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PROJECT PAPER

EGYPT: ISMAILIA THERMAL POWER PLANT

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# EGYPT - ISMAILIA THERMAL POWER PROJECT

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EGYPT - ISMAILIA THERMAL POWER PROJECT

Summary and Recommendation

1. Grantee: The Government of the Arab Republic of Egypt. The grant application is attached as Annex A.
2. Grant Amount: \$99,000,000 (Ninety-Nine Million Dollars). The grant amount will be passed on to the Egyptian Electric Power Authority as a contribution to the Authority's equity capital.
3. Executing Agency: The Egyptian Electricity Authority, a wholly owned Government corporation.
4. Description of Project: The project is the construction of a 300 MW thermal power plant, to be located near the city of Ismailia in the Suez Canal Area. The project will form part of the U.S. assistance for the reconstruction and development of the Suez Canal Area whose principal cities, infrastructure and basic facilities, such as power, were extensively damaged during the long period of intermittent warfare.
5. A.I.D. Representative View: USAID/Cairo has recommended authorization of the proposed Grant; see Annex C.
6. Statutory Criteria; All statutory criteria have been satisfied; see Annex D.
7. Recommendation: Authorization of a Grant in the amount of \$99.0 Million on terms and conditions as detailed in the Grant Authorization attached as Annex B.
8. Project Committee:
  - NE/CD - Robert Bakley
  - GC/NE - Robert Meighan
  - SER/ENG - Jack W. Wright
  - NE/ME - Frank Gillespie
  - USAID/Cairo - Robert N. Bakley  
John Callahan

## I. INTRODUCTION

1.01 The Government of the Arab Republic of Egypt (GOE) has requested assistance to finance the foreign exchange cost of a 300 MW thermal power plant near the city of Ismailia in the Suez Canal area. The project was evaluated, in part, by Sanderson & Porter, Inc. (S&P), a U.S. consulting engineering firm prominent in the electric power industry. S&P's services were financed from funds available under AID's Feasibility Studies Grant 263-11-003.

1.02 The project will form part of the U.S. assistance for the reconstruction and development of the Suez Canal area whose principal cities, infrastructure and basic facilities, such as power, were extensively damaged during the long period of intermittent warfare. The reconstruction of the cities and facilities has been given priority by the GOE. Plans include the rebuilding and new construction of a number of industries and the construction of housing for the population returning to the area. A key element to the success of any program is the availability of electric power. The 300 MW thermal power plant to be financed by this proposed grant will be a major element in ensuring this availability. Additionally, the plant will be incorporated into and form a part of the national power grid which will allow Egypt more flexibility in meeting the country's power requirements.

1.03 A large portion of A.I.D.'s program in Egypt is being directed to the electric power sector. In FY 1975 AID authorized a \$30 million grant (263-12-001) for financing electric power distribution equipment for the Suez Canal area which complements this proposed project. The grant is almost fully committed and manufacturing of most of the material is in progress.

1.04 Other projects in the electric power sector proposed for FY 1976 financing include 300 MW of gas turbine generators to be installed at Helwan and Talka, two prime industrial areas and a National Energy Control Center. The gas turbine generators will provide an economical short-term solution for meeting Egypt's immediate power requirements; and the National Energy Control Center, once completed, will provide Egypt with the ability to effectively and economically manage its entire system.

1.05 Additionally, we are in the process of selecting consultants for the study of the subtransmission and distribution systems in Cairo, Alexandria and two provincial capitals. Concurrently the World Bank is financing a study of other aspects of the power sector including management, organization, tariffs and finance. Work under the two studies is being coordinated between AID and the Bank and each will have access to the results.

## II. THE POWER AND ENERGY SYSTEM

### A. Organization

2.01 Electric power was first introduced into Egypt in 1895. Through 1964, the generation, transmission and distribution of electric energy was in the hands of a large number of independent governmental and private organizations. In 1964, the Ministry of Electricity was organized for the purpose of consolidating all individual electric generating facilities into one state-owned and controlled organization. The organization chart of the Ministry of Electricity is shown in Annex F. 1.

2.02 In 1965 a Presidential Decree was issued establishing the General Egyptian Electric Corporation (GEEC) with authority to manage, operate and maintain power stations and networks, and to construct new projects connected with the production, transmission and distribution of electricity in all parts of the country. While this Decree gave GEEC independent operating control, GEEC lacked certain financial authority, especially the ability to formulate its own budget, which was a part of the Ministry's overall budget.

2.03 In January 1976 the Peoples Assembly approved an act which established Egyptian Electric Power Authority (EEA) as a successor of GEEC. This act gives EEA broad power to completely manage its own affairs, including finance and, with the approval of the Government, set tariffs which will assure EEA a reasonable operating profit. The new act is included in its entirety as Annex G. To date EEA has not implemented any changes allowed under the act, organizationally or operationally.

2.04 EEA is divided into four main departments comprising (i) Manpower; (ii) Finance and Economy; (iii) Operations; and (iv) Study, Research and Projects. Operationally, EEA is separated into five autonomous operating zones, each with its own president. Each zone operates independently as a separate electric utility with its own generation, transmission and distribution facilities and other normal power company functions such as billing, collection and customer relations.

2.05 In addition to its utility operations, EEA owns three construction companies (General Company for Electrical Projects, High Dam Company for Mechanical and Electrical Projects and Misr Company for Electrical and Mechanical Projects) which carry out most of GEEC's construction work in addition to other work secured by competitive bidding. Each company operates autonomously with its own Board of Directors. All profits revert to EEA.

2.06 At present EEA has approximately 34,000 employees. EEA's organization chart is shown in Annex F.2.

2.07 One other organization involved in the power sector is the Rural Electrification Authority (REA). REA was created in 1971 to supervise the construction of electrical transmission and distribution facilities in rural areas. After each rural construction project is completed it is turned over to EEA for ownership, operation and maintenance.

## B. Generation and Transmission

2.08 The existing power system in Egypt is divided into five inter-connected 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.

2.09 The total installed generating capacity (excluding the captive plants) is 3,947 MW. The capacity of the hydro plants is 2,445 or 62 percent, the thermal plants 1,365 MW or 35 percent and gas turbine generators 137 or 03 percent. The total nameplate rating, however, gives a highly exaggerated value; available capacity from the units is slightly over 2,000 MW. The reasons 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 requirements 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. The High Dam reservoir is still being filled and will not reach its final design level until 1983 or later. The maximum energy output of the hydro plant will not be realized until that time. The available useable output from the hydro plants presently varies from a minimum of 900 MW in the winter months to about 1,400 MW in summer months.

b) Thermal Plants - The existing thermal plants have a firm capacity of only about 80 percent of their nameplate capacity primarily because of their age and damage received during the intermittent wars. Also, there has been a lack of maintenance and spare parts during the past decade due to a shortage of funds.

Annex H lists the existing generating plants by zone, type and equipment and shows both nameplate capacity and available capacity.

2.10 The main transmission system consists of 500 KV, 220 KV and 132 KV lines. The 500 KV lines transmit the power from the Aswan hydro stations to Cairo. The 132 KV line physically parallels the 500 KV lines and provides subtransmission for the Nile valley. The 220 KV lines distribute power from Cairo to all other zones. And there is a subtransmission system consisting of 66 and 33 KV lines. The distribution system has voltages of 11 KV, 6.6 KV, 3 KV and low voltage secondary service of 380/220 volts. Frequency is 50 Hz. The distribution system is old and has not been fully maintained during the past decade due primarily to a lack of funds. A schematic one line diagram of the entire existing system is shown in Annex I.

2.11 Since the 500 KV lines are subject to outages because of insulator flashovers due to sand combined with moisture from early morning dew, a spinning reserve of 450 MW must be maintained in the thermal plants to minimize the effects of the outages. These outages further reduce the available generating capacity.

C. Load Characteristics

2.12 The current peak power demand from the zones for the peak load and annual energy consumption is as follows:

TABLE 1

PEAK LOAD AND ANNUAL ENERGY CONSUMPTION BY ZONE

<u>Zone</u>	<u>Peak Power Demand</u>		<u>Annual Energy Consumption</u>	
	<u>MW</u>	<u>%</u>	<u>TWh</u>	<u>%</u>
Upper Egypt	310	21.3	2.4	25.8
Cairo	594	41.0	3.4	36.6
Alexandria	192	13.2	1.4	15.1
Lower Egypt	232	16.1	1.3	14.0
Canal	122	8.4	0.8	8.5
<u>Total</u>	<u>1450</u>	<u>100.0</u>	<u>9.3</u>	<u>100.0</u>

The daily peak load occurs in the evening at 1800 hours in the winter and at 2100 hours in the summer. The load curve for middle and upper Egypt is nearly flat since the load is primarily large industries with a constant demand. The power demand by different sectors of the economy is industry 62 percent, municipal and domestic 29 percent and agriculture 9 percent with the industrial sector growing at the fastest rate.

2.13 As firm generating capacity is about 2000 MW and peak power demand is 1450 MW the system is barely adequate to meet demand considering the reserve requirements for system stability.

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### III. LOAD AND GENERATION FORECASTS

#### A. General

3.01 In 1974 EEA's Studies, Research and Projects Division completed a study entitled "Electric Power Needs in the Arab Republic of Egypt 1975-2000 and How to Meet Them" in which several modern load forecasting methods were used (e.g., the accumulative, sentiment, extrapolative and correlation with GNP methods). Given, however, Egypt's recent past low growth rate, attributable to the disruptions in the economy caused by intermitten wars, and the planned accelerated expansion, none of the methods were considered entirely satisfactory. In consultation with A.I.D.'s consultant S&P, a modified method was devised. The following sections explain the methods used and the resulting load forecasts.

#### B. Load Forecasts

3.02 To forecast future load growth on a long-term basis, growth of Egypt's national economy and its related power demand were projected based upon experience in other developing countries with similar conditions. A high initial growth rate of peak load and energy demand is expected due to recent economic policy changes and as anticipated compensation for the low growth rates that prevailed during the war. It was therefore assumed that the load will double in the first seven years after 1974, that is, that the cumulative annual growth rate for the period 1974 to 1981 will be 10.4 percent. It was then assumed that the peak load would double again in eight years, or at an annual cumulative growth rate of 9.4 percent. The next doubling time period was projected at nine years, or at only 8.0 percent annually. For the years 1998 to 2000 and on into the 21st century, the annual rate of increase was assumed to be seven percent; that is, a doubling of the load every ten years. This projection appears to be reasonable as it is fairly well established by statistics that the rate of growth of power demand in the United States, Canada and Western Europe is about seven percent a year and higher in more advanced developing countries.

3.03 Table 3 below shoes the estimated peak load based on the forecast from the present to year 2000. Annex J-1 presents the results in tabular form together with the usable generating capacity and reserve requirements which are discussed in the succeeding section. Annex J-2 presents the results graphically.

3.04 As a check on the long-range load forecast, which predicts a doubling of peak load in seven years, a short-range load forecast was prepared by EEA and S&P. For this forecast it was assumed that existing loads for established consumers would grow at six percent a year and that 50 percent of the planned new industrial plants would actually materialize.

Table 2

Long-Range Forecast of Peak Load Growth

<u>Year</u>	<u>Annual Rate Growth</u>	<u>Estimated Peak Load (megawatts)</u>
1974	10.4%	1433
1975		1582
1976		1766
1977		1928
1978		2129
1979		2350
1980		2596
1981	9.4%	2866
1982		3135
1983		3430
1984		3753
1985		4105
1986		4491
1987		4913
1988		5375
1989	8.0%	5886
1990		6369
1991		6884
1992		7442
1993		8037
1994		8680
1995		9375
1996		10125
1997		10935
1998	7.0%	11820
1999		12650
2000		13533

3.05 New loads that have been approved by the Ministry of Industry include expansion of the iron and steel complex at Helwan, fertilizer and ferro-silica plants at Aswan, a phosphate mine at Esna, a cement plant at Suez, an aluminum complex at Aswan and a petroleum pipeline between Alexandria and Suez. Proposed but not yet approved industrial loads include a phosphate plant, extension of an aluminum plant, a sponge iron complex, petroleum refineries and a caustic soda plant.

3.06 The planned new loads amount cumulatively to 921 MW in 1976, 1164 MW in 1977 and 1269 MW in 1978. Using the criteria of six percent growth for the existing load plus 50 percent of the approved large industrial loads results in the following short-range load forecast. For the year 1981 the short-range projection of 2900 MW is virtually identical to the long-range projection of 2866 MW.

Table 3

Short-Range Load Forecast  
(Expected Peak Loads)

Year	Existing Loads Projected at 6% Annual Growth	50% (Projected) New Loads	Total Peak Loads
1973	- - - - - Actual	- - - - -	1293
1974	- - - - - Actual	- - - - -	1433
1975	1327	362	1643
1976	1407	460	1867
1977	1491	582	2073
1978	1580	635	2215
Load Growth Doubling in Eight Years (9.4% Annual Growth)			
1979			2423
1980			2651
1981			2900

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### C. Reserve Requirements

3.07. For planning purposes EEA uses a reserve of 25 percent of peak load. However, for developing countries with peak loads in Egypt's range, a 25 percent reserve margin is considered low. The International Atomic Energy Agency in their "Market Survey for Nuclear Power Developing Countries" (1974) recommends the following relations between peak demand and reserve margin.

Table 4

#### Relationship of Reserve Margin and Peak Demand

<u>Peak Demand (MW)</u>	<u>Reserve Margin (%)</u>
300	40.0
500	38.0
1000	35.0
3000	28.0
6000	24.0
10000	21.0
20000	17.0
30000	16.0
50000	15.0

Interpolating the value of reserve margin used by the IAEC would give:

	<u>Peak Load</u>	<u>Reserve Margin</u>
1976	1867	32%
1978	2215	31%
1981	2900	28%

3.08 In Egypt's particular case, a reserve margin of 25 percent is the bare minimum for safe system operation. First, Egypt's system is not interconnected with any other similar system and therefore must provide its total reserve requirement. Second, most of Egypt's presently generated power is hydroelectric from the Aswan and High Dams which is transmitted to northern Egypt through the 500 kv lines. An interruption in these lines leads to a severe frequency decline and possible system outage. Failures in the 500 kv sections occur about 30 times a year and a double circuits outage about 3 times a year. These outages require that 450 MW of spinning reserve from the thermal plants be kept floating on the line.

### D. Planning Generation Expansion

3.09 Four types of additional generation were considered by EEA for expansion of the system: hydroelectric, nuclear reaction steam plants,

conventional fossil fuel steam generators and combustion turbines. Of the four, hydroelectric offers few possibilities and nuclear power generation is constrained by other factors (primarily political and financial). Therefore combustion generators and conventional fossil fueled thermal plants are the only viable alternatives, at least for the near future requirements.

3.10 For its immediate needs EEA plans to install combustion turbines, primarily because of the speed with which they can be in operation. Two units are now in operation and five more are being installed in Cairo and the Suez Canal area. A 120 MW system is planned to be placed in operation at Helwan in 1978 and an additional 180 MW system is planned to be placed in operation at Talka in 1979. The Helwan and Talka installations will provide urgently needed interim generating capacity to serve industry. AID is considering financing for both installations.

3.11 For its long-term needs EEA has approved construction of five new fossil fueled thermal plants. Three are under construction (Kafr El-Dawar, El Guarb and Abu-Qir) and two (Ismailia and Suez) are being considered by AID. When completed these plants will add 1317 MW to the system. Table 5 below shows the location of the plant, their output and the year generation is expected.

Table 5

Planned New Steam Power Generation

<u>Year</u>	<u>Location</u>	<u>Megawatts</u>
1977	Kafr El Dawar I	220
1979	El Guarb West	87
1980	Abu Qir	300
1981	Kafr El-Dawar II	110
1981	Ismailia	300
1982	Suez	300
	Total -	<u>1317 MW</u>

3.12 Annex J-3 shows EEA's generation expansion plan through 1985 plotted on an energy basis and showing the expected commissioning dates of planned project. Annex J-4 shows the proposed expansion program as a curve broken down by the type of planned generation. These two annexes assume that the gas turbine generators at Helwan will be commissioned in 1976 and at Talka in 1978. However, both complexes, expected to be financed by AID, are now planned for start-up in 1979. Table 6 below shows the most recent estimates of load forecasts compared with planned generating capacity and the resulting available reserve.

Table 6

Load Forecasts, Generating Capacity and Reserve  
(1975-1982)

<u>Year</u>	<u>Existing<sup>1</sup></u> <u>Capacity</u>	<u>New<sup>2</sup></u> <u>Plants</u>	<u>Total</u>	<u>Load</u> <u>Forecast</u>	<u>Reserve</u>	<u>Percent</u>
1975	2046	-	2046	1582	464	22.7
1976	2265	-	2376	1766	610	25.7
1977	2375	220	2595	1928	667	25.7
1978	2475	220	2695	2129	566	21.0
1979	2555	607	3162	2350	812	25.7
1980	2605	907	3512	2596	916	26.0
1981	2655	1317	3972	2866	1100	27.7
1982	2705	1617	4122	3135	987	23.9

<sup>1</sup>Includes additional generation through (a) repair of existing thermal plants and (b) a higher water level at hydro sites.

<sup>2</sup>1977 Kafr El-Dawar 221 MW; 1979 Helwan 120 MW, Talka 180 MW and Cairo West 87 MW; 1980 Abu Qir 300 MW; 1981 Ismailia 300 MW and Kafr El-Dawar 110 MW; 1982 Suez 300 MW.

E. Conclusion

3.13 By 1979 the estimated peak load will be 2350 MW and the usable generating capacity will be 3162, including the proposed 300 MW of gas turbine generators at Helwan and Talka, representing a reserve of 25.7 percent. Without the addition of the gas turbine generators, the reserve margin would decrease to 17.9 percent - an unacceptable reserve level.

3.14 By 1981 the estimated peak load will be 2866 MW and the usable generating capacity 3972 MW, including the proposed 300 MW at Ismailia, representing a reserve of 27.7 percent. Without the Ismailia project the reserve margin would decrease to 21.5 percent, well below any recommended reserve requirement and providing little or no margin for safe operation of the system.

3.15 The load and generation forecasts, which on a whole are conservative, and the reserve requirements required, justify the implementation of the Helwan and Takla gas turbine generators project and the Ismailia thermal power project.

#### IV. THE PROJECT

4.01 The Project consists of the construction of a 300 MW thermal power plant, to be located near the city of Ismailia in the Suez Canal Area.

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4.02 The Project goal is to assist continuing industrial expansion and urban rehabilitation in the Suez area; to help improve the rural and urban living conditions; and to contribute to the general reconstruction of the Suez Canal Area.

4.03 The Project purpose is to augment the capacity of the Egyptian power industry to meet the increasing energy requirements of the industrial and residential consumers in the Suez Canal Area and to help meet power demand in other areas through connection with the National Grid.

4.04 A logical framework showing the Project design is included as Annex E.

## V. TECHNICAL ANALYSIS

### A. Site

5.01 The proposed site of the Ismailia steam power plant is approximately 25 kilometers south of Ismailia on the northwestern shore of the Great Bitter Lake, between the lake and the Ismailia-Suez Railway and highway. It is in a flat, sandy, unclultivad region that is remote from inhabited areas. Cooling water will be taken and returned to the Great Bitter Lake. The proposed site is adequate for the two planned 150 MW thermal generating units. As intake and discharge of cooling water will be from the Great Bitter Lake, intake and outlet points will have toe at least 500 meters apart. Soil at the site is in a natural, undisturbed state and should provide a good foundation. The site is adjacent to planned transmission lines, and to highway and railroad communications.

5.02 EEA received concurrence from the other concerned GOE entities to utilize the site in early May. A.I.D. has not yet reviewed the documentation regarding the concurrence. A condition Precedent to Disbursement will require that EEA have title to one site and that site explorations are undertaken.

### B. Plant Design

5.03 The proposed Ismailia steam power plant will have a total capacity of 300 MW. It will consist of two MW steam turbine/generator units. Provisions will be made for future installation of two additional 150 MW units. The need for 300 MW in generation offers an alternate choice of one 300 MW unit, two 150 MW units, or small units of standard size to make up a total of 300 MW. The largest thermal unit on the EEA system by 1980 will be 110 MW. While the jump to a 300 MW unit would not be too great, it would ordinarily call for an additional unit that would be excessive at this time. Three 100 MW units would be a natural arrangement, but standard practice in utilities is to gradually increase maximum unit ratings as the size of the utility grows. The two 150 MW units would be more economical in investment and operation. For the same reasons, units smaller than 100 MW would be ruled out. Considering the remote location in relation to other plants on the system, the two 150 MW units appear to be the optimum selection. An additional consideration is the fact that the bulk of Ismailia's load will be along the Canal Zone.

5.04 The steam generating units will be of outdoor design and will operate on a unit system; that is, one steam generating unit will feed one turbine generator unit. Two surface condensers and three motor-driven boiler feedpumps will serve each unit. The steam generating units will have a maximum continuous rating of steam flow to allow 5 percent in excess of all steam requirements of the turbogenerator and its auxiliaries at full rated output.

5.05 Generator rating will be 150 MW at 0.85 power factor (normal operating condition) or 176 MVA at unity power factor. The EEA system is 50 Hertz so the bi-polar generator will have a 3000 rpm rating. Voltage is usually determined by the manufacturer after optimizing design factors.

5.06 The turbine type will be determined by the vendor. They will probably be of the reheat tandem-compound two-flow type. S&P recommends that the turbine rating be based on 3.5 Hg absolute exhaust pressure and 3 percent make-up. Each turbine will also be specified for operation with 5 percent overpressure in accordance with standard United States practice.

### C. Fuel

5.07 The plant will be designed for dual fuel firing of Bunker "C" fuel oil (mazout) and natural gas. It will be possible to obtain full load with either fuel. Although natural gas is preferred, its allocation for use by this plant has not yet been confirmed. If confirmed, it will be supplied by pipeline from the Abu El Gharadig gas field about 320 kilometers west of Cairo on the southeastern extremity of the Qattara Depression. Gas composition is primarily methane. Its gross calorific value is 23,056 BTU per pound. Its cost is about the same as Bunker "C" oil, that is, about \$0.43 per million BTU.

5.08 Bunker "C" fuel oil (mazout) is available. Calorific value is 9500 Kcal per kilogram. It has a 3 to 5 percent sulfur content that will require special design of boilers and air preheaters to prevent damage to them. This Egyptian mazout will be transported by barge from the Egyptian General Petroleum Corporation (GPC) refinery at Suez to a new fuel transfer pier at the Great Bitter Lake. Pipelines will carry the fuel oil from the pier to the plant. It will be sold at the LE 7.5 per ton price established by the Government for oil of 9600 Kcal per kg calorific value. This corresponds to about U.S. \$0.43 per million BTU, a relatively low price.

### D. Transmission

5.09 Each generator will be connected to its transformer by means of an isolated phase bus duct. Generated voltage will then be stepped up to 220 KV by a 176 MVA generator transformer. The 220 KV side of each transformer will in turn be connected to an outdoor double-bus main reserve and transfer-bus switchyard.

5.10 The four outgoing 220 KV overhead transmission lines will go to the new Ismailia switchyard with its two 125 MVA step-down (220 KV to 66 KV) transformers used to supply power to the city of Ismailia and its environs. Additional outgoing 220 KV transmission lines from the city switchyard will run to Zagazig and Suez and tie into the Egyptian National Grid system.

## E. Personnel

5.11 The EEA contemplates a total staff of 172 persons: 17 engineers with university degrees, 150 mechanical and electrical technicians with technical high school certificates, and five chemists with university science degrees. Personnel will be recruited either from presently operating thermal plants or from among graduates of the two training centers operated by the EEA. About 20 technical staff employees will be sent to the training centers of the manufacturers supplying equipment for the power plant.

5.12 Normal United States practice would require about 120 persons to operate a two-unit steam plant of this size. The staff size specified by the EEA probably includes consideration of employment and training factors as well as plant operations.

## F. Cost

5.13 A cost estimate for the project was prepared in November 1975 by A.I.D.'s consultant, S&P. Foreign exchange costs were calculated directly in U.S. dollars based upon inquiries from a wide range of potential equipment suppliers. Costs were escalated at the rate of 10 percent per year. The S&P cost estimate is shown in Table 2.

Table 7

### Construction Cost Estimate

	Local Currency Equivalent	Foreign Exchange	Total
Equipment (FAS)		\$73,470,000	\$73,470,000
Freight and Insurance	\$ 3,840,000	3,840,000	7,680,000
Consulting Engineering Services	768,000	1,280,000	2,048,000
Civil Work	8,960,000		8,960,000
Erection	18,892,800		18,892,800
Inland Transportation	768,000		768,000
Customs and duties	11,008,000		11,008,000
Land	51,200		51,200
Railways	512,000		512,000
Colony and Misc. Structures	512,000		512,000
Salaries and Wages (EEA)	1,280,000		1,280,000
Access Roads	512,000		512,000
Equipment Inspection	768,000		768,000
Subtotal	47,872,000	78,600,000	126,462,000
Contingency (5%)	3,584,000	4,610,000	8,194,000
Escalation (10% per annum)	10,240,000	15,350,000	25,600,000
TOTAL -	\$61,696,000	\$98,560,000	\$160,256,000

5.14 A.I.D.'s review indicates that the proposed project is technically feasible according to the EEA's design, subject to the recommended modifications made by S&P in its November 1975 Report "Review and Analysis of Load Projections for Egyptian Power Supply," and subject to the further design modifications that will be made by the contractor and the EEA's consulting engineer (see Section VIII, paragraph 8.03).

## VI FINANCIAL ANALYSIS

### A. General

6.01 EEA is an operational organization within the Ministry of Electricity and its finances form a part of, and are commingled with, the Ministry's. As such, EEA's financial statements are essentially a listing of cash flow transactions that have occurred during one year, although it does own assets, has incurred liabilities and has a stated capital. From records obtained by A.I.D.'s consultant S&P, at December 31, 1974 EEA's assets were LE 478 million, its liabilities were LE 335 million and its capital LE 143 million which represents a debt to equity ratio of 2.36:1.

6.02 EEA's major source of revenue, the sale of electric power, is regulated by the Government and varies considerably by class of consumer. During the years 1973 and 1974 the average selling price was equivalent to 1.92¢ per KWH, a price comparable to the selling price in the U.S. during that period. On the expense side, the Government controlled fuel oil and natural gas price was greatly understated in terms of world prices. Presently, and for the past few years, EEA pays the equivalent of 43¢ per 10<sup>6</sup> Btu whereas U.S. utilities were paying, during that period, 195¢ per 10<sup>6</sup> Btu for fuel oil, 48¢ for natural gas and 69.5¢ for coal. On the surface, therefore, it would appear that EEA should be profitable and have sufficient revenues to service its debts. Through 1972 this was the case. But during the years 1973 and 1974 it lost money. A detailed analysis of EEA's financial management has not been performed but we would assume that the reasons for the losses are (i) a low plant operating factor; (ii) the large investment in generating capacity that is not presently usable; (iii) that EEA was not able to charge all customers; (iv) EEA's known inability to collect from its customers (e.g., at December 31, 1974 EEA's receivables equaled about 100 percent of its annual electricity sales).

6.03 To assist EEA in reversing its financial position the GOE increased the sales price of electricity to an average price of about 3.0¢ per KWH. The new rates were effective on January 1, 1975 and are shown in Annex K.2. Fuel oil costs remain unchanged at the subsidized price of 43¢ per 10<sup>6</sup> Btu. While this was not the proper diagnosis for EEA's ills, it should cure the patient by returning its financial position to the black and it does set the price of energy closer to its economic price.

6.04 In what would appear to be a further step in establishing EEA as a financially viable entity, in January 1976 the Government approved a new act which established EEA as a successor to GECC (see Annex G). This act, inter alia, gives EEA the authority to organize itself as

separate financial entity with its own accounting system and its own budget; to retain and utilize its revenues; to formulate its own revenue structure, subject to GOE approval; and to receive compensation from the public treasury if it is required by the Government to set tariffs below its established structure for any industry (e.g., see Annex K.1, Kima Fertilizer Industries).

6.05 To assist EEA to implement the authority provided under the new act and establish itself as a financially viable entity, the International Bank for Reconstruction and Development (IBRD) is sponsoring a study, financed by UNDP, which will recommend and implement improvements in EEA's accounting system accounting methods, financing sources, financial planning, management information systems and customer data file services. Also, a detailed study will be made of the existing electric tariff policies and tariff setting structure including subsidization problems. The study is expected to be completed by October 1977. The Terms of Reference for the study are included as Annex L.

6.06 A.I.D. is collaborating with IBRD on this study and all information will be available to A.I.D. Concurrently A.I.D. is financing a study of the "Rehabilitation and Expansion of Egypt's Electric Distribution Network" and is sharing its information with IBRD. Scopes of work for both studies have been reviewed and approved by both organizations. The Grant Agreement will contain a covenant requiring the GOE to review the results of the IBRD study with A.I.D.

6.07 Additionally we propose to negotiate two financial covenants in the Grant Agreement which will start to move EEA toward improvement of their overall financial position. The first will require that EEA move to and maintain a debt of equity ratio of 1.5:1 (60:40) which is consistent with sound public utility practice. We do not expect that this will be a problem in the immediate future as (i) we are recommending that A.I.D.'s grant for this project be passed to EEA as a contribution to its equity capital which will improve its capital position and (ii) EEA will need to reevaluate all its assets which, on balance, should increase its asset base and correspondingly its equity base. This covenant could, however, present some problems to EEA if it is able to proceed on its nuclear energy program and finances the entire operation with debt only.

6.08 The second financial covenant will require the GOE and EEA to set its tariff rates at a level which will allow EEA to earn a nine percent return on its net fixed assets. We consider this to be a minimum return consistent with sound management and in line with returns of public utilities in other developing countries (e.g., Syria and Jordan). At this point it would appear that the revised tariff of January 1975 is at a level which would achieve this return.

## B. Financing Plan

6.09 As of December 31, 1974 EEA's debt to equity ratio was 2.36:1 (70:30) which is above what is considered sound capitalization. Our Grant Agreement will contain a covenant which will require the GOE to take steps to correct this problem. To assist the GOE in this action and to help EEA with its current cash flow problem, we recommend that the GOE be required to pass on A.I.D.'s Grant to EEA as a contribution to EEA's equity capital. The alternatives to this procedure would be for the GOE to relend the Grant proceeds to EEA or to allow the Grant to pass directly to EEA. On the former alternative allowing the GOE to relend its proceeds would only exacerbate the problem we are trying to correct and would probably only result in a circuitous flow of funds from EEA to the GOE in the form of principal repayments and interest and then back again to EEA as equity to comply with A.I.D.'s covenant. The latter alternative would only further understate EEA's assets since the transaction, the building of the Ismailia project, would not be accounted for.

6.10 Under the assumption that A.I.D.'s Grant will be passed to EEA as a contribution to its equity, the financing plan for the Ismailia Project will be as follows:

Table 8

### Financial Plan

	<u>Local Currency Equivalent</u> (000)	<u>Foreign Exchange</u> (000)	<u>Total</u> (000)
Capital Cost Estimate	<u>\$61,696</u>	<u>\$98,560</u>	<u>\$160,256</u>
Internal Generation or GOE Loan	\$61,696	-	\$ 61,696
A.I.D. Grant passed on as equity	<u>-</u>	<u>\$98,560</u>	<u>\$ 98,560</u>
	<u>\$61,696</u>	<u>\$98,560</u>	<u>\$160,256</u>

6.11 If the local currency costs are financed by a loan from the GOE to EEA, interest during construction will increase the capital cost by approximately \$11.0 million; or if EEA finances the local currency costs from its own internal funds, it could be argued that the capital costs are understated by \$11.0 million considering the alternative use of capital.

6.12 The Grant 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 Grant to complete the project and operate and maintain the project.

C. Ismailia

6.13 Looking at Ismailia as a separate entity, its annual revenues are equivalent to \$45,144,000 calculated on the basis of 1,504,800,000 KWH of salable electricity (80 percent load factor, 8,000 hours per year with a six percent diversion for auxiliary plant power and a 16.4 percent line loss) at the average sale price of 3.0¢ per KWH, the new rate effective January 1, 1975. Annual cash operating costs, based on the current subsidized price of fuel oil and the current low wage rate are as follows:

Table 9

Annual Operating Costs

Fuel and its transportation	\$8,755,200
Salaries	384,000
Supplies and spare parts	256,000
Maintenance	<u>256,000</u>
Total	\$9,651,200

Using these values Ismailia has a payback period of nine years and its Internal Financial Rate of Return is 16.5 percent. Assuming the plant is depreciated over 25 years, the plant will show a net profit, before interest, taxes and head office administrative charges equivalent to \$29 million per year.

6.14 The project therefore will make a positive cash contribution to EEA. It also can absorb higher fuel and labor costs and still remain a viable unit in the overall system.

## VII. ECONOMIC ANALYSIS

### A. General

7.01 The primary benefit of this project is the economic value of the electricity that will be generated by the Ismailia thermal power plant. The amount of usable electricity that will be produced and delivered to users, per year, is 1,504,800,000 kwh. 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. Tariffs for larger customers, such as aluminum, iron and steel and fertilizer are negotiated on an individual basis; and special rates are charged for other purposes, such as irrigation (See Annex K). Rates, therefore, are based on the government's desires to subsidize the user.

7.02 Despite the wide rate variance between users, 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. 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¢ per kwh from the present average of 3.0¢ per kwh if EEA were to pay full cost for all its inputs an average of the relatively cheap hydropower and the more expensive thermal power plants operating on fuel oil.

### B. Least Cost Analysis

7.03 Once the need for additional power is established, as is the case for Egypt, the power must be produced internally - it cannot be imported. Thereafter the economic analysis confines itself to determining the least cost method of obtaining the new generation. As earlier noted, hydroelectric generation offers few possibilities in Egypt. The building of barrages on the Nile and transferring water from the Mediterranean Sea to the Quattara Depression in Western Egypt are present possibilities but neither appear viable. The second alternative, nuclear power, is being considered by EEA but, at present, implementation is constrained by financial and political factors. This leaves EEA

two alternatives - gas turbine generators and conventional fossil fueled thermal plants. The former is less economic than the latter in purely cost terms; but to meet urgent requirements, the gas turbine generators, which can be in operation in two and a half years, represent the only solution for Egypt's short term needs. The economy cannot afford the economic loss of foregoing the added power for an additional two years, the time to construct a conventional thermal power plant.

### C. Ismailia

7.04 The internal economic rate of return of the Ismailia project is the discount rate which equates the present value of the time streams of the attributable costs and benefits over the projects assumed life of 25 years. In the case of Ismailia, the real value of the benefits has not been determined with any precision - that is, the economic value of a kwh of power. We, therefore, have discounted the cost streams, after adjustment, and determined the kwh rate needed to produce an internal rate of return of 10 percent. On the cost stream, we have increased capital costs by 20 percent for expansion of the transmission and distribution network; increased operating costs by \$8.0 million per annum for transmission and distribution costs; and increased the cost of fuel from its present cost of 43¢ to \$2.00 per  $10^6$  BTU, equivalent to the current price of Persian Gulf crude. With these adjusted costs, power would have to be priced at 4.85¢ per kwh, an increase of 62 percent over the current rate of 3.00¢ per kwh, for Ismailia's economic rate of return to be ten percent. Prices, of course, will not have to rise to that level since Ismailia's power cost will be averaged in the system which includes the relatively cheap hydropower and some generation based on natural gas, which has a lower economic cost. Ismailia's costs, however, do foreshadow the realistic future picture particularly when new capital costs and prevailing fuel prices are considered compared with lower cost of earlier plants.

## VIII. SOCIAL ANALYSIS

8.01 The construction of the Ismailia Power Plant will have a number of direct and indirect social benefits which can be viewed as significant inputs of the project. First, there will be an important employment generation, mostly in the non-skilled field, for the entire construction period of four years as several hundred people will be engaged in the construction of the project. Although involving fewer people, significant new skills will be learned in metal work, construction practices and machinery installation during construction, many of which will be locally assimilable in the job market. The employment effects will not only be direct in their income-producing side, but will generate inputs on the consumption side as goods and services are traded for the new income.

8.02 Second, though relatively small, permanent employment will be generated for nearly 200 persons in the operation and maintenance of the completed plant.

8.03 Third, and most significant, is the expectation that new energy sources will make it possible for the Egyptian Government to implement its plans to (a) construct substantial new manufacturing facilities in the Canal Zone Area, (b) construct new free zone areas for warehousing and shipping as well as manufacturing for regional trade, and (c) develop new communities and productive areas in the Sinai area across from the Canal.

8.04 Fourth, the less tangible but important social effects of being able to supply towns and villages as well as large urban populations with electricity in their homes and business and open new possibilities for development of personal lives, education and commercial development.

## IX. ENVIRONMENT ANALYSIS

9.01 The original plant site was to be adjacent to the Suez Canal and Lake Tamsah and represented no major environmental problems. That site, however was not approved by Egyptian Military. The environmental aspects of the proposed new site at Great Bitter Lake has not yet been evaluated. A.I.D.'s consultant S&P, however, did make a preliminary evaluation of the new site and, in their opinion, the new site is superior. Specifically, the site is uninhabited, will not displace current or potential agricultural activity, and is remote from existing population. Cooling water will be taken and returned to the Great Bitter Lake at points which will not adversely affect aquatic life in the lake.

9.02 The plant will be designed to control air pollution caused by the use of fuel oil with a 3 to 5 percent sulphur content through use of electrostatic precipitators, scrubbers and other environmental equipment.

9.03 Now that the proposed new site is confirmed, A.I.D.'s consultant will make a thorough evaluation of the environmental aspect of the site and their recommendation will be incorporated in the project planning. Funds for this study are available from an existing PIO/T funded from A.I.D.'s feasibility study grant 263-11-001.

## X. IMPLEMENTATION

### A. Contracting Procedure

10.01 A contract with single responsibility for the complete project - design, engineering, supply of equipment and materials, construction and start up - is envisioned. All foreign exchange costs for equipment and services will be either fixed price or fixed price with escalation, whichever is applicable. Local currency costs will be largely on a cost reimbursement basis. The two major equipment suppliers - General Electric and Westinghouse - have both indicated they would submit bids on this basis. It is also possible that one or more of the larger construction firms would submit a bid; in which case it would purchase materials and equipment from U.S. manufacturers. Guarantees will include the plant heat rate, fuel oil consumption and completion schedule.

10.02 All equipment, materials and services will be of U.S. source and origin. Contracting will be in accordance with Handbook 11 - Host Country Contracting.

10.03 EEA will obtain the services of a U.S. engineering firm to assist them in bid preparation and evaluation and in monitoring the contractor's performance.

### B. Schedule

10.04 The Commerce Business Daily notice soliciting prequalification data from U.S. engineering firms was published on April 19. Proposals from short listed firms and contract negotiation is expected by September 30, 1976. The first act of the consulting engineer will be to review and, where necessary, revise Invitation for Bids prepared by EEA. The Invitation for Bids is expected to be released on January 1, 1977 with selection, negotiation and contract execution completed by June 30, 1977. Design, engineering and construction of the plant will take four years from contract execution. Assuming this schedule is adhered to, both 150 MW units will be in commercial operation by April 30, 1981. Annex M shows the proposed schedule on a bar chart and lists the major schedule events.

### C. Terminal Dates

10.05 Conditions Precedent. The terminal date for meeting Conditions Precedent to Disbursement will be 120 days from the date of Grant signing, the date by which funds will be needed to finance the services of the consulting engineer.

10.06 Letters of Commitment and Disbursement. The Terminal Date for opening of Letters of Commitment will be December 31, 1980., four months prior to commercial operation, and the Terminal Date for Disbursements will be December 31, 1981, twelve months after commercial operation, to allow for final payment after guarantee tests are complete.

#### D. Control and Monitoring Measures

10.07 At the commencement of his work the consulting engineer will review and, where necessary, revise the implementation schedule (Annex M ) and prepare a CPM/PERT network which will become the basis for project execution. The consulting engineer and the contractor will be required to submit monthly and quarterly progress reports to A.I.D., through EEA, stating progress in conformance with the implementation schedule. USAID/Cairo and EEA will monitor progress based upon review of contractor reports and regular site visits. In addition, A.I.D.'s internal financial reports will be monitored to insure that disbursements are occurring in accordance with the implementation schedule.

#### E. Evaluation

10.08 Evaluation will seek to determine: (i) whether construction and erection was completed on time, in accordance with the approved design and technical standards, within the cost estimate; (ii) whether the 3000 MW incremental addition to Egyptian power requirements actually occurred; and (iii) if EEA has complied with the financial covenants contained in the Grant Agreement. After commercial operation A.I.D. will conduct plant audits to evaluate management operation and maintenance of the facility for the first year of operation.

## XI RECOMMENDATION, CONDITIONS AND COVENANTS

### A. Recommendation

11.01 Subject to the conditions and covenants listed below we recommend that A.I.D. authorize a Grant to the Government of Egypt (GOE), in the amount of \$99.0 million, for the construction of a 300 MW thermal power plant near the city of Ismailia; and that the Grant be passed on by the GOE to the Egyptian Electric Power Authority (EEA) as a contribution to EEA's equity capital.

### B. Conditions Precedent to Disbursement

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

- a) An opinion of the Egyptian Ministry of Justice or other legal counsel satisfactory to A.I.D., that the grant agreement has been duly authorized or ratified by, and executed on behalf of, the GOE and is a valid and legally binding obligation in accordance with its terms.
- b) The names of the persons who will act as the representatives of the GOE and EEA, together with evidence of their authority and the specimen signature of each.
- c) Evidence that satisfactory arrangements have been made among the pertinent Government agencies and entities to carry out, operate, and maintain the Project as planned including the availability of the planned plant site on the northwestern shore of the Great Bitter Lake, or such other site acceptable to A.I.D.
- d) Evidence that the Grant proceeds will be made available to EEA as a contribution to EEA's equity capital.
- e) An executed contract for consulting engineering services for the Project acceptable to A.I.D.

11.03 Prior to any disbursement or to the issuance of any Letter of Commitment under the Grant for any purpose other than to finance the services of the consulting engineer, the GOE shall, except as A.I.D. may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D.:

- a) 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, have been budgeted by the GOE and are available for expenditure by EEA.

- b) An executed contract for the design, engineering, equipment, construction and related services for the Project acceptable to A.I.D. with a firm acceptable to A.I.D.
- c) A financial and physical plan for the connection of the Project with the National Grid.

C. Covenants:

11.04 The GOE will be required to covenant:

a) Execution of the Project

- i) To carry out the Project with due diligence and efficiency, and in conformity with sound engineering, construction, financial and administrative practices.
- ii) To cause the Project to be carried out in conforming with all the plans, specifications, contracts, schedules, and other arrangements, and with all modifications therein approved by A.I.D. pursuant to this agreement.
- iii) 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.

b) Funds and Other Resources to be provided

- i) To make available on a timely basis any Egyptian currency and any foreign currency in addition to the Grant, for the punctual and effective carrying out of construction, maintenance, repair and operation of the Project.

c) Operation and Maintenance

- i) 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.

d) Management

- i) 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.

e) Continuing Consultation

- 1) To cooperate fully with A.I.D. to assure that the purpose of the Grant 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 Grant Agreement, the performance of consultants, contractors and suppliers engaged on the Project, and other matters relating to the Project.
- ii) To review with A.I.D. the recommendation of the consultants engaged pursuant to the United Nations Development Programme to survey the Egyptian Power Sector.

f) Financial Planning

- 1) 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 this agreement the financing so provided will be divided between equity contributions and loans in such a manner that after the completion of each loan transaction the debt to equity ratio will be no greater than 1.5:1. Also, within three years from the date of this agreement tariffs shall be set at a level high enough to produce an annual rate of return of 9 percent on average net fixed assets in operation, appropriately valued and revolved from time to time.

g) Investment Guaranty Project Approval

- 1) That the construction work to be financed from the Grant is 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 issuance of investment guaranties covering a contractor's investment in the Project.

- C O P Y -

MINISTRY OF ECONOMY  
AND ECONOMIC COOPERATION

ANNEX A

Economic Cooperation Division  
Office  
Of the Under Secretary

Mr. Wilbert R. Templeton  
A.I.D. Representative  
United States Embassy  
CAIRO

Dear Mr. Templeton,

The Government of Egypt is planning to construct a 300 MW steam power plant near Ismailia to further the rehabilitation of the Suez Canal Area. Two 150 MW units will provide peak-season generation capacity by 1981 adequate for projected growth of existing loads, known new industrial loads, and required reserve capacity. The Egyptian Electricity Authority intends to contract for the turnkey services of a United States firm to carry out the project.

US A.I.D. consulting engineer, Sanderson and Porter, Inc., has prepared a reasonably firm estimate of the cost of this project. Foreign exchange costs are expected to amount to \$98.6 million. We therefore request the Agency for International Development to provide a \$99 million grant to finance foreign exchange costs of the project.

The Government of Egypt will provide the local currency costs of the project.

Best regards.

Sincerely yours,

Gamal El Nazer  
Under Secretary of State  
for  
Economic Cooperation

CAIRO, 28th, April 1976

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

OFFICE OF  
THE ADMINISTRATOR

GRANT AUTHORIZATION

Provided from: Foreign Assistance Act Section 532  
("Security Supporting Assistance Funds")  
EGYPT: Ismailia Power Project

Pursuant to the authority vested in the Administrator, Agency for International Development ("A.I.D.") by the Foreign Assistance Act of 1961, as amended, ("the Act") and the delegations of authority issued thereunder, I hereby authorize the establishment of a Grant ("the Grant") pursuant to Part 2 Chapter 2 Section 532, Security Supporting Assistance, of said Act to the Arab Republic of Egypt ("Grantee") of not to exceed Ninety Nine Million Dollars (\$99,000,000), such funds to be made available to the Egyptian Electric Power Authority (EEPA) to assist in financing the foreign exchange costs of a 300 mw thermal power plant near the city of Ismailia.

1. Source and Origin

Unless A.I.D. otherwise agrees in writing, all equipment, materials and services financed under the Grant shall have their source and origin in the United States.

2. Conditions Precedent to Disbursement

Prior to the first disbursement, or to the opening of a letter of commitment under the Grant Agreement, unless A.I.D. shall otherwise agree in writing, the Grantee shall furnish, in form and substance satisfactory to A.I.D.:

- (a) A legal opinion of the Egyptian Minister of Justice, or other legal counsel satisfactory to A.I.D., that the Grant Agreement has been duly authorized or ratified by, and executed on behalf of the Grantee and that it constitutes a valid and legally binding obligation thereof in accordance with its terms.

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- (b) A statement of the persons authorized to represent the Grantee and a specimen signature of each such person.
- (c) An executed contract for consulting services for the Project with a firm acceptable to A.I.D.
- (d) Evidence that the Grant funds will be made available to the Egyptian Electric Power Authority as a contribution to equity.

**3. Covenant**

Unless A.I.D. shall otherwise agree in writing, Grantee shall covenants to:

- (A) assure adequate long-term financing for EEPA's authorized expansion plans, and for any additions or modifications thereto, on terms satisfactory to A.I.D.
- (B) set and maintain tariffs at a level high enough to produce an acceptable rate of return on average net fixed assets in operation.

\_\_\_\_\_  
Administrator

\_\_\_\_\_  
Date

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Certification Pursuant  
to Article 611(e),  
Foreign Assistance Act

Cairo  
April 29, 1976

I, Daniel G. Pfoutz, the principal officer (Acting) of 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, do hereby certify that in my judgment Egypt has both the financial capability and the human resources capability effectively to maintain and utilize the capital assistance to be provided for the construction of a 300 MW steam power plant near Ismailia.

  
Daniel G. Pfoutz

CHECKLIST OF STATUTORY CRITERIA

The following abbreviations are used:

FAA - Foreign Assistance Act of 1961, as amended.

FAA, 1973 - Foreign Assistance Act of 1973.

App. - Foreign Assistance and Related Programs Appropriation Act, 1974.

MMA - Merchant Marine Act of 1936, as amended.

All Reference to a Loan or Loan Funds Shall Be Read to Mean Grant or Grant Funds.

COUNTRY PERFORMANCE

Treatment of U.S. Citizens and firms.

1. FAA § 620(c). If assistance is to a government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) a such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government? None of the known claims of any U.S. citizen asserted against the GOE meets the criteria of this section. In any event, Egypt has agreed to participate in a Joint Commission to consider debts of Egypt to U.S. citizens and will seek to negotiate settlement of such debts.
2. FAA § 620(e)(1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect or rationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? The Secretary of State has determined that Egypt's agreement to establish a Joint Commission to discuss compensation of American nationals constitutes taking appropriate steps for the purpose of this section.
3. FA § 620(o). Fisherman's Protective Act § 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing vessel on account of its fishing activities in international waters, No instance of any such seizure or imposition of such penalty or sanction is now known.

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a. has any deduction required by Fishermen's Protective Act been made?

a. Not Applicable.

b. has complete denial of assistance been considered by A.I.D. Administrator?

b. Not Applicable.

Relations with U.S. Government and Other Nations

4. FAA § 620(a). Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba.

No instance of any such present course of conduct is known.

5. FAA § 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement?

The Secretary of State has determined that Egypt is not controlled by the international communist movement.

6. FAA § 620(f). Is recipient country a Communist country?

No.

7. FAA § 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression?

The President has not determined that the recipient country is involved in such conduct.

8. FAA § 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property?

The President, in accordance with the requirement of section 620(j) has considered terminating assistance to Egypt and has determined that no sufficient reason exists not to furnish the assistance.

9. FAA § 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, in convertibility or confiscation, has the A.I.D. administration within the past year considered denying assistance to such government for this reason?

Egypt has reactivated its Investment Guaranty Agreement with the U.S.

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10. FAA § 620(n). Does recipient country furnish goods to North Viet-Nam or permit ships or aircraft under its flag to carry cargoes to or from North Viet-Nam? The recipient country is not known to be engaged in such a course of conduct.
11. FAA § 620(q). Is the government of the recipient country in default on interest or principal of any A.I.D. loan to the country? No such default exists. Reconciliation is taking place between the books of AID and the Government of Egypt in regard to several very minor amounts.
12. FAA § 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? Egypt severed diplomatic relations with the U.S. in 1967. Diplomatic relations have now been resumed. New bilateral assistance agreements have been entered into since such resumption.
13. FAA § 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the A.I.D. Administrator in determining the current A.I.D. Operational Year Budget? Egypt has paid all of its outstanding U.N. obligations.
14. FAA § 481. Has the government of recipient country failed to take adequate steps to prevent narcotic drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully? No.

LID

15. FAA § 659. If (a) military base is located in recipient country, and was constructed or is being maintained or operated with funds furnished by U.S., and (b) U.S. personnel carry out military operations from such base, has the President determined that the government of recipient country has authorized regular access to U.S. correspondents to such base?

There is no military base in Egypt within the definition of this section.

### Military Expenditures

16. FAA § 620(s). What percentage of country budget is for military expenditures? How much of foreign exchange resources spent on military equipment? How much spent for the purchase of sophisticated weapons systems? (Consideration of these points is to be coordinated with the Bureau for Program and Policy Coordination, Regional Coordinators and Military Assistance Staff (PPC/RC).)

The President has taken into account each of the listed considerations as to current military expenditures by the GA and has determined that these do not inhibit economic aid to Egypt but rather that the projected program contributes to the underlying intent of the FAA which seeks to reduce arms costs and to stimulate economic development.

### CONDITIONS OF THE LOAN

#### General Soundness

17. FAA § 611(a)(1). Prior to signing of loan 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 United States of the assistance?
18. FAA § 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 the purpose of the loan.

The necessary plans and cost estimates are completed.

No further legislative action is required to implement the program than confirmation action pertaining to the signed loan agreement.

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19. FAA § 611(e). If loan is for Capital Assistance, and all U.S. assistance to project now exceeds \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

The A.I.D. Representative in Egypt has so certified.

Loan's Relationship to Achievement of Country and Regional Goals

20. FAA § 601(a). Information and conclusions whether loan will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions.

The Grant will increase the flow of international trade and improve technical efficiency of industry, agriculture and commerce.

21. FAA § 619. If assistance is for newly independent country; is it furnished through multilateral organizations or plans to the maximum extent appropriate?

Egypt is not a newly independent country.

Loan's Effect on U.S. and A.I.D. Program

22. FAA § 601(b). Information and conclusion on how the loan will encourage U.S. private trade and investment abroad and how it will 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 are for goods and services from private U.S. concerns.

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23. FAA § 601(d). If a capital project, are engineering and professional services of U.S. firms and their affiliates used to the maximum extent consistent with the national interest? Yes.
24. FAA § 602. Information and conclusion whether U.S. small business will participate equitably in the furnishing of goods and services financed by the loan. Procurement of goods and services will be pursuant to established AID regulations.
25. FAA § 620(h). Will the loan promote or assist the foreign aid projects or activities of the Communist-Bloc countries? No.
26. FAA § 621. If Technical Assistance is financed by the loan, information and conclusion whether such assistance will 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, information and conclusion on whether they are particularly suitable, are not competitive with private enterprise, and can be made available without undue interference with domestic programs. Technical assistance will be to the greatest practical extent from private enterprise on a contract basis.

Loan's Compliance with Specific Requirements

27. FAA § 630. Will loan be used to finance police training or related program in recipient country? No.

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28. FAA § 114. Will loan be used to pay for performance of abortions or to motivate or coerce persons to practice abortions? No.
29. FAA § 604(a). Will all commodity procurement financed under the loan be from the United States except as otherwise determined by the President? Yes.
30. FAA § 604(b). What provision is made to prevent financing commodity procurement in bulk at prices higher than adjusted U.S. market price? Commodity procurement in bulk is not to be financed.
31. FAA § 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will the loan agreement require that marine insurance be placed in the United States on commodities financed by the loan? Yes.
32. FAA § 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.
33. FAA § 608(a). Information on measures to be taken to utilize U.S. Government excess personal property in lieu of the procurement of new items. Consideration will be given to the use of excess property when practical.
34. FAA § 611(b), App. § 101. If loan finances water or water-related land resource construction project or program, is there a benefit-cost computation made, insofar as practicable, in accordance with the procedures set forth in the Memorandum of the President dated May 15, 1962? No water-related land resource is to be financed.

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35. FAA § 611(c). If contracts for construction are to be financed, what provision will be made that they be let on a competitive basis to maximum extent practicable?
- The Grant Agreement will so Provide.
36. FAA § 612(b); § 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the United States are utilized to meet the cost of contractual and other services.
- The agreement will so provide.
37. Section 30 and 31 of PL 93-189 (FAA of 1973). Will any part of the loan be used to finance directly or indirectly military or paramilitary operations by the U.S. or by foreign forces in or over Laos, Cambodia, North Vietnam, South Vietnam, or Thailand?
- No.
38. Section 37 of PL 93-189 (FAA of 1973); App. § 111. Will any part of this loan be used to aid or assist generally or in the reconstruction of North Vietnam?
- No.
39. FAA § 612(d). Does the United States own excess foreign currency and, if so, what arrangements have been made for its release?
- Endeavor is being made for negotiation of an agreement for the release of U.S.-owned non-P.L. 480 pounds.
40. FAA § 620(g). What provision is there against use of subject assistance to compensate owners for expropriated or nationalized property?
- The agreement will not permit such use.
41. FAA § 620(k). If construction of productive enterprise, will aggregate value of assistance to be furnished by the United States exceed \$100 million?
- No.

42. FAA § 636(1). Will any loan funds be used to finance purchase, long-term lease, or exchange of motor vehicle manufactured outside the United States, or any guaranty of such a transaction? No.
43. App. § 103. Will any loan funds be used to pay pensions, etc., for military personnel? No.
44. App. § 105. If loan is for capital project, is there provision for A.I.D. approval of all contractors and contract terms? Yes.
45. App. § 107. Will any loan funds be used to pay UN assessments? No.
46. App. § 108. Compliance with regulations on employment of U.S. and local personnel. (A.I.D. Regulation 7). Yes.
47. App. § 110. Will any of loan funds be used to carry out provisions of FAA § 209(d)? No.
48. App. § 112. Will any of the funds appropriated or local currencies generated as a result of AID assistance be used for support of police or prison construction and administration in South Vietnam or for support of police training of South Vietnamese? No.
49. App. § 113. Describe how the Committee on Appropriations of the Senate and House have been or will be notified concerning the activity, program, project, country, or other operation to be financed by the Loan. The committees have been notified 15 days in advance of obligation.

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50. App. § 601. Will any loan funds be used for publicity or propaganda purposes within the United States not authorized by Congress? No.
51. App. § 604. Will any of the funds appropriated for this project be used to furnish petroleum fuels produced in the continental United States to Southeast Asia for use by non-U.S. nationals? No.
52. MMA § 901.b; FAA § 640C.  
(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 with funds made available under this loan 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.

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

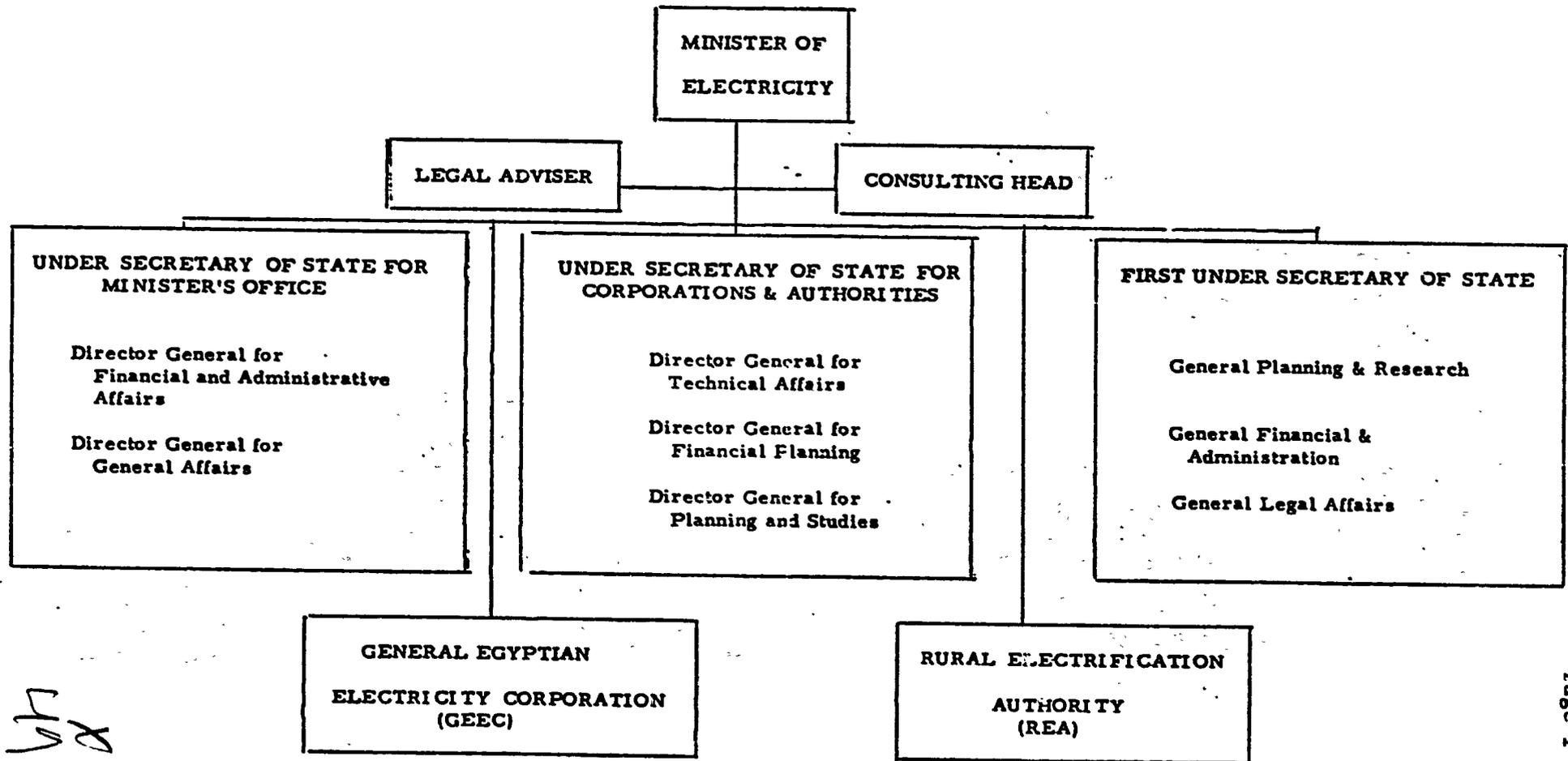
(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE PAR REPORT. IT NEED NOT BE RETURNED OR SUBMITTED.)

Life of Project: 81  
From FY 76 to FY 81  
Total U.S. Funding \$99.0 Million  
Date Prepared: 4/16/76

Project Title & Number: Ismailia Steam Power Plant

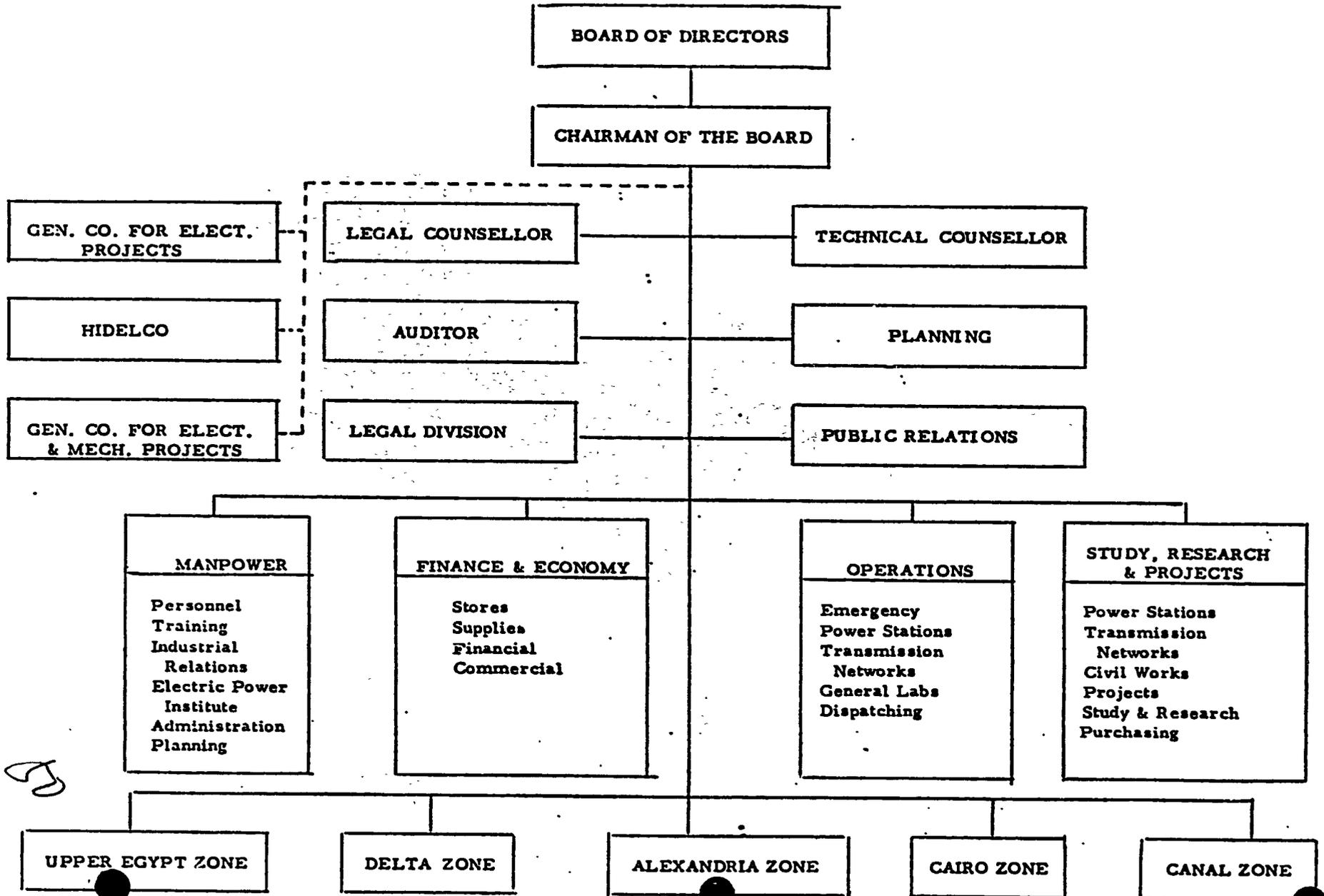
NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <ol style="list-style-type: none"> <li>To provide power needed for continuing industrial expansion and urban growth in the Suez Area.</li> <li>Improvement of rural and urban living conditions.</li> <li>General reconstruction of the Suez Canal area.</li> </ol>	<p>Measures of Goal Achievement:</p> <ol style="list-style-type: none"> <li>Increased industrial sector GDP.</li> <li>Increased industrial employment.</li> </ol>	<p>Government of Egypt Statistical data.</p>	<p>Assumptions for achieving goal targets:</p> <ol style="list-style-type: none"> <li>That negotiations leading to a settlement of political problems will continue and will achieve reasonable progress; that warfare will not be resumed.</li> <li>That policies and actions of the Egyptian Government concerning fiscal and monetary policy, prices, and debt management will foster continued growth.</li> </ol>
<p><u>PROJECT PURPOSE:</u></p> <p>To augment the capacity of the Egyptian Power industry to meet increased energized demands of Industrial and residential consumers in the Suez Canal and other areas in the country.</p>	<p><u>CONDITIONS THAT WILL INDICATE PURPOSE HAS BEEN ACHIEVED:</u></p> <p>The two 150 MW power units at the Ismailia (Great Bitter Lake) plant will be fully operational and will be delivering close to their rated output to the grid for commercial sale and industrial use.</p>	<p>Examination and inspection of the completed steam power plant.</p>	<p><u>ASSUMPTIONS FOR ACHIEVING PURPOSE:</u></p> <p>That required transmission lines, switching gear, substations, etc. required to connect the new plant and output to the grid will be completed by the EEA in a timely fashion.</p>
<p><u>OUTPUTS:</u></p> <p>Construction of a 300 MW Thermal Power plant at Ismailia consisting of two 150 MW steam/turbine generator units.</p>	<p><u>MAGNITUDE OF OUTPUTS:</u></p> <p>N/A</p>	<ol style="list-style-type: none"> <li>Review of invitation-for-bid for plant construction.</li> <li>Review and approval of contract.</li> <li>Contractor reports.</li> <li>Review of disbursements made upon shipment of equipment; contractor reports.</li> <li>Inspection and examination of the works; contractor reports.</li> </ol>	<p><u>ASSUMPTIONS FOR ACHIEVING OUTPUTS:</u></p> <ol style="list-style-type: none"> <li>That the Egyptian Army and the Suez Canal Authority will transfer title to the plant site to the EEA.</li> <li>That the Egyptian Government will provide all the local currency required to carry out the project.</li> </ol>
<p><u>INPUTS:</u></p> <ol style="list-style-type: none"> <li>Contract for architect-engineer services for project design, procurement, supervision and management.</li> <li>Turnkey construction contract for: (a) supply of turbines, generators and related electrical equipment; (b) supply of boiler and associated equipment; (c) execution of civil works, mechanical and electrical erector.</li> </ol>	<p><u>IMPLEMENTATION TARGET</u></p> <p>N/A</p>	<ol style="list-style-type: none"> <li>Contract review.</li> <li>Monitoring of financing actions to fund dollar contracts.</li> </ol>	<p><u>ASSUMPTIONS FOR PROVIDING INPUTS:</u></p> <ol style="list-style-type: none"> <li>That initial Conditions Precedent will be met.</li> <li>That U.S. construction companies and electrical equipment manufacturer will want to bid for this contract and will form appropriate combination for doing so.</li> <li>That local Egyptian firms will be available for civil works contracts.</li> <li>That local materials will be available.</li> </ol>

ORGANIZATION CHART OF THE MINISTRY OF ELECTRICITY.



Handwritten initials or signature.

ORGANIZATION CHART OF THE GENERAL EGYPTIAN ELECTRICITY CORPORATION



*B*

# THE EGYPTIAN ELECTRICITY AUTHORITY

(FORMERLY THE GENERAL  
EGYPTIAN ELECTRICITY  
ORGANISATION)

On the occasion of the issue of Law No 12 of 1976 on the establishment of the Egyptian Electricity Authority published in the seventh issue of the Official Journal on February 12, 1976, and in accordance with Article 31 of the same Law which stipulates that this Authority replaces the General Egyptian Electricity Organisation with all the assets and liabilities referred to it, the Egyptian Electricity Authority will be the legal successor of all those who had come to deal with the aforesaid organisation should deal in the future with the new Authority.

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DRAFT

The People's Assembly

The Speaker

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THE MINISTER OF POWER

Dear Sir,

I would inform you that the People's Assembly has ratified on its meeting of January 18, 1976, the draft law for setting up of "The Egyptian Electric Power Authority."

Attached hereto please find a copy of the draft law as ratified by the Assembly.

Yours faithfully,

The Assembly Speaker  
(Sjd)

DATE: January 26, 1976

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DRAFT LAW  
FOR THE SETTING UP OF  
"EGYPTIAN ELECTRIC POWER AUTHORITY"

In the Name of the People  
The President of the Republic

The People's Assembly has ratified the following  
law, and it is hereby promulgated:

Art. 1

A public authority to be named "Egyptian Electric Power Authority" shall be set up. It shall be a legal entity, affiliated to the Ministry of Power and shall have its head office in the City of Cairo.

The said Authority shall be subject to the rules and regulations spelled out in this law.

Art. 2

The Authority shall be exclusively assigned the following duties:

- (a) Implementation of the projects related to production of electric power, its transmission and distribution throughout the Republic.
- (b) Management of electric power stations, their operation and maintenance, as well as regulation of the loads on the main networks throughout the Republic.
- (c) Distribution of electric power and its sale throughout the Republic.

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- (d) Carrying out of studies and research regarding everything connected with the Authority's activities.
- (e) Rendering of expert advice and implementing projects which fall within the Authority's jurisdiction whether internal or external, and which are compatible with the Authority's capabilities and experience or which are attainable through it.

Art. 3

The Authority's capital is composed of: -

- (1) The funds of the General Egyptian Electricity Corporation founded by virtue of Republicial Decree No. 3726 of 1965.
- (2) The funds to be appropriated by the State.

Art. 4

The Authority's revenues are made up of: -

- 1 - The sums appropriated by the State.
- 2 - Proceeds of the electric energy's sale.
- 3 - The price differential resulting from sale of electric current at prices lower than the approved tariff for development purposes which are borne by the Public Treasury.
- 4 - Proceeds of the Authority's activities and in consideration of works and services rendered to third parties internally or externally .
- 5 - Loans advanced to the Authority by the State.
- 6 - Credit facilities secured by the Authority.
- 7 - Donations and grants-in-aid.

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- Art. 5 The authority/ shall have a special budget to be prepared in accordance with the rules set out in its statutes without being restricted by the laws and regulations governing preparation of the State Budget. Also, the Authority shall have a special account for depositing its revenue, and any surplus in the Authority's budget shall be carried forward from year to year.
- Art. 6 The Council of Ministers shall set the interest rate of the loans to be advanced by the State to the Authority.
- Art. 7 The Authority shall be entitled to engage in all actions and deeds assigned to accomplish the purposes for which it is set up, including direct contracting with individuals, companies, banks as well as local and foreign organizations, in consonance with the rules set forth in the Authority's statutes.
- Art. 8 The Authority is entitled, within the boundaries of its budget, to import itself or through another party without an import permit, its requirements of production, materials, instruments, tools, spare parts and means of transportation required for its activities in conformity with the rules as set by the Authority's statutes, without being restricted by the laws and regulations governing importation or foreign currency.
- Art. 9 The Authority's imports of equipment, instruments and materials required for its projects shall be exempted from customs duties and other taxes and dues. Also, imports by companies, organizations and bodies contracted with the Authority of instruments,

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equipment, tools, motor vehicles, materials and other movables are exempted from customs duties and other taxes and dues, provided that they are subject to inspection and the Authority's distribution of the exempted commodities are imported and required for its projects' implementation. Such exempted commodities shall be liable to the payment of taxes and dues in respect thereof if they are disposed of to another party within five years from the date of their enjoying the franchise.

Also, interest on loans and external credit facilities contracted for by the Authority shall be exempted from all taxes.

Art. 10 The Authority shall have a board of directors. Its chairman shall be appointed by Republican decree which shall also set his salary, whereas appointment of members of the Board shall be by an Order of the Prime Minister upon the recommendation of the Minister of Power.

Art. 11 The Board of Directors is the supreme body responsible for the management of the Authority's affairs. It discharges its functions as laid down in this law. It has the discretion to take whatever decisions it deems for the attainment of the objective for which the Authority was founded, particularly: -

1. Approval of the Authority's regulative structure.
2. Proposal of the tariff for the distribution and sale of electric energy to the various electric-using individuals and organizations after seeking the opinion of the Central

-5-

for accountancy and the costings to be approved by the Electricity Sector: Higher Council and the competent Ministerial Committee.

The SAID tariff shall not be enforced until after its approval by the Council of Ministers.

3 - Approval of the Authority's annual draft budget and its draft balance sheet.

4 - transfer of credits from one item to another within the boundary of the same category.

5 - Laying down the Authority's internal regulations related to financial, accounting, administrative, trading, technical and supply matters, as well as other general organization regulations.

6 - Framing the regulation related to the Authority's personnel including social insurance, travelling allowance and transportation expense.

7 - Establishing a system for surveillance and standards of performance in accordance with economic criteria.

8 - Proposing the contracting for loans.

9 - Accepting donations and grants-in-aid offered the Authority which are not inconsistent with its aims and purposes.

10 - Reviewing the periodical reports to be submitted concerning the progress of work at the Authority and its financial position.

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... Furthermore whatever the Minister of Power or the Chairman of the Board deems to submit to the Board regarding issues falling within his competence.

The Board may set up from among its members a committee or more to be entrusted temporarily with some of its assignments. The Board is entitled to delegate one of its assignments upon one of its members or entrust to him a certain mission.

Art. 12 The Board meets at least once a month upon the invitation of its chairman, provided that a quorum of the majority of its members are present. Its resolutions are passed with the absolute majority of its members. When the votes for and against are equal, the Chairman shall have the deciding vote. In the case of absence of the Board Chairman, the Board elects a substitute. The Board is entitled to invite whoever it deems to attend its meetings in an advisory capacity without having the right to cast their votes.

Art. 13 The Authority's Board Chairman shall communicate to the Minister of Power the Board's resolutions within three days from their adoption for their approval. The said resolutions shall be considered enforceable unless the Minister objects to them in writing to the Authority's Board within thirty days from the date of his receiving them.

Art. 14 The Authority's Board Chairman is assigned the following duties:

- 1 - Execution of the Board's resolutions.
- 2 - Management of the Authority, development of its system

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... establishing its organization.

... by the Minister of Power and the State

... the information, details and documents they

... report

The Authority's Board Chairman may delegate upon a director or more  
... of his assignments

Art. 15 The Board Chairman shall represent it at the courts of  
... its relations with other parties.

Art. 16 The Minister of Power shall nominate a delegate to replace the chair-  
man temporarily in the event of his absence or should his post be  
rendered vacant.

Art. 17 The Authority Board may, with the consent of the Minister of Power,  
dispose of the foreign currency allotted to the Authority in favor of  
the State's ordinary budget, or the foreign currency accruing from the  
loans advanced to it, or resulting from its activity or in considera-  
tion of the works and services it renders to other parties or the  
donations or grants-in-aid it receives, in accordance with the rules  
set out in the Statutes.

Art. 18 The decision of public utility respecting the real estate required  
for the Authority's projects rests with the Minister of Power. The  
provisions of the law regulating the expropriation of property for  
public utility or improvement shall apply.

Art. 19 In order to acquire its rights the Authority may take legal pro-  
ceedings to serve attachments in accordance with the provisions of  
the Attachment's Law.

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- Art. 20 - The Authority's regulations shall be issued by Republican decree without being restricted by the State's rules and regulations applicable to the Government machinery, within six months from the date of publication of this law in the official Gazette. The statutes shall take into consideration the following: -
- First - Linking the wage to productivity.
  - Second - The maximum of the pay scale annexed to Law No. 58 of 1971 related to the Government's civil servants.
  - Third - The additional and incentive bonuses and allowances to be set for the Authority's personnel should not exceed double the salaries set for them.
  - Fourth - The main principles of the standard social insurance scheme as spelled out by law No. 79 of 1975.
  - Fifth - Travelling allowances and transportation expenses of the Authority's personnel according to the hierarchy of their grades and original salaries should not exceed the actual expenses they incur.
  - Sixth - Adoption of the rules of the standard accounting system.
  - Seventh - No direct operations be entrusted except to monopolistic foreign firms or those with specialized international expertise or in cases of contingent urgency, subject to the approval of the Minister of Power.
  - Eighth - Following the most up-to-date supply rules applied in identical projects.

Art. 21 The Authority shall supersede the General Egyptian Electricity Corporation (GEEC) set up in virtue of Republican Decree No. 3726

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of 1965 as regards its rights and obligations.

Art. 22 The GEDC (personnel) shall be transferred to the Authority without taking any further measure.

Art. 23 Presidential Decree No. 3726 of 1965 setting up the GEDC is hereby cancelled as well as any other provision contrary to the rulings of this law.

Art. 24 The Ministry of Power shall issue the necessary Orders for the execution of this law.

Art. 25 This law shall be published in the Official Gazette, and shall become operative as from date of its publication.

This law shall be embossed with the State seal, and shall be executed as one of its laws.

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(Published on Feb 12 1976)

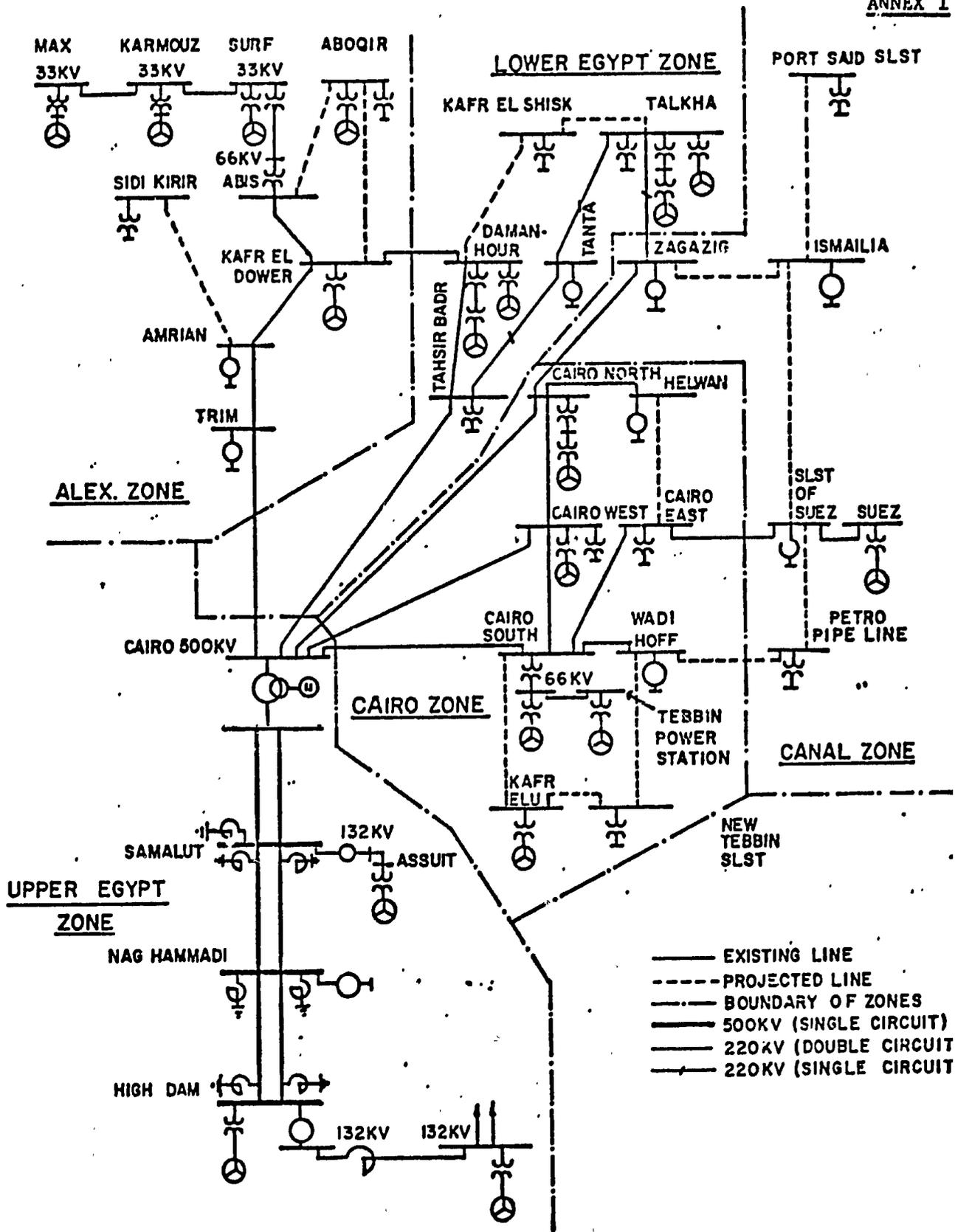
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## ANNEX H

EXISTING GENERATING STATIONS

Plant	Type	Units	Capacity (MW)	
			Design	Available
<u>Upper Egypt</u>				
High Dam	Hydro	12 x 175 MW	2100	
Aswan Dam	Hydro	7 x 46 MW		900
		2 x 11.5 MW	345	
Assuit	Thermal	3 x 30 MW	90	60
<u>Cairo</u>				
Cairo North	Thermal	2 x 10 MW		
		1 x 20 MW		
		2 x 30 MW	100	60
Cairo South	Thermal	4 x 60 MW	240	180
Cairo West	Thermal	3 x 87 MW	261	230
Tebbin	Thermal	3 x 15 MW	45	28
Cairo Area	Gas Turbine	1 x 17 MW	17	17
<u>Delta</u>				
Suez	Thermal	4 x 25 MW	100	
Talka	Thermal	3 x 12.5 MW		
		3 x 30 MW	127	127
Damonhour	Thermal	2 x 15 MW		
		3 x 65 MW	225	210
<u>Alexandria</u>				
Siouf	Thermal	2 x 26.5 MW		
		2 x 30 MW	113	100
Max	Gas Turbine	2 x 14 MW	28	12
Karmouz	Thermal	4 x 16 MW	64	30
<u>Canal Area</u>				
Suez (being restored)	Gas Turbine	2 x 23 MW	46	46
Ismailia	Gas Turbine	1 x 23 MW	23	23
Port Said	Gas Turbine	1 x 23 MW	23	23
		Total -	3947	2046

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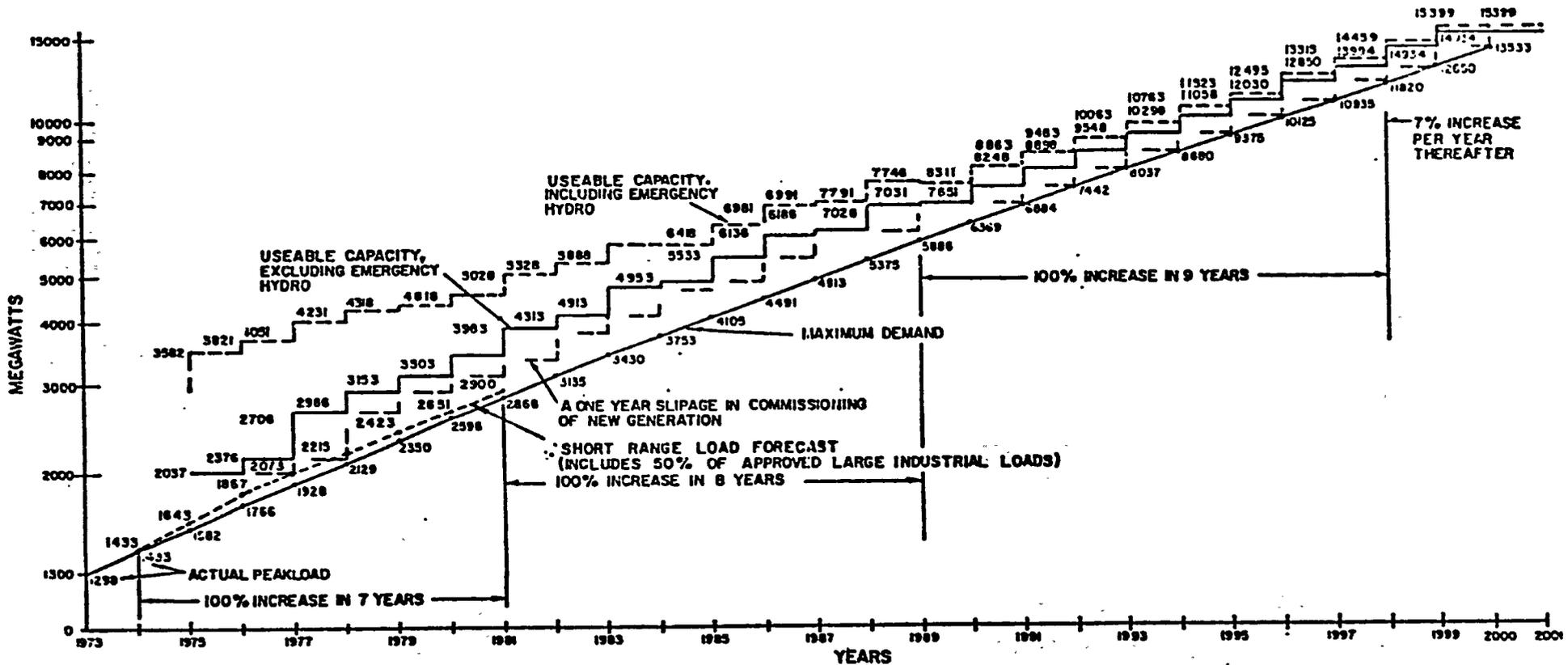
THE EGYPTIAN POWER SYSTEM  
ONE LINE DIAGRAM

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**TABULATION OF USEABLE GENERATING CAPACITY, ESTIMATED PEAK LOADS  
RESERVE IN MW AND PERCENT-ALSO RESERVE MINUS TWO LARGEST THERMAL UNITS**

Year	System Useable Gen. Capacity	Est. Load	Reserve Generation		Two Largest Thermal Units	Reserve Minus Two Largest Thermal Units MW	% Of Useable Generation
			MW	%			
1974		1433					
1975	2037	1582	455	22.3	175	280	13.7
1976	2376	1766	610	25.7	175	435	18.3
1977	2696	1928	768	28.5	220	548	20.3
1978	2976	2129	847	28.5	220	627	21.0
1979	3143	2350	793	25.2	220	573	18.2
1980	3493	2596	897	25.7	300	597	17.1
1981	3953	2866	1087	27.5	300	787	19.9
1982	4303	3135	1168	27.1	300	868	20.2
1983	4903	3430	1473	30.0	750	723	14.7
1984	4943	3753	1190	24.0	750	440	8.9
1985	5523	4105	1418	25.7	1200	218	3.9
1986	6126	4491	1635	26.7	1200	435	7.1
1987	6176	4913	1263	20.5	1200	63	1.0
1988	7016	5375	1641	23.4	1400	241	3.4
1989	7020	5886	1134	16.2	1400	(-)266	<0
1990	7641	6369	1275	16.7	1400	(-)125	<0
1991	8238	6884	1354	16.4	1400	(-) 46	<0
1992	8688	7442	1446	16.3	1400	46	0.5
1993	9538	8037	1501	15.7	1400	101	1.0
1994	10288	8680	1608	15.6	1600	8	0.0
1995	11048	9375	1673	15.1	1800	(-)127	<0
1996	12020	10125	1895	15.8	2000	(-)105	<0
1997	12840	10935	1905	14.8	2000	(-) 95	<0
1998	13984	11820	2164	15.5	2000	164	1.2
1999	14924	12650	2274	15.2	2000	(-)274	1.8
2000	14924	13533	1391	9.3	2000	(-)609	<0

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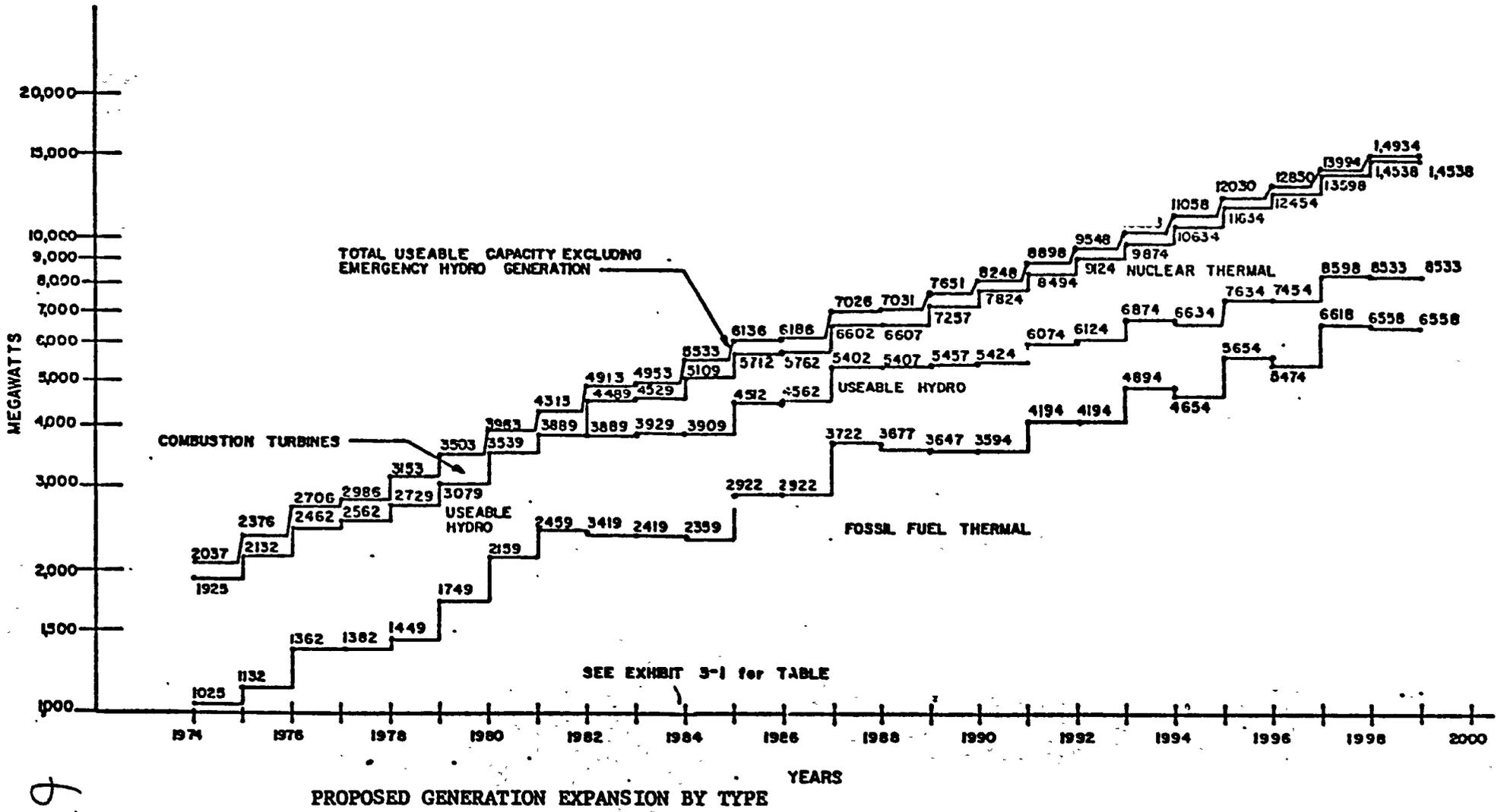


**ESTIMATED PEAK LOADS  
and  
PROPOSED GENERATION EXPANSION PROGRAM**

**CURVE N° 3-1**

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**AVERAGE ELECTRIC TARIFFS BY  
CATEGORIES OF CONSUMERS**

(Millimes\* of Egyptian Pounds/kwh)

Consumer Category	Average Tariff (Millimes/kwh)				
	1969	1970	1971	1972	1973
<b>Special Tariffs and Large Industry</b>					
Kima Fertilizer Industries	1.06	1.05	1.05	1.88	1.88
Iron & Steel Company	5.20	5.20	5.33	5.40	5.27
Masr Chemical Industries	5.20	5.04	5.29	5.00	5.32
Ship Yard				9.87	10.15
Iron & Steel Complex				7.04	7.00
Assout Phosphates				5.37	6.53
Others	7.74	7.50	7.49	7.55	7.31
<b>TOTAL INDUSTRY AVERAGE</b>	<b>3.81</b>	<b>3.83</b>	<b>3.89</b>	<b>4.75</b>	<b>5.44</b>
<b>Agriculture</b>					
Irrigation	7.13	6.93	6.93	6.93	6.93
Land Reclamation	8.86	8.41	8.32	9.07	8.09
<b>TOTAL AGRICULTURE AVERAGE</b>	<b>8.37</b>	<b>8.11</b>	<b>7.08</b>	<b>7.08</b>	<b>7.07</b>
Municipalities Bulk Sales for Rural Electrification	8.49	8.40	9.00	9.00	9.00
<b>Public Service</b>					
Traffic & Street Lights	12.59	9.85	9.88	9.90	9.90
Water and Sewage	6.80	7.38	7.09	7.99	7.09
Communications	6.37	6.37	6.39	6.28	7.30
Grain Storage				13.44	12.78
<b>TOTAL PUBLIC SERVICE AVERAGE</b>	<b>7.44</b>	<b>7.46</b>	<b>7.18</b>	<b>7.12</b>	<b>7.48</b>

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**AVERAGE ELECTRIC TARIFFS BY  
CATEGORIES OF CONSUMERS (cont'd)**

(Millimes\* of Egyptian Pounds/kwh)

Consumer Category	Average Tariff (Millimes/kwh)				
	1969	1970	1971	1972	1973
<u>Domestic and Others</u>					
Domestic & Commercial	14.51	14.40	14.40	14.51	14.52
Public Housing	4.89	4.46	4.80	5.61	9.00
High Dam	3.00	3.00	3.00	3.00	-----
Government	12.35	13.32	13.33	13.85	13.88
<b>TOTAL DOMESTIC AND OTHER</b>					
<b>AVERAGE</b>	<b>5.94</b>	<b>5.96</b>	<b>6.16</b>	<b>6.70</b>	<b>7.49</b>

\*1 Millime = LE 1 x 10<sup>3</sup>

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GEEC ELECTRIC TARIFF RATES  
(Effective January 1, 1975)

A- Consumers fed directly from high voltage

1. Fed on 220/132 kV - Price 5.072 Millimes/KW hr
2. Fed on 66/33 kV - Price 6.464 Millimes/KW hr

B- Consumers for electromotive power

1. Consumers fed on medium voltage with contracts for power more than 500 KW

Price includes the following:

a- fixed annual charge/KW contracted 5.620 LE/KW

b- variable rate annual tariff

- 1st Portion

Amount equal to 1000 hours x contracted power at the rate of 10.103 millimes/KW hr

- 2nd Portion

Amount equal to 1000 hours x contracted power at the rate of 9.503 millimes/KW hr

- 3rd Portion

Amount equal to 1000 hours x contracted power at the rate of 8.303 millimes/KW hr

- 4th Portion

Amount equal to 1000 hours x contracted power at the rate of 7.103 millimes/KW hr

GEEC ELECTRIC TARIFF RATES (cont'd)  
(Effective January 1, 1975)

b- Variable rate annual tariff (cont'd)

- 5th Portion

Amount equal to 1500 hours x contracted power at the rate of 5.403 millimes/Kwhr

- 6th Portion

More than this amount will be at the rate of 4.603 millimes/Kwhr

2. Consumers fed with contracts for power from 1 to 500 KW.

a- the prices are as follows:

- 1st Portion

Amount of 70,000 Kwhr /year at the rate of 20,347 milliems/Kwhr

- 2nd Portion

Amount of 10,000 Kwhr /year at the rate of 10,647 millimes/Kwhr

- 3rd Portion

More than these amounts at the rate of 15,847 millimes/Kwhr

3. Consumers fed Domestic Power

23.5 millimes/Kwhr for the first 45 KW

15.0 millimes/Kwhr for more than 45 KW

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EGYPTTERMS OF REFERENCE FOR POWER SECTOR SURVEYUNITED NATIONS DEVELOPMENT PROGRAMMEI. INTRODUCTION

1.01 These Terms of Reference outline the purpose and scope of a Power Sector Survey to be undertaken by a Consultant for the Government of Egypt, with financing provided by the United Nations Development Programme (UNDP) and for which the International Bank for Reconstruction and Development (IBRD) will act as Executing Agency.

II. GENERAL

2.01 Government organizations active in the energy field in Egypt include the following:

- (i) Egyptian General Petroleum Corporation (EGPC) under the Ministry of Petroleum.
- (ii) General Egyptian Electricity Corporation (GEEC) under the Ministry of Electricity.
- (iii) Rural Electrification Authority (REA) under the Ministry of Electricity.
- (iv) Atomic Energy Establishment (AEE) under the Ministry of Electricity.

2.02 Most of the power sector is State owned; autoproducers account for only 5 percent of national generating capacity. The sector is controlled and administered by the Ministry of Electricity through its executive branches, GEEC and REA. In addition, under a new law being considered, AEE is to form a new joint organization under the Ministry of Electricity, which will construct and operate future nuclear plants and sell the output to GEEC.

2.03 GEEC has operating entities in each of the five zones into which the country is divided as well as construction subsidiaries which also do some work for REA and other government and private organizations.

2.04 The power system in Egypt consists of about 2400 MW of hydroelectric capacity at Aswan in Upper Egypt and about 1300 MW of thermal capacity in the Delta Region. These two blocks of generation are interconnected through a 790 km, double-circuit 500-kV transmission line. The physical characteristics of the system present stability and reliability problems, which have a major effect on system operations and on the firm capacity requirements of the system. In addition, irrigation needs and dry season considerations present other operating limitations, consequently, GEEC already has additional thermal capacity under construction even though its peak load is only about 1600 MW, far less than the existing 3700 MW

plate capacity. A thorough analysis of present operations may disclose means of increasing the effectiveness of the existing facilities.

2.05 GEEC plans to install a computerized energy control center and is arranging to acquire system operational and planning computer programs for use at the control center; however, these facilities will not be available before 1979. The program under the Terms of Reference must therefore provide GEEC with interim computer program capability.

### III. OBJECTIVES

3.01 In view of the substantial growth in power demand expected in future as a consequence of the industrialization planned for the country as a whole and the rehabilitation program envisaged for the Suez Canal Zone, the Government considers it necessary to have a Survey made of the Power Sector to determine the changes that may be required in its institutional and organizational structure and in its operations and power development program to enable it to function more effectively and efficiently to meet the future power needs of the nation.

3.02 The principal objectives of the Survey are the following:

- (i) Energy Policy - Review the country's energy resources, energy demands, alternative sources of electricity production, and develop an appropriate Power Policy Statement for inclusion in the Energy Policy framework scheduled for preparation by the Government.
  - (ii) Sector Organization - Review the institutional framework and organization of the Power Sector and the various entities, recommend changes which may be desirable to improve effectiveness and efficiency, and assist GEEC in their implementation.
  - (iii) Operations - Analyze the existing facilities, procedures and staffing arrangements; recommend appropriate changes in facilities and methods to ensure maximum utilization of the available resources, and provide guidance in the implementation of these changes.
  - (iv) Power System Expansion Program - Assist GEEC in developing its system planning expertise. As part of this work prepare a load forecast for the period through 1995, analyze the power system expansion program as proposed by the Government for this period, recommend appropriate program changes in light of the Survey operational/economic findings, and recommend a bulk power system expansion program based on least cost alternatives for the near future (to 1985) with estimates of investment requirements each year, and global forecasts for future requirements (to 1995).
  - (v) Distribution - Review GEEC's present distribution system planning, and design standards; recommend changes which may be needed to modernize existing methods and assist GEEC in their implementation; analyze REA's electrification program and provide coordination to promote the use of similar distribution practices by REA and GEEC as appropriate.
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- (vi) Accounting and Finance - Study GEEC's existing accounting systems and methods and introduce appropriate changes to meet the needs of a fast-growing modern utility.
- (vii) Tariffs - Review tariff structures and levels and recommend revisions as found desirable.
- (viii) Training - Provide on-the-job training of counterparts and recommend appropriate programs to meet the staffing needs at all levels.

3.03 The Survey will be conducted in two phases:

- (i) Phase 1 (Diagnostic) requiring about 6 months to compile and analyze data (including data on the rural electrification program).
- (ii) Phase 2 (Implementation) requiring about 12 months to develop recommendations and implement appropriate changes within GEEC.

#### IV. SCOPE

4.01 The following sections outline the detailed scope of the Survey in each of the eight areas of interest.

##### Power Sector Policy

4.02 An overall formal Energy Policy for the country is scheduled for preparation by the Government. Since electric power forms an important segment of the total energy sector, it is considered desirable to include in the Survey the preparation of a Power Sector Policy Statement for consideration by the Government.

4.03 The known energy sources, such as oil and gas reserves, potential hydroelectric sites and nuclear fuel deposits, along with those being studied, e.g. the Qattara Depression and the Nile Barrages hydro sites, should be reviewed in discussions with the appropriate agencies. The information thus obtained and the conclusions reached in considering the other objectives mentioned herein should be incorporated in a suggested Power Sector Policy Statement.

4.04 The following matters should be included for consideration in preparing a Power Sector Policy Statement:

- (i) The principal objectives of the Power Sector, e.g. to provide reliable electric power at reasonable cost, to bring electric service to rural communities and to foster industrial growth.
- (ii) The coordination of the power sector with other Government entities which have a close tie with electric power, e.g. the Ministries of Industry, Economy, Finance and the other entities in the energy sector.
- (iii) Allowing the sector and the entities comprising it enough autonomy to control their internal affairs and finances under the Government's

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policy guidelines so that an efficient organization is created which will have the flexibility to face problems and be imaginative enough to find solutions.

- (iv) The authorization of tariffs and tariff adjustments at such levels and with such frequency as to keep the sector viable and to allow financing a reasonable proportion of the needed expansion program to meet the power needs of the nation.

#### Organization and Management

4.05 The review of the institutional framework and organization of the sector should include the following:

- (i) A detailed examination of the organization, functions and responsibilities of each of the entities comprising the power sector, and a critical analysis of its effectiveness and efficiency in carrying out its responsibilities.
- (ii) A detailed review of the manner in which the various entities are interrelated, with special attention to the relation with the Ministry of Electricity and the extent to which each entity has autonomy and control over its internal affairs.
- (iii) An investigation of the institutional framework of the sector with recommendations for changes to improve the effectiveness and flexibility of the sector as a whole and of the individual entities themselves in meeting their prime responsibility of providing the nation with reliable electric power at a reasonable cost.
- (iv) The general efficiency and competence of the staff at all levels and disciplines should be evaluated and a judgement made on whether the entities are overstaffed in any or all departments. Staffing constraints due to unavailability of specific categories of staff or conditions of employment should be identified.

#### Operations

4.06 A review should be made of operating practices, procedures, methods and systems to ascertain whether changes would improve performance and whether in specific instances new systems, equipment or procedures would be justified.

4.07 In particular, the hydraulic, thermal, stability and relaying limitations of the bulk power system should be examined and changes recommended which would achieve better utilization of these facilities.

4.08 A study should be made on a sector-wide basis of the existing information/data collection systems and procedures and the methods of analyzing this information

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for purposes of monitoring system performance and for load forecasting purposes. Recommendations should be made for changes or for the introduction of new methods and systems where advantageous.

4.09 A review should be made of plant operating procedures, maintenance schedules, spare part policies, etc. and appropriate changes should be recommended and implemented as may be required to improve performance.

4.10 The existing office and workshop facilities and current expansion plans should be described with comments on their adequacy. Recommendations for the consolidation, relocation or expansion of facilities should be made where this would lead to better utilization or improved efficiency.

4.11 The vehicle fleets and the workshop facilities for maintaining and operating them should be reviewed. Comments and recommendations should be made for improvements where needed.

4.12 The internal communications system should be reviewed and comments made on its efficiency with recommendation for changes where necessary, integrated with the changes proposed in conjunction with the system control center project.

#### System Planning

4.13 The Consultant will assist GEEC in training and developing its system planning staff, and in establishing sources and procedures for the collection of system planning data on a continuing basis.

4.14 The Consultant will provide the following computer programs for use on an IBM 360/40 computer in Cairo: load flow, short circuit, transient stability, loss of load probability, fuel and production cost, investment and annual costs, electric utility forecast, hydro/thermal dispatch and dynamic system response. IBRD will assist the Consultant in acquiring any programs not available in the Consultant's library so that the Project is assured the full capability of the listed programs.

4.15 In reviewing the power system expansion program, a study of the load forecasting methods and procedures should be made in depth, with emphasis on their effectiveness, validity and reliability, with recommendations for changes or the introduction of new methods and procedures where advantageous. To the extent compatible with known plans, the load forecast should be divided into two periods (a) the short term forecast 1976-1985, which would be expected to be reasonably accurate and reliable enough to form a firm basis for the planning program and (b) the long term forecast 1986-1995, which would be in terms of a percentage annual growth rate and would serve as only a guide for future system planning. In view of the special conditions which the country has experienced during the past several years, the load forecast will need careful study and should include a review of the Government's plans for encouraging industrial development and the rehabilitation of the Suez Canal Zone.

4.16 The review of the power system expansion program should include the following:

- (i) Assist GEEC in reviewing planning guidelines such as forced outage criteria, generation reserve, insulation levels, types of transmission faults, etc.
- (ii) Determine the present policy and operating practices of entities controlling activities affecting power production, e.g. operation of the High Dam for irrigation purposes, and assess the impact on the power sector. Where possible from the data readily available related to these activities, develop recommendations for improved inter-sectoral coordination.
- (iii) Based on the revised capability of the existing facilities in light of the operational findings, the latest load forecast, and the construction program already committed, determine the necessary timing of additional generating capacity.
- (iv) Develop procedures for updating schedules and data related to all potential power sources, to ensure that GEEC has available current project data.
- (v) Update the Government expansion program to develop the least cost alternative for bulk power facilities to 1995 using appropriate shadow pricing (as guided by IRRD) to reflect costs to the economy and sensitivity analyses for the principal factors affecting the recommended program.
- (vi) Coordinate the development of this power expansion program with the ongoing preparation for the "Master Plan for Water Use", since this portion of the Power Survey will constitute an input to the Water Master Plan.

#### Distribution

4.17 An assessment should be made of GEEC's distribution system, including types of equipment, operations, planning procedures, construction and maintenance procedures, distribution losses, service reliability and adequacy of the facilities. Recommendations for changes and improvements are to be prepared and appropriate action implemented including the introduction of equipment, planning procedures and standard designs.

4.18 In connection with the Rural Electrification Program under REA, it is especially important that the technical, financial and economic feasibility and justification of the Program be examined carefully to describe the procedures and methods used, make a critical analysis of these and make recommendations for changes or the introduction of new systems and methods where desirable. The effectiveness and the economic and social benefits derived so far from existing electrified areas and villages should be examined and commented upon. Recommen-

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dations are to be made for a system and method for compiling and analyzing statistical data so that the results being obtained from the ongoing program can be continuously monitored and evaluated. The type of information to be gathered should be given and its purpose explained. The system designs, construction procedures and costs should be examined critically and recommendations made for changes or improvements along with the justification for these, appropriately coordinated with GEEC's distribution practices. A system of priorities for the selection of villages or areas to be electrified should be prepared. The coordination between the REA program and other rural area development programs should be examined and commented upon. The cost, feasibility and justification of the program proposed by the Government should be examined and commented upon with recommendations for changes where considered desirable.

### Accounting and Finance

4.19 A detailed study should be made of GEEC's accounting system, accounting methods, financing sources, financial planning arrangements, management information and customer data file services. The present systems should be analyzed relative to their intended functions and GEEC's future requirements, e.g., facility cost and customer data for system planning purposes.

4.20 Appropriate system changes should be recommended and reviewed with GEEC and an agreed improvement program should be implemented under the Consultant's guidance.

### Tariffs

4.21 A detailed study should be made of the existing electric tariff policies and tariff-setting procedures. The objective should be to formulate a tariff policy and tariff structure to reflect, in so far as possible, the marginal cost of supply. At the same time the financial requirements of the sector should be kept in mind so that a reasonable internal cash generation to meet the cost of system expansion is achieved through the tariffs. The study should include medium and long-term projections of financial performance and external financing requirements. Any requirements for subsidization of specific sectors or segments of the population should be taken into account. A program and procedure for implementation of any changes should be prepared. In making the tariff study the general schedule of changes for service, e.g. connection and disconnection fees, etc., should be reviewed along with the regulations for giving service. The system of metering in general and specifically the metering of demand, off-peak usage, power factor, etc., should be reviewed and recommendations made where necessary for changes to the type of metering or form of billing with a justification for the changes. The procedures for the approval and implementation of periodic tariff adjustments to reflect changes in costs and the revaluation of fixed assets should be given emphasis. The recommended procedure should, in as far as possible, be based on a formula which would be given prior Government approval so that the approval of each tariff adjustment would be prompt and routine.

### Training

4.22 The Consultant's team should provide on-the-job training of their national counterparts. Through periodic missions, an IRRD training adviser will review GEEC's overall training program and prepare related manpower development recommendations assisted by the Consultant's team.

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## V. GENERAL REQUIREMENTS

5.01 The Consultant will be expected to work closely with IBRD as the executing agency for the Survey. Periodic discussions will be held either in Egypt or elsewhere, as required at the request of the Government or IBRD to review progress, solve problems, amend the requirements of the Survey or deal with such other matters pertaining to the Survey which may arise.

5.02 Monthly progress reports should be submitted by the Consultant to GEEC and IBRD by the middle of each month summarizing the Survey progress during the previous month and outlining the work performed (detailed by 8 fields of interest), personnel movement, problems encountered and action taken, forecast and actual accomplishments, special requests or recommendations, and budget status, appropriately illustrated by graphs and photographs. These reports will constitute an important means of monitoring the Survey and therefore at the start of the Survey the Consultant must obtain IBRD's approval of the format he intends using.

5.03 The Consultant should submit a Phase 1 report documenting the data and principal findings of the Survey within six months of the Starting Date. The report will be a diagnostic analysis and therefore the content will be dictated by findings but might include the following:

Power Sector Policy - data on energy supply and demand, energy development programs, energy competition, forecasts, preliminary recommendation on policy.

Organization and Management - background and charts for all sector entities, outline of their functions and responsibilities, detailed analysis of GEEC's management, organization, staffing and training program, preliminary recommendations.

Operations - complete data on existing bulk power system history, facilities, operating practices, system limitations and preliminary recommendations for improvements.

System Planning - explanation of historical planning methods and guidelines, analysis of (planned) system control facilities and planning arrangements, Phase 1 planning training, recommended technical planning guidelines, recommended inter-sector policy guidelines, data on future generation sources, preliminary analysis of expansion program.

Distribution - data on GEEC's distribution system history, facilities, construction and operating practices, losses, service reliability, limitations, preliminary recommendations, data and preliminary critique of REA's program.

Accounting and Finance - description and functional analysis of GEEC's accounting/financial systems and practices and appropriate recommendations.

Tariffs - analysis of electricity tariff history, policy, effectiveness, levels and preliminary recommendations.

Training - a report of training activities by the team and appropriate recommendations by the IBRD training adviser related to GEEC's manpower development program.

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Phase 1 of the Survey is expected to require 6 months, and will emphasize the development of clearly analyzed preliminary recommendations for implementation as part of the main Survey effort. Following completion of Phase 1, these recommendations will be reviewed by GEEC and IBRD with the Consultant and the Survey Terms of Reference and work program will then be appropriately modified to reflect the agreed implementation action. 1/ With the agreement of GEEC and IBRD interim reviews of specific areas of interest and agreement on further work programs may be done without awaiting the completion of the entire Phase 1 activity.

5.05 The Phase 2 (Implementation) part of the Survey is expected to require about 12 months. The emphasis should be on implementing appropriate measures within GEEC in accordance with the implementation plan through advising counterparts, on-the-job training, preparation of instruction guidelines and standard practices, and development of the power system expansion program.

5.06 The overall Survey is action-oriented, and therefore the preparation of comprehensive reports is to be minimized. Summary reports on each area of interest shall be prepared as part of the Phase 1 work (above) summarizing findings and presenting recommendations. At the completion of the Survey, the Consultant will prepare a completion report summarizing the activities undertaken and making recommendations. Where further detailed studies are considered necessary by the Consultant to achieve the longer-range objectives of the Survey, the final report should describe these and give suggested terms of reference, cost estimates and manpower requirements along with a justification for the recommendation. In addition, periodic progress reports will be required (see 5.02).

5.07 The Consultant's reports and all correspondence and other communications shall be in the English language.

5.08 In making the Survey the Consultant will review and make reference to existing reports which have a bearing on the subject at hand. The Consultant's final report should contain a list of the studies referred to and a short brief of the main conclusions and content of each report.

5.09 The Consultant is to work with counterpart staff to be assigned by the Government and will be expected to work in close cooperation with them so that they will at all times be fully informed and participate in carrying out the Survey.

5.10 The Government will provide the following local support for the Survey activities:

- (i) two counterpart professionals for each professional assigned by the Consultant;
- (ii) office space and furnishings for the Consultant's staff and counterparts;
- (iii) administrative, secretarial and clerical staff;
- (iv) drafting, copying, typing, report printing and computer services;
- (v) office and stationery supplies;

1/ Phase 2 implementation program to be agreed by November 30, 1976.

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(vi) transportation services within Egypt and accommodation for field missions.

5.11 The Consultant will be responsible for making arrangements for living accommodation, education facilities and medical services for its personnel in Egypt.

5.12 In accordance with the Basic Agreement between Egypt and the UNDP covering UNDP-financed projects, the Consultant and its expatriate personnel will be exempt from local taxes on any payments made to them in connection with the execution of the Survey.

**VI. WORK PROGRAM**

6.01 It is estimated that the Survey will require the following professional personnel and associated staff time.

	<u>Estimated Man-months</u>	<u>Related Activity</u>
Team Leader (Utility Management Specialist)	18	All
Energy Economist and Tariff Specialist	18	1,3,4,6 & 7
System Operating Engineer	18	1,2,3,4,5 & 8
System Planning Engineer	18	1,2,3,4,5,6 & 8
Distribution Planning Engineer	18	2,3,4,5,6 & 8
Financial Analyst	18	6,7 & 8
Generation Maintenance Specialist	<u>12</u>	3 & 8
<b>Total</b>	<b>120</b>	

**Assignments**

- |                                |                           |
|--------------------------------|---------------------------|
| 1. Power sector policy         | 5. Distribution           |
| 2. Organization and management | 6. Accounting and finance |
| 3. Operations                  | 7. Tariffs                |
| 4. System planning             | 8. Training               |

6.02 It is estimated that the selection of the Consultant will be made to permit the fielding of the Study team in April 1976 and the official Starting Date would be considered to be April 1, 1976. The target report dates would then be:

Monthly Reports - middle of month for previous month

Phase 1 Report - October 1976

Phase 2 (Final) Report - October 1977

NRD  
February 18, 1976

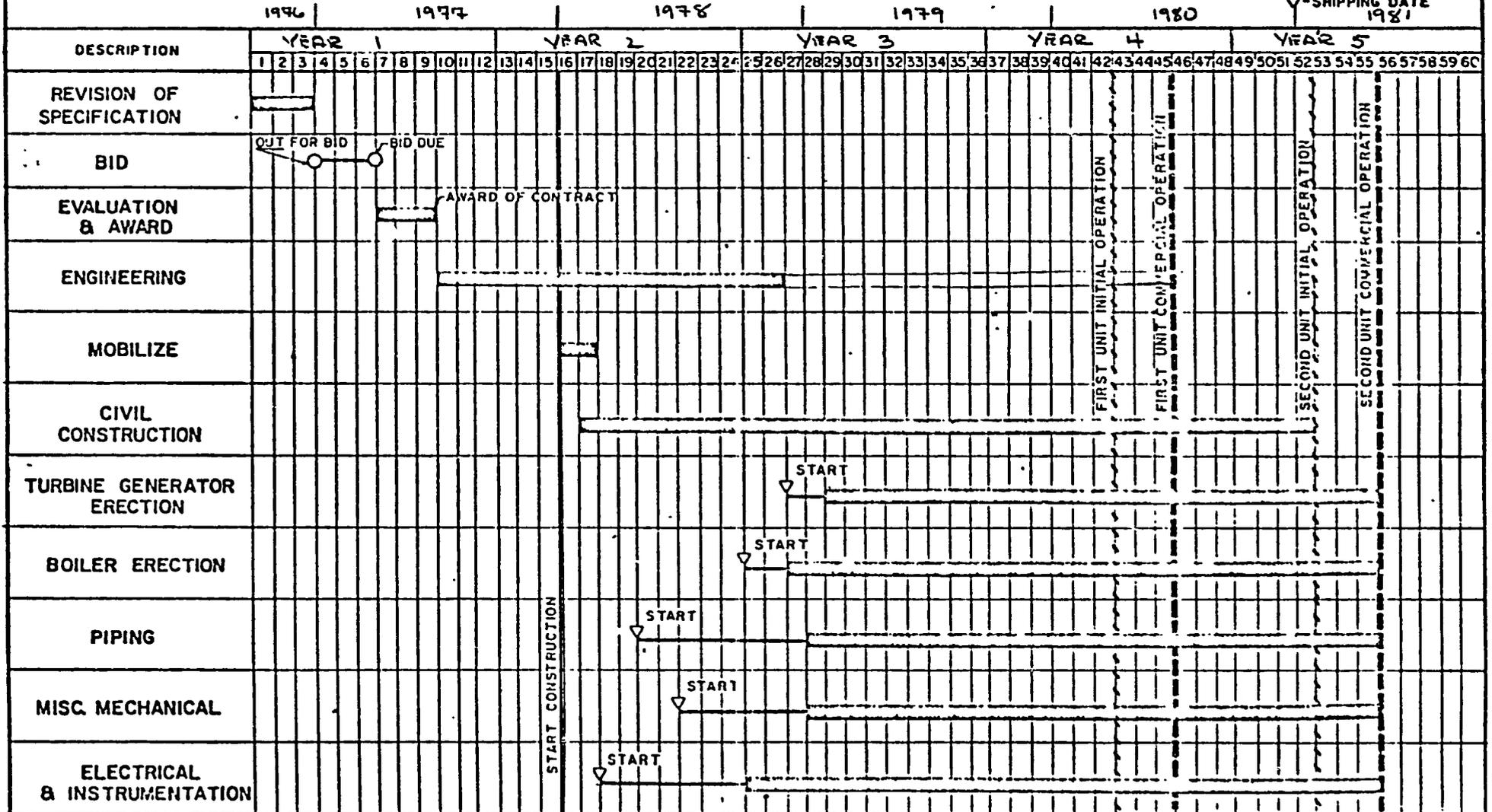
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# ISMAILIA THERMAL POWER PLANT

LEGEND

▽ SHIPPING DATE 1981



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