN	K. 3RD FY — L. GRANT	K. 3RD FY — M. LOAN
(1) SA	740B		825		17,012		80,155		
(2)									
(3)									
(4)									
TOTALS					17,012		80,155		

A. APPROPRIATION	N. 4TH FY — O. GRANT	N. 4TH FY — P. LOAN	Q. 5TH FY — R. GRANT	Q. 5TH FY — S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1) SA						97,167
(2)						
(3)						
(4)						
TOTALS						97,167

12. IN-DEPTH EVALUATION SCHEDULED: MM 09 YY 78

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET. 1 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE: Donald S. Brown
Director, USAID/Cairo

DATE SIGNED: MM 09 DD 07 YY 77

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (3-78)

PROJECT PAPER

EGYPT: URBAN ELECTRIC DISTRIBUTION PROJECT

SUMMARY AND RECOMMENDATIONS

1. Borrower: The Government of the Arab Republic of Egypt. The Loan Application is attached as Annex A.

2. Loan Amount: $97,200,000 (Ninety Seven Million Two Hundred Thousand Dollars) is the total loan amount recommended. The FY 77 authorization will be $17,012,000 (Seventeen Million Twelve Thousand Dollars).

3. Loan Terms: (Two Step Loan Arrangement).

   To the Government: Forty (40) years maturity, including a ten (10) year grace period of repayment of principal, with interest at two percent (2%) per annum during the grace period and three percent (3) thereafter.

   To the Egyptian Electricity Authority: The Government of Egypt will re-lend the funds to the Egyptian Electricity Authority (EEA) over twenty-five (25) years maturity, including a five (5) year grace period of repayment of principal, with interest at eight and one half percent (8 1/2%) per annum.

4. Beneficiary and Executing Agency: The Egyptian Electricity Authority, a semi-autonomous government corporation.

5. Description of the Project: Provide equipment and engineering services required by the EEA to rehabilitate the existing electric distribution systems in the cities of Cairo, Alexandria, Beni Suef and Shibin El-Kom and to expand the systems as necessary to meet current and projected increased demand.

6. USAID/Cairo View: USAID/Cairo has recommended authorization of the proposed loan. See Annex C.

7. Statutory Check-list: All statutory criteria have been satisfied. See Annex D.

8. Recommendation: Authorization of a loan in the amount of $17.012 million on terms and conditions as detailed in the Loan Authorization, attached as Annex B.

9. Project Committee:

USAID/Cairo

Committee Chairman	:	Charles Patalive
Engineer	:	John Callahan
Legal Advisor	:	James Phippard
Economist	:	James Norris
Program Officer	:	George Laudato

AID/Washington

NE/CD	:	Thomas A. Sterner
NE/CD	:	Charles Shorter
SER/ENGR	:	Wilson Hodges
GC/NE	:	Robert Meighan

I. INTRODUCTION

1.01 The Government of the Arab Republic of Egypt (GOE) has requested assistance to finance the foreign exchange costs of rehabilitating and expanding the electric distribution systems in the cities of Cairo, Alexandria, Shibin El-Kom and Beni Suef. See Annex E. The Egyptian Electricity Authority (EEA) and the Rural Electrification Authority (REA), semi-autonomous operating corporations owned by the Egyptian Ministry of Electricity, are responsible for the planning and installation of electric distribution systems in Egypt; the EEA for Cairo and Alexandria, and the REA for other cities and rural areas.

1.02 During January, 1977, EEA completed negotiations and signed an AID-financed contract with Harza Overseas Engineering Company (Harza) to carry out detailed technical studies on the distribution systems for the four project cities. The overall objective of the study is to develop recommendations for rehabilitation of the systems, and plans for the phased rehabilitation and expansion of the systems which will ensure that:

1. The distribution systems will reliably and efficiently serve consumer demands through the year 1982; and

2. The resultant systems will be compatible with long-range system development plans beyond 1982.

The Harza two-phased Scope of Work is shown in Annex F.

1.03 Harza completed Phase I of their study which included a detailed analysis of the existing systems, reviews of short-range and long-range plans, review of engineering and construction policies and methods and related technical recommendations. A summary of Harza's recommendations appears in Annex G.

1.04 In addition, Harza prepared for the EEA, a general list of equipment which Harza recommends EEA purchase over the next five years in its rehabilitation and expansion program. The total foreign exchange cost of the Five-Year Program is $463 million, well beyond the resources of any one donor. This project loan will finance the foreign exchange costs of the equipment and services required for the first year project, a total of $97.2 million. However, due to A.I.D. budgetary constraints, and a reallocation of funding requirements of A.I.D.-financed power sector projects, only $17.012 million will be authorized in FY 1977 and the balance in FY 78. For the purpose of project analysis, the entire Year One

Project, $97.2 million, is evaluated in this paper. A detailed discussion of the equipment requirements and related cost is included in the Technical Analysis Section of this paper.

1.05 During Phase II, Harza will prepare detailed design specifications and work plans for specific installations of the equipment and materials and assist the EEA in the procurement.

1.06 This project will form part of the U.S. assistance to reconstruct, rehabilitate and expand the power sector of Egypt. The U.S. has concentrated much of its assistance on the reconstruction of the power sector, especially in the Suez Canal area whose principal cities, infrastructure and basic facilities such as power, were extensively damaged during the long-period of intermittent warfare. In FY 1975, A.I.D. authorized a $30 million grant (263-12-001) for financing electric power distribution equipment for the Suez Canal cities. Over 80 percent of the equipment being financed by this grant has arrived in Egypt and is being installed. In FY 1976, A.I.D. Grant 263-12-220-009 was made to the GOE to finance the foreign exchange cost of a 300 MW steam power plant on the northwest shore of the Great Bitter Lake, about 28 kilometers south of the city of Ismailia. Also in the Canal area, A.I.D. is considering joint financing with other lending institutions during FY 1978, a 600 MW steam power plant in the Suez or Red Sea area. It is intended that this plant will utilize inexpensive natural gas, presently being flared from oil wells, as its primary fuel. To meet the immediate power requirements before the large steam plants come on line, an A.I.D. loan authorized in FY 1976 was signed during July 1976, (263-K-032) to finance 300 MW of gas-fired turbine generators; 120 MW to be installed at Helwan, just south of Cairo, and 180 MW to be installed at Talkha, in the Delta region. The most recent electric power sector project which A.I.D. authorized is an FY 1976 IQ loan (263-K-037) for $24 million to finance the foreign exchange costs of a National Energy Control Center (NECC). The NECC will monitor and control the high-voltage electric power grid in Egypt using an on-line computer operated dispatch center connected by a communication system to 39 remote terminals located at each power generation plant and at selected, key substations.

1.07 A.I.D. is also financing two major training programs under technical assistance grants. One program, costing $381,000, is being given in Egypt by the Overseas Advisory Associates Inc., a non-profit company. A total of 200 upper level management personnel of the Ministry of Electricity will attend the four-week course, which is a very comprehensive review of modern management of electric utility companies. The other program is a participant training given by the National Rural Electric Coop

in the United States. The course content is primarily technical and concentrates on operation of electic distribution systems, particularly rural systems.

1.08 The World Bank and the IDA are also becoming more active in assisting the Egyptian power sector. A power sector survey is being carried out by the consulting firm Sanderson & Porter, Inc., under UNDP-financing with the Bank acting as executing agency. Its objective is to integrate planning in the power sector with overall economic planning and to identify changes that are required in EEA's institutional and organizational structure, its operations and development program. Phase I of the Survey which was completed in November, 1976, recommended changes in energy policy, organization and management, accounting and finance and system operation. Under Phase II, the consultants are assisting EEA in implementing the key recommendations. These include: (i) financial consultants to help EEA resolve the problems in its accounting and finance systems; (ii) a training component would help in manpower planning and in the rehabilitation of EEA's training centers; (iii) study of electricity tariffs; and (iv) a review of EEA's safety and inspection practices. The Bank, during June 1977, extended a $48 million loan to the EEA to finance a portion of the technical assistance required to implement the Phase II recommendations and to finance the foreign exchange costs needed to provide electric power to 13 rural cities and a number of rural zones.

1.09 Since Harza was carrying out studies and preparing detailed designs for distribution systems in two smaller cities in Egypt, Beni Suef and Shibin El-Kom, under the A.I.D.-financed study, the Bank, EEA, and the REA agreed that it would be highly desirable to have Harza perform the same services for the Rural Electrification Project as well. In addition to having all the plans and materials reviewed only once by one contractor, the primary benefit from a technical point of view would be that the basic and detailed designs would be basically similar and compatible.

II. THE POWER AND ENERGY SYSTEM

A. History and Organization

2.01 Electricity was first introduced into Egypt in 1895. Isolated diesel and some oil-fired steam units were installed in major population centers by various Government, private and municipal organizations. Supply in Cairo was in private hands until 1949 when the Government-owned Cairo Electric and Gas Department took over the responsibility from the privately owned Lebon Company. In Alexandria the assets of the Lebon Company were nationalized in 1961 and placed in the hands of a government corporation, the Alexandria Electric and Gas Authority.

2.02 In 1964, the Ministry of Electricity and Energy (MEE) was formed to consolidate all of the electricity organizations into one state-owned organization. This was achieved in 1965 with the establishment of the General Egyptian Electricity Corporation (GEEC) to own, operate and expand the public power system. In 1971, the General Rural Electrification Authority was created to plan and supervise the construction of rural electrification projects. Early in 1976 the sector was reorganized through the establishment of four new authorities; the Egyptian Electricity Authority (EEA) replacing GEEC, the Rural Electrification Authority (REA), the Nuclear Power Plant Authority (NPPA) and Qattara Depression Authority.

Organization

2.03 The organizational structure of the sector is shown in Annex H. Each of the four authorities is responsible to the Minister of Electricity and Energy who prescribes sector policies and is responsible for coordination with Government plans. Regulation and coordination is facilitated through the Higher Council of the Electricity Sector which includes, in addition to the MEE, the Ministers of Agriculture and Irrigation, Industry and Petroleum. Each of the Authorities has a Board of Directors whose members are appointed by the Prime Minister upon the recommendation of the Minister of Electricity and Energy. The Chairman of the respective boards is appointed by Republican Decree.

2.04 Construction work is normally performed by three MEE companies which undertake works on a competitive proposal basis for the MEE's authorities, for other Government organizations and for the private sector. They have also contracted work in neighboring countries. However, private local contractors have recently indicated interest in REA work and are expected to participate through local bidding procedures.

Egyptian Electricity Authority (EEA)

2.05 The EEA is responsible for implementation, management, operation and maintenance of all power facilities throughout Egypt. Its organization is shown in Annex I. A new law (No. 12 of 1976) was ratified by the People's Assembly on January 18, 1976, as part of the reorganization of the sector; a summary of its main provisions is contained in Annex J. One of the key aims of the reorganization was to give the EEA more autonomy for developing its own manpower and budgetary policies, financial and accounting procedures. New by-laws were drafted accordingly and were approved by Government on April 26, 1977.

2.06 EEA is divided into four main departments comprising (i) Manpower, (ii) Finance, (iii) Operations, and (iv) Study, Research and Projects. Operationally, EEA is separated geographically into five autonomous operating zones, each with its own president, who in turn sits on the EEA Board of Directors. The Head Office is in Cairo from which it coordinates operation and maintenance through its five zone offices for the Cairo, Alexandria, Canal, Delta and Upper Egypt zones. The zones have freedom to develop their own internal procedures and practices but their programs, budgets and finances must be approved by the Head Office. Outside the Cairo and Alexandria Zones, coordination of transmission, distribution and customer billing between EEA, REA and the local councils within zones is achieved through offices in each Governorate (there are 26 Governorates or administrative divisions for the whole of Egypt).

2.07 Although a main objective of the creation of the EEA was to give it more autonomy for developing its own manpower and budgetary policies and financial and accounting practices, progress toward this objective so far has been slow. EEA had a payroll of 43,000 employees in 1976, including some 3,000 veterans and university graduates who were allocated to EEA by Government but could not be fully employed in established positions. The new By-laws would, inter alia, enable EEA to increase salaries and benefits, to provide incentives through reward of above average performance, and to dismiss staff in accordance with its own procedures where circumstances warrant it.

2.08 Partly as a result of the Government's salary policies and the opportunities offered in neighboring Arab countries, EEA has a severe shortage of experienced middle and top management executives. EEA is well aware of these problems and conscious of the continued need for upgrading existing staff through training which seems to be the only solution in the short-term.

2.09 The EEA is beset with other operational and administrative problems as well. EEA's current tariffs do not reflect the cost of electricity supply since they are based on pre-1973 fuel prices. Industries are effectively subsidized by EEA through preferential rates. Neither the EEA nor its predecessor have earned a profit since 1972. EEA's financial performance is distorted by previous years' adjustments, incomplete valuation of fixed assets, and other uncorrected problems identified by auditor's reports

2.10 Upper management of EEA is fully aware and concerned with EEA shortcomings. EEA's organization and operation is currently under a very comprehensive study being performed by Sanderson and Porter of New York, and financed by the World Bank which commenced in May, 1976. The scope of the study includes review, analyses and recommendations in the following areas:

a. Energy policy
b. Sector organization
c. Operations
d. Power system expansion program
e. Distribution policy and practices
f. Accounting and finance
g. Tariffs
h. Training program

2.11 Sanderson and Porter completed Phase I of their study and published their findings and recommendations in November, 1976. A brief summary of their report is shown in Annex K. The EEA is beginning to implement many of the recommendations on its own but for other more difficult recommendations, it will depend on the assistance of Sanderson and Porter provided by Phase II of the Contract. The World Bank, in extending a $48 million loan equivalent for its rural electrification project, has allocated portions of the proceeds to finance technical assistance to the EEA to implement the more substantive recommendations.

2.12 Sanderson and Porter followed up their first report with a second interim report entitled System Planning Diagnostic Report Phase I, in which they make recommendations concerning expension of the high voltage generation and transmission system.

Rural Electrification Authority

2.13 The REA established in 1971 as the General Rural Electrification Authority and subsequently renamed the REA under Law 27/76 signed by the President of the Republic on March 23, 1976. The organization structure of the REA is shown in Annex L. Law 27 contains provisions similar to those for EEA. REA's main functions are:

a. to study, plan and implement the Government's rural electrification program and upgrade the existing distribution networks up to and including 66KV (except those for Cairo and Alexandria which remain EEA's responsibility);

b. to connect new low and medium voltage consumers including local industries, irrigation and agricultural.

After each rural construction project is completed, it will be turned over to the EEA for ownership, operation and maintenance.

2.14 The REA has about 5,000 permanent staff and engages at least another 20 percent more on a temporary basis to meet construction needs. Like EEA, REA is overstaffed but short of capable senior and middle level staff.

2.15 REA's only source of funds to carry out its construction tasks are budget appropriations for rural electrification, foreign loans and suppliers' credits. It keeps records of the direct costs of its construction works to which at year end the proportionate shares of overhead and indirect costs are added. All its expenses, including interest on loans, are being capitalized. So far REA has not transferred, financially, any completed work to EEA but was expected to do so annually from 1976 onward. All loan and debt service obligations would be transferred to EEA together with the fixed assets.

2.16 REA is to spend about $400 million during the 1976 - 1980 period of which about 40 percent would be in foreign costs. Firm sources of foreign financing including the World Bank Loan of $48 million, arranged so far, will provide only about $65 million. REA is actively seeking other foreign funds in the form of supplier's credits and loans from bilateral sources on concessionary terms. The Government is giving high priority to rural electrification, and all local costs are expected to be provided for in the Government budget. However, the availability of foreign funds will clearly determine the extent to which the REA electrification program can be achieved.

B. Present Power Operation and Load System

2.17 The existing power system in Egypt is divided into five interconnected zones: Upper Egypt, Cairo, Alexandria, Lower Egypt, and the Canal Zone. The major generating facilities consist of the two Aswan hydro plants, located in the Upper Egypt zone, and a group of thermal plants near Cairo and Alexandria. In addition to the EEA operated utility plants, there are a number of industrial companies with captive power plants. These captive plants total about five percent of the country's generating capacity.

2.18 The total installed generating capacity (excluding the captive plants) is 3,970 MW and is distributed by plant type as follows:

TABLE I

Installed Generating Capacity

Type	Plants	Capacity (MW)		Percent of Total Capacity	
		Design	Availability	Design	Availability
Hydro	2	2445	1550	62%	57%
Thermal	10	1365	1051	34%	39%
Gas Turbine	5	160	110	4%	4%
TOTAL	17	3970 MW	2711 MW	100%	100%

As can be seen from Table 1, the design capacity, or nameplate rating, is substantially higher than the available capacity. The reasons for this discrepancy are:

(a) High and Aswan Dams — The hydroelectric power system consists of the Aswan Dam and the High Dam. The High Dam turbines discharge into the Aswan Dam reservoir that serves as a regulating basin. The available electric energy generation is constrained by the requirement that the total discharge through the hydro system must be sufficient to keep the Nile navigable and meet irrigation requirements. The irrigation discharge is fixed by the Ministry of Irrigation, reaching a maximum in the Summer and a minimum in the Winter months during the dry season. Also, for technical reasons including overall system balance and stability, EEA would be reluctant to put full load on the lines from Aswan if the water was available.

(b) Thermal Plants — The existing thermal plants have a firm capacity of only about eighty percent (80%) of their nameplate capacity primarily because of their age and lack of maintenance, the latter due in part to frequent unavailability of spare parts during the past decade caused in turn, primarily by shortage of foreign exchange. Annex M lists in detail the existing generating plants by zone, type and equipment and shows both nameplate capacity and available capacity.

C. Load and Generation Forecasts

2.19 In justifying previous loans and grants to Egypt to finance construction of power plants, (Loan 263-K-032 and Grant 263-0009), the load and generation forecasts were based on studies by Sanderson & Porter, Inc. in November 1975. For demand projections, two analyses were performed, one using established methods of forecasting titled "Long Range Forecast" and a second which took cognizance of the Egyptian economy titled "Short Range Forecast". Both forecasts proved to be conservative at least for the first two years projected. Table 2 below shows a comparison of the two forecasts with the actual experience.

TABLE 2

Actual vs. Projected Demand 1975 - 1976

(Megawatts)

Year	Long Range Forecast	Short Range Forecast	Actual
1975	1,582	1,643	1,733
1976	1,766	1,867	1,909

2.20 As discussed earlier, EEA has continued the services of S&P with financing provided by UNDP and the World Bank acting as Implementing Agency. S&P, with EEA assistance, has prepared revised projections.

2.21 For demand projections, S&P again separated their projects into two parts — a short range forecast (1977 - 1985) and a long range forecast (1985 - 200). These forecasts are shown in Annex N.

2.22 On the projected generation side, four assumptions which formed the basis of the 1975 projections have proved to be incorrect. First, and most important, was the filling of Lake Nasser in 1976 - an event not expected to occur until 1981 - which allows the Aswan and High Dam hydroelectric plants to generate more energy. Second are the delays in the construction of the Kafr El-Dawar and Abu Quir thermal plants. Completion of these plants has been delayed one or two years, and the schedule is still slipping. Third is the further deterioration in EEA's existing system, with most plants not operating at rated capacity. Fourth is the additional new planned generation not anticipated - especially the increase in the Abu Quir Plant from 300MW to 600 MW and the Suez Plant of 300 MW. The net effect of these changes is that the installed generating capacity has increased, but not to a great extent. S&P report provides an in-depth analysis of the capability of the Aswan and High Dam hydroelectric plants, a controversial subject. In summary, despite the filling of Lake Nasser, the installed nameplate capacity of 2,445 MW cannot be effectively utilized as mentioned earlier.

2.23 The conclusion drawn by S&P is that all plants now under construction or in planning are justified, and EEA must immediately plan for another 600 MW plant to start commercial operation in 1983.

2.24 USAID concurs in S&P's conclusions. USAID does, however, believe the situation is more critical than S&P's report indicates. First, the demand projections are still understated and will more closely parallel those projected in a separate study by the Nuclear Power Plants Authority and is shown in Annex O. Second, USAID is of the opinion that S&P's schedule of when new generation capacity will come on stream is unrealistic, especially the projection that the third and fourth units of Abu Quir will start commercial operation in 1981, one year behind the start-up of units one and two, which itself is an optimistic schedule. Third, we believe S&P's projected output from the existing plants is optimistic, considering EEA's existing experience. Note that S&P projects most plants to operate at full capacity and projects output from the Aswan High Dam Hydro-electric units at 2,360 MW despite the fact that output will probably be limited to 2,010 MW because of the penstock design.

2.25 Assuming, however, that S&P's projections are correct, with the Talkha/Helwan Gas Turbine units and the Ismailia Steam Plant on stream in a timely fashion, EEA's situation remains poor and without these plants the situation is critical. EEA's system is such that a plus 30% reserve requirement is necessary for system stability. The following table shows EEA's reserve capacity, using S&P supply/demand projections except as noted, with and without the Talkha/Helwan and Ismailia plants.

TABLE 3

Available Reserve

Year	Generating Capacity (MW)	Less Talkha/Helwan Ismailia	Net Capacity (MW)	Demand	Reserve With (Percent)	Reserve W/O (Percent)
1977	2711	-	2711	2192	19	19
1978	3271	-	3271	2470	17	17
1979	3568	300	3268	2678	25	18
1980	4075	300	3775	2942	28	23
1981	4343	300	4043	3192	27	21
1982	5250	600	4650	3578	32	23
1983	5511	600	4911	4028	27	18

NOTE 1. The commercial operating dates of the Talkha/Helwan and Ismailia projects do not agree with the present schedule. However, since these plants are deducted from the generating capacity, the illustration figures are accurate.

NOTE 2. Sanderson & Porter projections show the Abu Quir's third and fourth units starting in 1981. It is not likely that the first and second unit will be in operation by 1981 let alone the next two units. We, therefore, have shifted the start-up to January 1, 1983.

D. Unified Power System

2.26 Since 1970, all major hydro and thermal generating stations in Egypt have been interconnected through EEA's Unified Power System (UPS). See Annex P. UPS transmission is at 500 KV, 200 KV and 132 KV. A 500 KV, double-circuit transmission line, 790 km long, connects the Aswan hydro stations to Cairo and the Delta Region, and is the backbone of the UPS. Their interconnection is accomplished through 2,400 km of 220 KV and 3,550 km of 132 KV transmission.

2.27 The subtransmission system of 66 KV and 33 KV supply power to the 11 KV, 6.6 and 3 KV urban distribution systems. Frequency is 50 Hz.

2.28 The 500 KV lines were subject to a high number of outages because of insulator flashovers due to sand combined with moisture from early morning dew. This condition has been, for the most part, rectified by installing longer insulator strings between the conductor and the towers, thus decreasing flashovers. Over the last year, EEA reports that it experienced only five or six outages, compared to 25 before the modification. As a result, the EEA is gradually increasing the load on the 500 KV lines and thus utilizing more of the hydro generation capacity.

E. Urban Distribution Systems

General

2.29 The urban distribution systems, generally, are fed from 66 KV sub-transmissions through stepdown transformer sub-stations reducing the voltage to 11 KV, the primary distribution voltage. From the 11 KV distribution system, the voltage is again reduced, with distribution transformers, to 220 V and 380 V, the voltage supplied to consumers. Other voltages are presently being used in various cities in Egypt, such as 33 KV for sub-transmission, 6.6 KV and 3.3 KV for the primary distribution voltage; they are gradually being phased out, and replaced with the 66 KV/11 KV/380 V - 220 V system. Harza engineers concur with this standard system. A more technical description of the existing system, along with a typical system schematic appears in the Technical Analysis Section.

2.30 The fundamental design of the distribution systems is universal to all the cities in Egypt; however, detailed equipment design differ depending upon the manufacturer and country of origin. Egypt, over the years has received distribution equipment from Russia, Eastbloc countries, Western European countries, Japan, and the United States. Contrary to popular opinion Harza found, in general, that distribution system planning and engineering methods have been good. Most problems have been caused from inadequate construction and maintenance practices, deteriorated underground cables, and a shortage of spare parts which is aggravated by the mixture of origins of the equipment. Underlying these problems has been the chronic shortage of foreign exchange necessary to purchase new equipment and spare parts to keep abreast of growing demand.

2.31 In Cairo and Alexandria, the entire operation of the distribution system, including billing and collection comes under the respective EEA zone office. For all other urban distribution systems, the municipal councils buy power in bulk from EEA and bill and collect revenue from all low-voltage customers, even though EEA is responsible for all operations throughout the country, including distribution. The customer billing activities of the councils are not reported to EEA, and any surplus earned from this source is retained by the councils.

2.32 In September of 1976 the Higher Council of the Electricity Sector recommended to the government formation of seven new distribution companies to take over all distribution assets, operate and maintain them, and to undertake the customer billing function. The precise form of the companies will be determined by legislation to be enacted, but they are expected to be subsidiary companies of EEA. The companies to be established will encompass the same areas as EEA's existing zone offices except that Upper Egypt would be split into two, Middle Upper Egypt and High Upper Egypt, and a new northern zone would be created for the three Governorates west of Cairo and Alexandria. The World Bank in anticipation of these companies eventually owning, operating and maintaining equipment which the Bank is financing in its $48 million Rural Electrification Project, included a safeguard covenant in its Project Guarantee Agreement with the ARE. The covenant requires the ARE to ensure that, at the time the decision is made to set up the new companies to operate power distribution assets, including maintenance and collections, there be adequate provisions satisfactory to the Bank, for the management, ownership, operation and maintenance of the equipment being financed by the Bank. Furthermore, the operating

revenues and expenses as well as each company's assets and liabilities must be included in EEA's audited, consolidated financial reports to be used to assure the Bank that the EEA is meeting the financial planning covenants included in the Bank's Loan Agreements. A.I.D. will seek similar assurances for the equipment being provided under this loan.

Cairo Distribution System

2.33 EEA provides electric service in the greater Cairo area to approximately 1.1 million customers, which includes both households and industrial users. The population of Cairo is eight million and it is estimated that 81 percent of the households have dwellings lit by electricity. While it is difficult, at this time, to accurately forecast the number of households which will be served with electricity, EEA has estimated that by 1980, service will be increased to over 1.8 million households.

2.34 The Cairo Zone Office of the EEA is responsible for the installation, operation, and maintenance of the distribution system as well as customer billings and collections. Geographically the Cairo Zone is broken down into eleven sub-zones, each acting as a small electric utility company. It is planned that this number will increase to twenty-five sub-zone offices over the next five years. Each sub-zone office has a Commercial Office and an Engineering Office. The Engineering Office not only maintains and operates their portion of the overall system, it also performs engineering and planning functions for rehabilitation and expansion.

2.35 Out of each sub-zone Engineering Office, anywhere from 50 to well over 100, depending upon the size of the sub-zone, three-man work crews are dispatched for installation, maintenance and repairs. For construction of 220 V/380 V and the 11 KV systems, sub-zones utilize its own crews. Larger, major installations, as well as 66 KV construction projects are generally contracted out to contractors which are subsidiaries of the EEA.

Alexandria Distribution System

2.36 Alexandria, in addition to being Egypt's major port and industrial center, is the primary vacation city. This presents problems with respect to forecasting electric loads and energy consumption since the population fluctuates (700,000) from a current base population of 2.3 million to 3.0 million persons for the summer months. Alexandria is currently undergoing a vast program of apartment house/hotel expansion, since the hostile environment of Beirut has resulted in Alexandria becoming a resort for much of the Arab Gulf countries. During 1976, EEA had 420,000 customers in Alexandria; this figure is expected to reach almost 550,000 by 1980.

2.37 Physically, Alexandria with its geographic shape, presents a planning constraint not existing in other cities in Egypt. The city is a long strip of land about 3 km wide and 32 km long. For much of its length, it is bordered on one side by the Mediterranean Sea, and on the opposite side, Lake Mariut. Thus, unlike the Cairo system where EEA has just about completed a 220 KV loop around the city, Alexandria's sub-transmission and distribution system must run in a long, straight line along the coast.

2.38 Similar to Cairo, the distribution system in Alexandria is the responsibility of an EEA Zone Office. Construction, operation and maintenance are carried out by seven (7) sub-zones in the same manner as the Cairo zones.

Shibin El-Kom Distribution System

2.39 The town of Shibin El-Kom is located in the Nile Delta, about 60 km northwest of Cairo and two-thirds the distance to Tanta from Cairo. It is not, however, on the main agricultural highway that runs from Cairo through Tanta to Alexandria; Shibin El-Kom is on a secondary road system 10 km west of the main road. It has a population of approximately 330,000 persons. It is the provincial capital of the Menoufia Governorate, the home of Egyptian President Sadat. Being in the Delta, the city is supported primarily by surrounding agriculture and light industry; however, there is also a textile mill in the city.

2.40 As mentioned earlier, the municipality electric department operates and maintains the distribution system. It acts much like a Cairo sub-zone office in its functions and responsibilities except it only has responsibility for the secondary system; that is the 380/220 V distribution system which connects to individual consumers. The municipality has no responsibility for the 11 KV circuits and above; those circuits are the responsibility of the applicable EEA Zone Office, in this case, the Delta Zone Office. Municipality workers receive training from the applicable zone office but since it handles only the low voltage system, the training need not be as complicated as that given to EEA's employees.

2.41 Preliminary results of the 1976 Population and Housing Census indicates only approximately 64 percent of the dwellings, or 41,000, are lit by electricity. EEA states that 1976 sales to the city totalled 19.7 million KWH. This excludes the sales to the textile mill which consumed 46.8 million KWH. Sales to the city is expected to increase to about 29.7 million KWH by 1981.

Beni Suef Distribution System

2.24 Beni Suef, the capital of the Beni Suef Governorate, is located 115 km south of Cairo directly on the main highway which runs between Cairo and Aswan, which in turn parallels the Nile River. In addition to the usual agriculture and light industry, Beni Suef also has a technical institute specializing in Agriculture. The town and fringe areas have a combined population of about 275,000 persons. About 56 percent of the dwellings, or 31,500, are lit with electricity. EEA bulk sales to Beni Suef totalled 20.2 million KWH in 1976 and are expected to reach about 35 million KWH by 1981.

2.43 Like Shibin El-Kom, operation and maintenance of the electrical distribution system in Beni Suef is the responsibility of the municipal electricity department. Beni Suef, however, is in the EEA Upper Egypt Zone.

F. Distribution System Peak Load and Energy Consumption Forecasts

2.44 In planning electrical systems, both short and long term load forecasts are necessary to enable an orderly development of a distribution system. Long-range plans for generation, transmission, and distribution are necessary to ensure that facilities installed to meet short-range needs are compatible with longer-range developments. Quality of long-range forecasts is dependent upon the quality and availability of the data necessary to develop correlations between electric demand and consumption and the various governmental industrial and financial indices. Where this is lacking, historical trends in electric demand and consumption, tempered by judgment are often used. Where sophisticated techniques are not practical and historical trends unavailable, using multiples of present loads will enable the satisfactory development of long-range plans.

Present Forecasting Methods

2.45 EEA and REA use somewhat different approaches in forecasting short-range electrical demands and consumption at the distribution or consumer level. While the results have proven reasonable, Harza feels they are not sufficient to provide insight into longer-range system requirements.

2.46 For Cairo, EEA uses two methods for estimating peak demands, each giving comparable results.

Method 1: Projecting the 1975 peak load to 1980 by using the average annual rate of growth in demand for 1973-74 and 1974-75.

Method 2: Projecting the 1975 peak load to 1980 by using an average annual growth rate of 5 percent and adding to this the diversified demand of planned industrial projects.

2.47 Three methods were used for estimating the 1980 energy requirements for Cairo. The results of the three methods were then averaged to provide the estimated 1980 KWH requirements.

Method 1: Projecting the 1975 energy consumption to 1980 requirements by using the average annual rate of growth in energy consumption for 1973–74 and 1974–75.

Method 2: Projecting the 1975 energy consumption to 1980 requirements by using an average annual growth rate of 5 percent and adding the estimated energy requirements of planned industrial-type projects.

Method 3: Assume the average annual system load factor for the years 1973, 1974 and 1975 remains constant through 1980 and using this, convert the 1980-estimated KWH demand to KWH requirements.

2.48 Alexandria residential and commercial loads are forecast using a 10 percent growth rate. Planned projects are then added similar to the method used in Cairo.

2.49 The REA Electrical Design Institute (EDI) prepares forecasts for the provincial cities by considering the following:

a. Industrialization plans of the ARE.

b. General plans of the city.

c. Recommended norms for calculation of municipalities load and energy consumption in the cities of ARE 1975–85.

d. Information on load and energy consumption from the General Electricity Directors of each governorate.

e. Official statistical information on city populations.

f. Electrification plans of each province up to 1985.

Existing Load Forecasts

2.50 Using the above methods, peak loads for Cairo, Alexandria and the two smaller cities have been projected to increase over a range of ten percent a year to thirteen percent. Using computer-generated load forecasts, Harza will be able to project the growth rate for each of the cities with a considerably higher degree of precision. In the interim, Harza feels that the existing growth rates are reasonable. Using 1976 actual peak demand and energy consumption as a base, Harza is using the following projected peak loads and consumptions as a frame of reference for its studies.

TABLE 4

Peak Load and Energy Consumption

	Cairo		Alexandria		Beni Suef		Shibin El-Kom	
Year	MW	Million KWH	MW	Million KWH	MW	Million KWH	MW	Million KWH
1976	680	3216.7	240	1270	5.2	20.2	5.1	19.7
1977	768	3498.4	264	1441	5.8	22.6	5.8	21.4
1978	868	3809.4	290	1583	6.6	25.3	6.5	23.2
1979	981	4142.1	319	1741	7.4	28.2	7.4	25.2
1980	1109	4498.0	350	1910	8.4	31.6	8.3	27.3
1981	1253	4895.4	385	2101	9.5	35.3	9.4	30.0
Annual Growth Rate	13%		10%		13%		13%	

Distribution Engineering Management Program Load and Distribution Study

2.51 During Phase II, Harza will use a Distribution Engineering Management (DEM) Computer program consisting of a family of electrical distribution engineering management tools which include:

a. Loan forecasting model (system and distribution level).

b. Electrical Distribution System Management

c. Distribution Transformer Load Management

A brief description of each of the above is included in Annex Q.

2.52 The load forecasting model will be used for forecasting loads at the distribution level. These will enable forecasting short-range demands, one-five years, as well as long-range, up to 20 years. Forecasting will be accomplished using data on land usage and the present primary electrical distribution networks. Land usage considers present use of land and use of proposed expanded area for the future. Land use zoning maps indicating residential and commercial expansion through the 2000 prepared by the Ministry of Housing for most areas will be used by EEA, REA and Harza.

2.53 The Ministry of Industry has locations and estimated loads of heavy and light industrial over the next five years. This data will be used by Harza to ensure greater accuracy in future land forecasting.

2.54 EEA considers loads above 40 MW to be heavy industrial and to be considered upon their own merits in planning for generation and transmission for all of Egypt. Heavy industrial loads are subtracted from total loads, and light industrial, commercial, and residential are then trended. The existing and future heavy industrial loads are then added to the trended loads. For consumption, only loads above 625 KVA are considered heavy industrial loads for load forecasting purposes. In Alexandria, loads above 500 KVA are considered heavy industrial loads.

2.55 To prepare the long-range plans, it is necessary to forecast loads over a period of 20 years or more, annually updating such forecasts. Harza's DEM will readily forecast short and long-range electrical demands, permitting the preparation of short-range expansion plans engineered to be compatible with long-range expansion plans.

III. THE PROJECT

3.01 This project consists of the construction and installation of electric distribution equipment, including transformer substations, distribution transformers, switchgear, relays, distributors, and cable required to rehabilitate and expand the electric distribution systems in the cities of Cairo, Alexandria, Shibin El Kom and Beni Suef. Included in the project, in addition to the materials and equipment, are the services of an engineering consulting firm to provide engineering supervision during the construction phase, as well as formulate and oversee a related training program for applicable EEA and REA personnel. The project is based on a feasibility study prepared by Harza Overseas Engineering Co., an American engineering consulting firm headquartered in Chicago, in which the distribution systems and related load demand in the four project cities were studied.

3.02 Using highly specialized computer programs, Harza will prepare detailed design specifications and work programs for each of the cities to install the equipment. Installation will be carried out by EEA and REA work crews, or in the case of major installations such as the high voltage substation, by EEA civil contractors.

3.03 The total estimated foreign exchange requirement to be financed by A.I.D. for the Year One Project is $97.2 million. Due to current limitation on availability of funds, A.I.D. will authorize $17.012 million during FY 77 and the balance during FY 78 as additional funds become available.

All Egyptian pound costs will be financed by the Egyptian Electricity Authority or the Rural Electrification Authority as applicable depending upon the location and type of installation.

IV. TECHNICAL ANALYSIS

A. General

4.01 The distribution system is an important element of the electric power system. Its function is to take the electric energy from the bulk power source, the Unified Power System, and distribute or deliver it to the customers of each city. The effectiveness with which a distribution system fulfills this function is measured in terms of voltage regulation, service continuity, flexibility, efficiency and cost. The cost of the distribution system is an important factor in the delivered cost of electrical energy to the customer. For example, approximately 50 percent of the capital investment in electric power systems, including power generation plants, is in the distribution system.

Technical Objective

4.02 The objective of distribution projects, in general, is to design, construct, operate, and maintain a distribution system that will supply adequate electric service to the load area under consideration, both now and in the future, at the lowest possible cost. Unfortunately, no one type of distribution system can be applied economically in all load areas, because of differences in load densities, the existing distribution plant, topography, and other local conditions. Therefore, each distribution must be specifically engineered and designed to fit local requirements. In studying the load areas, the entire distribution system from the bulk power source is considered as a unit. This includes sub-transmission, distribution sub-station, primary feeder, distribution transformer (kiosks), secondaries and services. All these components are interrelated and must be studied as a whole so that money saved in one part of the distribution system will not cause offsetting increases elsewhere in the system.

4.03 The objective of this project is to design the rehabilitation and expansion of the Project cities' distribution systems in order to provide service with minimum voltage variation and a minimum of interruption. Service interruption should be of short duration and affect as small a number of customers as possible. The overall system cost, including construction, operation and maintenance of the system, should be as low as possible consistent with the quality of service required in the load area. The system must be flexible, to allow expansion in small increments so as to meet changing load conditions with a minimum of modification and expense. This flexibility will permit keeping the system capacity close to actual load requirements and thus permit the most effective and efficient use of system investment. System flexibility reduces the importance of predicting exact location and magnitudes of future loads. Therefore, equipment can be procured based on projected loads for a specific area and, if conditions change prior to installation, equipment can be effectively utilized in another load growth area.

B. Egyptian Distribution Systems

Source of Power

4.04 The Unified Power System furnishes bulk power to each of the four project cities. Generation and high voltage transmission facilities, as presently installed and planned, are adequate to supply bulk power over the life of the project. Sanderson & Porter, in their Power Sector Survey, System Planning Diagnostic Report, issued April 1977, confirmed the Unified Power System's adequacy. Cairo and Alexandria distribution systems are served bulk power from the 200 KV transmission lines. Beni Suef is served from the 132 KV transmission line and Shibin El-Kom is served directly from the 66 KV sub-transmission line.

Egyptian Distribution System Components

4.05 In general, the distribution systems in Egypt are comprised of the following components:

Distribution Sub-stations	66 KV/11 KV
Medium Voltage Circuits	11 KV
Distribution Points	11 KV
Distribution Transformer	11 KV/380 V-220 V
Low Voltage Feeders	380 V/220 V

Below is a technical description of the components:

1. Distribution Sub-stations

Transformers ranging in size from 10 MVA to 25 MVA, with normally from two to four per sub-station step the voltage down from the subtransmission voltage to the medium voltage. Each sub-station consists of a double high-voltage bus with each transformer being capable of connection through disconnect switches to either bus. The switches are interlocked to prevent connection to both busses at the same time. The medium voltage side of each transformer is normally connected to a separate bus with the busses interconnected with bus-coupler circuit breakers. The medium voltage busses are extended in a straight line, interconnected to form a ring bus, or a double bus.

Circuit breakers with overcurrent relays are installed in the high voltage leads to the transformer and circuit breakers with reverse current relays are installed in the low voltage leads. The transformer is also provided with differential and gas pressure protection.

2. Medium Voltage Circuits (11 KV)

Usually there are four medium voltage circuits per transformer, connected to the medium voltage bus through circuit breakers which radiate from the substation. While most of the circuits extend to a switching station called a "distribution point" or "distributor", some circuits radiate directly from the sub-station to "transformer points" or "kiosks". Four to eight or more transformer points are connected in series

to form the entire 11 KV circuit. Eight medium voltage circuits radiate from each distribution point to serve the loads. With few exceptions, these circuits are underground. All medium voltage circuits to the transformer points are in the form of loops from the sub-station or distributor bus with the loop being open at a transformer point bus.

3. Distribution Points or Distributors (11 KV)

Distribution points are switching stations consisting of a split-bus, each bus section being supplied by two 11 KV feeders, operating in parallel, from a sub-station bus. Each distribution point bus is supplied from a different sub-station. Each feeder is protected at the sub-station end by circuit breaker with overcurrent and earth leakage relays. There is a circuit breaker with overcurrent, reverse power and earth leakage relays at the distribution point end of these feeders. Four circuits extend from each bus section to transformer points. Each circuit is protected by a circuit breaker with phase overcurrent relays and earth fault protection.

4. Distribution Transformers (Transformer Points)

A transformer point may be a concrete or metal enclosure called a "kiosk", or a room in a building, set aside for the installation of electrical equipment. The equipment consists of an 11 KV bus, a transformer, and a low voltage bus (380 V-220 V). The transformer is connected to the medium voltage bus through either a current limiting fuse and a load-break disconnect switch, or an oil circuit breaker with overcurrent relays. The incoming and outgoing medium voltage cables are normally connected to the medium voltage bus through load or non-load-break disconnect switches. Disconnect switches in these "in" and "out" circuits act as sectionalizing switches to isolate faulted equipment and cables, and to transfer load between circuits in case of emergency. However, it is necessary to de-energize the circuit to accomplish this. Sometimes one or more additional medium voltage circuits are also connected to the bus through non-load-break switches. Normally the transformer low voltage winding is connected directly to the low voltage bus or through an air circuit breaker. The low voltage feeders which extend into the surrounding area to serve the customers are connected to the low voltage bus through fuses.

5. Low Voltage Feeders (380 V/220 V)

Usually there are four or five low voltage feeders radiating from each transformer point. In Cairo, each feeder serves one or more switching boxes which serve as fuse points for three or four separate circuits, each serving a group of customers. In Alexandria, the feeders serve a group of consumers directly. The major portion of the low voltage circuits in Cairo are installed underground with a small portion overhead in the outlying areas. In Alexandria 70 percent of the low voltage circuits are overhead. In Shibin El-Kom and Beni Suef nearly 100 percent of the low voltage circuits are overhead.

4.06 Annex R shows schematically the typical elements of the system from the sub-transmission bus to the customer circuit, as described above.

C. Cairo Distribution System

Bulk Power Supply

4.07 There are five bulk power supply distribution substations on the Cairo system as follows:

TABLE 5

Cairo Area 220 KV/66 KV Transformer Stations

Sub-Station	No. x MVA	Voltage KV	Capacity
Wadi Hoft	3 x 125	220/66	375 MVA
Cairo South	2 x 75	220/66	150 MVA
Cairo West	2 x 75	220/66	150 MVA
Cairo North	2 x 75	220/66	150 MVA
Heliopolis	3 x 125	220/66	375 MVA
Cairo East	3 x 75	220/66	225 MVA

4.08 The 220 KV to 66 KV bulk power supply transformer capacity for the Cairo area totals 1425 MVA. Based on 719 MW peak system load in 1976, and an 80 percent power factor, with optimum load distribution, the present capacity should be adequate to supply the projected five-year loads. In addition, approximately 450 MW of Cairo area generation feeds directly into the 66 KV system.

Distribution Sub-stations (11 KV output)

4.09 There are nineteen distribution sub-stations supplying the 11 KV primary feeders in the Cairo area. The total transformer capacity of these 66 KV to 11 KV sub-stations is 1210 MVA. In the near future, eight old 10 MVA, 66/11 KV transformers will be replaced with eight new 20 MVA transformers which have already been purchased and received in country. Another seven 20 MVA, 66/11 KV transformers are on order. This additional capacity, along with one 100 MVA sub-station included in this project will be sufficient to supply the projected five-year load.

4.10 Cairo has seven 66/6.6 KV sub-stations with a total capacity of 480 MVA. This 6.6 KV capacity is dedicated to industrial loads and is not available for general consumption and is not included for this project consideration.

Distribution Transformers (300-230 Volt output)

4.11 The Cairo distribution system, because of the large area and number of customers, is divided into eleven zones. Number and capacity of the distribution transformer in each of the zones is as follows:

TABLE 6

Cairo Area Distribution Transformers 11 KV/380 V-220 V

North	No. of Transformers	Capacity KVA	Voltage	Total Capacity MVA
Abbassia	483	201,500	11KV/300-230	201.50
Helmia	570	157,500	11KV/380-230	157.50
Shoubra	155	77,500	11KV/300-230	77.50
Shoubra El-Khema	332	128,000	11KV/300-230	128.00
South				
Sayeda	188	97,650	11KV/400-230	97.65
Boulaq	313	162,150	11KV/400-230	162.15
Kalaah	158	34,500	11KV/400-230	34.50
Helwan	158	50,150	6.6KV/400-230	50.15
Maadi	190	62,750	11KV/400-230	62.75
Nile West				
Dokki	410	120,000	11KV/400-230	120.00
Harem	400	80,000	11KV/400-230	80.00
Total	3281			1171.70

4.12 The total number of distribution transformers in the Cairo area is 3,281 and total capacity is 1171.7 MVA. Standard utilization voltage is 380-230 Volts. Load on the Cairo system in 1976 was 680 MW and the demand is projected to reach 1253 MW in 1981. Thus, additional distribution transformer capacity 11 KV to 380-230 Volts will be required to meet the projected five-year demand in the Cairo area.

D. Alexandria Distribution System

Bulk Power Supply

4.13 In Alexandria there are three bulk power supply sub-stations as follows:

TABLE 7

Alexandria Area 220 KV/66 KV Transformer Stations

Sub-station	No. x MVA	Voltage KV	Capacity
El Amria	2 x 125	220/66	250 MVA
El Matamir	2 x 125	220/66	250 MVA
Abis	2 x 75	220/66	150 MVA

4.14 The 220 KV to 66 KV bulk power supply transformer capacity for the Alexandria area totals 650 MVA. The system peak demand reached 250 MW during the first six months of 1977. With two additional 220 KV sub-stations on order and a third one planned, the bulk power supply will be sufficient with normal load distribution to supply the projected five-year loads. In addition there is approximately 110 MW of Alexandria area generation feeding directly into the 66 KV system.

Distribution Sub-stations (11 KV output)

4.15 There are twenty-seven sub-stations supplying the Alexandria area 11 KV and 6.6 KV primary feeder system. Total capacities are as follows:

220/11 KV - 150 MVA	66/6.6 KV - 126 MVA
66/11 KV - 306 MVA	33/6.6 KV - 48 MVA
33/11 KV - 283 MVA	
Total 739 MVA	174 MVA

4.16 Additions presently planned for the Alexandria area include: Five 66/11 KV sub-stations with a capacity of 360 MVA and three 66/6.6 KV sub-stations with a capacity of 150 MVA.

4.17 All of the 6.6 KV capacity and a portion, about 180 MVA, of the 11 KV capacity is dedicated to industrial customers and is not available for residential distribution.

4.18 The present 1976 demand is 250 MW in the Alexandria area. There is sufficient 220 KV to 11 KV distribution transformer capacity to meet the present and 5-year projected demands.

Distribution Transformers (400-230 Volt output)

4.19 The Alexandria area has a total of 2,066 distribution transformers and a total capacity of 536.35 MVA located in seven zones as follows:

TABLE 8

Alexandria Area Distribution Transformers

No. of Transformers	Capacity KVA	Voltage
1073	350,000	11KV/400-230
587	137,225	11KV/220-127
17	2,750	11KV/220
350	42,600	11KV/220-110
10	1,250	5KV/220-110
17	1,350	2KV/220-110
12	1,170	2KV/400-230
Total 2066	536,345	

4.20 Load on the system in 1976 was 240 MW and projected load is 385 MW in 1981. Utilization voltage to the customer is primarily 380/220 Volts. Other utilization voltages, 127 and 110 Volts, will be gradually phased out and replaced with the standard 380/220 Volt service. Many of the non-standard 127 and 110 Volt-transformers have exceeded their useful life and replacement with 380/220 Volt-transformer points is recommended. Although distribution transformer capacity in Alexandria is sufficient to meet the five-year projected loads, additional capacity will be required to replace the obsolete non-standard voltages.

E. Beni Suef Distribution System

Bulk Power Supply

4.21 At Beni Suef there is one bulk power supply distribution sub-station rated at 2 x 32 MVA for a total capacity of 64 MVA. This sub-station steps down the 132 KV source to 66 KV sub-transmission voltage. The maximum load at this sub-station reached 32 MW during the first six months of 1977. Assuming an 80 percent power factor and normal operation conditions, this transformer capacity should be adequate to supply the projected five-year loads.

Distribution Transformers

4.23 The Beni Suef area has 65 distribution transformers with a total capacity of 9.25 MVA. All of these transformers are 11 KV primary and 380-220 Volt secondary and are connected Wye grounded.

4.24 The total load at Beni Suef in 1976 was 8.5 MW including 5.2 MW residential; the projected demand is 15.7 MW including 9.5 residential in 1981. Additional distribution transformer capacity is required to meet the five-year projected demand in Beni Suef.

F. Shibin El-Kom Distribution System

Bulk Power Supply

4.25 The Shibin El-Kom system is supplied directly from the Unified Power System at 66 KV. No distribution transformers are installed. Bulk power supply is adequate to serve the five-year projected loads.

Distribution Sub-stations

4.26 The one existing distribution sub-station at Shibin El-Kom consists of two 16 MVA, 66/11 KV transformers. The present residential load at Shibin El-Kom is 5.1 MW and is projected to reach 9.4 MW in 1981. The present capacity of 32 MVA is sufficient to meet the projected 5-year demand including the 10.4 MW industrial (Textile Factory) loads.

Distribution Transformers

4.27 There are 54 distribution transformers in Shibin El-Kom with a total capacity of 7.2 MVA. All the above transformers are 11 KV primary and 220 Volts secondary. Additional distribution transformer capacity will be required to meet the projected 5-year demand.

G. Technical Conclusions Year One Project

4.28 An analysis of present capabilities of the installed distribution systems compared with present and projected demand leads to the following conclusions. Cairo needs additional 66/11 KV sub-station capacity and 11 KV to 380-220 Volt distribution transformer capacity. Alexandria, Beni Suef and Shibin El-Kom will require only additional 11 KV to 380-220 Volt distribution capacity. Harza detailed Phase I study has concluded that additional sub-transmission 66 KV cable is required in Cairo. Both Cairo and Alexandria require additional primary 11 KV cable and all four cities require additional secondary 380/220 Volt cable. Harza Phase I study of existing effectiveness of the distribution systems, measured in term of voltage regulation, service continuity and efficiency, has concluded that rehabilitation of selected components is required and justified. These components requiring rehabilitation include

the following: sub-station 66/11 KV and 66 KV cable in Cairo; transformer points 11 KV/380-220 Volt and distributors in Cairo and Alexandria; primary 11 KV cable in Cairo, Beni Suef and Shibin El-Kom and 380-220 Volt secondary cable in all four cities. Also, the street lights in Beni Suef and Shibin El-Kom require rehabilitation. Capacitors will be added to the distribution systems in Cairo and Alexandria to reduce power factor loss and increase operating efficiency.

4.29 Harza has recommended that the secondary warehouse and shop facilities, construction equipment, tools and test equipment, along with training and engineering services, be provided to implement the above rehabilitation and expansion program.

H. Training Program

Background

4.30 The electric power sector has been well provided in the past with training assistance from both bilateral and multilateral sources. As a result adequate facilities exist for the training and retraining of technical staff at all levels. However, these facilities are underutilized primarily because of a shortage of trained instructors, and a lack of adequate living accommodations at the two training centers.

4.31 The Institute of Engineers is a training center located on the site of the Cairo South Thermal Power Generating Station, and was started in 1967 through a UNDP-financed project. Courses are established in power generation, transmission and distribution and load dispatching for orientation and upgrading of graduate engineers. The facilities, including laboratories, workshops and classrooms, are capable of handling about 800 engineers per year. However, only 273 engineers attended the Center during 1976.

4.32 The Training Center for Mechanical/Electrical Skilled Workers and Technicians is located adjacent to the site of the Cairo North Power Generating Station. This facility was established through bilateral aid in 1973 for the training of middle and lower level technical staff in the following fields:

(a) repair and installation of transformers and electrical machines;
(b) repair and installation of substation switchgear;
(c) Repair of relays and control devices;
(d) village electrification;
(e) repair of measuring instruments;
(f) splicing of underground cables;
(g) operation and repair of low and medium voltage distribution systems;
(h) water treatment;
(i) general machining, welding and sheetmetal work.

The workshops, laboratory and classroom facilities can take about 3,000 trainees per year; however, only 900 passed through during 1976.

4.33 The World Bank under their 1977 Regional Electrification Project has included funds to upgrade both of the above mentioned training facilities. The IBRD will provide foreign exchange in the amount of $1,152,000 to provide three years of technical assistance, living accommodations for 100 trainees at each Center, training aids, and 18 man-months of overseas training for Egyptian instructor-trainees.

4.34 We, of course, will make maximum utilization of the above training facilities in the implementation of the Urban Distribution Project. The loan will supplement the IBRD input with $276,000 to provide facilities for our specific needs such as additional classroom rehabilitation, training aids, Egyptian instructor training in the U.S., and technical assistance of a specialized instructor for underground cable installation.

Project Training Requirements

4.35 Training requirements for this project were based on an evaluation of present operation, maintenance and construction activities as applied to the present and projected distribution systems. Consideration was given to management, engineering and technician capabilities and a training program devised which blends in with, and supplements, existing training programs.

4.36 Upper and middle level management training is adequately covered in the A.I.D.-funded Overseas Advisory Associates, Inc. training program for 200 managers. A.I.D. Participant Training in the United States at National Rural Electric Coop Association and REA facilities is an on-going program which now includes about eight distribution engineers. These participants will be trained in U.S. technology as applied to electric distribution system design, operation, maintenance and management.

4.37 Training which must be provided as a part of this project include construction techniques, maintenance of equipment and facilities and system operations. The Consulting Engineer, Harza, or others, will provide on-the-job training during the construction phase of this project. This will include classroom instruction for engineers and construction and maintenance crew foremen at the two training centers at Cairo and one training center in Alexandria. Special attention will be given to obvious problem areas such as underground cable installation, relay protection and fault location.

4.38 Provision will be made in the equipment procurement phase of this project for training in the U.S. at the equipment manufacture plant or facilities. This will include training in the installation, operation and maintenance of U.S. manufactured transformers, switchgear, substations and overhead and underground cable.

Summary

4.39 A summary of training to be provided under this project follows:

1. Consulting Engineer, Harza or other, will train foremen and skilled technicians in construction, operation and maintenance of distribution systems. Number to be trained: 15 foremen, and 50 technicians. Project funding is included in engineering services for a period of 18 months.

2. Training at the two training centers in Cairo and one in Alexandria for construction and maintenance crew foremen and technicians. Number to be trained: 20 foremen and 150 technicians. Project funds in the amount of $338,000 for a U.S. technician for six months; rehabilitation of classrooms, training aids and 20 months in the U.S. for Egyptian instructors.

3. Training at the equipment suppliers' facilities in the U.S. funded under equipment procurement. Training includes installation, operation and maintenance of major distribution equipment. Number to be trained will vary with number of suppliers but will range between 10 to 15 engineers and 20 to 25 technicians.

I. Capital Cost Estimates

4.40 The five-year program foreign exchange cost of rehabilitating and expanding the distribution systems in the four cities totals $463 million. Below are the yearly requirements:

TABLE 9

Annual Foreign Exchange Requirements ($000)

Year 1	$ 97,167
Year 2	86,707
Year 3	97,038
Year 4	89,988
Year 5	92,347
Total	$463,247

A more detailed five-year cost estimate with types of equipment broken out for the four cities appears in Annex S.

4.41 The Year-One Project total cost is $119,551,000 of which $97,167,500 is foreign exchange and the balance of $22,384,000 represents the Egyptian pound costs, converted one U.S. dollar equals .70 Egyptian pounds. Table 10 shows the foreign exchange and the Egyptian pound costs by city for the project.

TABLE 10

Year One Project Capital Cost Estimate Summary ($000)

	Rehabilitation		Expansion		Total Project	
	US $	LE	US $	LE	US $	LE
Cairo	$20668.3	$4803.1	$44342.2	$10983.1	$65030.5	$15786.2
Alexandria	10186.4	1976.1	17534.0	4129.6	27720.4	6106.3
Shibin El Kom	1918.1	246.4	0	0	1918.1	246.0
Beni Suef	2105.6	246.0	0	0	2105.6	246.0
Total	$34898.4	$7272.2	$62269.1	$15112.5	$97167.5	$22384.4
Combined Total Cost						$119551.9

4.42 For the Year One Project, Harza has broken out the foreign exchange requirements for each city and within each city for rehabilitation of the present system and for expansion of the system. Table 11 shows the detailed costs for each city.

4.43 Harza obtained costs both from its home office in Chicago and from recent procurements by the EEA and the REA. Freight and insurance were estimated at 15 percent of the F.O.B. cost. The cost for engineering services were estimated at $18,000 per man-month, for one field engineer and one home office engineer combined, including overhead and travel. A 10 percent escalation factor, and a 15 percent contingency factor were added to arrive at the estimated total cost.

TABLE 11
YEAR ONE PROJECT CAPITAL COST ESTIMATE
FOREIGN EXCHANGE

($000)

EQUIPMENT	CAIRO		ALEXANDRIA		SHIBIN EL-KOM		BENI SUEF		COMBINED CITIES		
	REHAB.	EXPANSION	REHAB.	EXPANSION	REHAB.	EXPANSION	REHAB.	EXPANSION	REHAB.	EXPANSION	TOTAL
I SUB-STATIONS (66/11 kv)											
A. NEW	$ -0-	$4400.0	$-0-	$ -0-	$-0-	$-0-	$-0-	$-0-	$-0-	$4400.0	$4400.0
B. REHABILITATION											
1. SWITCHGEAR	638.0	-0-	-0-	-0-	-0-	-0-	-0-	-0-	638.0	-0-	638.0
2. RELAYS	111.8	-0-	-0-	-0-	-0-	-0-	-0-	-0-	111.8	-0-	111.8
3. METERS	435.7	-0-	-0-	-0-	-0-	-0-	-0-	-0-	435.7	-0-	435.7
4. BATTERY CHARGERS	-0-	-0-	10.0	-0-	-0-	-0-	-0-	-0-	10.0	-0-	10.0
II TRANSFORMER POINTS (11/380-220)											
A. NEW	-0-	1986.0	900.6	450.3	271.0	-0-	357.3	-0-	1528.9	2436.3	3965.2
B. REHABILITATION											
1. 11 kv Bus	1449.6	-0-	724.8	-0-	-0-	-0-	-0-	-0-	2174.4	-0-	2174.4
2. 380/220 v Bus	373.0	-0-	559.5	-0-	-0-	-0-	-0-	-0-	932.5	-0-	932.5
3. FAULT INDICATORS	83.6	-0-	65.0	-0-	-0-	-0-	-0-	-0-	148.6	-0-	148.6
III DISTRIBUTORS (380-220v.)											
A. RELAYS	77.3	-0-	-0-	-0-	-0-	-0-	-0-	-0-	77.3	-0-	77.3
B. COMPLETE UNITS	-0-	-0-	180.0	450.0	-0-	-0-	-0-	-0-	180.0	450.0	630.0
IV CABLE AND FITTINGS											
A. 66 kv	591.3	4730.4	-0-	1478.2	-0-	-0-	-0-	-0-	591.3	6208.6	6799.9
B. 11 kv	5906.2	5906.3	-0-	7604.8	82.3 1/	-0-	85.0	-0-	6073.5	13511.1	19584.6
C. 380 v/220 v	2919.0	11676.0	2715.0	667.8	67.1 1/	-0-	41.4	-0-	5742.5	12343.8	18086.3
D. SERVICES	-0-	-0-	-0-	-0-	256.4	-0-	215.0	-0-	471.4	-0-	471.4
V Reclosures & SWITCHING	-0-	-0-	-0-	-0-	41.8	-0-	38.8	-0-	80.6	-0-	80.6
VI POLE FRAMING AND HARDWARE	-0-	-0-	-0-	-0-	124.1	-0-	191.1	-0-	315.2	-0-	315.2
VII WAREHOUSE & SHOPS	-0-	225.0	-0-	50.7	56.0	-0-	56.0	-0-	112.0	275.7	387.7
VIII CONSTRUCTION EQUIPMENT	506.0	506.0	945.5	945.5	77.0	-0-	77.0	-0-	1605.5	1451.5	3057.0
IX TOOLS AND TEST EQUIPMENT	138.4	-0-	472.2	-0-	15.0	-0-	15.0	-0-	640.6	-0-	640.6
X CAPACITORS	-0-	300.0	-0-	300.0	-0-	-0-	-0-	-0-	-0-	600.0	600.0
XI STREET LIGHTS	-0-	-0-	-0-	-0-	140.0	-0-	183.0	-0-	323.0	-0-	323.0
TOTAL EQUIPMENT	$13229.9	$29729.7	$6572.6	$11947.3	$1130.7	$-0-	$1259.6	$-0-	$22192.8	$41677.0	$63869.8
ESTIMATED FREIGHT	1984.5	4459.5	985.9	1792.1	169.6	-0-	188.9	-0-	3328.9	6251.6	9580.5
TOTAL CIF	15214.4	34189.2	7558.5	13739.4	1300.3	-0-	1448.5	-0-	25521.7	47928.6	73450.3
TRAINING	276.0	-0-	62.0	-0-	-0-	-0-	-0-	-0-	338.0	-0-	338.0
ENGINEERING SERVICES	864.0	864.0	432.0	432.0	216.0	-0-	216.0	-0-	1728.0	1296.0	3024.0
Sub-TOTAL	16354.4	35053.2	8052.0	14171.3	1516.3	-0-	1664.5	-0-	27587.7	49224.6	76812.3
ESCALATION 10%	1634.4	3505.3	805.2	1386.1	151.6	-0-	166.5	-0-	2758.8	4922.5	7681.2
CONTENGENCY 15%	2698.5	5783.8	1328.7	2287.0	250.2	-0-	274.6	-0-	4552.0	8122.1	12674.0
TOTAL PROJECT	$20688.3	$44342.2	$10186.4	$17534.0	$1918.1	$-0-	$2105.6	$-0-	$34898.4	$62269.1	$97167.5

J. Section 611(a) Requirements

4.44 In view of the foregoing, it is the position of the Mission in Cairo that the requirements of Section 611(a) of the Foreign Assistance Act of 1961, as amended, have been met. This project is based upon sound engineering plans as recommended by Harza Overseas Engineering, Inc., and a reasonably firm cost estimate also prepared by Harza. The Mission has reviewed the plans and cost estimate and finds them reasonable and accurate.

V. FINANCIAL ANALYSIS

A. General

5.01 Until 1976, the power sector finances of General Egyptian Electricity Corporation (GEEC) were for practical purposes part of the Government's. The GEEC budget was a part of the Government budget; any unspent funds and profits were returned to the Ministry of Finance at the end of each year. Since EEA was established on February 12, 1976, it prepares its own budget for approval by its Board of Directors, which then must be ratified by the Minister of Electricity and Energy and finally approved by the People's Assembly. EEA's budget is a cash budget which is prepared only for one year. Its 5-Year Plan for investments is submitted to the Ministry of Planning for coordination with the national 5-Year Plan.

B. EEA Historical Financial Position

5.02 (Much of this section and the following section C. - EEA Financial Projections, is based on the World Bank Document (1517a-EGT), "Appraisal of a Regional Electrification Project - Egypt" dated May 24, 1977.)

5.03 At the time EEA was created, it assumed all the GEEC's assets, liabilities, rights and obligations. The income statements and balance sheets of the GEEC for the years 1973 through 1975 are shown in Annex T. The accounts as of December 31, 1972 were for a period of 18 months following a change in the GEEC's fiscal year from June to December and these accounts have therefore not been shown.

5.04 Neither EEA nor its predecessor GEEC have earned a profit since 1972. Its financial performance is distorted by:

a. previous years' adjustments probably arising from delays in completion of accounts by the zone offices;

b. the use of the Government's standardized accounting system which is designed to measure production inputs and value-added for national statistical purposes;

c. failure to separate EEA's liabilities from those of the REA and transfer completed assets to EEA;

d. the valuation of fixed assets is not yet complete. Specifically the fixed assets forming part of the High Dam Project and associated loans are included in EEA's books at estimated values only; and

e. problem areas identified by the GEEC's audit reports in previous years have not been corrected. As a result the GEEC's auditors have not been prepared to give an unqualified opinion on the accounts. Problems which are referred to in the auditors' reports include:

i. lack of coordination between technical and financial departments which affects stock, work in progress, and fixed assets accounts;

ii. the costing system does not enable control of work in progress, stock and in-transit items;

iii. irregularities in stock records;

iv. accounts with the zones not reconciled; and

v. no inventory of fixed assets.

5.05 Unpaid electricity accounts at the end of 1975[1/] amounted to about LE 51 million representing almost 8 months sales; a provision for bad debts of almost LE 20 million had been made. Nearly all unpaid accounts are owed by the public sector; municipal councils, public utilities, government buildings and industrial companies. In some cases, failure to pay is due to inadequate budget provision by these organizations, in others it is due to refusal to accept the 20 percent rate increase which was introduced in January 1975.

1/ Figures for 1976 were not completed but EEA estimated delinquent electricity accounts as of December 31, 1976 to be about LE 60 million.

5.06 Although GEEC incurred a net loss in 1975, operating income was sufficient to provide a rate of return on average net fixed assets in service of 4.1 percent. If the provision for bad debts were reduced by half (i.e. LE 10 million), the rate of return would have exceeded 7 percent. However, the rate base, gross fixed assets in service minus depreciation, on which the rate of return was calculated, comprises fixed assets valued at historical costs and, as mentioned previously in the case of the High Dam assets at an estimated value. Depreciation is based on the straight line method using rates established under the national standardized accounting system. There has been some adjustment to rates for hydro plant, transmission lines and substations since the High Dam was completed. These are now all proposed to be depreciated over 50 years (previously 40 years). Assets which remain in service after they have been fully depreciated continue to be depreciated at half rates. However, the latter provisions which are held as a reserve for revaluation ar small. Depreciation policies, with the exception of the provisions charged on assets which have been fully depreciated, are considered appropriate but gross fixed assets in service and depreciation should be revalued periodically to reflect price level changes and to provide an appropriate rate base for determining EEA's operating performance.

5.07 Since 1973, while gross fixed assets in service have grown at less than 3 percent per annum to LE 436 million, sales have risen by 16 percent. This has been clearly a period of consolidation and little new investment due to Egypt's international problems, scarcity of funds, and adequacy of existing generating capacity. GEEC's capital structure reflects a similar trend; the debt/equity ratio was 75:25 at the end of 1975 (compared with 77:23 for 1973). The corporation's capital of LE 75.6 million has been unchanged since 1968. Most of EEA's existing long-term debt (about 88 percent) is owed to the Government and repayable over 12 years subject to annual interest of 5 percent. Foreign debts total about LE 40 million of which about LE 29 million is owed to the USSR and the remainder are short-term suppliers/export credits on soft terms. Foreign debts have not been revalued to reflect foreign exchange adjustments.

5.08 In making its $48 million dollar loan to the EEA for the Rural Electrification Project, the World Bank has obtained assurances from the EEA that these adjustments will be made.

Financial Planning Assistance

5.09 Many of the problems described above have been diagnosed by Sanderson & Porter (S & P) in the UNDP financed Power Sector Survey. Its report, dated November 1976, lists 58 recommendations or actions EEA should take in the areas of energy policy, organization and management, system operations, system planning, accounting and finance, tariffs and training. Eighteen of the recommendations were in the areas of accounting and finance and five on tariffs.

5.10 The World Bank proposed, and the EEA concurred, that $600,000 be set aside from its $48 million Rural Electrification Loan to finance the services of three additional financial consultants under a separate two-year contract, to augment the S & P team. Their principal functions are to assist EEA to:

a. modify the national standardized accounting system to better meet the needs of EEA as an autonomous public utility authority especially for improved cost control and management information;

b. update the fixed assets records and propose a simple formula for revaluation of EEA's fixed assets and depreciation provisions to reflect current price levels; and

c. undertake a study of the feasibility of transferring customer billing, payroll and other high volume accounting activities to computer processing.

The team members arrived in Egypt about the first of August and have begun work.

C. EEA Financial Projections

5.11 EEA, together with S & P, have prepared estimated income statements and balance sheets for the years 1976 through 1980. They are shown in Annex U; the assumptions used in preparing these forecasts are also given in Annex U.

5.12 Critical to EEA's future financial performance is its ability to collect overdue electricity accounts and reduce the volume of funds it has tied up in working capital. EEA is making concerted efforts to collect all overdue accounts, and, in fact, recently collected a major portion of a 7-year old receivable from an industrial user totalling LE 10 million.

5.13 If its budget estimates and forecast reduction in provisions for bad debts are achieved, in 1976 EEA could earn a rate of return of 10.5 percent on the existing book values of average net fixed assets in service. After 1976, net income is expected to decline rapidly again as costs increase, especially salaries and wages, depreciation on new plant, and interest charges on new loans including the depreciation and charges relating to the 1971-75 construction by REA which is expected to be taken up by EEA at the end of 1976. During the period 1976-1980 operating costs per unit are expected to increase by about 7 percent per annum.

5.14 At the present time, it is not possible to assess with any accuracy the impact of revaluation of EEA's accounts. Neither has it been possible to quantify the savings which might be achieved by converting EEA's oil-fueled thermal plants to natural gas, improvements in the 500 KV transmission system and optimization of plant capacity at Aswan. Therefore, for the purposes of the financial forecasts tariff increases of 20 percent in 1978 and 22 1/2 percent in 1979 which would increase tariffs about 50 percent above present levels have been assumed. These would only be sufficient to achieve a 9 percent rate of return in 1979 on average net fixed assets at existing value. Tariff increases of this magnitude would in all likelihood not be sufficient to achieve a 9 percent return on a fully revalued assets base. In its agreement with the World Bank, EEA has agreed, however, to complete the

valuation of its existing assets and establish a formula acceptable to the Bank for revaluation of its existing assets by June 30, 1978. EEA has further agreed to prepare a plan or proposals by December 31, 1978, for tariff increases or other measures designed to achieve a 9 percent rate of return on its average net fixed assets in service after revaluation.

Return on Investment

5.15 Similar to A.I.D.'s $50 million Loan to the EEA to finance the Talkha/Helwan Gas Turbines (263-K-032), the Bank included in its Agreement with the EEA the requirement that EEA attain a nine percent return on the average current net value of fixed assets by EEA fiscal year 1979. Although EEA feels that a nine percent financial return is a reasonable rate of return, it has expressed some doubt that the rate can be achieved by 1979 given EEA current financial position. A.I.D. concurs with the World Bank and EEA that the plan to be submitted at the end of 1978 would afford all parties an opportunity to exchange views on the target for 1979 and consult with other interested lending institutions which have agreed to similar financial targets for EEA. Thereafter, EEA has agreed to submit to the World Bank by the end of November each year a suitable financial plan for meeting the 9 percent rate of return in the following year. A.I.D. will have in its loan agreement with the EEA for this project, a covenant requiring EEA to submit a copy of the annual plan to A.I.D. for review with EEA and the World Bank. Since the rate of return is intended to measure the financial performance of the sector it would be calculated on the consolidated accounts of the EEA. These would include the accounts of distribution companies which the Government is planning to establish as EEA subsidiaries.

Debt/Equity Ratio

5.16 If the tariff increases assumed were to be adopted, EEA could expect to be able to finance about 26 percent of its construction requirements in the years 1977 through 1980. This would enable it to approach the debt/equity ratio target of 1.5 to 1 (60:40) proposed by A.I.D. in the Talkha/Helwan Loan Agreement. The debt/equity ratio is expected to improve from 75:25 in 1975 to 67:33 in 1980. After revaluation of fixed assets, the 60:40 objective could well be achieved. More importantly the tariff increases assumed would, after 1977, provide sufficient internal cash generation annually through 1980 to cover EEA's debt service commitments more than one and one half times. To ensure that EEA's debt to equity ratio continues to improve, and that its borrowing does not exceed prudent levels, EEA agreed to obtain the World Banks' consent to any borrowings it plans to undertake whenever its internal cash generation is not sufficient to cover its debt service at least one and one half times in any future year. In calculating amortization of long-term debt, EEA further agreed with the Bank that it would revalue all foreign debts at the end of each year in accordance with the current rates of exchange obtainable by the borrower.

D. Project Financing Plan

5.17 Although the foreign exchange requirement for the Year One Project as estimated by Harza is $97.2 million, it will not be possible for A.I.D. to finance this amount during FY 77 due to A.I.D. budgetary constraints and a reallocation of FY 77 funds within EEA requirements. Thus, there remains only $17.012 million for FY 77 authorization. It was agreed with EEA that since the proposed Urban Distribution Project could be implemented with tranche financing, A.I.D. would prepare the project justification based on the total Year One Project requirements, and that the authorization would be processed in two steps: FY 77 authorization for $17.012 million and an FY 78 authorization for the $80.188 million balance.

5.18 Therefore, A.I.D. proposes, with EEA and REA concurrence, to utilize the first portion, $17 million, to finance the rehabilitation of the two provincial cities, Shibin El-Kom and Beni Suef, and the rehabilitation of Alexandria. The remaining funds will be used to finance vitally needed tools, test equipment, construction and installation equipment, 66 KV cable, distribution relays and transformer parts all in Cairo. Below is a summary of the financial requirements:

TABLE 12

FY 77 YEAR ONE PROJECT ($ 000)

Sub-Project	Foreign Exchange	Egyptian Pounds	Total
Rehabilitation of Beni Suef	$ 2,105.6	$ 246.0	$ 2,351.6
Rehabilitation of Shibin El-Kom	1,918.1	246.4	2,164.5
Rehabilitation of Alexandria	10,186.4	1,976.1	12,162.5
Remainder Portion for Cairo Rehabilitation	2,801.9	253.7	3,055.6
	$17,012.0	$2,722.2	$ 19,734.2

5.19 The foreign exchange requirement will be financed by A.I.D. and the Egyptian pound portion will be financed by EEA from current operations or EEA borrowings from the Ministry of Finance. Since most, if not all, of the installation of the materials and equipment will be carried out by EEA and REA crews or EEA owned construction companies, the work will be done by existing work force which would otherwise be working on the system without the project.

5.20 It is proposed that U.S. dollar costs of this project be financed on a two-step basis; that is that the GOE be required to relend the A.I.D. loan proceeds to the EEA on commercial terms. Proposed terms to the GOE are recommended to be at A.I.D.'s lowest concessionary terms--principal repayment in 40 years with a ten-year grace period, with interest at two percent during the grace period and three percent during the repayment period. Proposed terms to the EEA are principal repayment in Egyptian Pounds over a 25-year period, including a five-year period with interest at 8 1/2 percent during the life of the loan. The latter terms are consistent with worldwide utility rates which tend to have a slightly lower interest rate.

5.21 The Loan Agreement will contain a Condition Precedent to Disbursement requiring evidence that the GOE has budgeted funds sufficient to finance the first fiscal year's local currency costs; and a covenant requiring the GOE to provide all Egyptian currency and any foreign currency required in excess of A.I.D.'s loan to complete, operate and maintain the project.

E. Disbursement Period

5.22 Disbursement for construction and installation costs of the FY 77 project is expected to run about two and a half years from the date of loan signing. Although this period may appear excessive the nature of the equipment itself, particularly transformers and cable, require long lead times from the factory. Accordingly below are the estimated disbursements over the implementation period of the FY 77 and FY 78 Year One Project:

TABLE 13

DISBURSEMENT SCHEDULE

Calendar Year	FY 77 Project AID Dollar Loan ($000)	FY 77 Project EEA Egyptian Pound ($000)	FY 78 Project AID Dollar Total	FY 78 Project AID Dollar Loan ($000)	FY 78 Project EEA Egyptian Pound ($000)	FY 78 Project Total
1977	$ - 0 -	$ - 0 -	$ - 0 -	$ - 0 -	$ - 0 -	$ - 0 -
1978	5,400	450	5,850	14,228	3,250	17,478
1979	8,497	850	9,347	27,610	6,140	33,750
1980	3,115	1,422	4,537	38,350	10,272	48,622
	$17,012*	$2,722	$19,734	$80,188*	$19,662	$99,850

5.23 Proportionately, EEA's Egyptian Pound disbursements will occur during the latter period of implementation compared with the dollar flow. This is a result of A.I.D. disbursements occurring at the time shipment is made from the United States, but EEA will not be able to begin installation until some three to six months later.

F. Debt Servicing Capability

5.24 Egypt's external debt amounted to about $12 billion at the end of 1976. Of this, roughly one-third was to Eastern European countries.

*Total foreign exchange requirement is $97,167,500 as shown in tables 10 and 11.

and primarily for past military equipment imports. The $8 billion balance includes almost $2 billion in deposit liabilities of the Egyptian Central Bank to the various Arab OPEC countries.

5.25 It is estimated that about $950 million in principal payments on medium and long-term debt were made in 1976. An amount estimated at $1.4 billion was owed on short-term bank credit facilities at the end of 1976. In 1977 Egypt received a loan of $1.5 billion from GODE which is being used to substantially reduce its current short-term debt problem.

5.26 Debt service requirements in the future depend heavily on the extent to which new short-term debt can be avoided. Over the near term, we expect the debt service ratio (including short-term debt) to move between 25 and 30 percent of export and service earnings.

5.27 In view of Egypt's heavy debt burden, A.I.D.'s normal concessional loan terms are proposed - 40 years, including a 10-year grace period, with an interest rate of 2 percent per year during the grace period and 3 percent per year thereafter. With these terms, particularly the 10-year grace period, repayment prospects for this $ 97.2 million loan appear reasonable.

VI. ECONOMIC CONSIDERATIONS

A. GENERAL

6.01 The primary benefit of this project is the economic value of the increased sale of electric energy to new customers to be served by extension of the distribution systems. An additional economic benefit will be derived from the reduced distribution system energy losses resulting after rehabilitation of the existing distribution systems. Additional transformer capacity will increase sales by 912 million KWH per year. Distribution system loss will be reduced from 9 percent to 8 percent resulting in a 65.9 million KWH per year saving in electrical energy generation requirements to serve the existing customers.

6.02 The true economic value of a KWH of electric power should be based on an estimate of customer's willingness to pay, based in turn on the shape of direct demand curves for domestic users and prevailing market conditions for the products of commercial and industrial users. For Egypt, such an analysis is not possible given the subsidies and controls that permeate all sectors of the economy. For electricity, tariff structures are formulated by the Ministry of Electricity and EEA under guidelines established by the GOE. Rates are based on the Government's desires to subsidize the user. The GOE has tried to assure that the overall average rates are set at a level which allows EEA a reasonable profit. The GOE's definition of a reasonable return is three percent over operating costs; not a normal method of setting rates. EEA's costs, however, are also to some extent subsidized; the most notable subsidy being the cost of fuel oil for its thermal power plants. Therefore, the overall average power rates, set at a level to allow EEA a reasonable return, represent an overall subsidy and a cost to the national economy. Our best guess is that the average overall rates would need to climb to about 3.5¢ to 4.0¢ per KWH from the present average of 1.3¢ per KWH if EEA were to pay full cost for all its input and average in the relatively cheap hydropower and the more expensive thermal power plants operating on fuel oil.

B. Urban Distribution

6.03 The internal economic rate of return represents the return over the life of the project to the resources engaged in the project. The internal economic rate of return of urban distribution projects is the discount rate which equates the present value of the time streams of the attributable costs and benefits over the project's assumed life of 25 years. At the present time, consumers of electricity in other countries at Egypt's approximate level of development are prepared to pay between 4¢ and 6¢ per KWH. Based on this, we have estimated the economic value of the electricity produced at 4.5¢ per KWH consumed. On the cost stream for reduced distribution system loss we have used this economic value of 4.5¢ per KWH.

6.04 On the cost stream for additional sales, we have included operation and maintenance costs for the generation and transmission system, a capital recovery factor (using a 15 percent discount factor) to account for an additional investment in the generation and transmission system that will be required, and the impact of a 16.4 percent total system loss factor. Generation cost is based on current export fuel cost and a 26 percent hydroelectric 74 percent fossil fuel combination which we expect will occur at project mid-life, 1990. With these adjustments to costs and using the parallel foreign exchange rate of $1.43/LE 1.00 the economic internal rate of return is calculated to be 18.4 percent. This calculation is shown in Annex V.

VII. INITIAL ENVIRONMENTAL EXAMINATION

A. Nature of Surrounding Environment

7.01 This project consists of rehabilitation and expansion of existing electric distribution systems in Cairo, Alexandria, Beni Suef and Shibin El Kom. A description of each of the project cities appears in the Urban Distribution Systems of this paper. See paragraphs 2.33, 2.36, 2.39 and 2.42.

B. Probable Environmental Impact

7.02 The electric power system in Egypt consists of generation, transmission and distribution of electrical energy. This project concerns distribution only and is defined as transporting electrical energy from the bulk source of high voltage electricity, 220KV, to the customer at 380 volts. This project involves rehabilitation of existing systems to improve reliability and efficiency and construction of new facilities to serve additional loads and new customers. Construction consists of additional 66/11 KV substations, 11 KV/400 V distribution transformers, 66KV and 11KV underground and overhead cable. A detailed equipment list is shown in the Technical Analysis Section of this project paper.

7.03 Although the project will add new customers to the distribution systems, the impact upon the environment caused by additional energy consumption is not evaluated by this IEE. The environmental impact of additional generation to serve the project is detailed in project documents dealing with electric power generation facilities such as Ismailia Power Plant and Helwan/Talkha Gas Turbine Plants. These documents include project papers, feasibility studies and preliminary design studies which identify environmental impact on the atmosphere, water quality and natural resources associated with generation of electric power.

7.04 The construction phase of this project will result in temporary increased employment for construction workers and installation technicians. Existing paved roads will provide

access for employees and materials. During the construction phase of the project, there will be increased vehicular and worker traffic. These disturbances will be confined to the boundaries of the existing urban areas and therefore will have no lasting deleterious effect upon the surrounding inhabitants and environs.

7.05 Construction activities will not have a significant effect on the overall ecology of the surrounding areas. Installation of underground cable will cause temporary inconvenience to road traffic in the urban areas. However, cable trenches are located in the sidewalk area of streets which minimizes the amount of road and street surface which will be disturbed during construction.

7.06 Distribution substations will be about 2,500 m^2 in area, and distribution transformers about 25 m^2. The EEA has, or will be, allocated land for installation of these facilities under GOE existing laws or statutes.

7.07 The space required for storage and issue of commodities during the construction phase of this project will utilize land which is not suitable for agricultural activity. The space requirements for storage is as follows:

Cairo	100 m by 100 m
Alexandria	30 m by 30 m
Beni Suef	30 m by 30 m

Temporary use of this land for storage facilities during the construction phase of this project is not anticipated to be long-term and will have no adverse effects upon the environment.

7.08 Beneficial socio-economic impacts attributable to this project include the following possible benefits:

1. Increased labor man-hours made available because residential illumination from electric lamps allows

additional incentive to do more cooking, laundry, repair work and social functions during non-daylight hours.

2. Increased productivity due to usage of electric power tools and equipment in commercial establishments.

3. Increased labor man-hours made available on a "per household" basis from large potable water supply pumping installations. The time required each day per household to obtain drinking water and water for sanitation requirements will be saved by each household.

4. Increased quality of home life through use of electric light illumination and electric appliances for convenience.

5. Increased availability for educational radio and television programs to promote literacy and general education

6. Increased street illumination to increase security and ease of movement after dark.

C. Discussion and Conclusions

7.09 The purpose of the urban electric distribution project is to increase reliability to existing customers and to provide efficient electric energy service to new customers in Cairo, Alexandria, Shibin El Kom and Beni Suef.

7.10 Since power generation is not a part of this project there will be no environmental impact on water quality, the atmosphere or on natural resources and health.

7.11 There will be slight environmental impact on land use by changing the land character by construction of storage yards during the implementation phase of the project. This impact is minimal and only temporary in nature, since the land will return to the original state, open desert or idle land with no agricultural value, upon completion of the project.

7.12 Sub-transmission and distribution cables will be mostly underground in Cairo and Alexandria and will not affect land use except during construction. In Shibin El Kom and Beni Suef low voltage distribution lines will be overhead on steel or concrete poles. Each footing will be small and total ground area disturbed by the installation of each pole will be minimal.

7.13 Cultural and socio-economic impacts resulting from this project will have beneficial effects upon the population of the area.

D. Threshold Decision

7.14 This project will not adversely affect such aspects of the human environment as air, water, land flora and fauna. Socio-economic conditions will be improved as a result of this project. The initial environmental examination indicates that this project will not have a significant effect on the environment. In fact, on balance the effect will be beneficial to the human environment.

7.15 The reasonable foreseeable effects of environmental impact on organisims in the biosphere, including human life, are not significant. Consequently, the threshold decision is that an Environmental Assessment or an Environmental Impact Statement is not considered as required for this project. The IEE Determination Sheet is shown in Annex W.

VIII. IMPLEMENTATION

A. Method of Implementation

8.01 Harza's existing contract with EEA, financed from A.I.D. Grant 263-0013 Feasibility Studies Project, provides for Harza preparing specifications and Invitation for Bid documents for the entire first year project commodities, and includes assisting the EEA in evaluating the resulting bids. EEA will contract directly with the equipment suppliers for all the required equipment and materials. A.I.D. is anticipating a request from EEA to retain Harza to perform as construction supervisory engineer on the job. Should the request materialize, Mission recommends the retention of Harza, since they will have completed the detailed design, prepared equipment specifications and in general would be the firm most familiar with the project. To follow A.I.D. selection procedure to obtain a replacement for Harza, at this time, would result in a six to nine-month delay in project implementation. Therefore, pursuant to applicable A.I.D. guidelines (Handbook II, Chapter 1, paragraph 1B2i and 1B2j) the Mission recommends the non-competitive selection of Harza to carry out the supervisory engineering services over the life of the project.

8.02 All construction and installation will be carried out by EEA or REA crews, and for the major job, such as installation of a new 66 KV/11 substation, by EEA subsidiary contractors. The American engineer on the job will act as consultant to EEA and supervise the construcion. The engineer will also provide on-the-job training to EEA and REA employees in areas which are critical, and areas which have proven to be most deficient as determined by Harza during their Phase I study. High on the list is cable handling, installation and splicing.

B. Contracting

8.03 All contracting for materials will be in accordance with applicable procedures set forth in A.I.D. Handbook 11, Chapter 3, Country Contracting, Equipment and Materials. All equipment,

materials and services financed by A.I.D. will be of U.S. source and origin. Contracts will be let directly to suppliers who manufacture themselves at least fifty percent of the item being supplied.

C. Schedule

8.04 It is anticipated that Harza will complete the critical portions of their Phase II study, prepare and issue equipment IFB's for the FY 77 portion of the Year One program by December 1977 with bid opening three months later, March 1, 1978. Evaluation of bids and award of contracts is expected to consume two months, with the first equipment shipment occuring by August, 1978. Based on delivery times included in the bid documents provided by potential suppliers, the consulting engineer will prepare detailed programmed construction and installation schedules to effectively utilize the EEA and REA work crews as materials and equipment arrive in Egypt. From prior experience, it is expected that transformers will have the longest lead time from contract award, possibly 12 to 18 months after contract award. A.I.D. and EEA will, however, encourage transformer suppliers to accelerate their delivery schedules to meet EEA schedule. Assuming the worst possible case, an 18-month delivery period, construction and installation of the equipment would not be completed until mid-1980, 33 months after loan signature.

D. A.I.D. Financing Procedures

8.05 All procurement financed by this loan will be financed by Letter of Commitment (L/Comms), as will the cost of services performed by U.S. consultant. At the request of EEA, A.I.D. will either issue one or more direct L/Comms to the U.S. contractors or will open L/Comms with a U.S. bank (s) selected by the EEA. Each L/Comm will specify the items of services eligible for loan financing and appropriate Letters of Credit will be issued thereunder.

E. Terminal Dates

8.06 Conditions Precedent. The terminal date for meeting Conditions Precedent to Disbursement will be 90 days from the date of signing the loan agreement.

8.07. Project Assistance Completion Date. The Project Assistance Completion Date (PACD) will occur approximately 33 months from the date the conditions precedent are accepted by A.I.D., and the terminal date for disbursement will be 9 months subsequent from the PACD.

F. Monitoring and Reporting

8.08 Upon signature of the Loan Agreement, USAID will issue an Implementation Letter which, among other things, will contain the necessary guidance and details on the types of reports (eg. monthly progress reports and monthly shipping reports) and reporting formats to be followed. For the present, Harza is submitting monthly reports to USAID and EEA describing their activities and findings under their present contract.

8.09 Also, included in Harza's present scope of work plan is the requirement for a scheduled work plan of the installation of the equipment. At the time a supervisory engineering contract is negotiated, be it either with Harza or another firm, reporting requirements will be included by which the engineer will be required to submit monthly and quarterly progress reports to A.I.D., through EEA, stating progress in conformance with work plans. Throughout the life of the project, the U.S. engineer will monitor the project to ensure satisfactory project progress. Any routine problems, together with corresponding suggested solutions, will be brought to the attention of USAID in the form of the monthly reports from the engineers and EEA. Serious problems requiring immediate attention will be brought to the personal attention of the USAID Project Manager and his counterpart in EEA. Project progress will be determined by measuring actual performance against the work plan developed by Harza and will be discussed at regularly scheduled meetings between EEA, the U.S. and USAID. In addition, AID's internal financial reports will be monitored to insure that disbursements are occuring in accordance with the implementation schedule.

8.10 A summary of the consultant engineer reports and a summary of AID's end use accounting reports will be developed annually by the project manager. This report will be submitted to EEA and AID and will be the only evaluation report which will be used for this project. If additional information is required by USAID to develop future tranches of framing for this activity we may evaluate the impact of the equipment funded under this project. This will depend however on whether there is a demonstrated need for the information when additional funds are needed.

IX. RECOMMENDATIONS, CONDITIONS AND COVENANTS

A. Recommendations

9.01 Subject to the conditions and covenants listed below, we recommend that A.I.D. approve a loan to the Government of Egypt (GOE) up to the amount of $97,200,000 for the rehabilitation and expansion of urban electric distribution systems in Egypt, including the cities of Cairo, Alexandria, Shibin El-Kom, and Beni Suef. Due to the limited availability of FY 77 funds, it is recommended that $17,012,000 be authorized in FY 77 and the balance, $80,188,00 be authorized in the following fiscal year, FY 78. We further recommend that the loan terms to the Government of Egypt be that the loan principal be repaid in forty (40) years, including a ten (10) year grace period, with interest at two percent (2%) per annum during the grace period, and three percent (3%) thereafter.

9.02 Egypt will relend the funds to the Egyptian Electric Power Authority (EEA) on terms and conditions acceptable to A.I.D. During loan negotiations, A.I.D. will seek to negotiate second-step loan terms to the EEA at an annual interest rate of eight and one-half percent (8 1/2) with the principal to be repaid over a twenty five (25) year period including a five (5) year grace period for the repayment of principal.

9.03 Procurement of equipment and service shall be of United States source and origin.

B. Conditions Precedent to Disbursement

9.04 Prior to the first disbursement or to the issuance of the first Letter of Commitment under the loan, the GOE shall furnish to A.I.D. in form and substance satisfactory to A.I.D.:

1. An opinion of the Egyptian Minister of Justice or other legal counsel satisfactory to A.I.D. that the loan agreement has been duly authorized and/or ratified by, and executed on behalf of, the GOE and the EEA and is a valid and legally binding obligation of the GOE and the EEA in accordance with its terms.

2. The names of the persons who will act as the representatives of the GOE and EEA, together with a specimen signature of each.

3. Evidence that the loan proceeds will be made available to EEA on terms and conditions acceptable to A.I.D.

4. Evidence that all Egyptian currency required for the first fiscal year in which funds will be required, in an amount based on the estimate of the consulting engineer, and as approved by EEA, has been budgeted by the GOE and is available for expenditure by EEA.

5. Exact location and firm construction plans for civil works for the A.I.D. financed warehouse storage facilities for the cities of Shibin El-Kom and Beni Suef.

6. A written and detailed explanation of EEA's method, and procedures for the inventory control which will be utilized to account for the A.I.D. financed commodities.

C. Covenants

9.05 The GOE will be required to covenant:

1. Execution of the Project

a. To carry out the project with due diligence and efficiency, and in conformity with sound engineering, construction, financial and administrative practices.

b. To cause the project to be carried out in conformance with all the plans, specifications, contracts, schedules, and other arrangements, and with all modifications therein approved by A.I.D. pursuant to this agreement.

c. To submit for A.I.D. approval prior to implementation, issuance, or execution, all plans, specifications, construction schedules, bid documents, documents concerning solicitation of proposals relating to eligible items, contracts, and all modifications to these documents.

2. Funds and Other Resources to be Provided

To make available on a timely basis all Egyptian currency and all foreign currency in addition to the loan and all other resources required, for the punctual and effective carrying out of construction, maintenance, repair and operation of the Project.

3. Operation and Maintenance

To operate, maintain and repair the project in conformity with sound engineering, financial and administrative practices and in such manner as to insure the continuing and successful achievement of the purposes of the project.

4. Management

To provide qualified and experienced management for the project and to train such staff as may be appropriate for the maintenance and operation of the project.

5. Continuing Consultation

a. To cooperate fully with A.I.D. to assure that the purpose of the loan will be accomplished. To this end the GOE, EEA and A.I.D. shall from time to time, at the request of any party, exchange views through their representatives with regard to the progress of the project, the performance of the GOE and EEA of its obligations under the loan agreement, the performance of consultants, contractors and suppliers engaged on the project, and other matters relating to the project.

b. To review with A.I.D. the recommendations of the consultants engaged pursuant to the United Nations Development Programme to survey the Egyptian power sector.

6. Investment Guarant Project Approval

That the construction work to be financed from this loan is agreed to be a project approved by the GOE pursuant to the Agreement between the Government of the Arab Republic of Egypt and the United States of America on the subject of investment guaranties, and no further approval by the GOE shall be required to permit the U.S. to issue investment guaranties under that Agreement covering a contractor's investment in the project.

7. Financial

a. In the event the Government of Egypt shall decide to establish companies or any other entities to take over the power distribution assets of the EEA for purposes of operation and maintenance, customer billing functions or for any other purpose, the Government of Egypt shall ensure that such decision or decisions shall include provision, satisfactory to A.I.D., for the management ownership, operation and maintenance of the assets provided under the project, the annual audit of the consolidated accounts of the EEA and performance of all EEA's financial obligations under Loan and Reloan Agreements.

b. Except as A.I.D. shall otherwise agree in writing, the EEA shall take promptly as needed all such action as shall be required to provide in any fiscal year an annual return on the average of the current net value of the fixed assets of the EEA in service at the beginning and end of such fiscal year at a rate of not less than nine percent (9%), commencing with its fiscal year 1980.

c. Except as A.I.D. and the GOE may otherwise agree, the GOE shall assure adequate long-term financing for EEA's expansion program which has been authorized and modifications and additions to such program. Within three years from the date of the Agreement, the financing so provided will be divided between equity contributions and loans in such a manner that after the completion of loan transaction the debt to equity ratio will be no greater than 1.5:1.

d. EEA undertakes (a) to prepare and to submit to A.I.D. by November 1 in each year, a provisional forecast of operating revenues, operating expenses and rate of return for the next following year, a statement of the tariffs and assumptions underlying the forecasts. an aging report of accounts receivable from major accounts, and a statement of the measures proposed, if any, to produce the annual return provided for in paragraph (b) above, and to furnish to A.I.D. all such detail as A.I.D. may reasonably request.

e. For the purposes of this Section:

(1) the annual return specified in paragraph (b) of this Section shall be calculated in respect of each fiscal year, by using as the denominator the average current net value of the fixed assets of EEA in service at the beginning and at the end of each such year, and as numerator the net operating income of EEA for the same year;

(2) the term "current net value of the fixed assets of the Borrower in service" means the gross value of EEA's fixed assets in service less the amount of accumulated depreciation, both as valued from time to time in accordance with consistently applied appropriate methods of valuation or revaluation acceptable to A.I.D.; and

(3) the term "net operating income" means gross revenues from all sources less all operating expenditures, including expenses of administration, adequate maintenance and taxes or any payment in lieu of taxes and adequate provision for depreciation but excluding interest and other charges on debt.

ANNEXES
TO
EGYPT: URBAN ELECTRIC DISTRIBUTION

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ANNEX A

Ministry of Economy &
Economic Cooperation.

Cairo 7 September 1977.

Dear Mr Braun

One of the major problems Egypt's industrialization efforts have had to confront is the lack of adequate electrical power to meet increased industrial and household demands.

To solve this problem the Government of the Arab Republic of Egypt has undertaken various expansions of generating capacity. It has also started a Rural/Urban Electrification Program to increase the capacity of the country's electric power distribution networks.

One segment of this Program is the expansion and modernization of existing distribution systems in Cairo, Alexandria, and two provincial cities of Beni Suef and Shibin-El-Kom. This project requires substantial foreign exchange expenditures.

We therefore request the assistance of the Government of the United States, on a loan basis, to cover the estimated $16.2 million foreign exchange requirements of this project. The Government of the Arab Republic of Egypt will supply the local currency expenditures, estimated at LE 1.8 million, from its budget.

Sincerely yours,

Gamal El Nazer
First Undersecretary of State
for Economic Cooperation.

PROJECT AUTHORIZATION

AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

Name of Country: Arab Republic of Egypt Name of Project: Urban Electric Distribution

Number of Project: 263-0033

Pursuant to Part II, Chapter 4, Section 532 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a loan to the Arab Republic of Egypt (the "Cooperating Country") of not to exceed Seventeen Million Twelve Thousand United States Dollars ($17,012,000) (the "Authorized Amount") to help in financing the foreign exchange costs of goods and services required for the project as described in the following paragraph.

This project consists of providing equipment, materials, and related services for the rehabilitation and expansion of urban electric distribution systems in Egypt, including Cairo, Alexandria, Shibin El-Kom and Beni Suef.

The entire amount of the A.I.D. financing herein authorized for the project will be obligated when the Project Agreement is executed.

I hereby authorize the initiation and negotiation of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority subject to the following terms and covenants and major conditions as A.I.D. may deem appropriate:

a. Interest Rate and terms of Repayment

The Cooperating country shall repay the Loan to A.I.D. in United States Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in United States Dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first ten (10) years and three percent (3%) per annum thereafter, on the outstanding balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods

Goods and services financed by A.I.D. under the project shall have their source and origin in the United States, except as A.I.D. may otherwise agree in writing.

c. Conditions Precedent to Disbursement

Except as A.I.D. may otherwise agree in writing:

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement for engineering services, Borrower shall furnish in form and substance satisfactory to A.I.D.:

1. An opinion of the Egyptian Minister of Justice, or other legal counsel satisfactory to A.I.D., that the Loan Agreement has been duly authorized by, and executed on behalf of the Arab Republic of Egypt, and that it constitutes a valid and legally binding obligation in accordance with its terms.

2. A statement of the names of the persons who will act as the representative of the Borrower, together with a specimen signature of each.

3. Evidence that the loan proceeds will be made available to EEA on terms and conditions acceptable to A.I.D.

4. Evidence that all Egyptian currency required for the first fiscal year in which funds will be required, in an amount based on the estimate of the consulting engineer, and as approved by EEA, has been budgeted by the GOE and is available for expenditure by EEA.

5. Evidence that the locations have been determined and firm construction plans for civil works have been completed for the A.I.D. financed warehouse storage facilities for the cities of Shibin El-Kom and Beni Suef.

6. A written and detailed explanation of EEA's method, and procedures for the inventory control which will be utilized to account for the A.I.D. financed commodities.

d. Covenants

1. Continuing Consultation

(a) To cooperate fully with A.I.D. to assure that the purpose of the loan will be accomplished. To this end the GOE, EEA and A.I.D. shall from time to time, at the request of any party, exchange views through their representatives with regard to the progress of the project, the performance of the GOE and EEA of its obligations under the Loan Agreement, the performance of consultants, contractors and suppliers engaged on the project, and other matters relating to the project.

(b) To review with A.I.D. the recommendations of the consultants engaged pursuant to the United Nations Development Programme to survey the Egyptian power sector.

2. Unless A.I.D. shall otherwise agree in writing, the Borrower shall make available on a timely basis all Egyptian currency and all foreign currency in addition to the loan and all other resources required, for the punctual and effective carrying out of construction, maintenance, repair and operation of the Project.

3. In the event the Government of Egypt shall decide to establish companies or any other entities to take over the power distribution assets of the EEA for purposes of operation and maintenance, customer billing functions or for any other purpose, the Government of Egypt shall ensure that such decision or decisions shall include provision, satisfactory to A.I.D., for the management ownership, operation and maintenance of the assets provided under the project, the annual audit of the consolidated accounts of the EEA and performance of all EEA's financial obligations under Loan and Reloan Agreements.

_____
Deputy Adminstrator

_____
Date

ANNEX C

CERTIFICATION PURSUANT TO

SECTION 611(e) OF THE

FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

I, Donald S. Brown, the Director for the Agency for International Development in Egypt, having taken into account, among other things, the maintenance and utilization of projects in Egypt previously financed or assisted by the United States and technical assistance and training planned under this Project, do hereby certify that in my judgment Egypt has both the financial capability and human resources capability effectively to maintain and utilize the capital assistance to be provided for the rehabilitation of the electric distribution system in the cities of Cairo, Alexandria, Shibin El- Kom and Beni Suef.

Donald S. Brown
Director

September 7, 1977
Date

6C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

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

GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b):

   (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure plus 10%)?

   (a) The Urban Electrification project was included in the FY 1977 Congressional Presentation.

   (b) The intended obligation for the project is within the level of funds appropriated for Egypt for FY 1977.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

   (a) Yes.

   (b) Yes.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

   No further legislative action is required to implement the project.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

   Not Applicable.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

   The Mission Director has so certified. See Annex C.

A.

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multilateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?	The project is not susceptible of execution as part of a regional or multilateral project. Egypt is not a newly fndependent country.
7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	By increasing the quantity and efficiency of the urban electric power distribution system in urban centers in Egypt, the project will improve the technical efficiency of industry, agriculture and commerce.
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	The great majority of funds expended will be for goods and services from private U.S. concerns.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	The agreement will so provide.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?	Yes. Release by the GOE is not a problem at present.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria	Not Applicable.
a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?	

B1

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [Include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;

(2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;

(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(b) to help alleviate energy problem;

(c) research into, and evaluation of, economic development processes and techniques;

(d) reconstruction after natural or manmade disaster;

(e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

B1

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing?

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary transportation and communications, planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?

h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.

2. Development Assistance Project Criteria (Loans only)

Not Applicable.

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds $100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?

d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

3. Project Criteria Solely for Security Supporting Assistance

FAA Sec. 531. How will this assistance support promote economic or political stability?

This assistance will promote economic and political stability by increasing the quantity and efficiency of electric power distributed in Egypt's major urban centers.

4. Additional Criteria for Alliance for Progress

[Note: Alliance for Progress projects should add the following two items to a project checklist.]

Not Applicable.

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?

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6C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by exclusion (as where certain uses of funds are permitted, but other uses not).

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?

   Procurement of goods and services will be pursuant to established A.I.D. regulations.

2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?

   Yes.

3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed?

   Yes.

4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?

   There will be no such procurement.

5. FAA Sec. 603(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?

   Consideration will be given to the use of excess property when practical.

6. MMA Sec. 901(b). (a) Compliance with requirement that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.

   Yes.

7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized,

   Technical assistance, to the greatest extent practical, will be from private enterprise on a contract basis.

A7

are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	
8. International Air Transport. Fair Competitive Practices Act, 1974 If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available	Yes.
B. Construction	
1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?	Yes.
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?	Yes.
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million?	Not Applicable.
C. Other Restrictions	
1. FAA Sec. 201(d). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?	Not Applicable.
2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?	Not Applicable.
3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-Bloc countries, contrary to the best interests of the U.S.?	The Loan Agreement will so stipulate.
4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction?	Financing is not permitted to be used for such purposes.

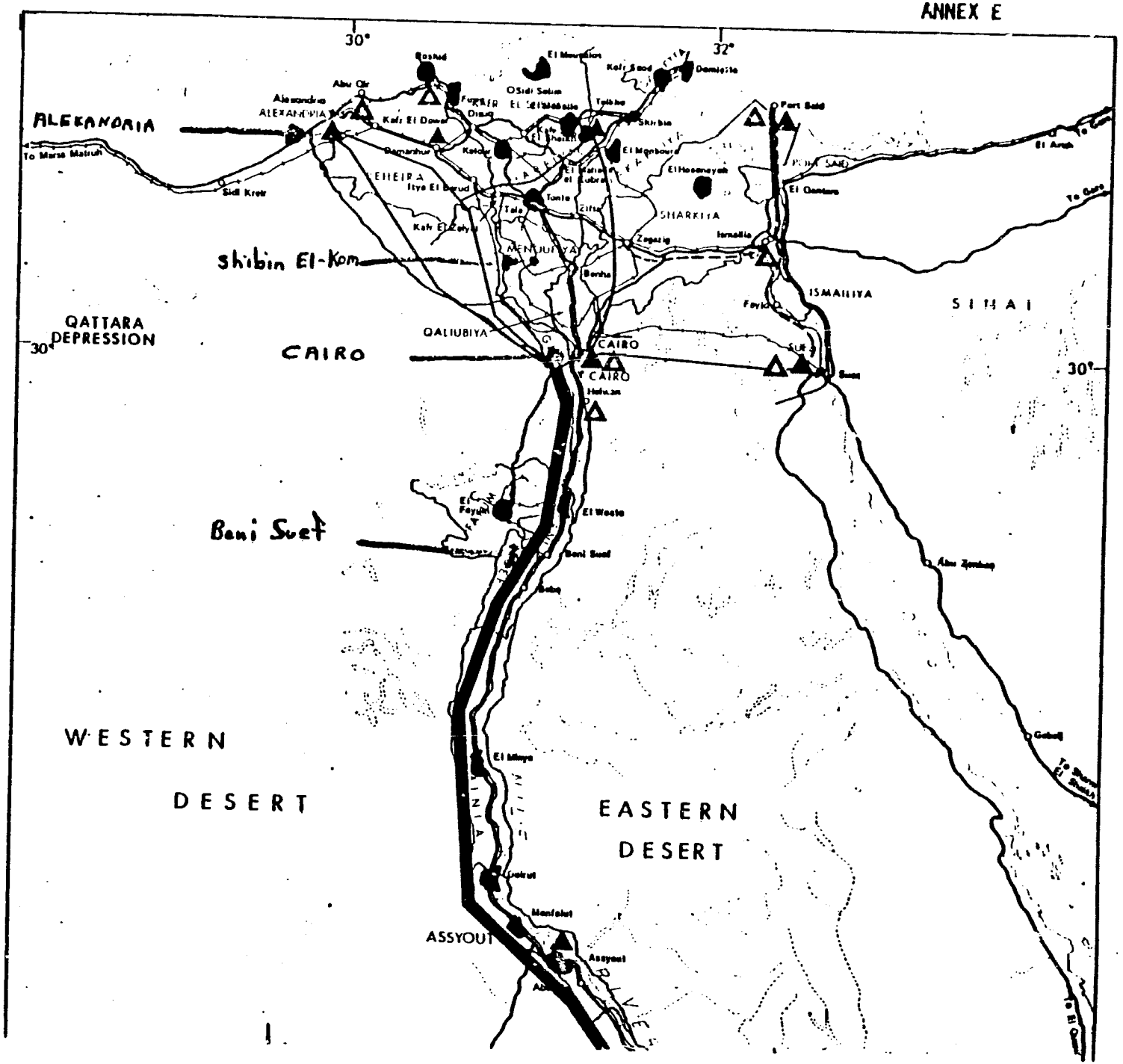
5. Will arrangements preclude use of financing:

a. FAA Sec. 114. to pay for performance of abortions or to motivate or coerce persons to practice abortions?	Yes.
b. FAA Sec. 620(g). to compensate owners for expropriated nationalized property?	Yes.
c. FAA Sec. 660. to finance police training or other law enforcement assistance, except for narcotics programs?	Yes.
d. FAA Sec. 662. for CIA activities?	Yes.
e. App. Sec. 103. to pay pensions, etc., for military personnel?	Yes.
f. App. Sec. 106. to pay U.N. assessments?	Yes.
g. App. Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for lending).	Yes.
h. App. Sec. 501. to be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes.

ANNEX E

(Printed As Facing Pages)

ANNEX E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32°
ALEXANDRIA
To Marsa Matruh
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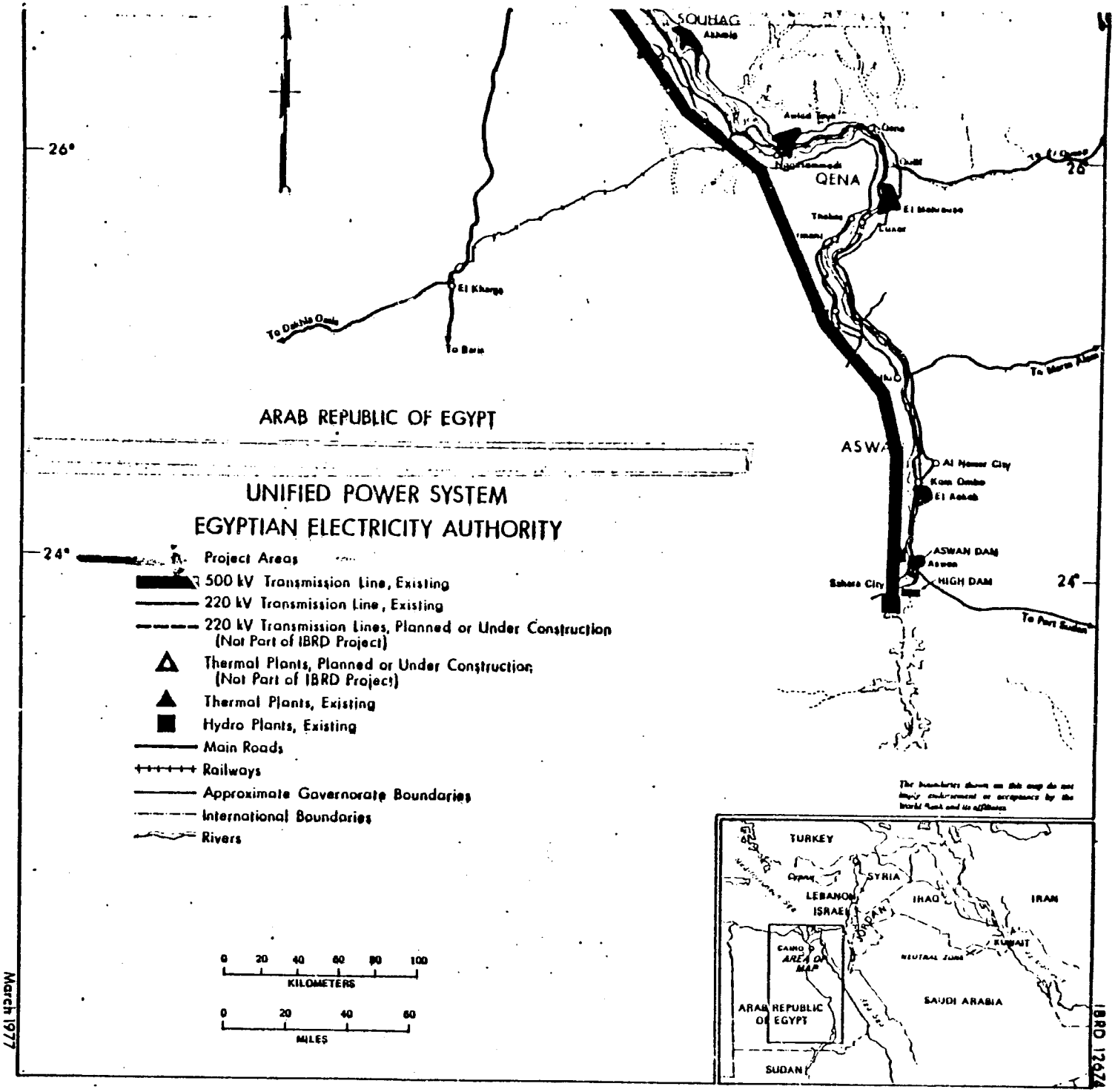
Abu Qir
Rashid
El Mansoura
Kafr Saad
Damietta
Kafr El Dawar
Damanhur
Kafr El Zayat
Tanta
Zifta
Port Said
El Qantara
El Arish
To Gaza
El Hasanayah
SHARKIYA
Zagazig
Ismailia
ISMAILIYA
SINAI
Shibin El-Kom
MENOUFIYA
Benha
Faqus
QALIUBIYA
CAIRO
Suez
Helwan
30°
QATTARA DEPRESSION
Beni Suef
El Fayoum
El Wasta
Beni Suef
Abu Zenima
WESTERN DESERT
EASTERN DESERT
El Minya
Mallawi
Qusiya
Manfalut
ASSYOUT
Assyout
NILE RIVER


SOUHAG
QENA
El Kharga
To Dakhla Oasis
To Bawa
To Marsa Alam
ASWA
Al Nasser City
Kom Ombo
El Adeib
ASWAN DAM
Aswan
Sahara City
HIGH DAM
To Port Sudan
26°
24°
ARAB REPUBLIC OF EGYPT
UNIFIED POWER SYSTEM
EGYPTIAN ELECTRICITY AUTHORITY
Project Areas
500 kV Transmission Line, Existing
220 kV Transmission Line, Existing
220 kV Transmission Lines, Planned or Under Construction (Not Part of IBRD Project)
Thermal Plants, Planned or Under Construction (Not Part of IBRD Project)
Thermal Plants, Existing
Hydro Plants, Existing
Main Roads
Railways
Approximate Governorate Boundaries
International Boundaries
Rivers
0 20 40 60 80 100
KILOMETERS
0 20 40 60
MILES
TURKEY
SYRIA
LEBANON
ISRAEL
IRAQ
IRAN
JORDAN
KUWAIT
SAUDI ARABIA
ARAB REPUBLIC OF EGYPT
SUDAN
CAIRO
AREA OF MAP
March 1977
IBRD 12674

Scope of Services by the Consultant

The Consultant's services shall be provided in two phases. These phases shall include but not be limited to the following:

A. Phase I

1. Review of all pertinent diagrams, plans and reports on the existing subtransmission and distribution systems in the above-mentioned cities, together with all available information on planned rehabilitation and expansions of the systems.

2. Review and analysis of base data and methodology employed to project and forecast future loads -- domestic, commercial, industrial and public -- as to magnitude and location within the study areas.

3. Review and analysis of currently used system planning policies, approaches, techniques and standards, construction and maintenance methods and practices, and equipment types and specifications.

4. Examination and analysis of the systems shall include but not be limited to the following aspects and features:

   a. Determine adequacy of existing 66 kV and 33 kV subtransmission systems, using load flow, short circuit and stability studies as required.

   b. Determine adequacy of existing distribution system voltages for the primary voltage in longer range development.

   c. Determine the feasibility of adapting existing 33 kV to distribution.

   d. Determine present distribution losses.

   e. Determine appropriateness of substation sizing, length of primary feeders and degree of interconnection to ensure reliability with economy.

   f. Determine relative economics of the existing practice of using kiosks (distribution transformers and primary and secondary switching in single enclosure).

g. Develop concept for single phase distribution facilities.

5. Familiarize himself through field inspection and review of pertinent reports with the physical condition and service performance of the existing subtransmission and distribution systems.

6. Review and assess the existing capability and capacity of the EEA, REA and others relative to accomplishment of rehabilitation and system expansion work; and a similar assessment of existing capabilities relative to system maintenance and repair.

7. Prepare and submit to the EEA, not later than four months after the effective date of his contract, a report presenting findings, analyses, conclusions and recommendations relative to rehabilitation and expansion of the systems in the study areas. The report shall set forth those policies, procedures, methods, techniques, standards, practices and equipment types recommended for use in planning the subject systems renabilitation and expansion. Alternatives to existing policies, procedures, practices and equipment shall be recommended in the interest of system economy, efficiency and reliability as required. The report shall form the basis for Consultant/EEA discussions and subsequent decisions by the EEA regarding the policies, procedures and practices to be employed in system rehabilitation and expansion planning. (Herein referred to as "Planning Parameters.")

B. Phase II

1. Upon determination by EEA of above-cited planning parameters, prepare phased rehabilitation and expansion plans for the study areas designed to meet market demands through year 1982 and compatible with longer range system development plans. The plans shall include for each phase:

a. Diagrams, plans and maps of required system improvements, supplemented by narrative descriptions as required to fully identify and detail such improvements.

b. A work plan and schedule for accomplishing the required work based on the existing capabilities of the EEA and REA. Recommendations for

construction and installation work by others will be made if required.

c. List of required equipment, cables and materials to complete the work, together with list of needed testing, installation and maintenance/repair equipment. Spare parts recommendations shall be presented. Equipment and materials available from local (Egyptian) markets shall be clearly identified.

2. Twenty copies of the initial draft of the plan shall be submitted for EEA review not later than six months after EEA determination of planning parameters. Five copies shall be furnished to USAID/Cairo.

3. A final report presenting all study activities, analyses, findings, conclusions, recommendations and planning parameters employed, together with the final system plan, shall be submitted not later than 30 days after EEA approval of the initial draft of the plan. Twenty copies of the final report shall be submitted to EEA and five copies to USAID/Cairo.

Supplemental Services

The services described in the Scope of Services above required only the Phase I and Phase II Studies for Cairo, Alexandria, and two Provincial Cities. Subsequently, the Consultant was requested to furnish, under this Contract, certain incremental services as described in the sections which follow:

1. Phase I Studies to be made of the distribution/subtransmission systems in nine additional provincial cities. The studies for these nine cities, performed on behalf of IBRD, shall correspond in their objectives to those for the Scope I services for the cities of Cairo, Alexandria and the two Provicincial Cities as described on page 2 of 4 of the original Terms of Reference, and will include the preparation of a Report as specified therein.

2. The objective of the Phase I & II Studies is to determine the general requirements for equipment and materials required to accomplish the rehabilitation and expansion programs recommended in the Phase I and Phase II Reports. Detailed information on equipment and materials would not be required for preparation of

the Reports; however, due to the additional services described in Paragraph 3 below, the Consultant will prepare more detailed information on equipment and materials required.

3. The Consultant will prepare Contract Documents for procurement of equipment and materials for upgrading and expanding the distribution systems for Cairo, Alexandria, and two Provincial Cities; assist EEA in prequalifying potential bidders; assist EEA in the issuance of the invitations to bid; assist in evaluating the bids, and then submit recommendations for award of each contract for the supply of equipment and/or materials.

4. EEA requires equipment for direct burial of distribution system cables in the Suez Canal Zone cities. The Consultant will prepare brief specifications which will be used by EEA for effecting the purchase of the required equipment.

5. EEA does not have vehicles necessary for the Consultant's long term field staff to carry out their work. The Consultant is requested to purchase ten vehicles, using, the AID Grant funds. The Consultant will solicit bids for vehicles in accordance with guidelines furnished by EEA and approved by AID, purchase, and arrange for shipping the vehicles to Alexandria, all to be accomplished with speed and dispatch in order that the cost of rental of vehicles in Egypt for accomplishing the Phase I work be held to a minimum.

6. It is imperative that preparation of reasonable estimates of capital expenditures for the purchase of equipment and materials to accomplish distribution system rehabilitation and expansion be made as early as possible. These cost estimates are to be furnished to USAID by August 31, 1977 for their use in preparing a Project Paper Document to justify a loan for purchasing equipment and materials for the Cairo, Alexandria, Shibin el Kom and Beni Suef electric distribution systems.

- LOAD FORECASTING

Methods presently used for load forecasting should be updated and augmented with the Distribution Energy Management (DEM) computer program which can be utilized both for short term (5 years) and long term (20 years) forecasting. From DEM studies, it is possible to determine the most economical and adequate:

(1) distribution voltage

(2) substation sizes and locations

(3) subtransmission requirements

(4) location and size of distribution feeders

(5) system construction schedules

(6) time to expand substations

(7) voltage regulation schemes

(8) method of substation load transfer

Basic information for such a study will be obtained from the various ministries concerned with land usage and the associated expanding industrial, commercial and residential demands for electrical energy.

Such information properly programmed into the DEM planning module can be utilized to determine necessary system requirements. This will be done in Phase II to enable proper materials and equipment to be specified, ordered and purchased for a planned rehabilitation and expansion program.

- SYSTEM PLANNING

Recommendations point out the need for: long range planning and intermediate planning on a 150% to 400% load-level-increase basis; yearly system load reviews; more extensive demand metering; preparation of suitable geographic-plan maps; and economic planning comparisons on a yearly and long range term basis.

- CONSTRUCTION STANDARDS

Existing construction standards were reviewed as

to their general content and completeness.

It is recommended that:

a) System Standards and Codes be established by a committee especially appointed to generate and maintain a complete set of such documents, updated on a yearly basis.

b) A form of National Electrical Code be adopted and enforced.

c) A general Electrical Safety Code be formulated and made enforceable.

d) Engineering Design Standards be expanded and made available to all interested parties.

- CONSTRUCTION AND MAINTENANCE METHODS - PRACTICES - MANPOWER

A review of methods, practices and manpower for construction and maintenance operations reveals a number of features needing remedial action. Management forces of the EEA and REA are aware of their needs in these areas and are willing and able to make the required changes necessary for operational improvements, once proper funds are made available.

Stated simply, the lack of tools, training, adequate

warehousing facilities, and proper operational methods stems directly from the present inadequate budget available for such items.

A vital consideration growing out of this problem is the definite need to develop a plan to retain qualified employees and to generate worker interest in advancement through training programs, once these programs have been properly implemented into the work system. This is a management problem requiring considerable thought and planning as it may necessitate a broad revision of existing policies.

- EQUIPMENT TYPES AND SPECIFICATIONS

It is noted that there is a wide variety of foreign equipment of diverse ratings presently installed in the existing system. Studies of available technical specifications indicate a need for the development of a more integrated set of these specifications, using precise electrical and physical parameters to describe the equipment properly and thus allow a more definitive bid analysis, better purchase control, and greater selectivity of materials and equipment.

- ADEQUACY AND PHYSICAL CONDITION OF EXISTING 66 KV AND 33 KV SYSTEMS

Investigations and studies of Cairo, Alexandria,

Beni Suef, and Shibin El-Kom pertaining to the subject systems have been made and analyzed. Each area has similar general characteristics but also system diversities and problems peculiar unto themselves.

Information was gathered and developed for each system area and includes:

1) Circuit breaker ampacity and rupture capacity
2) Transformer sizing and loading characteristics
3) Conductor sizing and ampacity ratings
4) Circuit loading
5) Fault levels and occurrences
6) Voltage regulation
7) System protection
8) System physical condition

Recommendations suggest:

1) The need for additional transformer capacity at Beni Suef.
2) Fault levels and circuit breaker rupture capacities be reviewed.
3) The replacement or modification of some

circuit breakers to obtain greater interrupting capacities.

4) Re-evaluation of system operating configurations.

5) The need for some additional relaying.

- DISTRIBUTION SUBSTATIONS

The configurations and design of existing substations were evaluated for adequacy and physical condition.

Based on the studies made, it is recommended that:

1) Circuit breaker ratings be upgraded as required by future system planning.

2) Spare part supplies be improved.

3) Transformers with forced-cooled ratings and dual primary voltages be considered.

4) Certain metering and relaying be added.

5) Emergency loading practices of transformers be reviewed.

6) On-load tap changers be provided for new distribution substation transformers.

7) A review of system interconnections be made to reduce requirements for additional transformer capacity.

8) Consideration be given to install an integrated demand metering scheme to measure system peak demand.

- FEASIBILITY OF HIGHER LEVEL VOLTAGE FOR MEDIUM TENSION DISTRIBUTION

Adequacy of the existing, 11 kV, medium-tension-voltage-level is discussed along with the possible feasibility and need to raise this level.

It is recommended that 11 kV continue to be the system standard. However, during the Phase II DEM study, evaluations of raising this voltage to a higher level will be conducted on an economic, future basis of need and desirability.

- DISTRIBUTION LOSSES

Data from the Cairo Monthly Reports and from the EEA Dispatch Center in Cairo formed the base of studies and calculations for various 11 kV system losses.

The information developed to prepare demand and loss curves and tabular data is given in Exhibits of the Report.

Only the Cairo system was considered due to the greater availability of significant data than in the other areas. During Phase II, information of a more complete

nature will become available which will allow a more detailed, overall system loss analysis to be made.

- ADEQUACY AND PHYSICAL CONDITION OF THE 11 KV DISTRIBUTION SYSTEM

Because of the complexity and extent of the 11 kV distribution system in Cairo, Alexandria, Shibin El-Kom and Beni Suef, considerable time and attention were given to these areas to determine system and voltage adequacy and system physical condition.

Appendix C contains sample calculations and tabulated results of voltage drop, ampacity and load flow. When all system parameters are evaluated, it is demonstrated that the existing 11 kV system is adequate for the present and for some time in the future.

However, as in any utility system, there is a need for consideration of system improvements to be made when it is being expanded because of load growth and when it is being renewed because of system deterioration caused by aging and use.

Recommendations include:

1) Installation of single-core, XLPE insulated, shielded, and PVC jacketed cable for all new construction; plus the gradual replacement of existing PILC cables as

they become obsolete or as circuit studies indicate cable rerouting.

2) Consideration of Pad-Mount type equipment for new installations.

3) Replacement of inadequate or out-dated kiosks.

4) System power factor improvement.

5) Consideration of overhead systems in certain areas.

6) Improved system earthing.

7) Elimination of unnecessary distribution points.

8) Consideration of installation of conduit in certain areas.

- LOW TENSION DISTRIBUTION SYSTEM

As with the medium tension system, the low tension system is complex and covers wide areas. There are several different voltage levels in the existing systems. Design, construction and operational practices were studied and evaluated. Various street lighting systems were inspected and reviewed.

It is recommended that an inspection and maintenance

program be established along with a design review to aid in reconstruction and rehabilitation of those portions of the system requiring attention because of age-deterioration or faulty installation practices. Other recommendations include:

1) Use of insulated conductors for overhead feeders.

2) Use of molded-case air circuit breakers.

3) Provision for adequate construction and test equipment.

4) Maintain more complete operational records for systems.

5) Establish and maintain a standard low tension voltage.

6) Rehabilitation of street lighting systems in Beni Suef and Shibin El-Kom.

- ADEQUACY OF INTERCONNECTIONS

Interconnection adequacy was considered for the subtransmission system, substations and distribution points.

It is recommended that consideration be given

to the elimination of any medium tension cable runs having extensive redundancy and that an investigation in the use of throw-over schemes for medium tension circuits be conducted.

- USE OF KIOSKS

A rather extensive study of kiosks as to type, application, and function was carried out because the kiosk is a basic building block in the distribution system family of parameters.

Recommendations include:

1) Standardization of basic component parts and construction practices.

2) The addition of metering in kiosks.

3) The use, in applicable installations, of Pad-Mounts.

4) The rehabilitation of kiosks that because of age or lack of proper maintenance are in need of repair.

5) Improved safely requirements.

6) Using overhead transformers in certain areas.

- SINGLE PHASE DISTRIBUTION

A study presentation was conducted to demonstrate

the differences between single and three-phase systems. The primary intent was to show that in many areas the application of the single-phase concept offers definite economic advantages.

It is recommended that Shibin El-Kom and Beni Suef be rehabilitated by installing a three-phase overhead system and using the single-phase concept; and that consideration be given in Phase II to the analysis of this type installation for use in other areas.

- MEDIUM TENSION SYSTEM PROTECTION

A review of the medium tension distribution system relaying scheme was conducted to check adequacy of such protection as offered by the existing relays.

Based upon this study are the following recommendations

1) More relay coordination studies for each part of the system should be made.

2) Reverse earth-fault-relays should be installed on all distribution point incoming feeder circuit breakers.

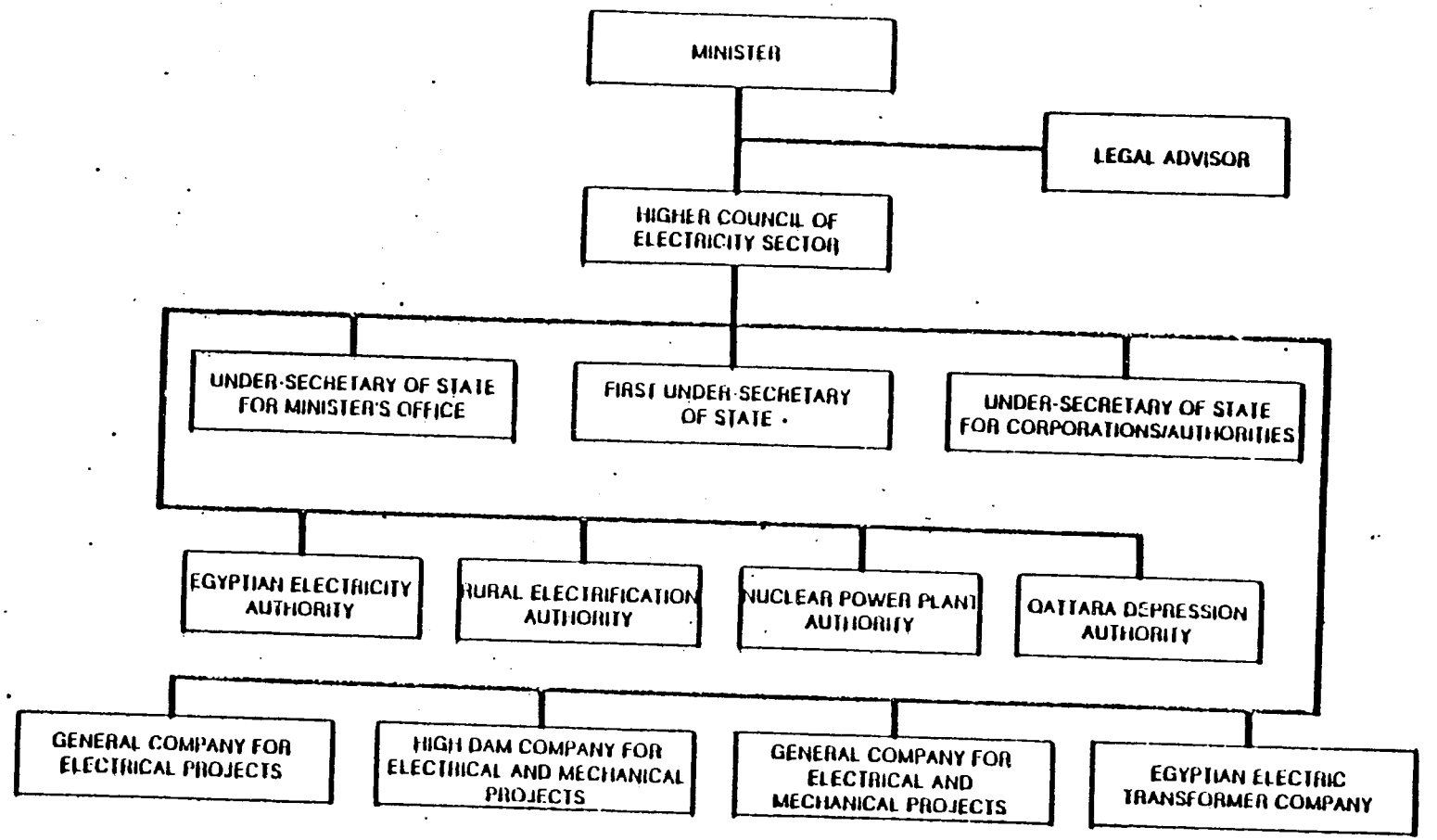
3) Consideration should be given to the application of very-inverse-time overcurrent relays to overcome the problems of cold load pick-up.

4) Study use of automatic sectionalizing equipment.

5) Employ fault indicators.

6) Eliminate distribution points to reduce amount of relay time delay.

EGYPT
MINISTRY OF ELECTRICITY AND ENERGY
ORGANIZATION CHART

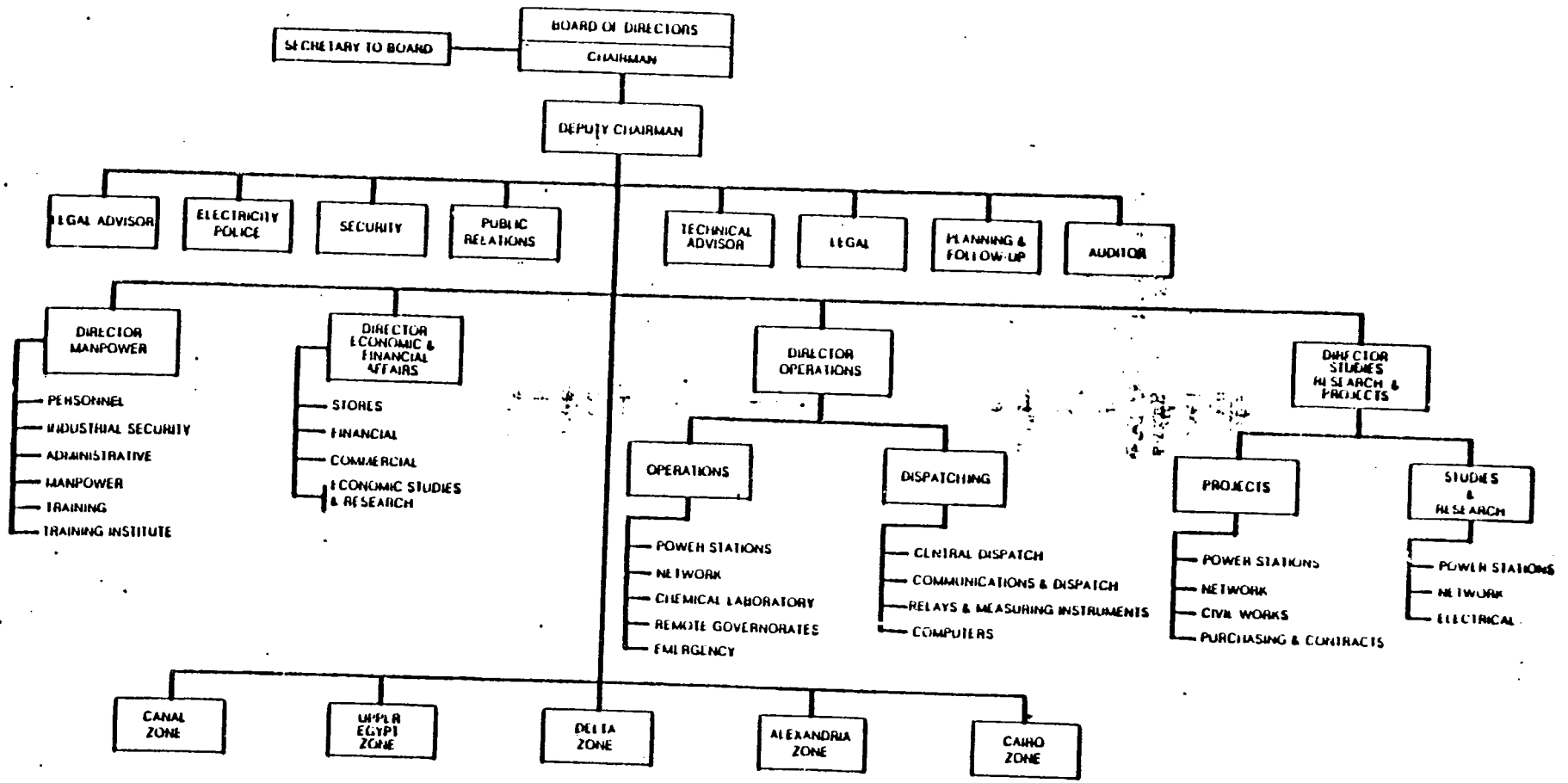


May 1977

World Bank—16892

ANNEX H

EGYPT
EGYPTIAN ELECTRICITY AUTHORITY
ORGANIZATION CHART



May 1977

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ANNEX I

Summary of Law Establishing EEA

1. Law No. 12 of 1976 establishing "The Egyptian Electric Power Authority" was ratified by the People's Assembly on January 18, 1976.

Legal Existence

2. The Authority is a legal entity affiliated with the Ministry of Electricity and Energy. Its head office is in Cairo.

Functions

3. EEA's functions are:

(a) Implementing generation, transmission and distribution Projects.
(b) Management, operation and maintenance of power stations.
(c) Regulation of loads on the main networks throughout Egypt.
(d) Distribution and sale of electric power throughout Egypt.
(e) Studies and Research.

Capital and Sources of Funds

4. The Authority's capital comprises the funds of the General Eyptian Electricity Corporation (GEEC) and funds appropriated by the State. Its revenues and sources of funds are proceeds of sales of electricity, Government subsidies, funds appropriated by the State, proceeds of works and services, Government loans, credit facilities, donations and grants.

Budget

5. The Authority has its own budget unrestricted by the laws governing preparation of the State Budget. Any budget surplus can be carried forward from year to year.

Interest Rates on Government Loans

6. The Council of Ministers sets the interest rate on Government loans.

Capacity to Contract

7. The Authority can enter into contracts with individual companies, banks and local and foreign organizations for purposes for which it was established.

Importation of Goods

8. The Authority can import its requirements without permits or restrictions by laws and regulations governing importation or foreign currency. Imports for its projects are exempt from customs duties and taxes.

Board of Directors

9. The Chairman and his salary are determined by Republican decree. Members of the Board are appointed by Order of the Prime Minister on the recommendation of the Minister of Electricty and Energy. The Board is responsible for the management of the Authority's affairs. It approves the Authority's regulatory structure and prepares electricity tariff proposals which are approved by the Higher Council of the Ministry of Electricity and Energy and the Council of Ministers.

The Board also has the discretion to:

(a) Approve the Authority's draft annual budget and balance sheet.
(b) Make budget transfers from one item to another.
(c) Lay down the Authority's internal regulations.
(d) Frame personnel allowances.
(e) Propose contracting for loans.
(f) Accept donations and grants.
(g) Review progress and financial reports.
(h) Review any items submitted by the Chairman or the Minister.

10. All the Board's resolutions are communicated to the Minister by the Chairman within 3 days. They become enforceable unless the Minister objects to them in writing within 30 days.

Chairman

11. The Chairman's duties include:

(a) Execution of the Board's resolutions.

(b) Managing the Authority.

(c) Supplying the Minister and State bodies with information they request.

(d) Representing the Authority in the courts.

Statutes

12. The Authority's statutes are to be issued within 6 months of the date of publication of this law in the official gazette. They will take into consideration

(a) Linking wages to productivity.

(b) Maximum pay scales related to Government's civil servants.

(c) Incentive bonuses and allowances should not be greater than double the salaries set.

(d) Main principles of the social insurance scheme (Law 79 of 1975).

(e) Travelling allowances and expenses should not exceed the actual expenses incurred.

(f) Adoption of the rules of the standard accounting system.

(g) Direct operations should only be entrusted to foreign firms or international experts with the approval of the Minister.

(h) The most up-to-date supply rules.

Personnel

The GEEC personnel are transferred to the Authority without any further measure.

May 1977

Summary of Findings and Preliminary Recommendations of Power Sector Survey 1/ by Sanderson & Porter, Inc.

1. Introduction

1.01 The next several pages present a summary of the findings during Phase I of the Power Sector Survey. There are two, however, which are considered to be of particularly outstanding significance since they possess potentials for great benefits to Egypt's economy for years to come. One of these relates to the use of associated natural gas which is now being flared in the Gulf of Suez area and the other to the full utilization of the hydroelectric potential of the Nile. Each of these has the potential for savings of many millions of Egyptian pounds for many years in the future. Both are discussed below and in greater detail in other sections of the report.

2. Power Sector Energy Policy

2.01 Egypt's principal indigenous energy resources are hydropower, natural gas, and oil.

2.02 EEA's energy policy should be directed towards harnessing as rapidly as possible two energy sources where there now is undesirable waste - the additional hydroelectric potential of the Nile and the associated natural gas now being flared in the Gulf of Suez oil fields. Afterward other natural gas resources can be used to free more oil for export and improve Egypt's position in world trade. National planning over at least the next 20 years should be based on the use of gas resources to supply domestic needs, leaving oil available for export.

2.03 To assure optimum use of Egypt's energy resources, it is important that EEA work closely with the Ministries of Irrigation, Petroleum, and Industry. Better coordination between the Ministries and their planning groups at the working level is essential. EEA's planning staff will have to be strengthened to accomplish the needed results.

2.04 Fuel pricing policies should be examined carefully and choices of production methods between high and low energy technologies available to some industries can be of major importance to the Nation's economy.

1/ Issued November 20, 1976.

2.05 In order to assure optimum use of Egypt's alternative energy sources, marginal costs of producing and delivering electric energy should be prepared on a regular basis and supplied to other concerned Ministries for their planning purposes.

2.06 Regular inter-Ministry planning liaison with regard to the economics of supplying large prospective power system loads is needed.

2.07 There may be opportunities for beneficial international cooperation between Egypt and several other countries in North Africa and the Middle East who are involved in extensive energy resource development and use programs.

3. Organization and Management

3.01 EEA was created by Law 12 early in 1976 but the new organization has not been fully implemented because of the lack of needed by-laws. It is highly desirable that this situation be corrected as soon as possible.

3.02 EEA is over-organized in some areas and understaffed in others with a serious need for qualified personnel to whom some of the management responsibilities now assumed by a relatively small number of top officials can be delegated.

3.03 EEA management realizes the existing personnel problems but is handicapped by serious shortages of qualified personnel, losses of capable people to other organizations both within and outside Egypt, and regulations governing employment, salaries, and promotions.

3.04 It is recommended that an effective management development program be organized to assist in solving some of the existing personnel problems. EEA's top management is staffed by a highly qualified group dedicated to their responsibilities of developing the electric power resources of Egypt, but many need substantial assistance in order to relieve them of overburdening workloads now prevailing.

3.05 The total number of EEA employees is extraordinarily large in terms of the electric system as compared to electric utilities in some other countries.

3.06 A high level engineering planning group should be organized and given the responsibilities for long-range power system planning.

3.07 The Studies, Research, and Projects Sector and the Operations Secror should be reviewed in terms of responsibilities and organizational needs.

4. System Operations

4.01 The Egyptian Unified Power System includes two large hydroelectric stations and a number of oil-fired thermal stations. Immediate attention should be given to the conversion of some of the thermal plants from oil to natural gas.

4.02 Housekeeping practices should be improved at a number of stations to reduce fire and safety hazards, improve general appearance, and perhaps produce better equipment performance in some cases.

4.03 An improved program is needed for the maintenance of metering, instrumentation, and operational monitoring equipment so that information needed by operators will be available and reliable especially during times of system emergency.

4.04 Accurate automatic system frequency control is becoming an increasingly important need of the Unified Power Ssytem, and provision of such a control system is recommended.

4.05 Establishment of a strong technically oriented central relay, instrument, and meter laboratory to supplement the existing zone arrangements is recommended. It would provide specialized expert repair, rehabilitation, preventive maintenance and calibration of delicate equipment.

4.06 Some EEA Zones now hold regularly scheduled meetings at frequent intervals with representatives of major customers to discuss power supply, future requirements, or related questions. This is a commendable practice and it is recommended that it be adopted in other areas where not already used. Communication between EEA and its customers and with other governmental organizations is often a problem and concerted efforts to improve communications both internally and externally would be helpful in solving many operating problems.

4.07 Future use of the hydroelectric potential of the Aswan and High Dams probably offers one of the greatest economic opportunities available to EEA. To accomplish this requires better coordination with the Ministries of Agriculture and Irrigation and also improvements in 500-kV transmission line performance if optimum benefits are to be achieved. It is urged that these opportunities be explored promptly.

4.08 Water leaks around sector gates at the High Dam should be corrected while the loss of water is less significant than it may be in the future.

4.09 More thorough analysis of power system interruptions is recommended with a view to improving system coordination performance, and reliability.

4.10 A number of independent small generating units are still being installed at industrial plants in Egypt. Every effort should be made to meet usual customer service requirements through service from the Unified Power System and curb the proliferation of small units.

4.11 Cooling towers now under construction at Karmouz station should be completed before the hot weather season of 1977 so that more of the plant's capacity will be usable to meet next year's load requirements.

4.12 Inventories of spare parts on hand and those needed for maintenance stock are recommended. Also special requirements to restore inoperable equipment to service should be identified in order to facilitate decisions as to whether such equipment will be returned to use or permanently retired.

4.13 Shortages of appropriate tools and maintenance equipment have been reported in some locations and an inventory of these needs is recommended.

4.14 It is suggested that each Power Station and Network Director be invited to submit a resume of outstanding needs in his area of responsibility in order that a determination of overall needs and relative priorities can be made.

5. System Planning

5.01 Appointment of a System Planning Engineer to the initial Power Sector Survey Team was delayed four-and-a-half months because of funding limitation. Consequently the System Planning aspects of the Survey largely remain to be developed later in the course of the survey work, and the corresponding section of this report is limited to general observations and comments.

5.02 A relatively large number of new generating units is already committed or anticipated in the near future. A comprehensive study of future system plans is recommended to assure adequate coordination between these unit additions and associated transmission system expansion programs.

5.03 Modifications and improvements of the 500-kV system are needed to permit reliable transmission of larger amounts of power from the High Dam to the Cairo and Lower Egypt areas. Significant fuel savings appear to be the reward for improved line performance and increased transmission capability.

5.04 EEA needs a capable engineering section to do long-range planning and develop an orderly system expansion program for meeting future load growth requirements.

5.05 An adequate load reporting and forecasting system should be developed to meet the specific needs of EEA for system planning purposes.

5.06 The option of providing hydroelectric generating facilities at the existing Nile barrages should be examined immediately. The usefulness of such capacity seems promising and any work to accomplish it should be included in the projects for rehabilitation and improvement of the existing civil works.

6. Distribution

6.01 The Power Sector Survey Team's responsibility with respect to distribution systems and problems is limited to coordination of the Power Survey with distribution studies which are to be carried out separately. Such coordination will be made with the studies planned for Cairo, Alexandria and two other provincial capitals and expected to be started in 1977.

7. Accounting and Finance

7.01 The national standard accounting system, by which EEA is now limited should be supplemented by accounting practices adapted especially to public utility operations in order to improve cost control and management information.

7.02 The Operating Budget should be subdivided for more significant comparisons with actual results, and emphasis should be given to controllable expenses.

7.03 Headquarters should exercise stronger leadership in coordination and supervision of Zonal accounting practices, and eliminate bottlenecks delaying prompt reporting of accounting and cost data.

7.04 Financial reports should be made more useful to operating management.

7.05 Supplementary Management Information reports should be expanded to meet needs of operating management and provide performance indicators for key management functions, not limited to technical functions.

7.06 Commercial operations should recognize the need for marketing and customer relations, especially services for large industrial consumers and for prospective consumers.

7.07 Revenue analysis should be reinforced to develop more complete analysis of consumption patterns for revenue forecasting and tariff planning.

7.08 Mechanization of commercial accounting should be coordinated on system-wide basis for eventual integration with other data processing requirements in large volume.

7.09 Long overdue delinquent accounts should be settled as quickly as possible and management of collections strengthened in order to minimize delinquencies in all categories.

7.10 Cost analysis and reporting should be standardized and given higher priority, so that significant results can be made available in time for effective follow-up.

7.11 Losses of energy not billed should be analyzed at all levels and avoidable losses minimized especially at distribution levels.

7.12 Fixed asset property accounting records should be improved, possibly requiring a physical inventory for transfers of properties and determination of a base for measuring return.

7.13 Planning should be started for uniform coding and eventual computerization of large volume processing functions, already begun in several isolated cases.

7.14 Performance measurement factors should be developed as a guide for management at all levels.

8. Tariffs

8.01 The marginal cost of producing electric energy should provide the basis for establishing EEA's electricity tariffs, and the calculation of marginal cost should include not only the total costs of facilities including financing charges but should take into account also both the domestic and international prices of fuels.

8.02 Government policy is for all industry to pay the full cost of energy consumed, calculated at domestic prices. Further industries producing for export should pay a supplement to cover the full export value of fuel embodied in that part of its operations. Marginal costs are not yet fully reflected in EEA tariffs and should therefore be furnished periodically as appropriate to other concerned industries for their planning purposes. The marginal cost calculations should provide figures at both the prevailing domestic price and the export value on "opportunity cost" of the fuel. As also suggested in the Energy Resources and Policy Section, there should be regular inter-Ministry planning liaison with regard to large prospective loads, total costs of supply including transmission, conditions of service, and other relevant factors.

8.03 EEA's cost estimating guidelines require it to take into account all costs, depreciation and actual interest payments on loans, plus a return of three percent on the value of its invested capital. If assets are undervalued, the cost calculation and therefore the tariffs derived from them will not produce sufficient funds for replacement of those assets. A December 1972 study valued EEA's assets at LE 420 million, equivalent to $630 million at today's "parallel market" exchange rate. Replacement value of EEA's 3845 MW generating capacity plus transmission and distribution systems might approximate $4 billion. 1/

8.04 EEA receives residual fuel oil (and natural gas) not at oil's export price or "opportunity cost" of $60 per metric ton but at a subsidized price equivalent to $11.25 per ton at the "parallel market" exchange rate of LE 1.00 equals $1.50.

1/ This figure represents the opinion of the consultant and not necessarily that of the Bank.

8.05 An example calculation based on current estimates of costs for construction and operation of a new 2 x 150 MW steam power plant shows production costs of 2.16 U.S. cents/kWh for the higher fuel price and 1.14 cents/kWh for the lower.

8.06 EEA's average billing rate was 9 milliemes/kWh in 1975. This provides relatively low revenues in terms of replacement values or assets. Furthermore, current investments in new facilities will force tariffs upward. If EEA were required to pay the export price for its fuel oil, the tariff structure would also have to undergo a sharp increase.

8.07 While all consumer sectors are being charged rates below the marginal economic cost of producing and delivering electricity, the lowest rates and greatest disparities are in the industrial sector. Appropriate adjustments should be considered to help support the high marginal costs of new facilities being added to the UPS and to assure the financial solvency of EEA. Some of the aluminum and fertilizer operations are analyzed in Section VII of this report as examples of the need to reexamine the tariff structures and seek more equitable bases for power supply to these types of consumers.

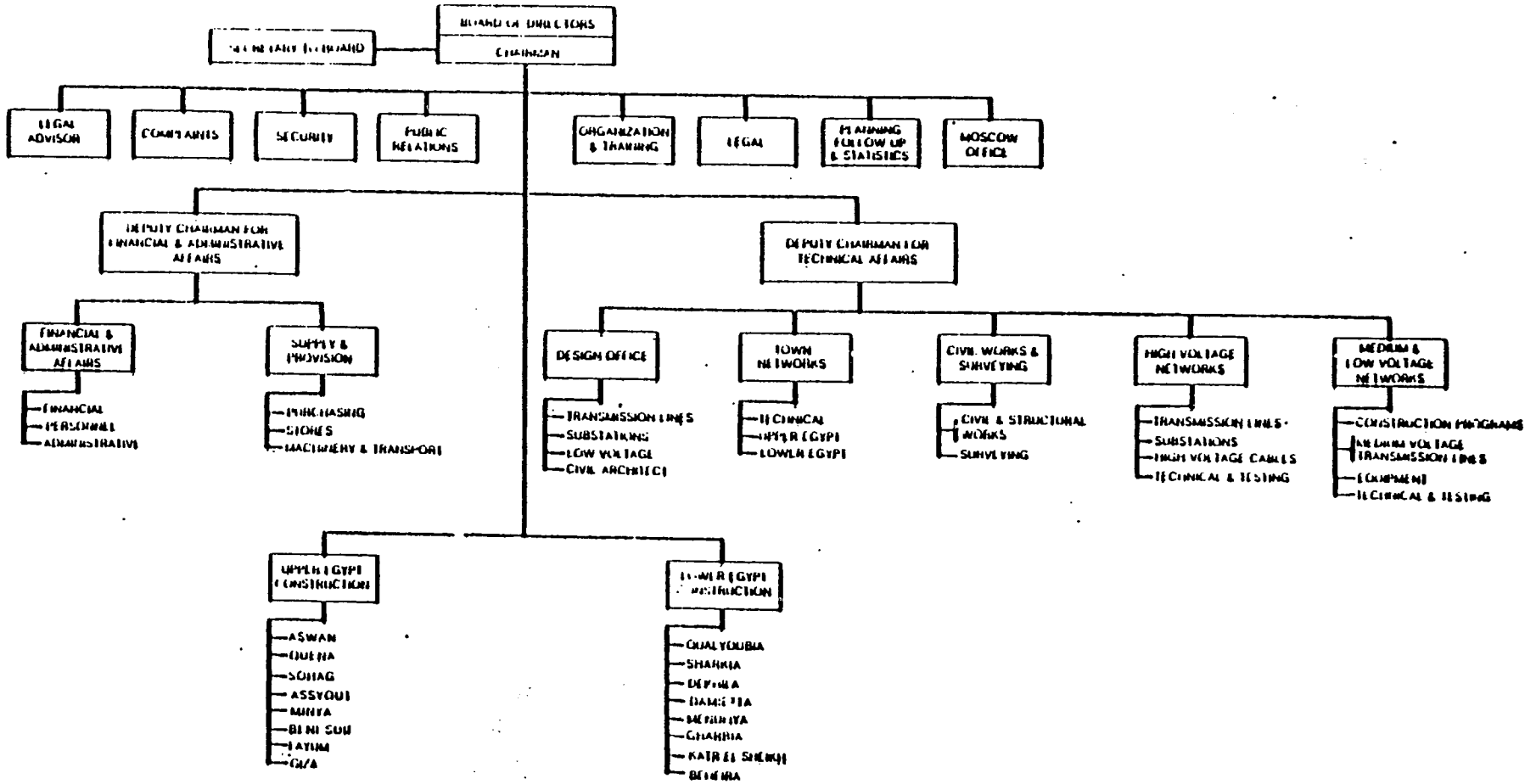
9. Training

9.01 During Phase I of the Power Sector Survey, it has been impossible to accomplish any significant training of national counterparts who are upper management people with responsibilities and work loads that preclude much attention to day-to-day work of the Survey Team. It is recommended that EEA consider whether some changes in assignments are desired so that more training through work association will be possible during the remainder of the project.

9.02 It is recommended that ways be explored to better utilize the facilities of the technical training institute at Cairo South station.

9.03 It is recommended that short courses for further education and development of technical employees be organized. It appears that there are engineers within existing employee ranks who are qualified to serve as part-time instructors for courses of this nature. Along the same line, selected courses from local university curricula may offer opportunities for further development of interested employees.

EGYPT
RURAL ELECTRIFICATION AUTHORITY
ORGANIZATION CHART



May 1977

W-bl Bank - 16892

ANNEX 1

INSTALLED AND PROJECTED GENERATING CAPACITY OF UPS

TABLE I-5

Name of Station	Installed Power Megawatts: Number and Capacity of Units	Total	Maximum Capability in Megawatts (Assuming All Generating Units in Service): 1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Cairo West	3 x 87	261	150	150	150	150	150	187	224	261	261	261	261
2. Cairo South	4 x 60	240	180	240	240	240	240	240	240	240	240	240	240
3. Cairo North	2 x 30 + 1 x 20 + 2 x 10	100	75	75	75	75	75	75	75	75	36	36	0
4. El-Tebbin	3 x 15	45	28	40	40	40	40	40	40	40	40	40	40
5. Talka	3 x 12.5 + 3 x 30	127	116	116	116	116	116	116	116	116	116	116	116
6. Damanhour	2 x 15 + 3 x 65	225	195	195	195	195	195	195	195	195	195	195	195
7. El-Seyouf	2 x 26.5 + 2 x 30	113	100	100	100	100	100	100	100	100	100	100	100
8. Karmouz	4 x 16	64	30	30	45	45	45	15	0	0	0	0	0
9. Assiut	3 x 30	90	60	90	90	90	90	90	90	90	90	90	90
10. Suez(Damaged)	4 x 25	100	---	---	---	---	---	---	---	---	---	---	---
11. Kafr El-Dawar	3 x 110	330	---	---	---	110	220	220	220	330	330	330	330
12. Cairo West	1 x 87	87	---	---	---	---	87	87	87	87	87	87	87
13. Abu Qir I	2 x 150	300	---	---	---	---	---	300	300	300	300	300	300
14. Ismailia	2 x 150	300	---	---	---	---	---	---	---	300	300	300	300
15. Abu Qir II	2 x 150	300	---	---	---	---	---	---	300	300	300	300	300
16. Suez I	2 x 150	300	---	---	---	---	---	---	---	300	300	300	300
17. New Plant I	2 x 300	600	---	---	---	---	---	---	---	---	300	600	600
18. Sidi Krir I	1 x 600	600	---	---	---	---	---	---	---	---	---	---	600
Total			934	1036	1051	1161	1358	1665	1987	2734	2995	3295	3859
COMBUSTION TURBINE STATIONS*													
1. El-Nax	2 x 14	28	12	24	24	24	24	24	24	24	24	24	24
2. Suez	1 x 17			17	17	17	17	17	17	17	17	17	17
3. Ismailia	1 x 23				23	23	23	23	23	23	23	23	23
4. Cairo North	1 x 23				23	23	23	23	23	23	23	23	23
5. Port Said	2 x 23								46	46	46	46	46
6. Fayum	1 x 23				23	23	23	23	23	23	23	23	23
7. Helwan	120 MW Total					120	120	120	120	120	120	120	120
8. Talka	180 MW Total					180	180	180	180	180	180	180	180
Total			12	41	110	410	410	410	456	456	456	456	456
HYDRO STATIONS**													
High Dam	12 x 175	2100***)											
Aswan	7 x 46 + 2 x 11.5	345***)	1400	1550	1700	1800	2000	2200	2360	2360	2360	2360	
Total System Capability			2477	2711	3271	3568	4075	4643	5550	5811	6111	6675	

*Winter Ratings.

**Hydro Capability varies as a function of load magnitude and distribution in the UPS network.

***High Dam output is usually limited to 1750 MW because units must be removed from service in pairs when under maintenance due to common penstock arrangements, and one or more units are consistently out for maintenance. Aswan capability is 260 MW due to reduced head after construction of High Dam.

PROJECTED GROWTH OF TOTAL INSTALLED EFFECTIVE GENERATING CAPACITY MAXIMUM DEMAND AND GENERATED ENERGY

Year	Installed effective generating capacity[a]	Maximum Demand		Generated energy		Annual load factor (%)
		MW	Annual increase (%)	GWH	Annual increase (%)	
1970 b		1091		6800		71.2
1971 b		1121	2.7	7300	7.4	74.3
1972 b		1176	4.9	7400	1.4	71.6
1973 b		1248	6.1	7400	0	67.6
1974 b		1433	14.8	8500	14.9	67.7
1975 b		1733	20.9	9800	15.3	64.6
1976 b	2477	1909	10.2	11640	18.8	69.4
1977	2711	2192	14.8	13500	16.0	70.3
1978	3271	2470	12.7	15150	12.2	70.0
1979	3568	2678	8.4	16750	10.6	71.4
1980	4075	2924	9.2	18520	10.6	72.1
1981	4643	3192	9.2	20470	10.5	73.2
1982	5550	3578	12.1	22630	10.6	72.2
1983	5811	4028	12.6	25020	10.6	70.9
1984	6111	4518	12.2	27660	10.6	69.7
1985	6675	5045	11.7	30580	10.6	69.2

Maximum Demand Compound Rate %		Generated Energy Compound Rate %	
(1952-76)	12.6[b]	(1952-76)	11.1[b]
(1970-76)	9.8[b]	(1970-76)	9.4[b]
(1976-80)	11.2	(1976-80)	12.3
(1981-85)	12.1	(1981-85)	10.6
(1976-85)	11.4	(1976-85)	11.5

a Total installed effective generating capacity = combined contributions of Aswan Dam and High Dam towards meeting annual maximum demand + installed and projected effective capacity of all other plant.(Does not account for shceduled or unscheduled equipment outages)

b Historical Data

ANNEX N
Page 1 of 2

LOAD FORECAST 1976-2000

	Year	Max.Demand (MW)	Energy (GWH)	Energy Growth (Percent)	Load Factor (Percent)
SHORT RANGE LOAD FORECAST	1976	1909	11640	18.8	69.4
	1977	2192	13500	16.0	70.3
	1978	2470	15150	12.2	70.0
	1979	2678	16750	10.6	71.4
	1980	2924	18520	10.6	72.1
	1981	3192	20470	10.5	73.2
	1982	3578	22630	10.6	72.2
	1983	4028	25020	10.6	70.9
	1984	4518	27660	10.6	69.7
	1985	5045	30580	10.6	69.2
LONG RANGE LOAD FORECAST	1986	5527	3360	9.1	68.9
	1987	6066	36400	9.1	68.5
	1988	6629	39710	9.1	68.2
	1989	7221	42890	8.0	67.8
	1990	7834	46320	8.0	67.5
	1991	8510	50020	8.0	67.1
	1992	9208	54030	8.0	66.8
	1993	10032	58350	8.0	66.4
	1994	10884	63020	8.0	66.1
	1995	11826	68060	8.0	65.7
	1996	12794	73500	8.0	65.4
	1997	13941	79380	8.0	65.0
	1998	15015	85100	7.2	64.7
	1999	16197	91230	7.2	64.3
	2000	17395	97790	7.2	64.0

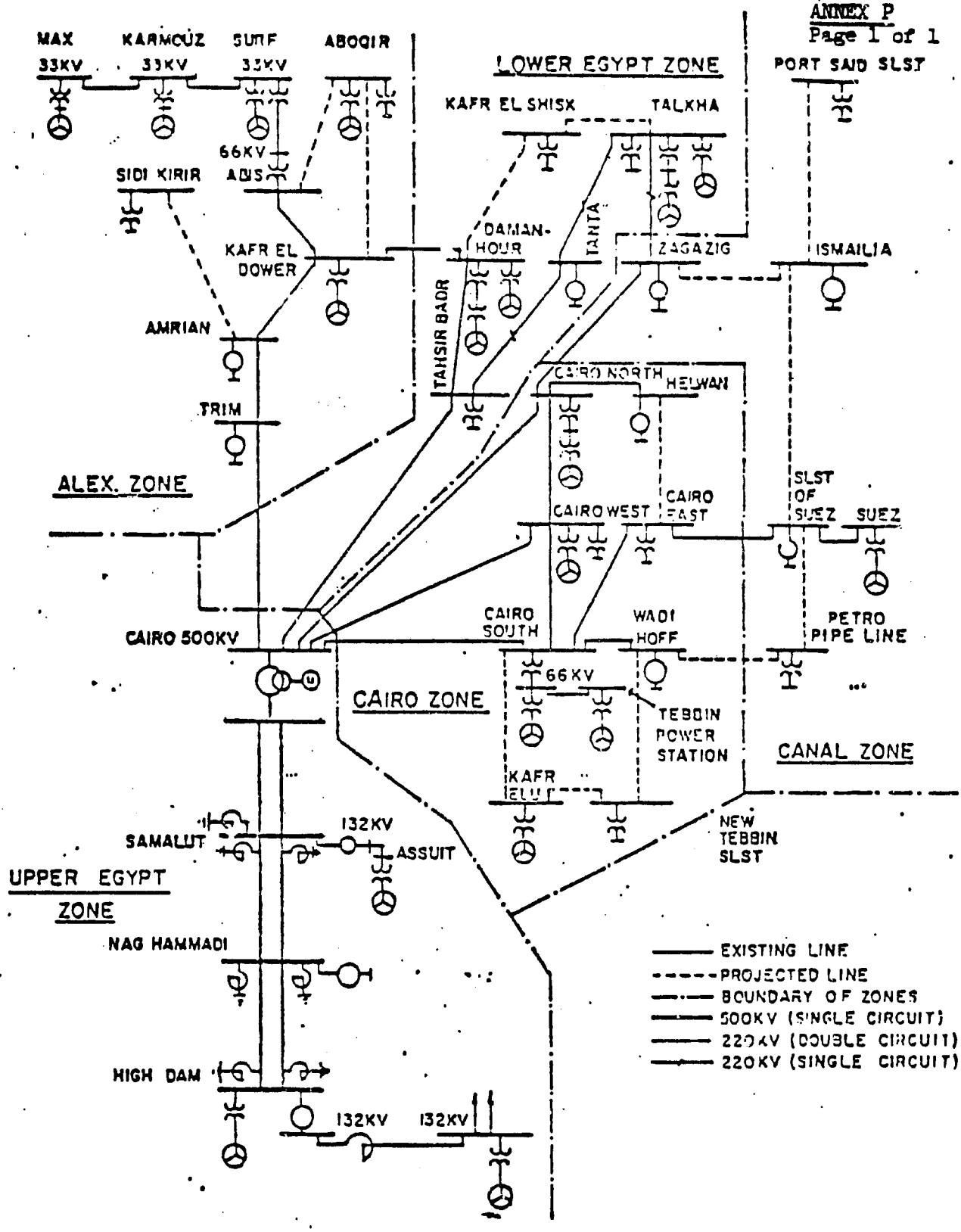
Compound Growth Rate	Max.Demand	Energy
1952-1976	12.6%	11.9%
1976-1985	11.4%	11.3%
1985-1995	8.9%	8.3%
1976-1995	10.1%	9.7%
1976-2000	9.6%	9.3%

TABLE I-4

COMPARISON OF FORECASTS OF ENERGY AND MAXIMUM DEMAND

Year	Sanderson & Porter (Apr. 1977)			Nuclear Power Plants Authority (Nov. 1976)			International Atomic Energy Agency (Sept. 1973)		
	Energy (GWh)	Load Factor (%)	Maximum Demand (MW)	Energy (GWh)	Load Factor (%)	Maximum Demand (MW)	Energy (GWh)	Load Factor (%)	Maximum Demand (MW)
1976	11640[a]	69.4	1909[a]						
1977	13500	70.3	2192	15200	77.1	2250			
1978	15150	70.0	2470	18100	78.0	2650	18408	71.9	2923
1979	16750	71.4	2678	20800	77.4	3050	19504	71.9	3097
1980	18520	72.1	2924	21900	76.9	3250	20669	71.9	3282
1981	20470	73.2	3192	23100	76.4	3450	22136	71.9	3516
1982	22630	72.2	3578	27300	76.0	4100	23717	70.9	3766
1983	25020	70.9	4028	28700	75.3	4350	25427	69.7	4091
1984	27660	69.7	4518	30300	75.2	4600	27157	68.8	4445
1985	30580	69.2	5045	32000	75.3	4850	29125	67.9	4831

a Historical Data.



THE EGYPTIAN POWER SYSTEM
ONE LINE DIAGRAM

DISTRIBUTION ENGINEERING MANAGEMENT[1/]

With rapidly expanding electric distribution systems and growing consumer demands, a computerized planning technique that can readily be updated has become a necessity. Distribution Engineering Management (DEM) provides this capability. It is a system designed on a long range basis, requiring a long-range load forecast by individual areas. It provides sufficient data (1) to select the most economical and adequate distribution voltage, (2) locates load centers for substation siting, (3) determines subtransmisssion requirements, (4) locates and sizes distribution feeders, (5) develops construction schedules for new substations and feeders, (6) schedules substation expansions, (7) locates and sizes capacitors and regulators and (8) provides an easy method of transferring load between substations.

To describe how DEM works, a typical medium sized city in the year 1977 is assumed, having a 7.2/12.5 kV wye distribution system. The system is digitized and placed in a computer model of the system. A 20 year forecast using

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1/ The description of the Distribution Engineering Management (DEM) program and how the program works is extracted from information furnished by Scott and Scott Consultant Engineers.

the forecast model is then prepared, based on electrical requirements of the various customer classifications and upon future land use.

Data on land use to the year 1997 was obtained from the city and regional planning agencies (Fig. 1). Included is information on zoning regulations concerning lot sizes, building restrictions, and parking requirements which are used to determine the density of the various classifications of land use (Table A-1). For example, the SF-4 residential zone requires 697 sq. meter lots. When 25% additional area is added to each lot for streets and alleys, the density becomes about 1.83 residences per hectare. This same logic is applied to all residential classifications to obtain the number of dwelling units per hectare.

Table A-1

Selected Categories of Future Zoning Classifications

Class	Type	Classification	Minimum Lot (sq.m.) Dwelling
SF-1	Residential	Single Family	465
SF-4	Residential	Single Family	697
MF-1	Residential	Multi-Family	1390
NS	Commerical	***	Not Specified
I-2	Industrial	***	Not Specified

A different approach is used in commercial and industrial density computations, as the zoning regulations do specify only parking, building set-back, number of floors above ground and basement requirements. These regulations are translated into square meters of floor space per hectare for the various commercial and industrial classifications.

Studies of existing and future electrical requirements for various classification of customers are performed by consultants or electric utility company engineering and marketing personnel. The starting point for the study is overall energy-usage statistics for 1975 (Table A-2).

Table A-2

Energy Usage for 1975 in Typical Metropolitan City

Classification	kWh per Customer	Number of Customers	Total MWh Usage	%
Residential	10,276	19,890	204,389	29.9
Commercial	53,107	2,363	125,491	18.4
Industrial	1,196,258	295	352,896	51.7
TOTAL		22,548	682,776	100.0

Studies of specific residential and industrial customers are then performed. Two residential areas are studied. One contains 103 customers with an average energy usage of 6,643 kWh

in 1975; the homes in this area are about 20 years old. The second area contains homes only about 3 years old, with an average 1975 usage of 18,847 kWh.

Studies of appliance saturations are performed to provide data for all 1977 residential customers. The results of this indicate that average usage will be about 28,000 kWh/year by 1997.

A sample of indistrial customers was taken of both the two industrial districts. One district contains eight industrial customers with an average of about 70,800 kWh per hectare per year, with an undiversified load factor of 42%. Eight industries studied in the other industrial district have an average annual energy usage per hectare of about 67,500 kWh, with an undiversified load factor of 51%. A third industrial area is not considered, as it is all heavy industrial customers. The results of the energy usage study for selected categories are shown in Table A-3.

Table A-3

Land Use and Electrical Requirements

Class	Family Units per Hectare	kWh Per Unit	kWh Per Hectare	Local Factor
SF-1	0.71	40,750	28,490	0.34
SF-4	1.83	24,550	44,920	0.42
MF-1	4.50	26,040	117,200	0.52
NS	***	***	91,060	0.52
1-2	***	***	242,820	0.62

The area is then divided into "load modules", which are sized for planning distribution circuits and substations. The load modules are established on the basis of a mapping index, which correlates with the governmental plane-grid-coordinate system. For the study, the smallest module (14.9 hectares) is used for the urban area, and four modules (55.7 hectares) are used for the rural areas. Dividing the system in this manner results in 913 separate load modules.

The 1997 land usage by zoning classifications is then extracted from the map for each of the 913 load modules. These data are then input into computer files.

Land usage is entered into the computer files followed by the electrical characteristics for each classification of usage. The model combines the land usage by hectares with electrical characteristics and computes energies and demands for each load module. The results indicate that the total metropolitan area will have a demand of about 625 MW in 1997, compared to a demand of about 100 MW in 1975. This is a compound growth rate of 8.3%, which appears reasonable for this area.

Upon completion of the forecast, the information in the computer-model files and other pertinent data are stored to enable periodic updating and for use in preparing similar load forecasts for other service areas.

A number of distribution-system plans are then studied. These plans are those that maintain a 7.2/12.5 kV distribution system for the city area, and plans that are a mixture of 7.2/12.5 and 19.9/34.5 kV distribution. All the alternatives are studied on a preliminary basis, with the best of each type then studied in detail. Basic ground rules used in sizing stations and feeders for each voltage class include:

a. Transformer size for 12.5 kV substations begins with a 20/33 MVA transformer with up to four circuits. Ultimately a second 20/33 MVA transformer and additional circuits up to a total of six would be added. The substation would be normally loaded to about 75% or 50 MVA. The circuits would normally be loaded to about 65% thermal rating, or about 8 MVA.

b. Transformer size for 34.5 kV substations begins with a 50/83 MVA transformer and three circuits. The next addition would be another 50/83 MVA transformer and additional circuits up to a maximum of six for the entire station. Normal loading on the station would be 125 MVA with the circuits loaded to about 23 MVA.

The long range planning study begins with imposing the 1997 loads from the load-forecast model onto the present distribution system. This immediately pinpoints the

deficiencies of the present system. The results indicate that the 1997 loads would severely overload feeders and substations transformers. Corrections of deficiencies by reconductoring, adding new feeders, and adding new substations is the next step.

The best all 12.5 kV plan (Fig. 2) would require the addition of eight substations, 42 new circuits, and additional capacity at three of the existing ten substations.

Several 34.5 kV systems are studied and the best of these (Fig. 3) would require addition of three new 34.5 kV stations, the changeover of the 12.5 kV Central substation to 34.5 kV adding 16 new circuits, and the dedication of the North 12.5 kV stations to serve only the adjacent industrial customers who purchase power at 12.5 kV.

The cost comparison between the two plans (Table A-4) indicates that the metropolitan area should be served by a mixture of 12.5 kV and 34.5 kV. The existing 12.5 kV system should be retained in the inner core of the city, and the fast growing suburban areas should be served at 34.5 kV. This plan will save about $1.4 million in capital costs and about $419,000 in system losses over the next 20 years, based on 1976 dollars.

Table A-4

Cost Comparison - Plan A vs B (1976 dollars)

Item	Plan A	Plan B	Savings B over A
Captial Costs			
Substations	$5,514,000	$3,762,000	$1,752,000
Distribution Lines	1,561,000	2,224,000	(663,000)
Transmission Lines	867,000	587,000	280,000
TOTAL CAPITAL	$7,942,000	$6,573,000	$1,369,000
Cost of Losses			
Demand	$ 739,000	$ 555,000	$ 184,000
Energy	1,641,000	1,406,000	235,000
TOTAL OF LOSSES	$2,380,000	$1,961,000	$ 419,000
TOTAL COSTS	$10,322,000	$8,534,000	$1,788,000

This plan, however, has heavier loads per circuit and consequently will have lower reliability, than the present all 12.5 kV system. The reliability was not measured in this study. The use of more sectionalizing and possibly supervisory control of some sectionalizing devices would improve reliability. Economic conditions make it necessary to sacrifice some of the reliability normally built into distribution systems.

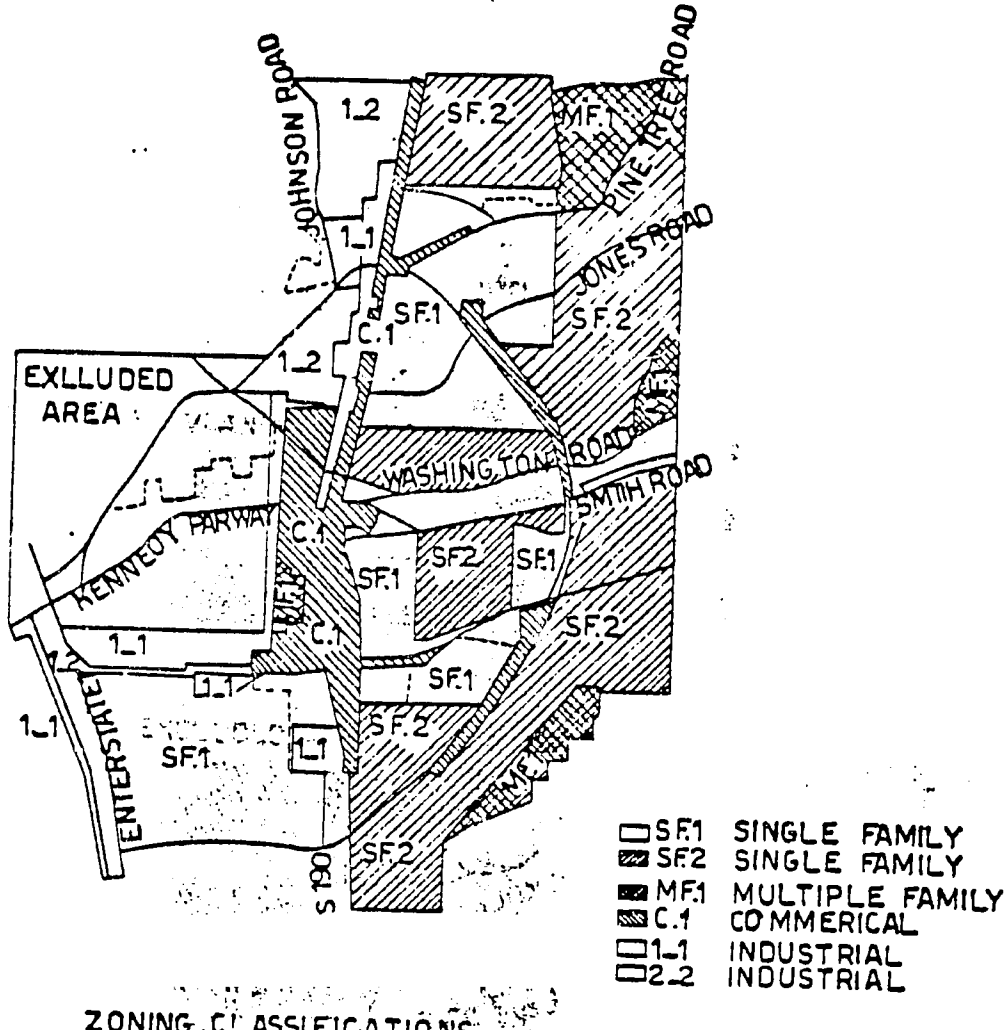
The distribution model of the DEM was developed to allocate station peaks to the nodes in proportion to the

connected kVA of distribution transformers. Where transformer records and maps are not accurate and complete enough for this, and there is not enough time to update them through field work and still meet study deadlines, loads may be measured at node points and adjusted to the year's peak-load day. The program can be adjusted to accept the information in this manner.

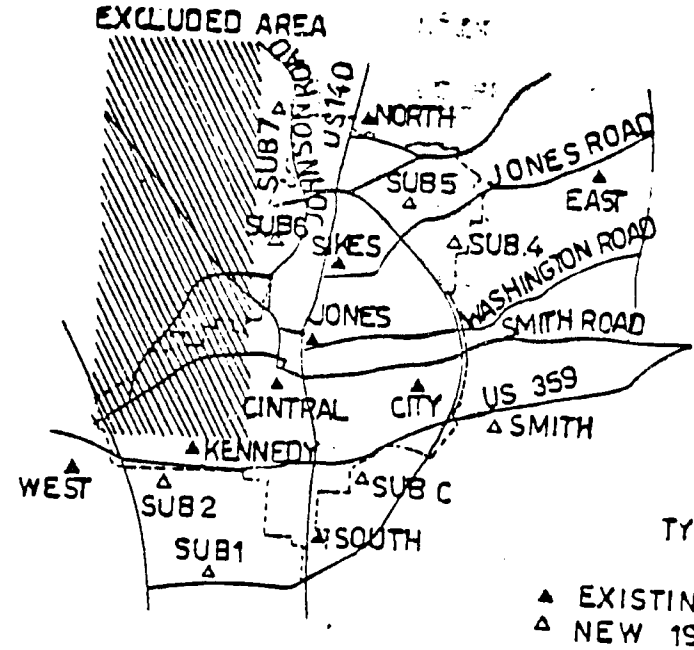
The model must be updated to include changes in conductor size, substation sources and load changes. These data can then be projected for a five-year period to be used in preparation of the construction budgets and forecasts. Computer runs can be made each year using the latest information available.

When there is an appreciable load added on a circuit, the computer printout can be referenced and if there are questions, a run with the new load added can determine the capability of existing facilities. Alternate supply circuits can also be examined.

This can be a very valuable tool in system operations. Circuit conditions can be examined by switching loads between substations on the model.

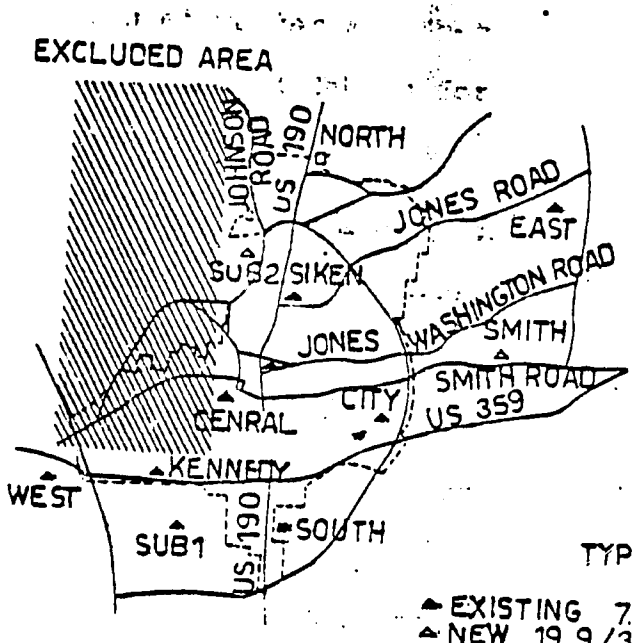


ZONING CLASSIFICATIONS
FIGURE 1



PLAN A
TYPICAL METROPOLITAN CITY
▲ EXISTING 7.2/12.5 KV STATIONS
△ NEW 19.9/34.5 KV STATIONS

.5 KV AND 34.5 KV BASIC SYSTEM PLAN
FIGURE 2

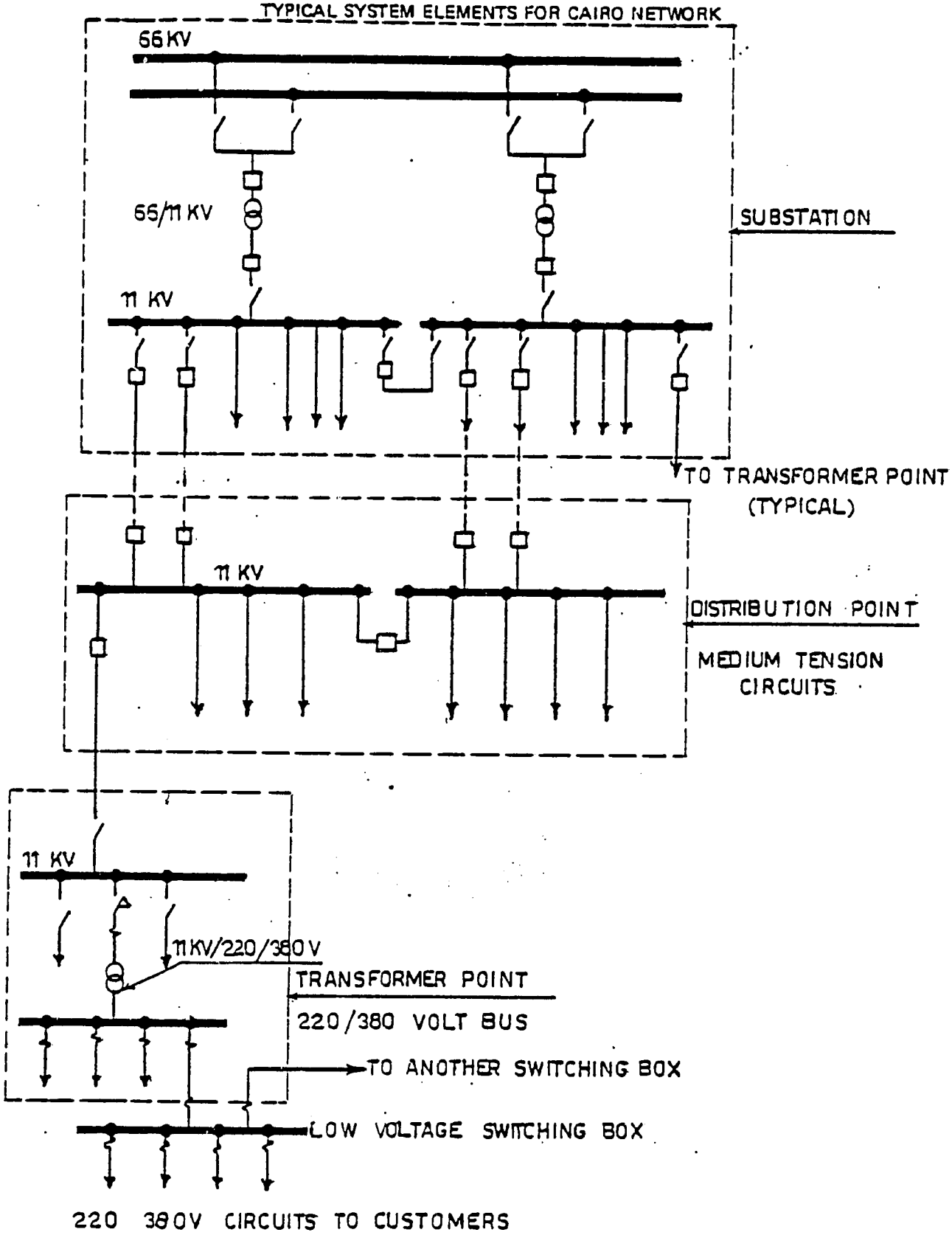


PLAN B
TYPICAL METROPOLITAN CITY
▲ EXISTING 7.2/12.5 KV STATIONS
△ NEW 19.9/34.5 KV STATIONS
■ CONVERSION TO 19.9 34.5 KV STATION
□ CONVERSION TO INDUSTRIAL STATION

12.5 KV AND 34.5 KV WITH STATIONS CONVERTED
FIGURE 3

E T!AN ELECTRICITY AUTHORITY REHABILITATION AND EXPANSION
OF ELECTRIC DISTRIBUTION SYSTEMS

TYPICAL SYSTEM ELEMENTS FOR CAIRO NETWORK



HARZA OVERSEAS ENGINEERING CO.
SABBOUR ASSOCIATES CAIRO A.R.E.

DWG. NO:-1004P
DATE 13 JUNE 1977

FIVE YEAR PROGRAM CAPITAL COST ESTIMATE
FOREIGN EXCHANGE COSTS

($000)

MAJOR COMPONETS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
SUB STATIONS	$ 5595.5	$ 6106.3	$12053.7	$ 1399.7	$ 712.2	$25867.5
TRANSFORMER PTS.	7220.7	6323.2	7005.6	7826.3	8578.9	36954.7
DISTRIBUTORS	707.3	564.2	603.5	645.7	691.3	3212.0
CABLE FITTINGS AND SERVICES	44942.2	47437.0	49096.0	53762.2	55560.0	250797.4
WAREHOUSE/WORKSHOP	387.7	133.7	-0-	-0-	-0-	521.4
CONSTRUCTION EQUIP.	3057.0	-0-	-0-	-0-	-0-	3057.0
TOOLS AND TEST EQUIP	640.6	-0-	-0-	-0-	-0-	640.6
CAPACITORS	600.0	642.0	686.9	735.0	786.5	3450.4
RECLOSERS & SWITCHES	80.6	-0-	-0-	-0-	-0-	80.6
POLE HARDWARE	315.2	-0-	-0-	-0-	-0-	315.2
STREET LIGHTS	323.0	-0-	-0-	-0-	-0-	323.0
TOTAL EQUIPMENT	63869.8	61206.4	69445.7	64368.9	66328.9	325219.8
ESTIMATED FREIGHT	9580.5	9181.0	10416.9	9655.3	9949.3	48783.0
TOTAL CIF	73450.3	70387.4	79862.6	74024.2	76278.2	374002.8
ENGINEERING SERV.	3024.0	1420.0	500.0	500.0	200.0	5644.0
TRAINING	338.0	-0-	-0-	-0-	-0-	338.0
SUBTOTAL	76812.3	71807.4	80362.6	74524.2	76478.2	379984.8
ESCALATION 10%	7681.2	3590.4	4018.1	3726.2	3823.9	22839.8
CONTINGENCY 15%	12674.0	11309.7	12657.1	11737.6	12045.3	60423.7
TOTAL PROGRAM	$97167.5	$86707.4	$97037.8	$89988.0	$92347.5	$463248.3

EGYPTIAN ELECTRICITY AUTHORITY

Income Statements for the Years Ending December 31, 1973-80
(Thousands of LE)

	ACTUAL			FORECAST				
	1973	1974	1975	1976	1977	1978	1979	1980
Sales of Electricity - GWh	6,178	6,895	8,308	9,800	11,200	12,600	14,280	15,925
Average Revenue per kWh Sold (millièmes)	7.49	[illegible]	8.94	8.94	8.84	10.66	13.18	13.27
Operating Revenues								
Sales of Electricity	46,292	50,121	74,303	87,612	99,008	134,316	188,210	211,325
Connection and Maintenance Charges	2,709	2,378	3,725	5,359	7,084	8,217	9,427	10,724
Other Operating Revenues 1/	1,655	1,953	1,869	2,205	2,514	2.816	3,154	3,532
Total Operating Revenues	50,656	54,452	79,897	95,176	108,606	145,349	200,791	225,581
Operating Expenses								
Fuel and Lubricants	6,765	7,135	9,344	11,173	12,760	14,478	16,803	21,801
Salaries and Wages	12,150	13,062	16,421	17,596	21,115	23,226	25,549	28,104
Purchase of Materials and Services	6,143	5,847	9,873	4,232	8,879	13,506	16,612	17,797
Other Operating Expenses	2,268	7,228	18,187	6,178	7,243	8,398	9,651	11,011
Depreciation	12,066	13,604	13,531	17,380	25,667	32,815	41,307	43,628
Total Operating Expenses	39,392	47,676	67,356	56,559	75,664	92,423	109,922	122,341
Operating Income	11,264	6,776	12,541	38,617	32,942	52,926	90,869	103,240
Non-Operating Income (Loss) 2/	(1,709)	(1,611)	(316)	(366)	(455)	(586)	(548)	(492)
Gross Income	9,555	5,165	12,225	38,251	32,487	52,340	90,321	102,748
Interest								
Gross Interest	9,555	8,421	16,869	18,835	28,096	36,104	44,272	49,634
Less: Interest Charged to Construction	-	-	-	(4,158)	(7,603)	(9,502)	(13,144)	(13,272)
Net Interest Expense	9,555	8,421	16,869	14,677	20,493	26,602	31,128	36,362
Net Income	-	(3,256)	(4,644)	23,574	11,994	25,738	59,193	66,386
Average Net Fixed Assets in Service	312,015	307,715	304,929	368,358	556,717	784,728	1,008,340	1,146,082
Operating Income as a % Thereof	3.61	2.20	4.11	10.48	5.92	6.75	9.01	9.01

1/ Includes meter rentals, sales of scrap, and revaluation of stocks, sales of gas and distilled water.
2/ Includes income and expense adjustments for previous years, dividends from associated companies, compensation awarded against contractors or consumers, and proceeds of sale of assets.

May 1977

EGYPTIAN ELECTRICITY AUTHORITY

Balance Sheets as of December 31, 1973-80
(Thousands of LE)

	ACTUAL			FORECAST				
	1973	1974	1975	1976	1977	1978	1979	1980
Assets								
Fixed Assets								
Gross Fixed Assets in Service	414,932	421,921	435,801	579,341	855,566	1,093,044	1,376,912	1,454,264
Less: Accumulated Depreciation	(104,081)	(117,342)	(130,523)	(147,903)	(173,570)	(206,385)	(247,692)	(291,320)
Net Fixed Assets in Service	310,851	304,579	305,278	431,438	681,996	887,459	1,129,220	1,162,944
Work in Progress	36,347	50,011	69,466	111,324	130,287	221,806	224,978	359,960
Total Fixed Assets	347,198	354,590	374,744	542,762	812,283	1,109,265	1,354,198	1,558,904
Investments	1,914	2,177	2,248	276	276	276	276	276
Long-Term Receivables	5,626	5,506	5,778	419	419	419	419	419
Current Assets								
Cash	12,368	9,603	14,859	28,784	27,313	44,708	42,526	30,523
Inventories	25,212	32,221	44,798	49,905	54,019	58,469	62,870	67,490
Accounts Receivable	59,093	63,970	88,221	95,993	49,506	33,579	47,052	52,830
Total Current Assets	96,673	105,794	147,878	174,682	130,838	136,756	152,448	150,843
Total Assets	451,411	468,067	530,648	718,139	943,816	1,246,716	1,507,341	1,710,442
Liabilities								
Capital and Reserves								
Capital	75,617	75,617	75,617	75,617	75,617	75,617	75,617	75,617
Reserves	7,421	11,455	31,336	32,503	113,425	168,480	221,319	268,165
Legal Reserves	13,622	10,244	15,522	15,522	15,522	15,522	15,522	15,522
Retained Earnings		(3,256)	(7,900)	15,674	27,668	53,406	112,599	178,985
Total Capital and Reserves	96,660	94,060	114,575	139,316	232,232	313,025	425,057	538,289
Long-Term Debt								
Total Long-Term Debt	329,334	322,292	347,060	495,470	641,992	846,192	1,006,411	1,094,009
Less: Debt Due Within 1 Year	NA	(13,221)	(19,768)	(19,439)	(19,711)	(21,480)	(22,080)	(24,166)
Net Long-Term Debt	329,334	309,071	327,292	476,031	622,281	824,712	984,331	1,069,843
Current Liabilities								
Current Portion of Long-Term Debt	NA	13,221	19,768	19,439	19,711	21,480	22,080	24,166
Accounts Payable and Deferred Liabilities	21,206	47,007	63,981	77,415	62,823	79,715	67,054	68,311
Consumers' Deposits	4,211	4,708	5,032	5,938	6,769	7,784	8,819	9,833
Total Current Liabilities	25,417	64,936	88,781	102,792	89,303	108,979	97,953	102,310
Total Liabilities	451,411	468,067	530,648	718,139	943,816	1,246,716	1,507,341	1,710,442
Ratios								
Debt/Equity Ratio	77:23	77:23	75:25	78:22	73:27	73:27	70:30	67:33
Current Ratio	3.8	1.6	1.7	1.7	1.5	1.3	1.6	1.9

May 1977

ANNEX I
Page 2 of 2

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EGYPTIAN ELECTRICITY AUTHORITY

Forecast Sources and Applications of Funds 1976-80
(Thousands of LE)

	1976	1977	1978	1979	1980	TOTAL 1976-80
Sources of Funds						
Internal Cash Generation						
Gross Income	38,251	32,487	52,340	90,321	102,748	316,147
Depreciation	17,380	25,667	32,815	41,307	43,628	160,797
Total Internal Cash Generation	55,631	58,154	85,155	131,628	146,376	476,944
External Sources						
Contributions from Ministry of Housing & Reconstruction		63,080	54,055	52,839	46,846	216,820
US AID Grants	1,167	17,842	1,000			20,009
Borrowings						
Proposed IBRD Loan		667	11,339	16,008	3,986	32,000
Ministry of Finance	30,401	21,812	74,587	7,563		134,363
US AID Loans		18,973	42,996	69,624	58,080	189,673
Other Foreign Loans	33,130	38,884	36,279	31,017	11,068	150,378
Total Borrowings	63,531	80,336	165,201	124,212	72,483	505,763
Total Sources of Funds	120,329	219,412	305,411	308,679	266,356	1,220,187
Applications of Funds						
Construction Requirements (incl. Interest Charged to Construction)	80,751	208,896	259,748	212,745	207,804	969,944
Proposed Regional Electrification Project 1/	–	667	11,339	16,008	3,986	32,000
	80,751	209,563	271,087	228,753	211,790	1,001,944
Debt Service						
Amortization	19,768	19,439	19,711	21,480	22,080	102,478
Interest (Net)	14,677	20,493	26,602	31,128	36,362	129,262
Total Net Debt Service	34,445	39,932	46,313	52,608	58,442	231,740
Net Change in Working Capital	5,133	(30,083)	(11,989)	27,318	(3,876)	(13,497)
Total Applications of Funds	120,329	219,412	305,411	308,679	266,356	1,220,187
Times Gross Annual Debt Service Covered by Internal Cash Generation	1.4	1.2	1.5	2.0	2.0	1.7

1/ Foreign cost only being amount of proposed Bank loan.

EGYPTIAN ELECTRICITY AUTHORITY

Notes and Assumptions for Financial Forecasts

A. Income Statement

1. Sales of Electricity have been based on information furnished by EE which was subsequently modified by the Bank. We have assumed annual kWh sale... growth of 18% in 1976, 14.3% in 1977, 12.5% in 1978, 13.3% in 1979 and 11.5% in 1980. Average revenue per unit sold for forecast years has been based on estimates by customer category prepared by EEA's commercial department. Tariffs are assumed to be unchanged through 1977 and increased thereafter by 20% in 1978 and 22.5% in 1979.

2. Connection and Maintenance Charges were assumed to increase by the same percentages as annual kWh sales of electricity. Maintenance charges were based on forecast sales to Municipalities in kWhs at 1.5 milliemes per kWh.

3. Other Operating Revenues were assumed to increase by the same percentages as annual kWh sales of electricity.

4. Fuel and Lubricants were based on estimates of generation from steam units and gas turbines using fuel prices and heat rates as follows:

(1) Fuel Prices:

Diesel fuel - LE 24.60 ton (gas turbines)
Fuel oil - LE 7.50 ton (steam turbines)

(2) Heat Rates:

Gas turbines - 15,475 Btu = 1 kWh
Steam turbines - 14,500 Btu = 1 kWh (1976)
14,000 Btu = 1 kWh (1977)
13,000 Btu = 1 kWh (1978)
12,000 Btu = 1 kWh (1979)
11,000 Btu = 1 kWh (1980)

5. Salaries and Wages in 1976 were based on EEA's budget estimate and thereafter escalated by 20% in 1977, and 10% in each of 1978, 1979 and 1980. No specific increases in staff were assumed since EEA is considered to be overstaffed now.

6. Purchase of Materials and Services and Other Operating Expenses were based on estimates furnished about October 1976 by EEA to the Kuwait Fund for Arab Economic Development. An escalation factor of 10%/a was added to the EEA estimates.

7. Depreciation. Gross fixed assets in service at the beginning of each year were depreciated at an average annual rate of 3%/a.

8. Non-Operating Income (Loss) represents the balance of non-operating revenues and expenses as estimated by EEA in the October 1976 forecasts for the Kuwait Fund.

9. Interest was calculated at the rate of 5%/a on all loans from the Ministry of Finance including funds provided to REA for rural electrification. Interest on all existing foreign loans was based on EEA's actual calculations. All new borrowing including USAID, suppliers' credits and Ministry of Finance loans were assumed to be at an average interest rate of 5%/a (it is expected that some of these funds e.g. USAID will be provided as grants and others, particularly those obtained from neighboring OPEC countries, will be on low interest terms). Interest at the rate of 5%/a was added to construction costs of all generating plant until it was commissioned. The same interest rate was added to the progressive costs of rural electrification assets under construction through December 1976; these assets were planned to be handed over financially to EEA as of December 1976.

B. Balance Sheet

10. Gross Fixed Assets in Service are valued at historical cost. They do not reflect the findings of a committee which reviewed the valuation of EEA's assets following acquisition of electricity assets after completion of the High Dam in 1970. If the recommendations in the committee's report are adopted they would increase the valuation of gross fixed assets in service by about LE 22 million or 5%.

11. Inventories were based on EEA's October 1976 estimates subject to 10%/a escalation.

12. Accounts Receivables. EEA's estimate for 1976 was accepted for the Bank's forecast. Thereafter, it was assumed EEA would reduce the level of outstandings to the equivalent of three months sales by the end of 1978.

13. Reserves were increased each year by contributions received from the Ministry of Housing and Reconstruction and grants by USAID..

14. Accounts Payable and Deferred Liabilities were estimated each year on the basis of three months of annual capital expenditures and cash operating expenses.

15. Consumers' Deposits were increased by the same precentages as kWh sales of electricity.

C. Sources and Applications of Funds

16. Contributions from the Ministry of Housing and Reconstruction were based on EEA's 5-Year Plan estimates.

17. USAID Grant was for $30 million for power distribution equipment for Suez cities. Disbursement was based on USAID estimates furnished to the Bank.

18. Borrowings. All foreign borrowings were converted to Egyptian pounds using the parallel market rate of exchange of LE 1 = US$1.50. EEA's planned borrowing program was adjusted to meet the needs of the construction program which was revised by the Bank. The 1976 borrowing program was taken from EEA's 1976 budget estimates, and that for the years 1977 through 1980 from information prepared by EEA from their 5-Year Plan estimates.

19. Construction Requirements were based on EEA's estimates and escalated using the Bank's February 1976 guidelines for price contingencies i.e.

	1976	1977-79	1980
Equipment	9	8	7
Civil Works	13	12	10

The foreign costs of all construction were adjusted to the parallel market rate of exchange which is now being used by EEA for recording purposes. (The official rate of exchange is still used by Government for its 5-Year Plan projections).

20. Amortization of Long-Term Debt. Ministry of Finance loans were assumed repayable over 12 years after 3 years' grace. Amortization of USAID loans was assumed to commence after the expiration of the 10 years' grace period i.e. after 1980. Amortization of other existing foreign loans was based on EEA's calculations. Other future foreign loans were all assumed to be repayable after expiration of grace periods i.e. after 1980. Loans for rural electrification were assumed to be non-repayable in accordance with present Government policy except for the proposed Bank loan which is expected to have a 4-1/2 year grace period. Therefore amortization on the Bank loan would not commence until about December 1981.

May 1977

URBAN ELECTRIC DISTRIBUTION

INTERNAL RATE OF RETURN
(Million U.S. Dollars)

YEAR	INVESTMENT	REDUCED DISTRIBUTION LOSS SAVINGS	ADDITIONAL SALES	NET FLOW	CUMULATIVE DISCOUNTED CASH FLOW 18.4%
-1	15.00	-0-	-0-	[15.00]	[15.00]
1	75.00	2.97	-0-	[72.03]	[75.84]
2	18.00	3.23	16.23	1.46	(74.79)
3		3.84	16.23	17.76	(64.09)
4		3.84	16.23	20.07	53.88
5		3.84	16.23	20.07	45.26
6		3.84	16.23	20.07	37.97
7		3.84	16.23	20.07	31.82
8		3.84	16.23	20.07	26.62
9		3.84	16.23	20.07	22.23
10		3.84	16.23	20.07	18.53
11		3.84	16.23	20.07	15.39
12		3.84	16.23	20.07	12.75
13		3.84	16.23	20.07	10.52
14		3.84	16.23	20.07	8.63
15		3.84	16.23	20.07	7.04
16		3.84	16.23	20.07	5.69
17		3.84	16.23	20.07	4.55
18		3.84	16.23	20.07	3.59
19		3.84	16.23	20.07	2.78
20		3.84	16.23	20.07	2.10
21		3.84	16.23	20.07	1.52
22		3.84	16.23	20.07	1.03
23		3.84	16.23	20.07	0.62
24		3.84	16.23	20.07	0.27
25		3.84	16.23	20.07	0.00

THRESHOLD DECISION BASED ON INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Egypt

Project Title: Urban Electric Distribution

Funding (Fiscal Year and Amount): FY 77 $17.012 million
FY 78 $80.188 million

IEE Prepared By: C. J. Patalive Date: September 14, 1977

Environmental Action Recommended: Negative Determination
(Environmental Assessment, Negative Determination, etc.)

Bureau for Near East Decision:
(Approval/Disapproval of Environmental Action Recommended in the IEE.)

APPROVED: _____

DISAPPROVED: _____

DATE: _____

Clearances:
NE/GC: _____ Date: _____

NE/TECH: _____ Date: _____
SER/ENGR: [signature] Date: 9/17/77
TA/OST: _____ Date: _____
(as necessary)

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INITIAL ENVIRONMENTAL EXAMINATION
NARRATIVE DISCUSSION

1. Project Location: Egypt

2. Project Title: Urban Electric Distribution

3. Funding (Fiscal Year and Amount): FY 77 $17.012 million
FY 78 $80.188 million

4. Life of Project: 20 - 30 years

5. IEE Prepared By: C. J. Patalive Date: September 14, 1977

6. Action Recommended: Negative Determination

7. Discussion of Major Environmental Relationships of Project Relevant to Attached Impact Identification and Evaluation Form:

See attached.

(Or Section VII of the Project Paper)

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas	Impact Identification and Evaluation 1/
A. LAND USE	
1. Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	N
c. Land clearing	N
d. Changing soil character	N
2. Altering natural defenses	N
3. Foreclosing important uses	N
4. Jeopardizing man or his works	N
5. Other factors	N
_____	
_____	
B. WATER QUALITY	
1. Physical state of water	N
2. Chemical and biological states	N
3. Ecological balance	N
4. Other factors	
_____	
_____	

1/ N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

C. ATMOSPHERIC

1. Air additives	
2. Air pollution	N
3. Noise pollution	N
4. Other factors	N 1/

1/ During construction - temporary

D. NATURAL RESOURCES

1. Diversion, altered use of water	
2. Irreversible, inefficient commitments	N
3. Other factors	N

E. CULTURAL

1. Altering physical symbols	
2. Dilution of cultural traditions	N
3. Other factors	N

F. SOCIOECONOMIC

1. Changes in economic/employment patterns	M 1/
2. Changes in population	L
3. Changes in cultural patterns	L
4. Other factors	

1/ Positive effect - electricity will allow more jobs.

IMPACT IDENTIFICATION AND EVALUATION FORM

G. HEALTH

1. Changing a natural environment	N
2. Eliminating an ecosystem element	N
3. Other factors	
_____	_____
_____	_____

H. GENERAL

1. International impacts	N
2. Controversial impacts	N
3. Other factors	
_____	_____
_____	_____

I. OTHER POSSIBLE IMPACTS (not listed above)

_____	_____
_____	_____
_____	_____

Prepared By: C. J. Patalive Date: 9/14/77

Project Location: Egypt

Project Title: Urban Electric Distribution

Proj. 2630033
PD-

DEPARTMENT OF STATE

AGENCY FOR INTERNATIONAL DEVELOPMENT

WASHINGTON

DEPUTY ADMINISTRATOR

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

Name of Country: Arab Republic of Egypt

Name of Project: Urban Electric Distribution

Number of Project: 263-0033

Pursuant to Part II, Chapter 4, Section 532 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Loan to the Arab Republic of Egypt (the "Cooperating Country") of not to exceed Seventeen Million Twelve Thousand United States Dollars ($17,012,000) (the "Authorized Amount") to help in financing the foreign exchange costs of goods and services required for the project as described in the following paragraph.

This project consists of providing equipment, materials, and related services for the rehabilitation and expansion of urban electric distribution systems in Egypt, including Cairo, Alexandria, Shibin El-Kom and Beni Suef.

I approve the total level of A.I.D. appropriated funding planned for this project of not to exceed Ninety Seven Million Two Hundred Thousand United States Dollars ($97,200,000), of which $17,012,000 is authorized above, during the period FY 1977 through FY 1981. $80,188,000 will be available for additional increments during that period of Loan funding, subject to the availability of funds in accordance with A.I.D. allotment procedures.

I hereby authorize the initiation and negotiation of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority subject to the following terms and covenants and major conditions as A.I.D. may deem appropriate:

a. Interest Rate and Terms of Repayment

The Cooperating Country shall repay the Loan to A.I.D. in United States Dollars within forty (40) years from the date of first disbursement of the Loan, including a grace period of not to exceed ten (10) years. The Cooperating Country shall pay to A.I.D. in United States Dollars interest from the date of first disbursement of the Loan at the rate of (a) two percent (2%) per annum during the first ten (10) years and three percent (3%) per annum thereafter, on the outstanding balance of the Loan and on any due and unpaid interest accrued thereon.

b. Source and Origin of Goods

Goods and services financed by A.I.D. under the project shall have their source and origin in the United States, except as A.I.D. may otherwise agree in writing.

c. Conditions Precedent to Disbursement

Except as A.I.D. may otherwise agree in writing:

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement for engineering services, Borrower shall furnish in form and substance satisfactory to A.I.D.:

1. An opinion of the Minister of Justice, or other legal counsel satisfactory to A.I.D., that the Loan Agreement has been duly authorized by, and executed on behalf of the Cooperating Country, and that it constitutes a valid and legally binding obligation in accordance with its terms.

2. A statement of the names of the persons who will act as the representative of the Borrower, together with a specimen signature of each.

3. Evidence that the Loan proceeds will be made available to the Egyptian Electrical Authority (EEA) on terms and conditions acceptable to A.I.D.

4. Evidence that all local currency required for the first fiscal year in which funds will be required, in an amount based on the estimate of the consulting engineer, and as approved by EEA, has been budgeted by the Cooperating Country and is available for expenditure by EEA.

5. Evidence that the locations have been determined and firm construction plans for civil works have been completed for the A.I.D. financed warehouse storage facilities for the cities of Shibin El-Kom and Beni Suef.

6. A written and detailed explanation of EEA's method, and procedures for the inventory control which will be utilized to account for the A.I.D. financed commodities.

d. Covenants

In addition to the covenants in the A.I.D. standard form Project Loan Agreement the following covenants are applicable:

1. Continuing Consultation;

the Borrower shall covenant

(a) To cooperate fully with A.I.D. to assure that the purpose of the Loan will be accomplished. To this end the Cooperating Country, EEA and A.I.D. shall from time to time, at the request of any party, exchange views through their representatives with regard to the progress of the project, the performance of the Cooperating Country and EEA of their obligations under the Loan Agreement, the performance of consultants, contractors and suppliers engaged on the project, and other matters relating to the project.

(b) To review with A.I.D. the recommendations of the consultants engaged pursuant to the United Nations Development Programme to survey the Egyptian power sector.

2. Unless A.I.D. shall otherwise agree in writing, the Borrower shall make available on a timely basis all local currency and all foreign currency in addition to the Loan and all other resources required, for the punctual and effective carrying out of construction, maintenance, repair and operation of the Project.

3. In the event the Cooperating Country shall decide to establish companies or any other entities to take over the power distribution assets of the EEA for purposes of operation and maintenance, customer billing functions or for any other purpose, the Cooperating Country shall ensure that such decision or decisions shall include provision, satisfactory to A.I.D., for the management, ownership, operation and maintenance of the assets provided under the project, the annual audit of the consolidated accounts of the EEA and performance of all EEA's financial obligations under Loan and Reloan Agreements.

4. Except as A.I.D. shall otherwise agree in writing, the EEA shall take promptly as needed all such action as shall be required to provide in any fiscal year an annual return on the average of the current net value of the fixed assets of the EEA in service at the beginning and end of such fiscal year at a rate of not less than nine percent (9%), commencing with its fiscal year 1980.

5. Except as A.I.D. and the Cooperating Country may otherwise agree, the Cooperating Country shall assure adequate long-term financing for EEA's expansion program which has been authorized and modifications and additions to such program. Within three years from the date of the Agreement, the financing so provided will be divided between equity contributions and loans in such a manner that the debt to equity ratio will be no greater than 1.5:.

6. EEA undertakes to prepare and to submit to A.I.D. by November 1 in each year, a provisional forecast of operating revenues, operating expenses and rate of return for the next following year, a statement of the tariffs and assumptions underlying the forecasts, a current report of accounts receivable from major accounts, and a statement of the measures proposed, if any, to produce the annual return provided for in paragraph (4) above, and to furnish to A.I.D. all such detail as A.I.D. may reasonably request.

Robert H. Nooter

9/28/77

Date

SEP 28 11 26 AM '77
AID
EXECUTIVE SECRETARIAT

2265

SEP 23 1977

ACTION MEMORANDUM FOR THE DEPUTY ADMINISTRATOR

THRU: ES

THRU: AA/PPC, Alexander Shakow

FROM: AA/NE, Joseph C. Wheeler

Problem: Your signature is required on the attached Loan Authorization to authorize the FY 77 project: Egypt - Urban Electric Distribution, (Project No. 263-0033), for $17.012 million.

Discussion: The Government of Egypt has requested assistance in financing the foreign exchange costs, totalling $97.2 million, of goods and services required for the rehabilitation and expansion of municipal electric distribution systems in Cairo, Alexandria, Shibin El-Kom and Beni Suef. However, due to FY 77 funding availabilities, the project is being financed on an incremental basis; $17.012 million in FY 77 and the balance of the requirement, $80.188 million will be authorized in FY 78. The project is based upon a study prepared by an A.I.D. financed U.S. consulting firm, Harza Overseas Engineering Inc.

Because of the timing of the incremental funding, the FY 77 loan proceeds of $17.012 million will be utilized for (1) the total rehabilitation of the distribution systems of Alexandria, Shibin El-Kom and Beni Suef and, (2) first phase rehabilitation for Cairo. The FY 78 loan proceeds will finance the remaining rehabilitation requirements in Cairo, and the expansion programs in Cairo and Alexandria, and elsewhere in Egypt.

Specifically, the loan will finance transformers, switchgear, cable, construction equipment and tools, as well as supervisory engineering services and training required for the project. As a part of the consultant's study, computer generated load and demand forecasts will be prepared which will dictate exact locations for installation of applicable units of equipment. All construction and installation will be carried out by the Egyptian Electricity Authority in Cairo and Alexandria and the Rural Electrification Authority in Shibin El-Kom and Beni Suef. Completed construction and installation is expected by the middle of 1981.

Loan funds will be provided from FY 77 Security Sypporting Assistance Funds for Egypt. The project was included in the FY 77 Congressional Presentation and therefore there is no waiting period for Congressional notification. However, for the balance of the incremental funding of $80.188 million in FY 78, Congressional notification will be required.

The Project Paper was reviewed and approved by the Near East Advisory Committee on September 15, 1977. A copy of the paper is attached for your perusal. The Development Loan Committee expiration date was September 26, 1977.

As regards human rights under Section 502B of the Foreign Assistance Act of 1961, as amended, the Bureau for Intergovernmental and International Affairs has advised that there are no recent developments which adversely affect Egypt's position respecting human rights.

Recommendation: That you sign the attached Loan Authorization.

Attachments:
1. Loan Authorization
2. Project Paper

Clearances: AID/GC, MBall Date
DAA/NE, ADWhite Date
GC/NE, GBisson Date
NE/CD, SATaubenblatt Date
PPC/DPRE, EHogan Date
SER/ENGR, ECallahan Date
NE/EI:GKamens Date
SER/FM, TBlacka Date
NE/DP, BLangmaid Date

Drafted by: USAID/Cairo:CPatalive:bn:9/21/77:x28263