UNCLASSIFIED

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY

AGENCY FOR INTERNATIONAL DEVELOPMENT

CAIRO, EGYPT

PROJECT PAPER

PROJECT NO. 263-0196

JULY, 1986

EGYPT: TALKHA COMBINED-CYCLE ADDITION

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number: — DOCUMENT CODE: 3

2. COUNTRY/ENTITY: EG,PT

3. PROJECT NUMBER: 263-0196

4. BUREAU/OFFICE: ANE / 03

5. PROJECT TITLE (maximum 40 characters): TALKHA COMBINED-CYCLE ADDITION

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 08 DD 31 YY 89

7. ESTIMATED DATE OF OBLIGATION (Under "B." below, enter 1, 2, 3, or 4): A. Initial FY 86 B. Quarter 3 C. Final FY 86

8. COSTS ($000 OR EQUIVALENT $1 = 1.35)

A. FUNDING SOURCE	FIRST FY 86 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	65,000		65,000	65,000		65,000
(Grant)	(65,000)	( )	(65,000)	(65,000)	( )	(65,000)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country		15,000	15,000		15,000	15,000
Other Donor(s)						
TOTALS	65,000	15,000	80,000	65,000	15,000	80,000

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	C. PRIMARY TECH. CODE 2. Loan	D. OBLIGATIONS TO DATE 1. Grant	D. OBLIGATIONS TO DATE 2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	E. AMOUNT APPROVED THIS ACTION 2. Loan	F. LIFE OF PROJECT 1. Grant	F. LIFE OF PROJECT 2. Loan
(1) ESF	744	825		0	0	65,000	-	65,000	-
(2)									
(3)									
(4)									
TOTALS				0	0	65,000	-	65,000	-

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code						
B. Amount						

13. PROJECT PURPOSE (maximum 480 characters)

TO INCREASE THE EFFICIENCY OF THE EGYPTIAN ELECTRICITY AUTHORITY'S EXISTING GAS TURBINE GENERATING FACILITIES BY RECYCLING OTHERWISE WASTED THERMAL ENERGY.

14. SCHEDULED EVALUATIONS: Interim MM YY MM YY; Final MM YY

15. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [ ] 941 [ ] Local [ ] Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment)

USAID/EGYPT CONTROLLER CONCURS WITH THE PROPOSED METHODS OF IMPLEMENTATION AND FINANCING.

17. APPROVED BY — Signature: Frank B. Kimball — Title: — Date Signed: MM 7 DD 31 YY 86

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

AID 1350-4 (8-79)

EGYPT - TALKHA COMBINED-CYCLE ADDITION

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REFERENCES

1. AID Project Paper, "Egypt: Helwan and Talkha Gas Turbine Plants", Project No. 263-0008 dated May 1976.

2. AID Project Paper, "Egypt: Helwan and Talkha Gas Turbine Plants, Amendment I", Project No. 263-0008 dated September 1977.

3. EEA Report, "Appraisal of Converting Open-Cycle to Combined-Cycle with Special Interest to Talkha Gas - Turbine Plant" dated January 1981.

4. Ebasco Services Incorporated Report, "Talkha Generating Station Combined-Cycle Conversion Study" dated April 1985.

5. Annual Report of Electric Statistics - 1984, Egyptian Electricity Authority.

6. EGPC Annual Reports for 1983 and 1984, the Egyptian General Petroleum Corporation.

GLOSSARY OF ABREVIATIONS

AID	Agency for International Development
bbl	Barrel
b/d	Barrels per day
Btu	British Thermal Unit
C	Centigrade
CT	Combustion Turbine
Ebasco	Ebasco Services, Incorporated
EEA	Egyptian Electricity Authority
EGPC	Egyptian General Petroleum Co.
F	Fahrenheit
GAI	Gilbert Associates, Inc.
GE	General Electric Company
GOE	Government of the Arab Republic of Egypt
HRSG	Heat Recovery Steam Generator
Kcal	Kilocalories
Kg	Kilogram
Kv	Kilo volt
lb.	Pound
MSCM	Million Standard Cubic Meters
MEE	Ministry of Electricity and Energy
MW	Megawatt
NECC	National Energy Control Center
Psi	Pounds per Square Inch
rpm	Revolutions per minute
ST	Steam Turbine
UPS	Unified Power System
USAID	United States Agency for International Development

CONVERSION FACTORS

Power:

1 Kilowatt (kW) = 1,000 watts
1 Megawatt (MW) = 1,000 Kilowatts

Energy:

1 Kilowatthour (kwh) = 1,000 watthours
1 Megawatthour (mwh) = 1,000 Kilowatthours
1 Kilowatthour (kwh) = 3412 Btu
1 Kilowatthour (kwh) = 859.845 Kilocalories
1 Kilocalorie (kcal) = 3.968 Btus

Pressure:

1 Kg/cm^2 = 14.2 $pounds/in^2$ (psi)

Weight:

1 Kilogram (Kg) = 2.2 pounds (lbs)
1 Metric Ton (Tonne) = 1000 Kg

Length:

1 Meter (m) = 3.28 Feet (ft)
1 Centimeter (cm) = 0.3937 inches

Area:

1 Hectare = 2.47 acres
1 square kilometer = 0.386 square miles

Temperature:

1 degree centigrade = 0.555 (degree Fahrenheit - 32)

Volume:

1 barrel (bbl) = 42 gallons

EGYPT - TALKHA COMBINED-CYCLE ADDITION

SUMMARY AND RECOMMENDATIONS

1. Grantee: The Arab Republic of Egypt. The Grant application is attached as Annex A.

2. Grant Amount: U.S. $65 million

3. Implementating Agency: The Egyptian Electricity Authority (EEA), a separate entity within the Ministry of Electricity and Energy (MEE).

4. Terms to the Implementation Agency: A loan to the Egyptian Electricity Authority on terms satisfactory to AID.

5. Project Purpose: To increase the efficiency of the Egyptian Electricity Authority's existing gas turbine generating facilities by recycling otherwise wasted heat energy.

6. Project Description: Design, manufacture, installation and testing of Heat Recovery Steam Generators, Steam Turbine Generators and their auxiliaries, rehabilitation of gas turbines and training of personnel, and for necessary technical assistance and consultant engineering services.

7. Total Project Cost: Total Project Cost, both foreign exchange and local currency equivalent is $80 million. AID will finance foreign exchange costs up to $65 million under this authorization.

8. Environmental Considerations: The environmental impact of the combined-cycle addition on the air and water quality have been addressed and satisfactory mitigative actions have been included in the project.

9. Source of U.S. Funds: Fiscal Year 1986 Economic Support Funds.

10. Statutory Requirements: All statutory criteria have been satisfied; see Annex E.

11. Project Committee Recommendation: That the Mission Director approve waivers of AID competitive procurement procedures to permit EEA to negotiate contracts with Gilbert Associates, Inc. for consultant services and General Electric Co. for the design, supply and installation of equipment, startup services, tuning and spare parts and authorize a Grant of $65 million in accordance with the terms and conditions set forth in draft Grant Authorization which is appended hereto as Annex B.

12. Project Committee:

Project Chairman:	John P. Hunt
Project Committee:	Tim Hammann, DR/ID
	Thomas Johnstone, FM/FA
	Elaine Kelly, IS/CMT
	Adele Abadir, HRDC/TNG
	Kevin O'Donnell, LEG
	Charles Richter, DPPE/PAAD
	Mona El Shaffei, DPPE/PO
	John Starnes, DR/UAD

I. INTRODUCTION

1.01 During 1976 and 1977 AID authorized two loans to the Government of Egypt (GOE) totaling $69 million to assist in financing the foreign exchange costs for engineering and construction of two gas turbine generating plants. One of these plants was located in the Al Dakahliya Governorate near the city of Talkha adjoining the existing Talkha thermal power station. The Talkha gas turbine plant consists of eight 24MW single cycle packaged gas turbines which operate on natural gas supplied from the Abu Madi gas field and delivered to the site by pipe line. The backup fuel is Solar, a distillate fuel similar to No. 2 oil (Kerosene) delivered to the site by either railroad tank car or by highway tractor-tanker. In arranging the plant on the Talkha site, provisions were made for the future addition of a steam cycle, i.e. heat recovery steam generators (HRSG's), steam turbine generators and auxiliary equipment, to form a combined-cycle plant.

1.02 In August 1979, EEA requested that additional funds be provided for the steam cycle addition which would add more than 90MW of additional generating capacity. Due to conditions prevailing at that time including other financial commitments and lack of studies which examined the benefits of the proposed addition, USAID deferred action on the request.

1.03 The Talkha gas turbine plant was placed in operation in late 1979 and has generated more than one billion kilowatt hours of energy each year since 1980. The performance of the plant is summarized in Annex F.

1.04 In 1981, EEA completed a preliminary study of the economics of combined-cycle versus a single cycle operation of the Talkha plant. This preliminary study demonstrated that substantial fuel savings could result from the addition of a steam cycle to the Talkha gas turbine plant as compared to the operation of an equivalent size gas fired steam cycle power plant.

1.05 In 1982, the combined-cycle addition to the Talkha gas turbine plant was incorporated in the GOE's Five Year Development Plan and accorded a priority second only to Abu Sultan Unit 4 in 1983 and Shoubrah El Kheima Unit 4 in 1984. With financing of both add-on units assured, EEA then turned their attention to securing financing and implementating the Talkha combined-cycle addition at the earliest possible time.

1.06 In early 1984, AID/W waived the requirement for a Project Identification Document (PID) and agreed to finance a detailed study to examine the technical, environmental, financial and economic feasibility of adding a steam cycle to the existing gas turbine plant at Talkha (84 STATE 175473). The study was completed by Ebasco Services, Inc. (Ebasco) in April 1985. The Ebasco study report concluded that the proposed project is entirely feasible and that "the combined-cycle installation should be implemented based on its positive energy conservation contribution supported technically and economically by the results of this feasibility study".

1.07 In August 1985 the GOE formally requested assistance to finance the foreign exchange cost for the addition of equipment at Talkha to modify the existing Gas Turbine plant for combined-cycle operation (Annex A).

II. PROJECT RATIONALE

2.01 Energy resources have been an important domestic source of Egypt's economic growth. Beginning in the early 1970's substantially increased supplies of energy resources became available and Egypt's economy entered a new and dramatic growth period. The initiation of this period was marked by the completion of the Aswan High Dam and the development of its hydroelectric potential and the recovery by Egypt of its Gulf of Suez oil fields as a part of the peace settlement with Israel.

2.02 The increased supplies of energy have directly contributed to the significant increases in industrial output experienced since 1976 and indirectly to the increased amounts of foreign exchange made available to Egypt. In an effort to sustain and accelerate the rate of economic growth, Egypt has promoted faster development of its petroleum and natural gas resources. Since 1973: Egypt has entered into more than 100 oil concession agreements covering an area in excess of 750,000 square kilometers; crude oil production has been increased sharply to meet the growing domestic and export needs; major infrastructure investments have been made to support increased levels of transport, refining and processing of crude oil; and major natural gas reserves have been identified, as a by-product of the petroleum exploration process, and are being utilized as a more efficient source of domestic energy. (See Annex G for a more complete discussion).

2.03 A major source of Egypt's domestic energy is its electric power supply system. The continuing development of Egypt's electric power system represents a critical element of the US assistance program in support of Egypt's efforts to maintain political and economic stabilities. A strong and reliable power supply system is considered a vital infrastructure component and the driving force for sustaining Egypt's economic development and for creating a stable society capable of providing basic human support services to the country's large and growing population. Without sufficient electric power, Egypt's struggling development effort could seriously lag or even suffer economic reversals.

2.04 Egypt has installed 145 generating units composed of hydro, steam turbine and gas turbine plants located from Aswan to the Mediterranean sea, along and near the Nile river and near the Suez canal. The EEA system generating capacity in 1985 was 8,330 MW. Of this 4,095 MW are steam electric plants, 1,589 MW gas turbines, and 2,647 MW hydro (Annex H). The fuel mix of the non-hydro generation is 62 percent oil (51 percent mazout, 7 percent solar and 1 percent naptha), and 38 percent natural gas and less than 1 percent coal (Annex H).

2.05 Egypt is acutely aware that the oil reserves, which have been one of the main sources of economic growth over the past 10-15 years, are being depleted at a frightening rate and that gas reserves are not being developed to meet the needs of Egypt. Even at the current reduced rate of oil production, it is estimated that existing oil reserves will be completely depleted within the next 18 to 19 years (see Annex G). In addition, Egypt's foreign exchange earnings are decreasing due to curtailed worker remittances, reduced revenues from oil exports caused by lower oil prices, and reduced revenues from [illegible] Canal tolls. As a result, the GOE is considering ways to expeditiously implement projects which will enhance foreign exchange income and/or savings.

2.06 Projects which can offer opportunities for significantly improving the efficiency of the existing power generating facilities would clearly support such objectives. The existing generating facilities currently consume about 35 percent of the petroleum and about 50 percent of the natural gas produced domestically (Annex G).

2.07 While Egypt is trying to find ways to conserve its domestic energy resources it is also faced with the need to meet the country's expanding power requirements. Less than 80 percent of the system's total rated name-plate generating capacity is available to meet demand requirements (Annex H). Because of the need to use the plants to meet customer demand, EEA has not been able to carry out planned maintenance of generating units. Because of shortages of foreign exchange needed to purchase replacement parts, plant reliability and output have also suffered. As a result, EEA has in the past and will in the future frequently interrupt service to customers when demand exceeds EEA's ability to supply. In the past these interruptions have often resulted in as much as 400-500 MW of electric demand being systematically shed from the system to avoid overloading of the generating units resulting in the breakup of the EEA system and a system-wide blackout.

2.08 In an effort to help Egypt to deal effectively with this energy problem the proposed project will finance the addition of equipment at the Talkha gas turbine plant to permit operation as a combined-cycle plant and thereby produce an additional 830,000 MWh of energy per year with no additional fuel consumption and could result in a fuel savings in excess of 1.8 million barrels per year equivalent to $ 18 million per year (assuming a price per barrel of $ 10). The combined-cycle addition to Talkha is now a top priority project of the GOE, and is contained in the GOE's Five Year Development Plan. Given the urgent need to conserve petroleum fuel, increase foreign exchange and, at the same time, increase the country's power generation capacity, the GOE

believes it is essential to implement this project immediately. For similar reasons and because USAID has, for some time now, been trying to encourage the GOE to initiate actions necessary to increase foreign exchange earnings/savings, the proposed project is now considered a high priority activity within USAID and represents the only new USAID power project for FY 86. By recycling energy that is otherwise lost, the proposed project increases the efficiency of existing thermal generating facilities and therefore complements our efforts to assist Egypt to conserve its natural energy resources.

III. PROJECT DESCRIPTION

A. Purpose

3.01 The purpose of the project is to increase the efficiency of the Egyptian Electricity Authority's existing gas turbine generating facilities by recycling otherwise wasted thermal energy.

B. Project Description

3.02 The project consists of engineering and construction of a nominal 110MW thermal cycle addition to the existing 192MW gas turbine plant at Talkha and the upgrading of the present eight (8) gas turbines. The thermal cycle addition will include individual Heat Recovery Steam Generator (HRSG) for each gas turbine, two steam turbine generators each capable of producing 55MW under normal operating conditions, together with the necessary auxiliary equipment and controls.

3.03 The proposed AID Grant assistance will finance:

a. The foreign exchange costs for consultant engineering services for the combined-cycle Addition;

b. The foreign exchange costs for the design, engineering, equipment, construction and related start-up services for the combined-cycle addition, and

c. The foreign exchange cost for the upgrading of the eight gas turbines to obtain optimum performance.

3.04 The Heat Recovery Steam Generators will utilize thermal energy in the form of exhaust gases, being discharged from the gas turbines, to convert water into steam which will drive the steam turbine generators to produce an additional 106MW of electric energy when the eight gas turbines are generating at full output.

3.05 The performance of the gas turbines will be upgraded with replacement of hot gas path components with components that will provide a five percent increase in output and a three percent improvement in heat rate.

C. Project Cost Estimate

3.06 A preliminary project cost estimate was prepared by Ebasco Services, Incorporated as a part of the feasibility study for the combined-cycle addition. Since this preliminary estimate was limited to the combined-cycle addition and did not include the modifications to the gas turbines, EEA provided additional information to allow USAID to develop a project cost estimate which includes the upgrading of the existing eight gas turbines (Annex I).

3.07 The project cost estimate is summarized in Table III-1

TABLE III-1

SUMMARY OF COST ESTIMATES
(U.S. $ and LE - Thousands)

	FOREIGN	LOCAL
Consultant Services	$ 2,500	LE 700
Turnkey Contractor	$48,300	LE 13,300
Contingency	$14,200	LE 6,000
Total Project Cost	$65,000	LE 20,000

D. Project Design

A logical framework showing the Project design is included in Annex J.

E. Section 611(a) Requirements

3.08 It is the conclusion of the Project Committee that the requirements of Section 611(a) of the Foreign Assistance Act of 1961, as amended, have been satisfied. The project is based upon sound engineering analysis performed initially by Ebasco and reviewed by Gilbert Associate, Inc. The Mission has reviewed the plans and finds them to be acceptable and has reviewed the cost estimate and finds them reasonably firm within the meaning of the statutory requirements.

IV. PROJECT IMPLEMENTATION AND PROCUREMENT

A. Implementing Agency

4.01 EEA will have prime responsibility for the overall construction, operation and management of the project and for providing direction to the engineering consultant and turnkey contractor.

B. Project Procurement Plan

4.02 The proposed project will follow the procurement plan approved in principle by the USAID Mission Director on December 17, 1985 (Annex K). This plan includes the use of a "Turnkey" contracting approach and provides for the negotiation, on a non-competitive basis, of two major contracts:

(a) a contract with Gilbert Associates Inc. for providing conceptual design parameters, detailed cost estimate, assisting EEA to negotiate, administer, monitor and supervise testing of the complete plant.

(b) a contract with General Electric Company for detailed design, supply and installation of equipment, testing and startup of the completed plant (i.e. "turnkey" contracting).

4.03 A detailed discussion of the analysis and justification for the project procurement plan is included in Annex K. The necessary waivers of competition for the two contracts mentioned above are included within the Project Authorization.

4.04 The procurement plan was based in part on the urgent need of GOE to substantial taking action to achieve foreign exchange savings that would result from the displacement of oil at a time when the market price of crude oil was $25.40 per barrel. The recent drop in crude oil prices, while reducing the foreign exchange savings, will however still provide Egypt with substantial foreign exchange and does not materially effect the original decision to expedite the construction of the combined-cycle addition.

C. Contracting Procedure

4.05 USAID has had extensive prior experience with EEA's contracting capabilities and has found them to be effective and satisfactory even if at times they appear cumbersome and time consuming. Due to the urgency to realize the economic benefits of the combined-cycle addition, EEA will intensively negotiate both the consultant services and turnkey equipment supply/installation contracts. EEA will utilize Host Country contracts with U.S. dollar payment through Direct Letters of Commitment,

4.06 EEA will negotiate with GAI a contract to provide engineering review, contract administration and construction supervision services for the combined-cycle addition. USAID will review the contract to assure compliance with AID regulations and the reasonableness of the contract cost.

4.07 EEA, assisted by GAI, will negotiate a turnkey (single responsibility) contract with GE.

D. AID Componentry Requirements

4.08 All commodities procured under the project will comply with the standard AID componentry rules. i.e. each "commodity" must - to qualify for AID funding - contain at least 50 percent (on a cost basis) U.S. sources/origin components. To satisfy AID's componentry rules it is anticipated that the turnkey contract will identify the major items of equipment and services, i.e. turbine generators, heat recovery steam generators, pumps, instrumentation and controls, civil/structural/architectural work, mechanical/electrical installation, etc. The contract will have an appendix, listing the commodities and assigned a fair value (from the total contract lump sum) to each. The contract shall state that AID's componentry rules will apply separately to each item of major equipment or services.

E. Implementation Schedule

4.09 By July 30, 1986 the project is expected to be authorized by USAID.

4.10 By August 30, 1986, the Project Grant Agreement should be executed by representitives of the government of the United States and the Arab Republic of Egypt.

4.11 EEA is currently negotiating a contract with Gilbert Associates to provide the consultant/engineering services needed under the project. This contract is expected to be executed in September 1986.

4.12 EEA is also negotiating a contract with General Electric Company to design, supply and install, and test and startup the combined-cycle plant. Execution of this contract is expected in September 1986.

4.13 By November 30, 1986 all Requirements Precedent to Disbursement contained in the Grant Agreement should be satisfied and a Direct Letter of Commitment would be issued to the turnkey contractor.

4.14 By November 30, 1988 it is anticipated that initial start-up and commercial operation of the two combined-cycle units will have been completed and EEA will have provided provisional acceptance of the combined-cycle addition.

4.15 Final acceptance of the two combined-cycle units is expected to occur by August 31, 1989 when all goods and services would have been provided.

4.16 By August 31, 1989 final payment would be made to the turnkey contractor.

F. AID Financing Procedures

4.17 The U.S. dollar costs for procurements of services and materials financed by this Grant will be financed by Direct Letters of Commitment (L/Comms). Upon receipt of an executed contract, acceptable to AID, and a request from EEA to issue a Letter of Commitment, AID will issue Direct L/Comms to the supplier. EEA will issue appropriate Egyptian Pound Letters of Credit.

G. Terminal Dates

4.18 Requirements Precedent. The terminal date for meeting the Requirements Precedent to the Disbursement for the funds provided by this agreement will be 90 days from the signing of the agreement.

4.19 Project Assistance Completion Date. The project assistance completion date will be August 31, 1989.

4.20 Terminal Disbursement Date. The terminal disbursement date will be May 31, 1990, nine months after completion of all services to allow for final payments.

H. Monitoring and Evaluation

4.21 Throughout the life of the project, the U.S. consultant will monitor the project, bringing all the routine problems, together with recommended solutions, to the attention of EEA and USAID in the form of monthly progress reports. The contractor will submit monthly and quarterly progress reports stating progress conformance with the project schedule. Upon the commencement of site construction, frequent progress review sessions will be held with GAI, GE, EEA and, as appropriate, USAID staff to closely monitor project progress. More serious problems, those requiring immediate action, will be monitored by members of the USAID/Cairo Project Committee through frequent and timely periodic visits to the project site and meetings with EEA principals and site personnel.

4.22 It is anticipated that all project evaluation activities will be carried out as an integral and regular part of the Mission's ongoing monitoring and management activities described above. Project implementation will follow normally accepted management and evaluation practices currently being used worldwide for engineering and construction projects of a similar nature and size. Execution of these procedures should adequately assure an early identification of implementation problems and timely management actions to make necessary design changes and achieve the project purpose. No special evaluations or studies requiring the use of project funds are comtemplated at this time.

4.23 The consultant and contractor progress reports, discussed above, should provide useful information on the provision of inputs and outputs and for measuring purpose and goal level achievement. In addition, the progress review meetings should permit EEA to carefully examine contractor progress and compare actual progress against anticipated progress. In this manner, any stoppages or delays from the planned schedule should be quickly identified, possible impacts discussed and solution approaches explored. At least once every six months it is expected that senior level officials from EEA, the consultant and contractor firms and USAID will meet to review overall progress and discuss major implementation problems.

I. Audit

4.24 Funds in the amount of $100,000 have been provided for an external audit of cost reimbursable Host Country contracts if needed.

V. TECHNICAL ANALYSIS

A. General:

5.01 The recommended project design represents the culmination of many years of review and consideration of the various technical issues associated with the possible combined-cycle addition activity at Talkha. The use of thermal heat energy being exhausted from the gas turbines to produce additional electric energy utilizing the basic combined-cycle concept has long been recognized as the most efficient thermal power generating technology available. For this reason the Talkha gas turbine plant was originally designed and constructed to allow for an eventual combined-cycle expansion.

5.02 Since 1979 EEA has been closely examining the merits of various design alternatives. Alternative designs considered included: utilization of the steam produced to supply existing steam turbines; various combinations of HRSG's to gas turbines; and the benefits of gas turbine upgrading. In addition, an important output of the AID financed project feasibility study completed by Ebasco services in April 1985 (a copy of the study report is available in the DR/ID files) was to help identify the most appropriate and efficient plant design.

B. Major Findings:

5.03 Using the available analysis and study information, EEA and their engineering consultant, Gilbert, recommended a plant configuration which has been reviewed and approved by USAID's Power Systems Group for purposes of preparing a draft contract to be used for negotiation with the turnkey contractor.

5.04 This configuration is based on one heat recovery steam generator (HRSG) installed at grade near each of the eight gas turbines. The steam from individual groups of four HRSG's will be piped through a steam header to their respective steam turbine-generators (a more complete discussion of the proposed combined-cycle plant is included in Annexes L and M). In addition, it was recommended to include in the project an upgrading of the gas turbine hot gas path to obtain additional gas turbine output, efficiency and increased steam production in the HRSG's.

5.05 The recommended plant configuration was selected because:

(a) It provides the maximum waste heat recovery generation of 106 MW (gross) at the lowest possible capital cost;

(b) It provides the shortest run to the existing cooling water canal and close proximity to the spare bay in the 220 kV substation switch yard;

(c) It utilizes existing paved roads with no extension;

(d) It will be constructed on a site which is clear of obstructions and requires no relocation of existing facilities that have to be maintained;

(e) It provides for maximum accessibility for maintenance for the gas turbines.

(f) It ensures the minimum interference with the operation of the gas turbines during the construction of the waste heat boilers.

(g) It provides a plant which will have no adverse environmental impact.

C. Conclusion:

5.06 The combined-cycle technology is a proven technology which has been widely and successfully used in the electric utility industry for over 20 years.. The design for the proposed project builds on this experience and is consistent with the general body of knowledge on combined-cycle technologies. Given the many years of EEA operating experience with a wide variety of generating plant facilities, USAID believes that the GOE implementing agency will require only minimal additional personnel and training to effectively operate and maintain the proposed combined-cycle plant. Accordingly, the proposed project design is determined to be technically appropriate and cost effective.

VI. ECONOMIC ANALYSIS

A. Basic Assumptions:

6.01 The Talkha combined-cycle addition project is an energy conservation project. By utilizing the thermal energy in the exhaust gases at the existing Talkha plant to produce steam for generating electrical energy, the project will result in decreased fuel consumption of petroleum products which would otherwise be needed if the project is not implemented.

6.02 The major benefits of the project are derived from the savings in fuel and O & M costs. These savings consist of the economic value of fuel (oil or its equivalent) not used for electrical generation but which can be considered available for other uses or export plus the difference in other elements of the cost of operation saved as a result of reduced operation at other plants. There are no savings in operating personnel costs at the other plants but there are savings in maintenance and other elements of the operating costs.

6.03 The capital costs are to be incurred over the first two years of the project after which the life of plant is estimated to be approximately 25 years.

6.04 The amount of generation from any one plant on EEA's system is controlled by EEA's National Energy Control Center (NECC). The NECC determines automatically and instantaneously the optimum generation to meet customer requirements and allocates the generation between the generating units to achieve the most economical operation of the EEA system. In meeting load requirements, those generating units having the lowest production costs are loaded first (base load) followed by load assignments at the individual plants in the order of ascending production costs with those units having the highest production cost being utilized for the minimum period of time to meet the requirements of the daily load curve which has a peak demand in the early evening. EEA's system daily load factor (the average demand divided by the peak demand) averages about 65 percent. Thus it is reasonable to assume that EEA will utilize plants with the lowest production costs for meeting its base load and utilize those plants having the highest production cost for peaking service only. Because of its low operating cost, the Talkha combined-cycle plant will be operated as a base load plant under EEA's operating scheme to meet the load that will exist when the project is complete with a saving in fuel.

6.05 To identify fuel savings resulting from the operation of the combined-cycle addition, EEA simulated the energy supply to their system for 1989 based on anticipated system load conditions predicted to exist at that time using plants that will be available at that time. The simulation was based on economic dispatch including operating and security constraints for the system with and without the Talkha addition. The study demonstrated that the 830,000 MWH expected to be produced by the Talkha plant will offset an equivalent amount of energy produced by various other facilities. There will be reduced operation of various steam turbine plants which use mazout oil or natural gas as fuel 362,000 MWH from thermal plants and 468,000 MWH from gas turbine plants. Based on the estimated characteristics of individual generating units and considering that if gas were not used it would be replaced by oil, the total conservative energy displacement is estimated at the equivalent of 1,868,800 barrels of oil per year if the load forecast for 1989 is to be reached and maintained.

B. Project Data:

6.06 The project is assumed to add 110,000 KW of generating capacity which will result in an energy output of 830,000 MWH per annum when operated as a base load plant. Construction time is estimated at two years while the life of plant is approximately 25 years. The costs associated with the project are estimated as:

Capital Costs: $65 million of which 75 percent will be spent the first year and the remaining 25 percent in the second. In addition, there will be a capital cost of LE 20 million with 30 percent being incurred in the first year and 70 percent in the second. For purposes of economic analysis, the shadow exchange rate is estimated at LE 1.90 = $1.00.

Operation and Maintenace Costs: O & M costs are divided into fixed costs of LE 2.7 per KW per year and variable costs of LE 6 per MWH (excluding fuel cost). The fixed costs are primarily labor costs while the variable costs are principally for lubricants, chemicals and replacement parts. It is assumed that these products are either imported by EEA at the official exchange rate of LE 0.83 = $1.00 or that those which are produced domestically have lower market prices than shadow prices such that their shadow ratios are similar to those used to convert the official exchange rate to the shadow exchange rate (2.29).

6.07 Savings in the amount of fuel not used and thus freed for export and in operation and maintenance costs are assumed to commence after completion of the project. The maximum amount of fuel displacement possible is estimated at the equivalent of 2,336,000 barrels of petroleum per year. In order to ensure that the economic analysis is not based upon overly optimistic figures, actual fuel displacement is assumed to be 80 percent of the maximum possible which is equivalent to the amount derived by EEA using the NECC computer dispatch program which maintains service to the load predicted to be on EEA's system when the project becomes operational. O & M cost savings (exclusive of fuel savings) for reduced use of other plants are estimated at LE 10 per MWH. This savings primarily results from the variable component of the O & M costs. Petroleum prices are assumed to remain constant at $10 per barrel.

C. Economic Rate of Return:

6.08 To determine the economic rate of return (ERR) the streams of costs and benefits are derived as depicted in Table VI-1. All data in the table are expressed in constant 1986 dollars with the figures representing economic, not financial, costs and benefits. In contrast to the financial analysis, the economic analysis values petroleum at its export value instead of at its lower internal price paid by EEA for its fuel. Also the price used to convert pounds into dollars is based on the free market exchange rate rather than on one of the officially established rates. It is assumed that the free market rate represents the closest approximation to the economic (or shadow) price of foreign exchange. O & M costs are expressed in dollars and, where necessary, a shadow ratio of 2.29 is applied to domestically produced inputs.

6.09 Upon analyzing the benefits and costs presented in Table VI-1, it is found that the economic rate of return (ERR) is 25.1 percent. The results were subjected to sensitivity analysis. Cost increases (of both capital and O & M costs) of 20 percent, would lower the ERR by 21 percent to 20.7 percent. An increase in the price of petroleum to $15 barrel (50 percent increase) commencing in the year the project is completed would raise the ERR by 36 percent to 34.1 percent at the estimated project costs. If all costs are 20 percent higher than estimated and fuel costs are increased 50 percent, the ERR would increase to 28.1 percent (12 percent higher).

TABLE VI-1

ESTIMATION OF COSTS AND BENEFITS
(in Millions of Dollars)

Period	Benefits	Costs
0	-	51.91
1	-	23.62
2	28.69	6.16
3	28.69	6.16
4	28.69	6.16
5	28.69	6.16
6	28.69	6.16
7	28.69	6.16
8	28.69	6.16
9	28.69	6.16
10	28.69	6.16
11	28.69	6.16
12	28.69	6.16
13	28.69	6.16
14	28.69	6.16
15	28.69	6.16
16	28.69	6.16
17	28.69	6.16
18	28.69	6.16
19	28.69	6.16
20	28.69	6.16
21	28.69	6.16
22	28.69	6.16
23	28.69	6.16
24	28.69	6.16
25	28.69	6.16
26	28.69	6.16
27	28.69	6.16

D. Least Cost Alternative:

6.10 Once the Talkha combined-cycle addition is completed, placed in operation and connected into the Egyptian Unified Power System, the added capacity will be operated as a substitute for other generation more costly to operate. At the same time, it must be recognized that new load is continuously added to the grid and that all generating units, including this addition, may contribute to serving that load. EEA's fuel savings calculation were based on this condition (see para 6.05 page 24). Accordingly, an examination of the economic and financial feasibility of the project under the condition that the capacity is being installed only to meet anticipated load growth indicated that the project would be economically viable. This finding is based on the theory that the alternative with the least present worth of costs to meet a predicted electrical load is economically viable. In this case, the alternatives considered should provide the same firm capacity and energy over the same time period without endangering economic growth. The alternatives which might be considered in this case are:

- Hydro electric sources. None are available for the time period that would be considered.

- Interconnections with adjacent countries. None are planned or practical.

- Gas or Oil fired Steam Plant. Such a plant could be constructed and placed in service in less than 36 months if contracts are negotiated and the addition constructed at a developed site utilizing an existing design such as was done for Unit 4 at the Ismailia Power Plant. This type of capacity addition would require 12 months longer than the proposed project with a capital expenditure comparable to the steam cycle addition at Talkha and would consume substantial quantities of fuel.

- Gas turbine units. Such an addition could be completed in less than 24 months. However, even if natural gas supplies were available, Egypt's limited supply of gas could be better utilized in existing steam power stations. This type plant would provide a lower capital cost than the proposed project but would consume a substantial quantity of fuel.

- Diesel units. A bank of low speed diesel engine driven generators could be built in less than 24 months. This type plant would provide the highest capital cost addition and consume substantial quantities of fuel.

Curtailment of Existing Load. A substitution of existing demand for new demand by reducing or eliminating certain existing loads is not considered a viable alternative because of its potential short term cost to the economy. It is also conceivable that the actual costs of attempting to meet new demand by reducing existing demand through curtailment of service to some industries may be more than the capital cost of the project. No electric utility would consider curtailment of service to existing revenue paying customers in order to serve new customers as a viable alternative to capacity addition.

6.11 Of all the above alternatives, only the gas turbine plant alternative, with costs similar to recently added gas turbine units on the EEA system, or the steam turbine plant alternative with costs similar to Unit 4 at Abu Sultan, are practical alternatives that could achieve the same purpose. The Talkha combined-cycle addition provides, we believe, a lower present worth cost than any other alternative. Therefore, the Talkha combined-cycle addition would be judged economically viable.

E. Conclusion:

6.12 The proposed project is economically sound.

VII. FINANCIAL ANALYSIS

A. Introduction:

7.01 An accurate financial analysis of an electrical energy project is difficult to carry out for Egypt. This is because the market prices of major inputs and electrical energy are subject to severe distortions and are difficult to estimate over the life of an investment project. Some relative prices are so low (in particular the energy tariffs and amount paid for fuel by EEA), that they appear unlikely to be sustained at their current levels. Future changes in these prices may be so drastic that the results of any financial analysis could quickly be obsolete.

7.02 An analysis was made to assess the financial viability of the Talkha combined-cycle project. An internal rate of return (IRR) was derived, utilizing currently prevailing prices and costs over the expected life of the project. Utilizing the energy produced by the project to replace an equivalent number of kilowatts produced from petroleum fired plants, the fuel bill paid by EEA would decline annually by LE 7.2 million. As an alternative an IRR was also derived considering the project as meeting new demands rather than as an alternative to the use of the project to meet existing loads.

B. Financial Viability:

7.03 The project is assumed to add 110,000 KW to Egypt's generating capacity which will result in an energy output of approximately 830,000 MWH per annum. The construction time is estimated at two years while the life of plant is approximately 25 years. The costs associated with the project are estimated as:

- Capital costs: $65 million of which 75 percent will be spent the first year and the remaining 25 percent in the second. In addition, there will be a capital cost of LE 20 million with 30 percent being incurred in the first year and 70 percent in the second.

- Operational and Maintenance Costs: O & M costs are divided into fixed costs of LE 2.7 per KW per year (labor cost) and variable costs of LE 6 per MWH per year for lubricants, chemicals and replacement parts.

7.04 Benefits are assumed to commence after completion of the project. Project implementation resulting in fuel conservation would result in O & M savings of approximately LE 10 per MWH annually in variable costs and a LE 7.2 million reduction in the fuel bill paid by EEA.

7.05 The yearly flows of estimated costs and benefits presented in Table VII-1, result in an internal rate of return of 12.0 percent when using the data shown in the table. Using an exchange rate of $1.00=LE 1.35 the IRR drops to 7.4 percent.

TABLE VII-1

ESTIMATION OF FINANCIAL COSTS AND BENEFITS 1/
(in millions of dollars)

Period	Benefits	Costs
0	-	55.98
1	-	33.12
2	18.65	6.36
3	18.65	6.36
4	18.65	6.36
5	18.65	6.36
6	18.65	6.36
7	18.65	6.36
8	18.65	6.36
9	18.65	6.36
10	18.65	6.36
11	18.65	6.36
12	18.65	6.36
13	18.65	6.36
14	18.65	6.36
15	18.65	6.36
16	18.65	6.36
17	18.65	6.36
18	18.65	6.36
19	18.65	6.36
20	18.65	6.36
21	18.65	6.36
22	18.65	6.36
23	18.65	6.36
24	18.65	6.36
25	18.65	6.36
26	18.65	6.36
27	18.65	6.36

1/ Assuming the conservation option and an exchange rate of $1.00 = LE 0.83 for EEA transactions.

7.06 It is expected that the money made available to the project to finance the capital cost will be loaned to EEA denominated in pounds with a two and one half year grace period and eight percent nominal interest rate on the outstanding balance.

7.07 While the project is a fuel conservation project, as stated in the Economic Analysis, Section 6, it might be considered as being operated to help EEA meet its load (new or existing) and for a complete analysis, the project could be analysed as a project to supply new load. In this case the revenue from sales of energy would be utilized to pay EEA's debt and operation costs of the project. If the financial analysis is based on the revenue earned from the sale of energy using the present sale price of 21.33 milliemes per KWH /1 rather than on the savings in operating costs to EEA (i.e. savings in cost that EEA pays for fuel) the project has a rate of return of 9.9 percent compared to that of 7.4 percent (exchange rate of $1.00 = LE 1.35) considering the project as a conservation project. Changing the exchange rate to $1.00 = LE 0.83 increases the IRR for this analysis to 15 percent. A comparison of IRR's for the two energy use scenarios is presented in Table VII-2.

TABLE VII-2

INTERNAL RATE OF RETURN FOR FOUR SCENARIOS

	Market Exchange Rate	
Energy use	0.83	1.35
Fuel Conservation	12.0%	7.4%
Sales	15.0%	9.9%

/1 Average sales rates per KWH as estimated by Stone & Webster in the "1.200 MW Thermal Power Plant Economic Feasibility Study".

C. Conclusion:

7.08 The proposed project is financially feasible in all of the analysis performed except in the case of fuel savings where all costs were converted to U.S. dollars using an exchange rate of $1.00=LE 1.35. However as pointed out above any increase in fuel cost to EEA improves the financial viability.

D. Tariffs:

7.09 Progress to reduce the subsidy for electrical energy has been slow. At the same time, recent substantial rate adjustments are indications of a deepening GOE commitment to gradually adjust the electricity rates towards to the true costs of energy.

7.10 Electricity tariffs based on a 1970 study by Electricite de France remained unchanged from 1975 until January 1980 when changes were introduced for residential and small commercial customers. These increases were further adjusted in March 1980. Following tariffs studies by Soferlec (Paris, France), the GOE has instituted the following tariff increases:

a. In April 1982, tariffs were increased 5 to 20 percent, depending on the level of consumption, for High Voltage, Irrigation and Drainage customers and Medium and Low Voltage customers in the tariff classifications of Housing Company, Government and Public Utility, Private Sector, Lighting and Residential and Small Commercial except for those Residential and Small Commercial customers in the lowest consumption level.

b. In November 1982 tariffs were increased by 60 percent for Kima Fertilizer and 50 percent Nag Hammadi aluminum.

c. In April 1983, tariffs were again increased 5 to 20 percent, depending on level of consumption, for High Voltage, Irrigation and Drainage customers and Medium and Low Voltage customers in the tariff classifications of Housing Company, Government and Public Utility, Private Sector, Lighting and Residential and Small Commercial except for those Residential and Small Commercial customers in the lowest consumption level.

d. In July 1983 the tariffs for several Very High Voltage, High Voltage and Medium and Low Voltage consumers, whose tariffs had not been increased since 1975, were raised by 15 percent.

e. Between January and March 1984, tariffs to all customers at the lowest consumption level were again increased 10 to 20 percent.

f. In July 1985 tariffs were again increased to all customer classes from 10 to 60 percent.

g. An increase of 15 to 50 percent to all customer classes is scheduled to be implemented in July 1986. The trend in average electricity prices is summarized in Table VI-I.

TABLE VII-3

TREND IN AVERAGE ELECTRICITY PRICES
(milliemes per kilowatthour - m/kwhr)

Year	(m/kwhr)	Price Index (1975 = 100%)	Price Index (1981/82 = 100%)
1975	8.94	100	-
1980	10.80	121	-
80/81	10.52	118	-
81/82	11.14	125	100
82/83	12.37	138	111
83/84	14.66	164	131
84/85	16.36	183	147
85/86	21.33	239	191
86/87	27.00 **	302	242

Excludes wholesale price to distribution company.
* Forecast
** Proposed

7.11 These increases represent modest but significant progress toward bringing electricity tariffs to the unsubsidized price of electricity. The removal of energy subsidies has been the subject of discussions with the GOE and EEA by A.I.D. and other financing institutions for some time. Any reduction in subsidies must consider the political and economic impact on the country and are influenced both by the proposed timing and magnitude of tariff increases. The GOE recognizes the importance and need for gradual price increases in electricity and energy.

7.12 A covenant will be included in the Grant requiring EEA to periodically consult with AID on electricity tariffs and their impact on the financial viability of EEA. Thus financial viability over time will improve as rates are increased.

E. Project Financial Plan:

7.13 The sources and utilization of project funds required to construct the Talkha combined-cycle addition are summarized according to the following plan.

TABLE VII-4

PROJECT FINANCIAL PLAN

Funding Provided	U.S. Dollars (Millions)	Egyptian Pounds (Millions)
AID Grant	$65.0	
GOE Contribution		LE 20.0
Total	$65.0	LE 20.0
Funding Utilization		
Consultant Services	$ 2.5	LE 0.7
Equipment w/ Spare Parts	$38.6	-
Gas Turbine Upgrading	$ 3.2	-
Materials/Installation	$ 6.5	LE 13.3
Contract Audit	$ 0.1	-
Contingency (Physical)	$ 4.7	LE 2.3
Contingency (Price)	$ 9.4	LE 3.7
Total	$65.0	LE 20.0

7.14 The Grant Agreement will contain a Requirement Precedent to Disbursement requiring that the funds, made available by AID to the GOE, will be loaned to EEA on terms and conditions approved by the appropriate authorities of the cooperating country. (Recent Loan Agreements have provided for repayment in 15 years with 25 semi-annual payments with the first payment of principal due two and one-half years after the first disbursement by AID with interest at the rate of eight percent per annum on the outstanding balance).

F. Disbursement Period:

7.15 Disbursement of the $65 million in AID funds for consultant services and the design supply of equipment and materials, installation, testing, start-up and training of EEA staff will extend over 31 months from EEA's Notice to Proceed to commercial operation of the second and last unit to be installed. The estimated disbursements over the implementation period are summarized below:

TABLE VII-5

DISBURSEMENT SCHEDULE
(U.S. $ millions)

Year	Disbursement
First year	$45.5
Second year	$15.9
Third year	$ 3.6
	$65.0

G. Elegibility Date:

7.16 EEA by letter dated December 10, 1985 requested approval of the procurement plan (discussed in para 4.02 on page 17) and requested permission to initiate negotiations. In response by letter dated December 18, 1985 USAID approved the plan and advised EEA that should funds be authorized by AID, costs incurred after that date would be elegible for financing. Therefore, not with standing Section C.2 of the Standard Provision Annex, EEA will be advised that the elegibility date for financing for the proposed grant will be December 18, 1985 for consulting services only. The eligibility date for the turnkey contract services will be the date USAID approves the contract or the date when the Grant Agreement is signed, which ever is earlier.

VIII. SOCIAL ANALYSIS

A. Sociocultural Feasibility:

8.01 The social and cultural impacts of this project, while limited, will however be positive due to the potential reduction of interrupted service to customers caused by the failure of old, obsolete generating facilities which this capacity addition will displace. The recent and longer term situation in the power sector is that EEA must frequently interrupt service to customers when old inefficient equipment fails or when demand exceeds EEA's ability to supply. This project will conserve fuel and also relieve other more obsolete equipment which is more susceptible to failure than the new equipment to be installed by the project. Of course, EEA is an operating utility and it will use any generating capacity that it has to help meet the demands of its customers. The project is not being financed for the purpose of serving new customers, but to the extent that it does help EEA to meet its load more efficiently it will have a positive social impact on all users of the energy.

8.02 Since the capacity added by combined-cycle modification will not consume additional fuel there will be no increase in airborne contaminants but there will be a reduction in the thermal effects of the exhaust gases to the nearby surrounding area. In addition, the enclosing of the steam turbine-generators in a building, the location of the equipment on the site and the fact that the equipment selected meet applicable U.S. noise standards indicate that there should be no significant noise additions. Consequently, the operation of this project will present no social disruption to surrounding communities.

B. Spread Effects:

8.03 The combined-cycle addition at Talkha will utilize standard technology presently in use at many existing power stations. The unique feature of the addition is the use of unfired boilers to produce steam for the steam cycle equipment. EEA staff at Talkha have successfully operated steam cycle generation for many years and training will build upon already existing skills. An expanded maintenance staff will be required to service the combined-cycle addition. A portion of the present maintenance staff will be trained to service the modern equipment and control systems. Since EEA anticipates the addition of steam cycles to other gas turbine plants, the project could provide training and development for these future combined-cycle plants.

C. Benefit Incidence:

8.04 The combined-cycle addition to the Talkha Gas Turbine plant will offer both short-term and long-term employment opportunities which will directly enhance the economy of the Talkha area but it will not require moving people from one area to another except for the small number of technicians who may be assigned from areas away from Talkha.

8.05 In addition to the current operation and maintenance staff of 65 people, the combined-cycle operation will increase the plant work force by approximately 17 people. Although small in number, this increase does represent permanent employment in the Talkha area.

8.06 To the extent this project contributes to the continuity and efficiency of energy service to customers it will benefit all persons utilizing electrical energy from Egypt's unified power system.

D. Conclusion:

8.07 The design of the proposed project is compatible with the sociocultural environment in which it is to be introduced; should cause an adequate introduction in Egypt of the combined-cycle technology particular to those host country personnel who will be trained as a part of the project; and should result in direct and indirect benefits being distributed throughout Egypt.

IX. ENVIRONMENTAL ANALYSIS

9.01 In 1976 and 1977, Environmental studies of the Talkha plant were conducted by Sanderson and Porter, the feasibility study consultant, and by Gilbert Associates, Inc., the project engineering consultant. The effects of the plant on the physical, biotic and human environment were assessed and the combustion turbine plant was designed and constructed to assure compliance with appropriate environmental standards.

9.02 The combustion turbines burn either natural gas or solar (No. 2 oil), the effects of these fuels on the environment were assessed and found to be less than the limits established by environmental regulations. Operation on natural gas is preferred since particulate, NO and SO_2 emissions from natural gas burning are very small compared to solar. (A covenant will be included in the Grant requiring EEA to operate the combined-cycle plant, under normal operating conditions, on gas).

9.03 The Talkha Generating Station Combined-Cycle Conversion Study prepared by Ebasco Services Incorporated addresses the environmental issues associated with the proposed plant conversion. This study indicated that the only significant potential environmental impact is related to thermal discharges into the Nile. The study recommends further investigation to determine whether the Nile at Talkha is used as a spawning, nursery or feeding ground, or a migration route during the months of May and June by important fishes; such information is needed to assess the ecological effects of the thermal discharge on such species. Annex N contains the environmental considerations developed by Ebasco Services Incorporated.

9.04 The Bureau Environmental Coordinator has delegated environmental clearance for this project to the Mission Environmental Officer (see Annex P).

9.05 The Mission Environmental Officer has recommended that a scoping session be conducted and that a concise Environmental Assessment be developed which focuses on the impact of the thermal discharge on aquatic species. The proposed Environmental Assessment shall incorporate the findings of existing environmental studies by reference. The format of the Environmental Assessment shall be consistent with the requirements of 22 CFR 216, "AID Environmental Procedures".

9.06 The engineering services contract scope of work will require the investigation mentioned in para 9.03 above and for conducting a scoping session. Funding for the turnkey contract will not be released until the Environmental Assessment has been completed and the environmental clearance has been issued by the Mission Environmental Officer.

X. MANAGERIAL/ADMINISTRATIVE ANALYSIS

A. Organization:

10.01 With the formation of the Ministry of Electricity and Energy (MOEE) in 1964 all individual electric generating facilities were consolidated into a single state-owned and controlled organization. The Egyptian Electricity Authority (EEA) is the operating authority for MOEE responsible for the planning construction and maintenance of the nation's Unified Power System (UPS).

10.02 EEA is organizationally divided into five administrative and five operational zones. The Delta operational zone (which includes the Talkha geographic area) has been effectively managing for over 20 years the operation and maintenance of a complex system of generation and transmission facilities in the Nile Delta. These facilities presently include a total installed generating capacity of 1,367MW, 1,378Km of 220KV transmission lines and 1,840MVA of transformer capacity (Additional discussion of the GOE implementing agency organization is provided in Annex O)

B. EEA Project Management:

10.03 We anticipate that EEA will establish a Project Team, reporting directly to the EEA Chairman, with authority to make day-to-day decisions and approvals. The team will be composed of a project manager, project engineer and financial specialist. The team members will be integrated into the Talkha plant staff upon completion of the combined-cycle addition.

C. Operations and Maintenance of the Combined-Cycle Plant:

10.04 To effectively operate and maintain the combined-cycle, the existing Talkha operating staff (steam and gas turbine) will be increased by about eight persons, from approximately 25 to 33 employees to operate the HRSG's steam turbine-generator on the combined-cycle addition on four shifts. The Talkha maintenance staff will be increased from 30 to approximately 39 employees. The administrative staff will not be increased.

10.05 Since the combined-cycle addition will include equipment for two steam cycles, the present operators and additional operators and maintenance staff will be trained to operate and maintain the new equipment. This training will be provided in the United States and/or Egypt. EEA will be required, through a Covenant, to commence training of the additional staff sufficiently in advance of the equipment installation and check out, so that the EEA staff will be knowledgeable about the equipment and can participate in the check-out and start-up of the plant. The operating staff will be trained using classroom instruction, and on-the-job study instruction and hands-on experience.

10.06 The turnkey contractor start-up staff will be required to remain at the site for the duration of the start-up period until the combined-cycle plant is accepted by EEA.

D. USAID

10.07 The Power Systems Group within the Office of Infrastructure Development, Development Resources Division (DR/ID) will have monitoring responsibilities for AID. The Group has been responsible for implementation of other projects in the electrical sector and has developed an excellent working relationship with all levels of EEA personnel. The assigned personnel are experienced in the design, construction, operation and maintenance of electric power systems and management and administration of electric utilities and should provide sufficient AID monitoring support for this project.

E. Conclusion:

10.08 EEA and the staff of the Talkha power plant already have many years of extensive and successful experience in the operation and maintenance of power generating facilities. The proposed project is designed to effectively build-on this experience. In addition, EEA has demonstrated a capability to effectively manage the implementation of much larger and more complex power plant construction projects. At the same time, the available DR/ID staff should be sufficient to provide the necessary AID monitoring support. Accordingly, the project appears to be administratively feasible.

XI. RECOMMENDATIONS

A. Funding

11.01 We recommend that AID authorize a grant to the Government of Egypt in the amount of $65 million for the modification and conversion of the Talkha Combustion Turbine plant to operate as a combined-cycle plant.

11.02 We further recommend that the Government of Egypt lend the funds to the Egyptian Electricity Authority on terms mutually agreeable to the GOE and EEA.

11.03 Procurement of all goods and services financed by AID will have their source, origin and nationality in the United States.

B. Requirements Precedent to Disbursement

11.04 We recommend that the project authorization include the following Requirements Precedent to disbursement:

a. Prior to the initial disbursement or to the issuance of any commitment documents under the Grant, the Cooperating Country shall furnish to AID, in form and substance satisfactory to AID:

i A statement of the names of the persons authorized to represent the Cooperating Country for Project purposes, together with a specimen signature of each such person.

ii The designation of one of the authorized representatives as project manager responsible and with the authority to carry out the implementation of the project accompanied by a listing of supporting staff assigned.

iii An executed contract acceptable to AID for consultant services for the project, which will *inter alia* call for the preparation of an Environmental Assessment concerning the Project.

iv Evidence that the Grant proceeds will be loaned to the Egyptian Electricity Authority (EEA) on terms and conditions approved by the appropriate authorities of the Cooperating Country.

b. Prior to any disbursement or to the issuance of any Direct Letter of Commitment under the Grant, for any purpose other than to finance the services of the consulting engineer, the Cooperating Country shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

i An executed contract which will appropriately reflect inter alia the outcome of the Environmental Assessment prepared by the Project consulting engineer, for the design, engineering, equipment, construction and related startup services and training for the two combined-cycle plants at Talkha.

ii Evidence that Egyptian General Petroleum Company (EGPC) will continue to provide fuel transmission facilities and deliver sufficient gas to the Talkha plant to permit EEA to operate the combined-cycle plant, under normal plant operating conditions, on gas.

iii Evidence that local currency financing for the project has been budgeted by the Cooperating Country and will be available for expenditure by EEA on the Project pursuant to a cost estimate made by the consulting engineer and approved by EEA.

11.05 We recommend that the terminal date for meeting the Requirements Precedent to disbursement of funds provided by this grant be 90 days from the signing of the grant agreement.

C. Procurement Waivers

11.06 We recommend the non-competitive selection of Gilbert Associates, Inc. to provide consulting engineering services and that EEA be authorized to negotiate a contract with Gilbert Associates, Incorporated.

11.07 We recommend the non-competitive selection of General Electric Company as the turnkey contractor to design, supply, install, test and start up the equipment and facilities and train EEA personnel and that EEA be authorized to negotiate a contract with the General Electric company.

D. Covenants

11.09 We recommend that the Cooperating Country be required to the covenant as follows:

a. Exemption from Decennial Liability Law:
The Cooperating Country shall agree that contractors, architects, consultants and subcontractors, regardless of nationality, working on this project shall be exempt from the application of Articles 651 through 654 of the Egyptian Civil Code and from the application of Law 106 of 1976. Such contractors, architects, consultants or subcontractors shall not be relieved of their duty to exercise sound judgement, in accordance with the standards of their respective profession, to ensure the safety and fitness of the works for the purpose for which they are designed and erected.

b. Plant Operations and Maintenance Training:
The Cooperating Country shall covenant that EEA will select additional operational and maintenance staff, and will commence a comprehensive training program, sufficiently in advance of the start up of the first combined-cycle plant, so that operation and maintenance personnel will be on-site, trained and fully qualified to operate and maintain the combined-cycle plant when it is placed in service.

c. Plant Fuel Supply:
The Cooperating Country shall covenant that EEA will operate the Talkha combined-cycle plant, under normal conditions, on gas.

d. Consultation on Electricity Tariffs:
The Cooperating Country shall covenant that EEA will periodically consult with AID on electricity tariffs and their impact on the financial viability of EEA.

MINISTRY OF Planning AND
INTERNATIONAL COOPERATION

000486

August 5 , 1985

Mr. Frank Kimball
USAID Director
USAID / C

FM
DPPE
DD
ACTION TO DR DIR
ACTION TAKEN DATE 8/19
NAME INITIALS

Dear Mr. Kimball:

Please note that the Ministry of Electricity is intending to use Combined Cycle at Talkha Station to increase its capacity from 180 M.W. to 270 M.W.,this addition for Taklha G.T. plant will help meeting the requirements of Power and Energy in the near future.

It will be much appreciated if AID will take in consideration financing the costs of the said project due to the top priority and urgent requirements of the national plan.

Best regards.

Sincerely yours,
Ahmad Abdel Salam.
Ahmad Abdel Salam Zaki
Administrator.

RC'D 8/8/85

ARAB REPUBLIC OF EGYPT
MINISTRY OF PLANNING AND INTERNATIONAL COOPERATION

DEPARTMENT FOR ECONOMIC COOPERATION
WITH U.S.A.

259

April., 2 ,1986

Mr. Frank B.Kimball
AID Director
U.S.AID/C.

AD
DIR
DEPT
EM

ACTION TO DD
ACTION TAKEN _____ DUE DATE N/A
MAN _____ INITIALS _____

Dear Mr. Kimball:

With reference to cur letter dated August 5,1985, concerning our request to finance the costs of the Combined Cycle at Talkha Station, Please note that the estimated funding requirements, over life of project, are $ 65 million and L.E.20 million.

It will be much appreciated if you take the necessary action to finance the required amount in foreign exchange costs for the project from U.S.assistance for FY.1986.

Best regards.

Sincerely yours,
Ahmad Abdel Salam.
Ahmad Abdel Salam Zaki
Administrator.

45

PROJECT AUTHORIZATION

Name of Country: Arab Republic of Egypt

Name of Project: Talkha Combined-Cycle Addition

Number of Project: 263-0196

1. Pursuant to Part II, Chapter 4, Section 532 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Talkha combined-cycle addition project for the Arab Republic of Egypt (the "Cooperating Country"). The Project involves planned obligations of not to exceed Sixty Five Million Dollars ($65,000,000) in grant funds, to help in financing foreign exchange costs for the Project.

2. The Project will assist the GOE to increase the efficiency of the Egyptian Electricity Authority's existing gas turbine generating facilities by recycling otherwise wasted heat energy.

3. The Project Agreement may be negotiated and executed by the officer(s) to whom such authority is delegated in accordance with AID Regulations and Delegations of Authority. The Project Agreement shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as AID may deem appropriate.

4. Source and Origin of Commodities, and Services

   Commodities and services financed by AID under the Project shall have their source and origin in the United States, except as AID may otherwise agree in writing.

5. Initial Disbursement

   The Project Agreement shall contain the following Requirements Precedent:

A. Requirements Precedent to Disbursement

Prior to the first disbursement or to the issuance of any commitment documents under the Grant, the Cooperating Country shall furnish to AID, in form and substance satisfactory to AID:

(1) A statement of the names of the persons authorized to represent the Cooperating Country for Project purposes together with a specimen signature of each such person.

(2) An executed contract acceptable to AID for consultant services for the Project, which shall inter alia call for the preparation of an Environmental Assessment concerning the Project.

(3) Evidence that the proceeds of the Grant will be loaned to the Egyptian Electricity Authority (EEA) on terms and conditions approved by the appropriate authorities of the Cooperating Country.

B. Subsequent Disbursements

Prior to any disbursement or to the issuance of any disbursement authorization or commitment to disburse under the Grant, for any purpose other than to finance the services of the consulting engineer, the Cooperating Country shall, except as AID may otherwise agree in writing, furnish to AID in form and substance satisfactory to AID:

(1) An executed contract, which will appropriately reflect inter alia the outcome of the Environmental Assessment prepared by the Project's consulting engineer, for the design, supply and installation of equipment, testing and startup, and training for the two combined-cycle units at Talkha.

(2) Evidence that local currency financing for the Project has been budgeted by the Cooperating Country and will be available for expenditure by EEA on the Project pursuant to a cost estimate made by the consulting engineer and approved by EEA.

6. Covenants

The Cooperating Country shall covenant substantially as follows:

a. Exemption from Decennial Liability Law:
The Cooperating Country shall agree that contractors, architects, consultants and subcontractors regardless of nationality, working on this Project shall be exempt from the application of Articles 651 through 654 of the Egyptian Civil Code and from the application of Law 106 of 1976. Subcontractors, architects, consultants shall not be relieved of their duty to exercise sound judgement, in accordance with the standard of their respective professions, to ensure the safety and fitness of the works for the purpose for which they are assigned and erected.

b. Plant Operations and Maintenance Training:
The Cooperating Country shall covenant that EEA will select additional operational and maintenance staff, and will commence a comprehensive training program, sufficiently in advance of the startup of the first combined-cycle plant, so that operation and maintenance personnel will be on-site, trained and fully qualified to operate and maintain the combined-cycle plant when it is placed in service.

c. Consultation on Electricity Tariffs:
The Cooperating Country shall covenant that EEA will periodically consult with AID on electricity tariffs and their impact on the financial viability of EEA.

7. Waivers:

For purposes of implementation of the Project, waivers of competition are hereby approved to permit AID funded non-competitive procurement by EEA of the following:

a. A contract for Consultant Engineering services with Gilbert Associates, Inc. The eligibility date for consultant services will be December 18, 1985.

b. A turnkey contract with General Electric Company for the design, supply installation test and startup of the equipment and facilities, and training personnel to permit the Talkha combustion turbine plant to operate as a combined-cycle plant.

Frank B. Kimball
Director, USAID/Cairo

July 31, 1986
Date

Non-Competitive Review Board:
IS/CS:JDzierwa _____ Date 6/26/86
A/SLA:MWilliams _____ Date 7/27/86
IS/CMT:RRichardson _____ Date 7/24/86

Clearances:
OD/ID:TAPearson _____ Date 7/24/86
AD/DR:FAZobrist _____ Date 7/24/86
AD/LEG:KO'Donnell _____ Date 7/21/86
AD/FM:WMiller _____ Date 7/23/86
AD/DPPE:GLaudato _____ Date 7/23/86

ANNEX C

CERTIFICATION PURSUANT TO
SECTION 611 (e) OF THE
FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED

As Director and Principal Officer 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, I do hereby certify that in my judgement Egypt has both the financial capability and human resources capability to effectively maintain and utilize the capital assistance to be provided for the combined-cycle addition to the Combustion Turbine Plant in Talkha, Egypt.

This judgement is based upon general considerations discussed in Section X of the Project Paper to which this certification is attached.

Frank B. Kimball
Director

July 31, 1986
Date

ANNEX D

CERTIFICATION PURSUANT TO GRAY AMENDMENT

As Director and Principal Officer of the Agency for International Development in Egypt, I certify that full consideration has been given to the potential involvement of small and/or economically and socially disadvantaged enterprises, historically black colleges and universities and minority controlled private and voluntary organizations covered by the Gray Amendment.

The project procurement plan is based on the urgent need to utilize contractors with specitic substantial knowledge and technical competence as discussed in Section IV and Annex M of the Project Paper to which this certification is attached. The necessary knowledge and expertise is not available, to the best of our knowledge, from minority and women-owned firms, historically black colleges and universities and minority controlled private voluntary agencies.

Frank B. Kimball
Director

July 31, 1986
Date

5C(2) PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A. includes criteria applicable to all projects. Part B. applies to projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

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

A. GENERAL CRITERIA FOR PROJECT

1. FY 1986 Continuing Resolution Sec. 524; FAA Sec. 634A.

   Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project.

   a. Congress has been notified..

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimte of the cost to the U.S. of the assistance?

   The necessary planning and cost estimate have been completed.

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

   No further legislative action is required.

4.	FAA Sec. 611(b); FY 1986 Continuing Resolution Sec. 501. If for water or water-related land resource construction, has project met the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See AID Handbook 3 for new guidelines.)	N/A
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	The Mission Director has so certified, See Annex C
6.	FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	The project is not susceptable to execution as part of a regional project.
7.	FAA Sec. 601(a). Information and conclusions whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; and (c) encourage development and use of cooperatives, and credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency f industry, agriculture and ommerce; and (f) strengthen ree labor unions.	The grant will increase the flow of international trade and improve technical efficiency of industry, agriculture and commerce, and foster private initiative and competition. It will not have any apparent effect on encouraging cooperative credit unions and savings and loan associateions, nor monopolistic practices, nor free labor unions.

8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	All funds expended will be for goods and services from private U.S. concerns.
9. FAA Sec. 612(b), 636(h); FY 1986 Continuing Resolution Sec. 507. Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	The Project Grant Agreement so provides and the GOE has certified that all local currency funds required will be provided by GOE.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	No
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes, competition is waived in accordance with AID regulations.
12. FY 1986 Continuing Resolution Sec. 522. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	N/A

13. FAA 118(c) and (d). Does the project comply with the environomental procedures set forth in AID Regulation 16. Does the project or program take into consideration the problem of the destruction of tropical forests?	c. Yes d. N/A
14. FAA 121(d). If a Sahel project, has a determination been made that the host government has an adequate sysem for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated therefrom)?	N/A
15. FY 1986 Continuing Resolution Sec. 533. Is disbursement of the assistance conditioned solely on the basis of the policies of any multilateral institution?	No
16. ISDCA of 1985 Sec. 310. For development assistance projects, how much of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?	N/A

3. Economic Support Fund Project Criteria

a. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of part I of the FAA?	Will enhance ability of GOE to sustain economic growth and recovery which will have positive political results. To the extent rural areas will be served, policy direction of section 102 will be reflected.
b. FAA Sec. 531(c). Will assistance under this chapter be used for military, or paramilitary activities?	No
c. ISDCA of 1985 Sec. 207. Will ESF funds be used to finance the construction of, or the operation or maintenance of, or the supplying of fuel for, a nuclear facility? If so, has the President certified	No

	that such country is a party to the Treaty on the Non-Proliferation of Nuclear Weapons or the Treaty for the Prohibition of Nuclear Weapons in Latin America (the "Treaty of Tlatelolco"), cooperates fully with the IAEA, and pursues nonproliferation policies consistent with those of the United States?	N/A
d.	FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?	N/A

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

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

A. Procurement

1.	FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed?	Sole source waivers approved by AID Mission Director for procurement of consultant services and turnkey design, supply and installation services
2.	FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or under delegation from him??	Yes
3.	FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company?	Egypt does not so discriminate.
4.	FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). 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? (Exception where commodity financed could not reasonably be procured in U.S.)	There will be no such procurement

5.	FAA Sec. 604(g). Will construction or engineering services be procured from firms of countries which receive direct economic assistance under the FAA and which are otherwise eligible under Code 941, but which have attained a competitive capability in international markets in one of these areas? Do these countries permit United States firms to compete for construction or engineering services financed from assistance programs of these countries?	No
6.	FAA Sec. 603. Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent such vessels are available at fair and reasonable rates?	No
7.	FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable?	Yes
	If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?	N/A

8.	International Air Transportation Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available?	Yes
9.	FY 1986 Continuing Resolution Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States?	No direct USG contract is comtemplated.
B.	Construction	
1.	FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services be used?	Yes
2.	FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?	Sole source waiver approved by AID Mission Director for turnkey design, supply construction and installation of plant addition.
3.	FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million (except for productive enterprises in Egypt that were described in the CP)?	Yes, but FAA Section 620(K) provides exception for Egypt

C. Other Restrictions

1. FAA Sec. 122(b). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? — N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? — N/A

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? — Yes

4. Will arrangements preclude use of financing:

a. FAA Sec. 104(f); FY 1986 Continuing Resolution Sec. 526. (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo — 1. Yes — 2. Yes

	sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion?	3. Yes 4. Yes
b.	FAA Sec. 488. To reimburse persons, in the form of cash payments, whose illicit drug crops are eradicated?	Yes
c.	FAA Sec. 620(q). To compensate owners for expropriated nationalized property?	Yes
d.	FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs?	Yes
e.	FAA Sec. 662. For CIA activities?	Yes
f.	FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained?	Yes

g.	FY 1986 Continuing Resolution, Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for military personnel?	Yes
h.	FY 1986 Continuing Resolution, Sec. 505. To pay U.N. assessments, arrearages or dues?	Yes
i.	FY 1986 Continuing Resolution, Sec. 506. To carry out provisions of FAA section 209(d) (Transfer of FAA funds to multilateral organizations for lending)?	Yes
j.	FY 1986 Continuing Resolution, Sec. 510. To finance the export of nuclear equipment, fuel, or technology?	Yes
k.	FY 1986 Continuing Resolution, Sec. 511. For the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights?	Yes
l.	FY 1986 Continuing Resolution, Sec. 516. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes

TALKHA GAS TURBINE PLANT PERFORMANCE

	Gross Generation (Million KWh)	Net Generation (Million KWh)	Mazout fuel Consumption (10^3 Tonnes Mazout Equivalent)	Equivalent Mazout Fuel Consumption Kg per Mwh Tonnes per million KWh	Peak Output MW	Load Factor	Availability %
1980	893.3	891.4	298.1	334	199	51.1	81.3
1981	1085.1	1083.1	384.1	354	200	61.9	87.6
1982	1161.3	1159.2	419.3	361	195	68	90
1983	1260.6	1257.0	449.1	356	194	74.2	92
1984	1364.6	1362.4	475.9	349	176	88	93
1985	1266.3	1262.4	460.8	365	193	75	-

Source: EEA Annual and monthly Electric Statistics

TALKHA GAS TURBINE PLANT FUEL CONSUMPTION - 1985

	Natural Gas (10^3 m^3)	Mazout Equivalent of Natural Gas in Tonnes	Solar Tonnes	Mazout Equivalent of Solar Tonnes	Total Mazout Equivalent in Tonnes
January	38,871	35,337	8,488	8,828	44,165
February	37,122	33,748	5,119	5,324	39,072
March	42,141	38,310	2,897	3,012	41,322
April	42,090	38,263	1,543	1,604	39,867
May	42,912	39,011	115	120	39,131
June	31,721	28,837	2,551	2,653	31,490
July	30,724	27,931	418	435	28,366
August	32,642	29,674	110	115	29,789
September	41,869	38,062	77	80	38,142
October	44,843	40,768	113	117	40,885
November	46,457	42,233	-	-	42,233
December	50,994	46,358	-	-	46,358
	482,386	438,532	21,431	22,288	460,820
Fuel Use as Percent of Total		95%		5%	100%

EGYPT'S FUEL SUPPLY

A. INTRODUCTION

A variety of indigenous primary energy resources are available in Egypt, but only in limited quantities. The primary energy resources include petroleum, gas, coal and water. Other potential energy resources, yet to be developed, include solar, wind, nuclear, geothermal and biomass.

EEA is contemplating future base load generating units which will utilize imported coal as their primary fuel. Should natural gas be available in sufficient quantities to be used for future generation, it would be used in existing units, thereby displacing oil. Mazout savings through direct or indirect displacement by either natural gas or coal, would substantially increase either the supply of crude oil for export or extend the life of the existing petroleum reserves. Solar savings through direct or indirect displacement by natural gas would reduce solar fuel imports and extend the life of the existing petroleum reserves.

B. PETROLEUM

1. Resources

Discovery of oil in commercial amounts occurred in 1909, but significant production was not attained until 1969 and the first small exports were made in 1975. Until 1966 all oil discoveries in Egypt were in the Gulf of Suez basin, which remains the major source of oil reserves and oil production. Since 1966 oil discoveries have also been made in the Eastern and Western Deserts, and in the Sinai. Egypt has entered into more than 100 oil concession agreements since 1973 covering an area in excess of 750,000 square kilometers (290,000 square miles). Proven reserves of crude oil are estimated to be about four billion barrels. In 1985, crude oil production averaged 860,000 barrels per day (b/d), a rate which would have depleted reserves in 12-13 years. In early 1986, with falling oil prices, Egypt cut back crude oil production to 600,000 b/d. If production were continued at this rate, Egypt's known oil reserves would be depleted in 18 to 19 years.

Most crude oil reserves are located in the Gulf of Suez basin where 23.9 million tonnes were produced in 1982, 26.4 million tonnes were produced in 1983 and 30.2 million tonnes were produced in 1984. Crude oil production by area is summarized in Table/G-1. Of the total crude oil production, about 50 percent is used locally, 30 percent is taken by foreign companies and 20 percent is available for export. The use of crude oil is summarized in Table/G-2.

TABLE G-1

CRUDE OIL PRODUCTION BY AREA
(Thousand Metric Tons-Tonnes)

Area	1982		1983		1984	
Sinai	6,744	20%	7,255	20%	7,858	19%
Eastern Desert	1,334	4%	1,324	4%	1,881	5%
Suez Gulf	23,936	73%	26,384	73%	30,224	73%
Western Desert	878	3%	994	3%	1,254	3%
Total	32,892	100%	35,957	100%	41,217	100%

Source: EGPC Annual Reports

TABLE G-2

CRUDE OIL USE
(Thousand Metric Tons-Tonnes)

Area	1982		1983		1984	
Domestic	16,810	51%	18,144	50%	19,541	47%
Foreign Company Cost Recovery/Equity Share	8,782	27%	9,550	27%	12,586	31%
Egypt-Export	7,300	22%	8,263	23%	9,090	22%
Total	32,892	100%	35,957	100%	41,217	100%

Source: EGPC Annual Reports

2. Oil Pipelines

In 1974 Egypt began the construction of two parallel 42 inch pipelines between Suez and Alexandria, a distance of nearly 200 miles. The pipelines, completed in 1977, provide a crude oil carrier between the oil fields in the Gulf of Suez and the Red Sea and the refineries on the Mediterranean Sea, and supplements the Suez Canal because of the number of shipments and draft limitations of the Canal. The pipeline permits large tankers that could not pass through the canal loaded to discharge crude oil at the Suez terminal, transit the Canal and reload the crude oil at the Mediteranean terminal.

3. Refining and Processing

Refinery through put (processing of crude oil) in 1982 was 16.8 million metric tonnes and increased in 1983 to 18.1 million tonnes, an increase of 7.7 percent. In 1984, 19.5 million tonnes were processed through Egyptian refineries, an increase of 7.7 percent. There are six refineries in Egypt: two in Suez, one in Cairo, one in Tanta, and two in Alexandria. The individual refinery processing is summarized in Table/G-3.

TABLE G-3

REFINERY PRODUCTION
(Thousand of Metric Tons-Tonnes)

	1982		1983		1984	
Suez						
Suez Petroleum	1,100	6%	1,142	6%	1,170	6%
Nasr Petroleum	2,980	18%	3,282	18%	3,521	18%
Subtotal	4,080	24%	4,424	24%	4,691	24%
Cairo/Tanta						
Mostorod	4,398	26%	4,895	27%	6,016	31%
Tanta	961	6%	1,005	6%	1,139	6%
Subtotal	5,359	32%	5,900	33%	7,155	37%
Alexandria						
Amireya	2,864	17%	2,913	16%	2,940	15%
Max	4,507	27%	4,907	27%	4,755	24%
Subtotal	7,371	44%	7,820	43%	7,695	39%
Total	16,810	100%	18,144	100%	19,541	100%

Source: EGPC Annual Reports

The net output of refined products from the six refineries was 16.0 million tonnes in 1982, 17.2 million tonnes in 1983 and 18.5 tonnes in 1984. Table/G-4 summarizes the type and quantities of refined products.

TABLE G-4

REFINERY PRODUCTION FROM PETROLEUM
(Thousand of Metric Tons-Tonnes)

	1982		1983		1984		First-Half 1985	
Fertilizer Gases	9	-	8	-	2		-	-
Propane/Butagas	168	1%	227	1%	254	1%	144	1%
Gasoline/Naptha	2,213	13%	2,323	13%	2,506	13%	1,346	13%
Kerosine	1,917	11%	2,135	12%	2,245	11%	1,110	11%
Solar	2,693	16%	2,862	16%	3,107	16%	1,667	16%
Mazout	8,377	50%	8,879	50%	9,475	48%	4,807	47%
Bitumen	378	2%	508	3%	564	3%	297	3%
Basic oils *	78	1%	122	1%	154	1%	93	1%
Others	71	1%	133	1%	235	2%	152	2%
Subtotals	15,904	95%	17,197	95%	18,541	95%	9,616	94%
Losses	906	5%	947	5%	1,000	5%	561	6%
Total Throughput	16,810	100%	18,144	100%	19,541	100%	10,178	100%

* Basic oils include lubricating oils and special oils

Source: EGPC Annual Reports

4. Utilization for Electricity Generation

The two principal refinery products, Mazout and Solar, are utilized for electric energy generation. Mazout a blend of crude oil and No. 6 oil is the fuel utilized in the majority of EEA's steam power plants. Mazout has a heating value of 9,806 Kilocalories per Kilogram (17,650 Btu's per pound). Solar, similar to No. 2 oil, is the fuel burned in many of EEA's gas turbine plants. Solar has a heating value of 10,000 kcal/kg (18,000 Btu/lb.). Table/G-5 summarizes the use of these fuels by EEA.

TABLE G-5

PRODUCTION, SALES AND CONSUMPTION OF PETROLEUM FUEL BY EEA
(Thousand of Metric Tons-Tonnes)

	1982		1983		1984	
Mazout						
Production by EGPC	8,377		8,879		9,475	
Sales to EEA *	2,705	32%	3,170	36%	3,349	35%
Consumption by EEA **	2,709		3,160		3,339	
Solar						
Produced by EGPC and Imported	3,617		4,168		4,461	
Sales to EEA *	665	18%	778	19%	890	20%
Consumption by EEA **	608		775		926	
					7,265	

* EGPC Annual Report
** EEA Annual Report

EEA is the largest single user of Mazout and Solar fuel accounting for more than 35 percent of Mazout production and 20 percent of Solar usage in Egypt.

Both fuels are sold to EEA at prices far below their boarder prices. Mazout was sold to EEA at a price of LE 7.5 per tonne until July 1985 when the price was increased to LE 15 per tonne (the boarder price was estimated to be LE 122 per tonne). Solar was sold to EEA at a price of LE 40 per tonne until July 1985 when its price was increased to LE 80 per tonne (the boarder price was estimated to be LE 174 per tonne). The bulk of EEA's more modern generating units can burn either petroleum or gas. EEA generating units are summarized by operating zone, type capacity and fuel in Annex H of this project paper.

C. NATURAL GAS

1. Resources

Natural gas was discovered in Egypt as a by-product of petroleum exploration. Since its introduction into the domestic market in 1975, financing institutions have consistently advocated greater utilization as a more efficient source of energy and as a means of displacing Mazout and increasing the volume of crude oil for export, or to slow depletion of the oil reserves. Known reserves of natural gas are estimated to be about 232 billion cubic meters (8.2 trillion cubic feet) and additional major reserves which could increase reserves to 760 billion cubic meters (20 trillion cubic feet) are anticipated. However, production rates have remained modest relative to Egypt's energy needs. Natural gas production by field is summarized in Table/G-6.

TABLE G-6

NATURAL GAS PRODUCTION BY FIELD
(Million of Cubic Meters)

Field	1982		1983		1984	
Abu Gharadig	1,081	41%	1,007	32%	1,125	28%
Abu Madi	873	33%	965	31%	1,163	29%
Abu Qir	703	26%	958	31%	1,062	27%
Gulf of Suez	-		201	6%	657	16%
	2,657	100%	3,131	100%	4,007	100%
Production/day	7.3		8.6		11.0	

Source: EGPC Annual Reports

The four gas producing fields are described below:

Abu El Gharadig:

Abu El Gharadig gas field in the Western Desert was discovered in 1971 by AMOCO. It was developed in 1976 and a separation facility with a capacity of 3.5 million standard cubic meters (MSCM) has since been constructed. A 24 inch pipeline runs to Dahshour where a portion of the gas is treated to separate LPG and condensate. The remaining gas continues on to Helwan where it is distributed to various consumers.

Major consumers connected to this gas field are:

- Iron and Steel complex in Helwan
- Helwan Cement
- Torrah Cement
- Qaqmiya Cement
- El Tebin Gas Turbine Power Station
- Heliopolis Gas Turbine Power Station
- Helwan Gas Turbine Power Station
- Sigwart
- Domestic consumers at Helwan, Maadi, Heliopolis and Nasr City
- Suez Fertilizer

Production from Abu El Gharadig gas field has been maintained at about 3.5 MSCM/Day to date.

Abu Madi:

The Abu Madi field in the Lower Delta (North Delta) is the oldest and largest production gas field in Egypt. Discovered in 1967 by ENI and developed in 1975, this field produced 3.5 MSCM/Day until 1984.

In 1985, with the addition of a new processing plant, output was increased to about 5.5 MSCM/Day and is expected to reach 6.8 MSCM/Day in early 1986.

A 12 inch pipeline and a 22 inch pipeline supply gas to Talkha where it is distributed to the following consumers through a 28 inch pipeline:

- Talkha Fertilizer Plant
- Shoubra El Kheima Thermal Power Station
- Talkha Gas Turbine Power Station
- Mehalla Spinning and Weaving Company
- El Nasr Dying Company

A 28 inch branch from this line at Tanta is now under construction to supply the Mahmoudia and Damanhour power stations from Abu Madi.

Abu Qir:

The Abu Qir field is an offshore field northeast of Alexandria. This field was discovered in 1969 by Philips Petroleum and was later developed by EGPC in 1979 to produce 3.5 MSCM/day. A 12 inch, 57 Kilometer pipeline transfers the gas from the field to the mainland. The gas pipeline network with the addition of a new processing plant, will increase the output to 6.8 MSCM/Day in early 1986.

Major Consumers connected to this field are:

- Abu Qir Fertilizer
- Siouf Gas Turbine Power Station
- Mahmoudia Gas Turbine Power Station
- Damanhour Thermal Power Station
- Abu Qir Thermal Power Station

Two additional major consumers are expected to be added in 1986/1987. They are the Dikheila steel complex and the petrochemical complex in Amireya.

Gulf of Suez:

With the legislation prohibiting flaring of associated gases, most gases in the Ras Shoukeir areas of the Gulf of Suez are being collected for industrial and power generation consumption.

Until 1985, production was only 1.7 MSCM/Day. However, a project is underway to boost production to 4.2 MSCM/Day in 1986.

The gases collected are supplied through a 16 inch, 265 km pipeline to Suez and Ismailia.

Major consumers connected to the Gulf of Suez fields are:

- Suez Cement
- Suez Fertilizer
- Attaka Thermal Power Station
- Abu Sultan Thermal Power Station
- Ras Shoukeir - Mostorod Crude Oil Line - Pumping Station
- Suez and El Nasr Refineries Suez

2. National Gas Grid:

Contracts have been awarded for construction of a national gas grid. The grid will have a master control center in Cairo and dispatch centers in the Delta, Alexandria, and Suez.

Gas is gradually being supplied to most households in the greater Cairo area. Helwan, Maadi, Nasr City, Heliopolis, Ein Shams, and the Kouba Garden districts now have gas piped to households. Work will begin soon on extension for the system to Mohandessin, Dokki, and Giza in anticipation of the time when sufficient gas will be available to provide all of greater Cairo with piped gas. Around 1990, the GOE plans to provide Alexandria households with piped gas.

3. Gas Pipelines:

Egypt currently has four major gas pipelines:

1. Cairo is linked to Abu Gharadig (the AMOCO western desert gas gathering facility) through a 24 inch pipeline.

2. Abu Qir is linked to the Abu Qir fertilizer plant and Kafr El Dawar and Damanhour power plants.

3. Ras Shoukeir is linked to Suez by a 16 inch pipeline with a 120 mm cubic foot per day capacity.

4. Suez is linked to Cairo with a 10 inch pipeline which can carry 30 million cubic feet of gas per day.

In addition, a new pipeline is under construction to link Tanta with Damanhour. When the line is complete, in 1-2 years, EGPC will have increased ability to distribute gas supplies to locations where it is needed.

4. Gas Field Development:

Known gas fields, which are currently being evaluated and/or developed, are:

- North Abu Qir offshore gas field is currently being developed to produce 3.5 MSCM/day during 1985.

- Temsah Gas field is being developed by EGPC to produce 3.4 MSCM/day in 1986.

- Tina off shore gas field, north of Port Said is being evaluated.

- Quantara gas field west of the Suez canal in the Eastern desert is being developed to produce 0.8-1.4 MSCM/day in 1986.

- Abu Sinan gas field in the Western desert is being developed and tied to Abu Gharadig facilities to produce 1.0 MSCM/day in 1985.

- Galal El Zeit gas field in the Gulf of Suez, close to the Sinai Penninsula shore, is planned to supply Sinai with its natural gas needs.

- Bedhr Eldin gas field in the Western desert is being developed by Bapetco to produce 1 MSCM/day by 1988.

5. Utilization for Electric Generation:

Natural gas is sold to EEA at a price of LE 13.8 per thousand cubic meters. Natural gas has a heating value of 9545 Kcal/M^3. EEA utilizes their natural gas allocation to fuel their gas turbines and boilers for their steam turbines. The electrical utility industry has been the largest consumer of natural gas over the past years. The GOE's allocation of natural gas for future utilization places the electrical utility behind residential heating and cooking and petrochemical (fertilizer) plants. Historical consumption of natural gas is summarized in Table/G-7.

TABLE G-7

CONSUMPTION OF NATURAL GASES
(Million of Cubic Meters)

	1982		1983		1984	
Electricity	1108	48%	1463	49%	1954	50%
Industry	973	42%	1308	43%	1501	39%
Housing	211	10%	248	8%	370	10%
Petroleum	-		-		46	1%
Total	2292		3019		3871	

Source: EGPC Annual Reports

TABLE G-8

POWER STATION CONSUMPTION OF NATURAL GAS
(Million of Cubic Meters)

	1982		1983		1984	
Steam Turbines	141	13%	136	9%	326	17%
Gas Turbine	977	87%	1327	91%	1628	83%
Total	1118	100%	1463	100%	1954	100%
Consumption per day	3.1		4.0		5.4	

Source: EGPC Annual Reports

EEA and EGPC have signed a Technical Agreement which sets forth the allocations of natural gas for power station during the period 1985 through 1995. The total natural gas allocation is summarized in Table/G-9.

TABLE G-9

ALLOCATION OF NATURAL GAS DELIVERY TO POWER PLANTS
(Million of Cubic Meters per Day)

Year	85/86	86/87	87/88	88/89	89/90
Quantity	12.8	12.6	11.3	14.8	13.8
Year	90/91	91/92	92/93	93/94	94/95
Quantity	12.6	13.2	13.2	13.9	13.9

Source: EGPC Annual Reports

Based on EEA present natural gas usage and the natural gas allocation for future years, EEA performed a study to identify how EEA could best utilize the natural gas allocated to them for their gas turbines and steam turbines. The study has verified that there will be sufficient gas to operate the four units at the Shoubrah El Kheima Thermal Power Plant at their full capacity (an RP and Covenant of Project 263-0030), operate the planned combined-cycle plants at Talkha and Fareskur, operate 900MW of gas turbines an average of 2000 hours per year, and operate some 1700MW of steam turbine capacity dual fired, i.e. equivalent amounts of mazout and natural gas. Should additional gas become available, it will be used in those units equiped for gas firing. Future allocations of gas will be prioritized, with combined-cycle plants having the highest priority, followed by steam and gas turbines.

C. HYDRO

The hydroelectric energy potential of the Nile River between Sudan and Cairo is theoretically about 14 billion kWh annually, based on a drop in river level from Lake Nasser to Cairo of approximately 100 meters and an average water flow of 80 billion cubic meters. The present hydro facilities at Aswan, the High Dam and Aswan I generate, in a normal year, approximately 10.5 billion kWh. The Aswan II hydro facilities are expected to produce an additional 1.7 billion kWh per year. Contemplated hydro generating facilities at Esna, Nag Hammadi and Assiut could produce 1.1 billion kWh per year. The theoretical hydro potential of the Nile River below Cairo is 9 billion kWh based on a drop in river level of 70 meters. Practical development would be substantially more difficult and the economic benefits decidedly less attractive due to the diminished water flow resulting from the many water diversions into irrigation canals. Therefore, further development of hydro energy from the Nile is limited.

D. DOMESTIC COAL

The only identifiable coal reserves in Egypt are located at the Maghara Coal Mine in the Sinai peninsula. The workable reserve is estimated at 35.6 million tonnes. Plans are underway to develop this mine to produce 600,000 tonnes/year by 1987. The coal may be used to supply a part of the fuel requirements of one of the proposed thermal power stations.

EGYPTIAN ELECTRICITY AUTHORITY
EXISTING GENERATING STATIONS
(December 31, 1985)

Plant	Type	Units No.	Units MW	Capacity (MW) Design	Capacity (MW) Available*	Fuels Burned**
Upper Egypt Zone						
High Dam	Hydro	12	175	2100	1823(1)	-
Aswan Dam I	Hydro	7	46			-
	Hydro	2	11.5	345	267(2)	-
Aswan Dam II	Hydro	3	67.5	202	202	-
Assiut	Steam	3	30	90	85	M
El Fayoum	Gas Turbine	1	20	20	16	NG/S
		25		2555	2393	
Cairo Zone						
Cairo North	Steam	2	10)			M
	Steam	1	20)			M
	Steam	2	30)	100	74	M
Cairo North	Gas Turbine	1	23	23	15	NG/S
Cairo South	Steam	4	60			M
	Steam	2	7.5)	255	199	M
Cairo East	Gas Turbine	2	23	46	41	NG/S
Cairo West	Steam	4	87.5	350	309	M
El Tebbin	Steam	3	15	45	42	M
El Tebbin	Gas Turbine	2	23	46	41	NG/S
Helwan	Gas Turbine	5	24	120	105	NG/S
Heliopolis	Gas Turbine	3	12.5	37	15	NG/S
Shoubrah El Kheima	Steam	3	315	945	730	NG/M
Wadi Hot	Gas Turbine	3	33	100	100	NG/S
		37		2067	1671	
Delta Zone						
Talkha	Steam	3	12.5)			M
	Steam	3	30)	128	120	M
Talkha	Gas Turbine	8	24	192	176	NG/S
Damanhour	Steam	2	15)			M
	Steam	3	65)	225	115	M
Damanhour	Gas Turbine	4	25	100	100	NG/S
Kafr El Dawar	Steam	3	110	330	181	M
Mahmoudia	Gas Turbine	4	50)			NG/S
	Gas Turbine	8	24)	392	319	NG/S
		38		1367	1011	

Alexandria Zone						
Abu Qir	Steam	4	150	600	296	NG/M
	Gas Turbine	1	20	20	15	NG/S
Abu El Matamir	Gas Turbine	1	20	20	14	NG/S
El Max	Gas Turbine	2	14	28	22	NP/NG/S
Karmouz	Steam	4	16	64	0	-
Karmouz	Gas Turbine	2	12.5	25	0	-
Siouf	Steam	2	26.5			M
	Steam	2	30)	113	34	M
Siouf	Gas Turbine	1	24)			NG/S
	Gas Turbine	6	33)	223	140	NG/S
		25		1093	526	
Canal Zone						
Abu Sultan	Steam	3	150	450	450	NG/M
Ataqa	Steam	2	150	300	300	NG/M
Ismailia	Gas Turbine	1	20	20	19	NG/S
Port Said	Gas Turbine	3	20	60	35	NG/S
Shabab	Gas Turbine	3	33	100	80	NG/S
Suez	Steam	4	25	100	33	M
Suez	Gas Turbine	1	17	17	2	S
		17		1047	769	
	Total	145		8331	6290	

** Fuel Burned
- NG - Natural Gas
- M - Mazout
- S - Solar
- NP - Naptha

SUMMARY OF INSTALLED CAPACITY

Summary	Steam Capacity	No. Units	Gas Turbine Capacity	No. Units	Hydro Capacity	No. Units	Total Capacity	No. Units
Upper Egypt Zone	90	3	20	1	2647	24	2757	28
Cairo Zone	1695	21	372	16	-	-	2067	37
Delta Zone	683	14	684	24	-	-	1367	38
Alexandria Zone	777	12	316	13	-	-	1093	25
Canal Zone	850	9	197	8	-	-	1047	17
Total	4095	59	1589	62	2647	24	8331	145
Installed Capacity Mix by Type	49%		19%		32%		100%	

SUMMARY OF AVAILABLE CAPACITY

Summary	Steam Capacity	No. Units	Gas Turbine Capacity	No. Units	Hydro Capacity	No. Units	Total Capacity	No. Units
Upper Egypt Zone	85	3	16	1	2292	24	2393	28
Cairo Zone	1354	21	317	16	-	-	1671	37
Delta Zone	416	14	595	24	-	-	1011	38
Alexandria Zone	330	12	191	13.	-	-	521	25
Canal Zone	813	9	136	8	-	-	949	17
Total	2998	59	1255	62	2292	24	6545	145
Percent Installed Capacity Available	73%		79%		87%		79%	
Available Capacity Mix by Type	46%		19%		35%		100%	

*

(1) Based on eleven (11) units available for operation and capacity limited by available net head.

(2) Capacity limited by available net head.
Capacity Available from Gas Turbines based on Winter temperatures

Source: EEA Monthly and Annual Reports

EGYPTIAN ELECTRICITY AUTHORITY
FUEL CONSUMPTION BY TYPE OF FUEL

YEAR	MAZOUT [1000 TON]	SOLAR [1000 TON]	NAPTHA [1000 TON]	NATURAL GAS [M^3]	FURNACE GAS [M^3]	MAZOUT EQUIVALENT [1000 TON]
1965	1145.6					
1966	1227.0					(1227.0)
1967	1226.6		31.5 (34.7,			(1261.3)
1968	1035.5		20.5			(1057.8)
1969	812.7		37.6 (41.4)			(854.1)
1970	741.7		46.9 (51.6)			(793.3)
1971	769.2		56.8 (62.5)			(831.7)
1972	770.7		15.6 (17.2)			(787.9)
1973	782.6		20.7 (22.8)			(805.4)
1974	826.5		20.8 (22.9)			(849.4)
1975	1049.3		10.9 (12.0)			(1061.3)
1976	1251.7	3.1 (3.2)	3.3 (3.6)			(1258.5)
1977	1509.2	12.5 (13.0)	20.7 (23.0)			(1545.2)
1978	1693.9	32.7 (33.7)	20.6 (22.9)			(1750.7)

YEAR	MAZOUT [1000 TON]	SOLAR [1000 TON]	NAPTHA [1000 TON]	NATURAL GAS [M^3]	FURNACE GAS [M^3]	MAZOUT EQUIVALENT [1000 TON]
1979	2036.8	116.5 (121.2)	36.6 (40.6)	108X106 (98X2)		(2296.7)
1980	2004.4	219.9 (228.6)	62.7 (69.3)	$668X10^6$ (607.3)	$227.9X10^6$ (26.0)	(2935.6)
1981	2295.5	458.1 (476.4)	67.3 (74.4)	$853X10^6$ (775.3)	$37.6X10^6$ (3.5)	(3625.1)
1982	2709.0	584.4 (607.8)	68.4 (75.6)	$1101X10^6$ (1001.4)	$10.9X10^6$ (1.0)	(4394.8)
1983	3160.0	745.0 (775.0)	69.0 (76.4)	$1430X10^6$ (1300.0)	Coal [1000 Ton]	(5311.4)
1984	3339.2	890.8 (926.4)	47.3 (52.3)	1934 (1758.2)	19.9 (16)	(6092.1)
Mix (%)	55%	15%	1%	29%	-	100%
1985	3647.4	464.6 (483.3)	24.5 (27)	2811 (2555)	26.7 (21.5)	(6734.3)
Mix (%)	54%	7%	1%	38%	-	100%

( ) denotes Mazout equivalent

1 ton solar = 1.04 ton mazout equiv.
1000 m^3 NG = 0.91 ton mazout equiv.
1000 m^3 F.G. = 0.94 ton mazout equiv.
1 ton naptha = 1.11 ton mazout equiv.
1 ton coal = 0.8 ton mazout equiv.

Heating value of Fuels

Mazout = 9,806 kilocalories/Kg
Solar = 10,000 kilocalories/Kg
Natural Gas = 9,545 kilocalories/m^3
Naptha = 10,400 Kilocalories/Kg

Source: EEA Annual Reports

PROJECT COST ESTIMATE

The project cost estimate is summarized below in Table I-1.

TABLE I-1

SUMMARY OF COST ESTIMATE

	Foreign Exchange (Dollars-Millions)	Local Currency (Pounds-Millions)
Consultant Services	2.5	0.7
Equipment w/Spare Parts	38.6	-
Gas Turbine Upgrading	3.2	-
Materials and Installations	6.5	13.3
Contract Audit	0.1	-
Contingency (Physical)	4.7	2.3
Contingency (Price)	9.4	3.7
	$65.0	LE 20.0

The project cost estimate above was developed from the Ebasco feasibility study cost estimate. The Ebasco estimate was based on two 45 MW steam turbines and did not include modification of the gas turbines. The Ebasco cost estimate is summarized in Table I-2.

TABLE I-2

SUMMARY OF EBASCO COST ESTIMATE

	Foreign Exchange (Dollars-Millions)	Local Currency (Pounds-Millions)
Consultant Services	2.8	
Equipment w/Spare Parts	33.6	
Materials and Installations	-	22.2
Contingency (Physical)	4.8	3.7
Subtotal	41.2	25.9
Contingency (Cost)	10.1	4.3
Total	$51.3	LE 30.2

The contractors estimated cost for the gas turbine upgrading and steam turbine size upgrading from 45 MW to 55 MW is $9 million.

USAID has adjusted the Ebasco estimate to incorporate:

- The estimated additional cost of $5 million for the large capacity turbine generators, HRSG's and plant auxiliaries. A scaling formula was utilized for this cost adjustment. The scaling factor was 1.15.

- The estimated cost of $3.2 million for upgrading the eight gas turbines (a propriety procurement) was based upon the proprietory contractors estimate of $400,000 per gas turbine.

- The estimated cost of materials and installation labor which Ebasco assigned as a local currency cost has been allocated between dollars and LE based on utilization of partial Egyptian labor and use of local materials i.e. crush stone, foundation piling and reinforced steel and actual sources of material and construction labor.

- Consultant services costs were allocated to both U.S. dollar and LE based on partial Egyptian staffing.

The Ebasco feasibility study cost estimate is included in this Annex on pages 3 thru 7.

EXHIBIT 8 Sheet 1 of 5

CAPITAL INVESTMENT ESTIMATE
SUMMARY

1.	US ORIGIN EQUIPMENT (Incl Shipment and Contingency)	
	HEAT RECOVERY STEAM GENERATORS	14,950,000
	STEAM TURBINE-GENERATORS	9,890,000
	WATER TREATMENT	720,000
	OTHER EQUIPMENT	11,360,000
	SPARE PARTS FOR 5 YEARS	1,446,000
		$38,366.000
2.	EGYPTIAN ORIGIN MATERIAL	$7,860,000
3.	INSTALLATION BY EGYPTIAN SUB-CONTRACTORS	$12,100,000
4.	A-E SERVICES	
	ENGINEERING AND DESIGN $2,270,000	
	CONSTRUCTION MANAGEMENT 540,000	$2,810,000
	Total	$61,136,000

See summary sheet pricing breakdown for details

EXHIBIT 8 Sheet 2 of 5

CAPITAL INVESTMENT ESTIMATE

SUMMARY SHEET PRICING BREAKDOWN

1. US ORIGIN EQUIPMENT

HEAT RECOVERY STEAM GENERATORS	
Composite of Vendor Base Prices	$10,200,000
Allowance for Bypass Dampers	240,000
Freight to East Coast Port	560,000
Ocean Transportation	1,080,000
Delivery to Jobsite	180,000
Supplements, Vendor Field Representation	740,000
SUBTOTAL	$13,000,000
CONTINGENCY	1,950,000
ESTIMATED SUPPLY COST	$14,950,000
STEAM TURBINE-GENERATORS	
Composite of Vendor Base Prices	$8,000,000
Freight to East Coast Port	100,000
Ocean Transportation	120,000
Delivery to Jobsite	20,000
Supplements, Vendor Field Representation	360,000
SUBTOTAL	$8,600,000
CONTINGENCY	1,290,000
ESTIMATED SUPPLY COST	$9,890,000

EXHIBIT 8 Sheet 3 of 5

CAPITAL INVESTMENT ESTIMATE

SUMMARY SHEET PRICING BREAKDOWN

1. US ORIGIN EQUIPMENT (Cont'd)

WATER TREATMENT EQUIPMENT	
Composite of Vendor Pricing	$600,000
All Transportation Costs	30,000
SUBTOTAL	$630,000
CONTINGENCY	90,000
ESTIMATED SUPPLY COST	$720,000
OTHER EQUIPMENT (Incl all transportation costs)	
Intake Equipment, Circ Water Pumps & Motors	$1,250,000
Steam Turbine-Generator Building Bridge Crane	300,000
Gas Turbine Service Bridge Gantry Crane	380,000
Process Pumps & Motors, Service Pumps & Motors	920,000
Condensers, Deaerators, Other Heat Exchangers	1,750,000
Compressed Air Plant	210,000
Discharge Treatment Equipment	110,000
Instrumentation Equipment	100,000
Electrical Equipment and Wiring System	4,860,000
SUBTOTAL	$9,880,000
CONTINGENCY	1,480,000
ESTIMATED SUPPLY COST	$11,360,000
SPARE PARTS FOR 5 YEARS BASED ON BASE PRICE OF EQUIPMENT ($28,920,000)	1,446,000
TOTAL ESTIMATED SUPPLY COST	$38,366,000

EXHIBIT 8 Sheet 4 of 5

CAPITAL INVESTMENT ESTIMATE

SUMMARY SHEET PRICING BREAKDOWN

2. EGYPTIAN ORIGIN SUPPLY

Crushed Stone-Yard Surfacing, Roads, Earthwork	L.E.	360,000
Foundation Piling		990,000
Reinforced Concrete - Concrete Materials, Reinforcing Steel, Embedded Metals		1,960,000
Structural and Miscellaneous Steel		1,950,000
Buildings - Architectural, HVAC, Plumbing, Lighting		1,090,000
Piping - Process, Service, and Circulating Water		1,390,000
Insulation and Lagging - Equipment and Piping		670,000
Paint and Coatings		110,000
SUBTOTAL	L.E.	8,520,000
CONTINGENCY		1,700,000
ESTIMATED SUPPLY COST	L.E.	10,220,000
	U.S.	$7,860,000

EXHIBIT 8 Sheet 5 of 5

CAPITAL INVESTMENT ESTIMATE

SUMMARY SHEET PRICING BREAKDOWN

3. INSTALLATION BY EGYPTIAN SUBCONTRACTORS		
Direct Installation (1,060,000 workhours)	L.E.	6,330,000
Temporary Construction Plant and Equipment		5,070,000
Indirect Installation - Temporary Requirements Provided for all Subcontractors		2,280,000
SUBTOTAL	L.E.	13,680,000
CONTINGENCY		2,050,000
ESTIMATED INSTALLATION COST	L.E.	15,730,000
	U.S.	$12,100,000
4. A-E/CM SERVICES		
Engineering and Design		2,270,000
Construction Management		540,000
ESTIMATED SERVICES COST		$2,810,000

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 86 to FY 89
Total U. S. Funding $65 MILLION
Date Prepared: JUNE 1986

Project Title & Number: TALKHA COMBINED-CYCLE POWER GENERATION PLANT - 263-0196

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: (A-1) To efficiently increase and improve power electric power supply in Egypt.	**Measures of Goal Achievement: (A-2)** 1. Saving of domestic petroleum or natural gas that could be exported. 2. The amount of fuel consumed per KWH generated by the entire system will be reduced.	**(A-3)** 1. EGPC Annual Reports 2. MEE Records 3. EEA Annual Reports 4. EEA Monthly Operating Reports 5. EEA Plant Operating Reports	**Assumptions for achieving goal targets: (A-4)** 1. The GOE places high priority on increasing efficiency of power generation infrastructure, as well as increasing electric power generated. 2. The GOE also wants to save as much exportable fuel as possible by implementing energy conservation measures and developing renewable energy sources.
Project Purpose: (B-1) To increase the efficiency of the Egyptian Electricity Authority existing gas turbine generating facilities by recycling otherwise wasted heat energy.	**Conditions that will indicate purpose has been achieved: End-of-Project status. (B-2)** 1. Talkha gas turbine generating plant will be fully operational and will be producing an additional 106 MW of energy per year with no additional fuel consumption. 2. The combined-cycle plant will be staffed by trained operators and maintenance personnel.	**(B-3)** 1. Examination and inspection of the completed combined-cycle addition. 2. Provisional acceptance certificate issued.	**Assumptions for achieving purpose: (B-4)** The GOE considers this project an energy conservation project (through freeing up fuel, for export or other uses, that would have had to be used to generate the same amount of MW generated by this project. The GOE also is interested in replication of this energy-efficient, cost-effective technology.
Project Outputs: (C-1) A 110 MW combined-cycle add-on plant installed at the Talkha gas turbine plant and existing gas turbine facilities upgraded.	**Magnitude of Outputs: (C-2)** 1. Two 55 MW steam turbine generators installed. 2. Eight heat recovery steam generators installed. 3. Associated auxiliary equipment and controls installed. 4. Existing 220 KV substation expanded. 5. Existing eight gas turbines upgraded to improve output and efficiency.	**(C-3)** 1. Contractor Monthly Reports 2. Consultant Monthly Reports 3. Inspection and examination of the works	**Assumptions for achieving outputs: (C-4)** 1. GOE will provide all local currency required to carry out the project 2. Required rights of way, property and permits required for performing the installation work will be provided by the GOE in a timely manner.
Project Inputs: (D-1) 1. Contract for providing conceptual design parameters and detailed cost estimate; will also assist EEA in the negotiation, administration, monitoring and supervision of the construction contract of the add-on plant. 2. Contract for the detailed design, supply and installation of equipment, testing and startup of the plant.	**Implementation Target (Type and Quantity) (D-2)** 1. AID Financed Inputs (Dols 000) a. Technical Assistance 4,000 b. Construction 56,000 c. Other 5,000 Total 65,000 2. GOE contribution LE 20 million	**(D-3)** 1. Review of contracts 2. Reviewing factory inspection and shipping reports for equipment and material 3. Progress reports 4. Visual inspection 5. Evaluation and project completion reports.	**Assumptions for providing inputs: (D-4)** 1. Initial conditions Precedent of Grant Agreement Amendment will be met in a timely manner 2. Review and approval of contracts, invoices and other project documentation will be expeditiously performed by the GOE.

UNITED STATES AGENCY for INTERNATIONAL DEVELOPMENT

CAIRO, EGYPT

c/o American Embassy
5 Latin America Street
Garden City, Cairo

NOV 27 1985

Eng. Abdal Hamid El Sayyad
Chairman
Egyptian Electricity Authority
Nasr City, Abbassia
Cairo, Egypt

Dear Sir:

We have recently discussed with your representatives prospects for AID funding of the Talkha Combined-Cycle activity. I am pleased to advise you that AID, in consultation with the Ministry for Planning and International Cooperation, shares the priority which EEA attaches to the Combined-Cycle activity. We are planning, accordingly, to develop the Project for funding during the current U.S. fiscal year and are currently working with EEA on necessary documentation. We are hopeful of executing the Project Agreement in February of 1986. We estimate funding requirements, over life of project, at $65 million (from AID) and L.E.20 million (from your Government).

You have also requested our views on the appropriate contracting procedure (competitive vs. non-competitive) for the necessary engineering consulting services and construction services/equipment procurement. I am pleased to enclose an analysis, as seen by AID, of these questions. This analysis is offered as a conceptual approach, rather than in direct response to the proposal of any particular company.

You will note that, as we see it, there are various options, with advantages and disadvantages to each. It would, of course, be both possible and normal to obtain all necessary services and equipment on the basis of full competition. We do note, however, that there are major potential foreign exchange earning opportunities to the Government of Egypt should these contracts be awarded non-competitively.

Also, we have analysed at your request the "turnkey" vs. other methods of construction and equipment supply. Our analysis in this respect is also attached.

I would suggest that, as the next step in developing this Project for AID funding, you write me with your stated preference for: (a) "turnkey" vs. other construction/equipment contracting methods; and (b) competitive vs. non-competitive procurement for the necessary contracts. To the extent that you prefer non-competitive procurement, please indicate your preferred contractors, by name, with appropriate supporting justification. We would then assess your stated preferences in terms of AID contracting procedures and, in consultation with your representatives, would settle upon a procurement plan for the Project.

We look forward to working with you on this important undertaking.

Sincerely,

Frank B. Kimball
Director

Attachments:

Annexes:

Annex 1 - Description of Project
Annex 2 - Options re: Procurement of Consultant Engineering Services
Annex 3 - Options re: Form of Contract for Construction Services and Equipment Procurement
Annex 4 - Contracting Options: Implementation Schedules
Annex 5 - Summary of Annexes 1 through 4

cc: H.E. Minister of Electricity & Energy, w/Annexes
MPIC:AAZaki, w/Annexes

ANNEX 1

TALKHA COMBINED-CYCLE ADDITION

Eight General Electric combustion turbines were installed at the Talkha site in 1979. Each unit is designed to supply a nominal 24 MW to the EEA power system. The combustion turbines can be fueled by either natural gas or kerosene (No. 2 oil known in Egypt as Solar).

The combustion turbines, when in operation, draw air into a compressor which compresses the air and delivers the air at high velocity, to ten combustion chambers located around the periphery of the turbine where the fuel is mixed with the air and ignited, heating the air and combustion products to approximately 1900° F. The heated air containing combustion products, at high pressure, is channeled to the turbine where it passes through the turbine vanes to rotate the turbine and gear-coupled generator to produce electrical energy. The heated air and combustion products, having passed through the turbine, are exhausted at high velocity to the atmosphere still possesing substantial thermal energy with exhaust gas temperatures above 900° F.

Substantial energy can be recovered from the combustion turbine exhaust gasses and used to produce additional electric energy. The exhausted gasses are diverted into a heat recovery steam generator (boiler) where the thermal energy of the exhaust gasses converts water to steam which is discharged through a steam turbine coupled to a generator to produce the additional electrical energy. The steam exhausted from the steam turbine is condensed to water and returned to the boiler for reheating to produce steam.

When a gas turbine cycle is integrated with a steam turbine cycle, the resulting system is commonly referred to as a Combined-Cycle. A Combined-Cycle plant can generally produce 50 percent more energy than would be possible with combustion turbines alone. This additional energy is produced without the consumption of additional fuel. The Combined-Cycle heat rate (efficiency) is comparable to the most efficient steam driven power generating plants.

In the Combined-Cycle plant, the combustion turbines exhaust into the heat recovery steam generators rather than the atmosphere resulting in a slight reduction in gas turbine efficiency due to the higher turbine back pressure. The normal practice of boiler feedwater heating to achieve optimum efficiency, common in conventional steam turbine cycle design, is not utilized in the Combined-Cycle so that the maximum energy conversion can be achieved from the exhaust gasses.

EEA's National Energy Control Center determines automatically and instantaneously the optimum generation to meet customer requirements and the allocation of the generation between the generating units to achieve the most economical operation for the EEA system. In meeting load requirements, those generating units having the lowest production costs are loaded first followed next by generation assignments in the order of ascending production costs with those units having the highest production costs being utilized for the minimum period of time. Dr Hamdy El Shaer, Deputy Chairman-Operations reports that it is EEA's intent to operate the Combined-Cycle Addition at Talkha as a base loaded plant next in order of loading to the hydro generation but before the new base load gas fueled generation at Shoubrah El Kheima, Abu Qir and Abu Sultan thermal power stations and thereby realize the maximum benefit from the combined-cycle plant's efficiency and low production costs which will minimize the operation of those units with the highest production costs. The estimated 775 million kWhrs of energy produced by the Talkha addition will displace generation from gas turbines fueled by Solar (kerosene) fuel having the highest production costs which will result in a net savings in Mazout oil consumption of 2.3 million barrels per year with a estimated foreign exchange value of $59 million based on the international market price of Mazout of $25.40 per barrel.

Attachment 1: Plant Capacity and Fuel Saving

ANNEX 1
Attachment 1

TALKHA COMBINED-CYCLE ADDITION
PLANT CAPACITY AND FUEL SAVINGS

Talkha Combined Cycle Plant Capacity:	Per Unit	Plant
Gross Gas Turbines Upgraded Output (4 @ 26,000 kW)	=104,000 KW	208,000 kW
Derating for C/C Operation-2.45%	= 2,548 kW	5,096 kW
Net Gas Turbine Output	=101,452 kW	202,904 kW
Steam Turbine - 1 @ 55,300 kW	= 55,300 kW	110,600 kW
Gross Output	=156,752 kW	313,504 kW
Auxiliary Power	= 2,230 kW	4,460 kW
Net Plant Output of Combined Cycle Plant	=154,522 kW	309,044 kW

Fuel Savings - Combined Cycle versus Simple Cycle and System Dispatch

Combined-Cycle Plant Fuel Requirement:

Combustion Turbine:

208,000 kW x 3021 kCal/kWhr x 7008 hrs/year x Bbl/1.46 x 10^6 kCal = 3,016,166 bbls./Yr.

Steam Turbine:

110,600 kW = 0 bbls.

Total Fuel Required for Output of 309,044kW Combined Cycle Plant

= 3,016,166 bbls./Yr.

Talkha Simple Cycle Existing Gas Turbines Fuel Utilization:

197,760kW x 3112 kCal/kWhr x 7008 hrs/year x bbl/1.46x10^6 kCal = 2,954,060 bbls./Yr.

Additional Energy Required from EEA System to Equal Output of Capacity of Upgrade Combined Cycle Plant:

111,284kW x 4491 kCal/kWhr x 7008 hrs/year x bbl/1.46x10^6 kCal = 2,398,927 bbls./Yr.

Total Fuel Required Without Combined Cycle Plant Equivalent Generation:

= 5,352,987 bbls./Yr.

Fuel Savings from Combined-Cycle Operation is 5,352,987 bbls/Yr. - 3,016,166 bbls./Yr. 2,336,821 bbls./Yr.

Potential Foreign Exchange earnings = $59,355,253*

*Heavy Crude price $25.40/bbl.

ANNEX 2

TALKHA COMBINED-CYCLE ADDITION
CONSULTING ENGINEER OPTIONS

The Talkha Combined Cycle Addition project will require the services of a Consultant Engineer to assist EEA in contracting for and overseeing construction.

Five options are available for obtaining consultant services:

Option A: Utilize an IQC contractor for the preparation of the IFB including technical specifications and construction cost estimate for two or more supply/install contracts and assist EEA in evaluation of bids and awarding of contracts; and in parallel, compete the Consultant Services for construction supervision.

Option B: Utilize an IQC contractor for the preparation of an RFP including technical specifications and construction cost estimate for a Turnkey contract and to assist EEA in proposal evaluation and contract negotiation and in parallel, compete the Consultant Services for design review, contract and construction administration.

Option C: Utilize an IQC contractor for the negotiation of a Turnkey (single-responsibility) contract and in parallel, compete the Consultant Services for design review, contract and construction administration.

Option D: Compete Consultant Services for project design and implementation services.

Option E: Waive competition for the procurement of A/E services and authorize EEA to negotiate with a sole source for project design and implementation services.

Each of the above options is further reviewed below and the advantages and disadvantages of each option are identified.

Option A: The use of an IQC contractor to prepare two or more IFB's including technical specifications and assist EEA in bid evaluation and contract negotiations would require 17 months. IQC Work Orders limit IQC services normally to four months. This Alternative would require repetitive IQC Work Orders which is clearly not the intent of the IQC Contract.

Option B: The use of an IQC contractor to prepare an RFP including technical specifications and assist EEA in proposal evaluation and contract negotiations would require 13 months. IQC Work Orders limit IQC services normally to four months. This Alternative would require repetitive IQC Work Orders which is clearly not the intent of the IQC Contract.

Option C: The use of an IQC contractor to negotiate a turnkey contract based on the GE proposal would require four months. A single IQC Work Order would be required. At the same time an A/E would be competitively selected to assist EEA in design review, contract and construction administration. [The Electric Utility IQC is Laramore Douglass & Popham who would use the services of Gilbert Commonwealth Inc. for the assignment.]

The IQC would:

(1) Review over a one month period the feasibility study and other relevant documents to establish the acceptability of the technical proposal and define the technical modifications to meet the requirements of EEA.

(2) Prepare an engineering cost estimate for the Combined-Cycle addition at Talkha consistant with technical specifications.

(3) Over a three month period, assist EEA in the negotiation of a Turnkey contract for the Combined-Cycle addition.

The A/E when selected would:

(1) Review and approve design drawings

(2) Provide contract administration

(3) Provide construction supervision

(4) Provide project management for multiple supply and construction contracts,

(5) Monitor and review the Combined-Cycle addition start-up and testing.

(6) Prepare and oversee the training program for operation and maintenance staff.

(7) Assist EEA in the selection, ordering, stocking and inventory control of spare parts.

Advantages:

IQC would subcontract work to Gilbert Commonwealth Inc., the A/E for the original Talkha project.

IQC subcontractor would begin work immediately.

IQC subcontractor assistance to EEA in contract negotiations would not disqualify consultant from future work.

A/E services for design review, contract and construction administration would be competed.

AID Direct Contract for IQC services through the procurement phase with Host Country contract for A/E services for design review, contract and construction administration.

Disadvantages:

Change from IQC to A/E following turnkey contract execution could result in loss of continuity, ambiguity, delays, claims and excess costs in design review and project administration if A/E design philosophy different than IQC.

Initial design approvals would be required before Consultant Engineer contracted and could result in delays.

Option D: The competitive selection of a A/E according to normal AID procedures would require 12 months (Attachment A).

The A/E would:

(1) Prepare Preliminary Design of Combined-Cycle Addition and construction cost estimate.

(2) Prepare either RFP for turnkey installation or IFB's and technical specifications for multiple supply and construction contracts for addition.

(3) Assist EEA in Prequalification of firms.

(4) Assist EEA in evaluations and contract award.

(5) Review and approve design drawings.

(6) Provide contract administration.

(7) Provide construction supervision.

(8) Provide Project management services for multiple supply and construction contracts.

(9) Monitor and review the Combined-Cycle addition start-up and testing.

(10) Prepare and oversee the training program for operation and maintenance staff.

(11) Assist EEA in the selection, ordering, stocking and inventory control of spare parts.

Advantages:

- Single A/E would participate in the project implementation assuring uniformity of design, procurement and construction.
- A/E with best presented qualifications would be selected.

Disadvantages:

- Initiation of project delayed by 12 months
- A/E would require 8 months to prepare preliminary design specification and IFB's or RFP
- Procurement of equipment and construction services delayed by 20 months

Option E: The non-competitive selection of the Consultant Engineer would have to be justified by the criteria of AID Handbook 11, Chapter 1.

The advantage gained by following this selection procedure would be the savings of the time required for competitive selection and the consequent saving of significant foreign exchange by the GOE. Annex A attachment A shows that from 9 to 14 months could be saved. The disadvantage would be the forgoing by the GOE of consideration of A&E proposals from other than the chosen "sole source" awardee.

ANNEX 2
Attachment A

Comparison of Time Requirements, in Calendar Days, Competitive Selection of Consultant

Steps in Competitive Selection	Target	Experience: Ismailia & Talkha	Experience: Shoubrah El Kheima	Experience: 1200MW Study
Preparation of Scope of Work and publication of CBD Notice	90	—	—	—
Preparation & Submission of Prequalification Data	30	29	27	45
Evaluation of Prequalification Data and Short List Approval	40	49	39	36
Preparation and Submission of Technical Proposal	60	51	106	60
Evaluation of Technical Proposal and A/E Selection	60	50	55	65
Contract Negotiations and Contract Execution	80	82	194	181
Total (days)	360	261	421	387
(months)	12	9	14	13

Comparison of Time Requirements, in Calendar Days, for Preparation of Procurement Documents

Steps in Preparation of Documents	Target	Experience: Ismailia	Experience: Shoubrah El Kheima	Experience: Talkha
Preparation of Preliminary Design	100	103	91	124
Preparation of IFB	180	--	180	--
Preparation of RFP	160	222	--	158
Total (days)	230	274	247	162
(months)	8	9	8	5

ANNEX 3

TALKHA COMBINED-CYCLE ADDITION
EQUIPMENT/CONSTRUCTION CONTRACT FORM

There are three basic types of contracts that could be utilized for the equipment procurement and site construction*.

Option 1. Lump sum turnkey (single-firm with responsibility for design, supply and install, test and place in operation)

Option 2. Lump sum Thermal Cycle supply/install contract coupled with "balance of plant" supply/install contracts

Option 3. Multiple lump sum equipment procurements and one civil, mechanical and electrical installation contract

Option 1:

An RFP with performance specifications would be prepared by EEA assisted by a U.S. consulting engineer. The RFP would be issued to Prequalified firms. Following a Pre-Bid meeting, the firms would prepare technical proposals and costs. The proposals would be evaluated by EEA, assisted by the consultant, and a contract award would be made to the firm with the lowest evaluated cost. The turnkey contractor would have total project responsibility for the design, engineering, supply, manufacture, shipment, installation, testing and start-up of the combined-cycle addition and training of personnel.

Advantages:

The advantage of this option is that there would be only one contract to administer with all of the advantages of having to deal with only one contractor who has full responsibility for the work and because he has full responsibility, including performance, it could reasonably be assumed that the overall period of time required to complete the project would be less than that required by other options. Savings in time would primarly result from the contractor being able to place orders for long delivery items before all detail design is completed.

* Due to the fact that the work is to be done in an operating station which is on a small rather congested site only one construction contractor should be utilized for ease of coordination of all activities.

Disadvantages:

The disadvantage is that competition would be somewhat limited in that fewer construction firms would be qualified and the contractor would not be obligated to such wide competition amongst equipment suppliers and some might argue that as a result quality would suffer.

Option 2:

An RFP with performance specifications for the thermal cycle (HRSG, steam turbine-generator, condenser, boiler feed pumps, controls) would be prepared by EEA, assisted by a U.S. consulting engineer. The RFT would be issued to prequalified firms with previous Combined-Cycle experience. Each firm would prepare technical proposals and costs. The proposals would be evaluated by EEA, assisted by the consultant, and a contract award would be made to the firm with the lowest evaluated cost. The thermal cycle contractor would have total project responsibility for the design, engineering, supply, manufacture, shipment, installation, testing and start-up of the thermal cycle addition and would provide a gross plant performance guarantee.

EEA, assisted by the consultant, would prepare four to six IFB's and technical specification for the "balance of plant" equipment. The IFB's would be issued to interested firms. Each firm would submit their bid which would be evaluated by EEA assisted by the consultant, and a contract award made to the lowest responsive bidder. The "balance of plant" contractors would provide performance guarantees for their equipment.

The A/E would act as project manager and construction manager and would develop an integrated training program.
Advantages:

- Permits substantial competition.
- Overall plant design the responsibility of A/E.
- A/E responsible for Project and Consultant Management.
- A/E responsible for development of comprehensive training program.
- Gross plant performance guarantee.

Disadvantages:

- Equipment supply responsibility divided.
- Customs clearances required by multiple suppliers.

- Procurement and installation would require longer period than option one.
- Potential for delays and protests due to construction inferences from multiple contractors on site.
- Schedule subject to timely excution of balance of plant contracts.
- Implementation of training program dependent upon A/E and equipment suppliers.
- Net plant performance subject to performance of minor items of equipment.

Option 3:

Six to ten IFB's would be prepared by EEA, working with a U.S. consultant engineer. The IFB's would be issued to interested firms. Each firm would prepare bids. Bids would be evaluated and contracts awarded to the lowest responsive bidder. [Since technical specifications would often be dependent on major equipment performance characteristics, some IFB's would be delayed until major equipment awards]. The first two IFB's would be for the heat recovery steam generators and the steam turbine-generators, followed by the condensers and pumps. Performance guarantees would be required for each item of equipment. Any delay in delivery of equipment or services would disrupt the schedule and EEA would demand substantial liquidated damage clauses in each contract.

Advantages:

Would encourage maximum competition in terms of both quality and cost.

Individual equipment guarantees.

Plant addition cost.

Disadvantages:

Substantial engineering design to prepare specifications with subsequent redesign following bid award.

Responsibility for plant divided among all contractors.

Possibility of bid award protests and/or delays which would extend schedule.

Procurement and installation would probably require longer period than other options.

Lack of net guarantee on overall plant performance.

Possibility of protracted spare parts negotiation with each supplier.

Would require substantial AID involement in procurement phase.

Potential for substantial claims for extra work.

ANNEX 4

TALKHA COMBINED-CYCLE ADDITION
PROJECT IMPLEMENTATION SCHEDULE BASED ON CONTRACTING OPTIONS

The effect of various Consultant Service and Supply/Construct contracting options on the project implementation schedule have been quantified. The options are identified by alphanumeric code. Option E-1 is the combination of Option E, for Consulting Services contracting, as described in Annex 2 with Option 1, for Equipment and Construction contracting, as described in Annex 3. The options and resulting schedule are summarized below:

Implementation Plan	Project Duration Months
Option E-1:	
A/E competitive selection is waived and contract is negotiated. A/E prepares preliminary Design and RFP. A/E assists EEA in proposal evaluation and contract negotiations. Turnkey contractor designs, supplies and constructs the Combined-Cycle addition. A/E provides design review, contract and construction administration.	45
Option E-1 With Waivers:	
A/E competitive selection is waived and contract is negotiated with selected firm. During negotiations the firm assists EEA in negotiation of turnkey contract. The selected turnkey contractor designs, supplies and constructs the Combined-Cycle addition. The engineering firm provides design review, contract and construction administration.	30
Option D-3:	
A/E competively selected. A/E prepares Preliminary Design and six to ten IFB's for equipment supply and site construction contracts. A/E assists EEA in bid evaluation and contract award. Each supply contractor designs and supplies equipment. Each construction contractor designs and constructs facilities. A/E provides design review, contract and construction administration and project management.	53

Option C-1:

IQC (subcontractor GAI) assists EEA in negotiation of a turnkey contract with selected turnkey contractor. The turnkey contractor designs, supplies and constructs the Combined-Cycle addition. A/E competitively selected to provide design review, contract and construction supervision. A/E selection delays design review by minimum of 5 months following turnkey contract — 36

Option D-1:

A/E competitively selected. A/E prepares Preliminary Design and RFP for turnkey contract. A/E assists EEA in proposal evaluation and contract negotiations. Turnkey contractor designs, supplies and constructs the Combined-Cycle addition. A/E provides design review, contract and construction administration. — 52

Option E-3:

A/E competitive selection waived and contract negotiated. A/E prepares Preliminary Design and six to ten IFB's for equipment supply and site construction contracts. A/E assists EEA bid evaluations and contract awards. Each contractor designs and supplies equipment. Each contractor designs and constructs facilities. A/E provides design review, contract and construction administration, and project management. — 46

Option D-2:

A/E competively selected. A/E prepares Preliminary Design and RFP for turnkey contract for thermal cycle and IFB's for balance of plant equipment. A/E assists EEA in proposal and bid evaluations and contract negotiations. Turnkey contractor designs, supplies and constructs the thermal cycle portion of Combined-Cycle addition. Other equipment and — 52

construction contractors design supply and/or construct the balance of plant addition. A/E provides design review, contract and construction administration and project management.

Option E-2:

A/E competitive selection waived and contract negotiated. A/E prepares Preliminary design and RFP for turnkey contract for thermal cycle and IFB's for balance of plant equipment. A/E assists EEA in proposal and bid evaluation and contract negotiations. Turnkey contractor designs, supplies and constructs the thermal cycle portion of Combined-Cycle addition. A/E design review, contract administration and construction and project management. 45

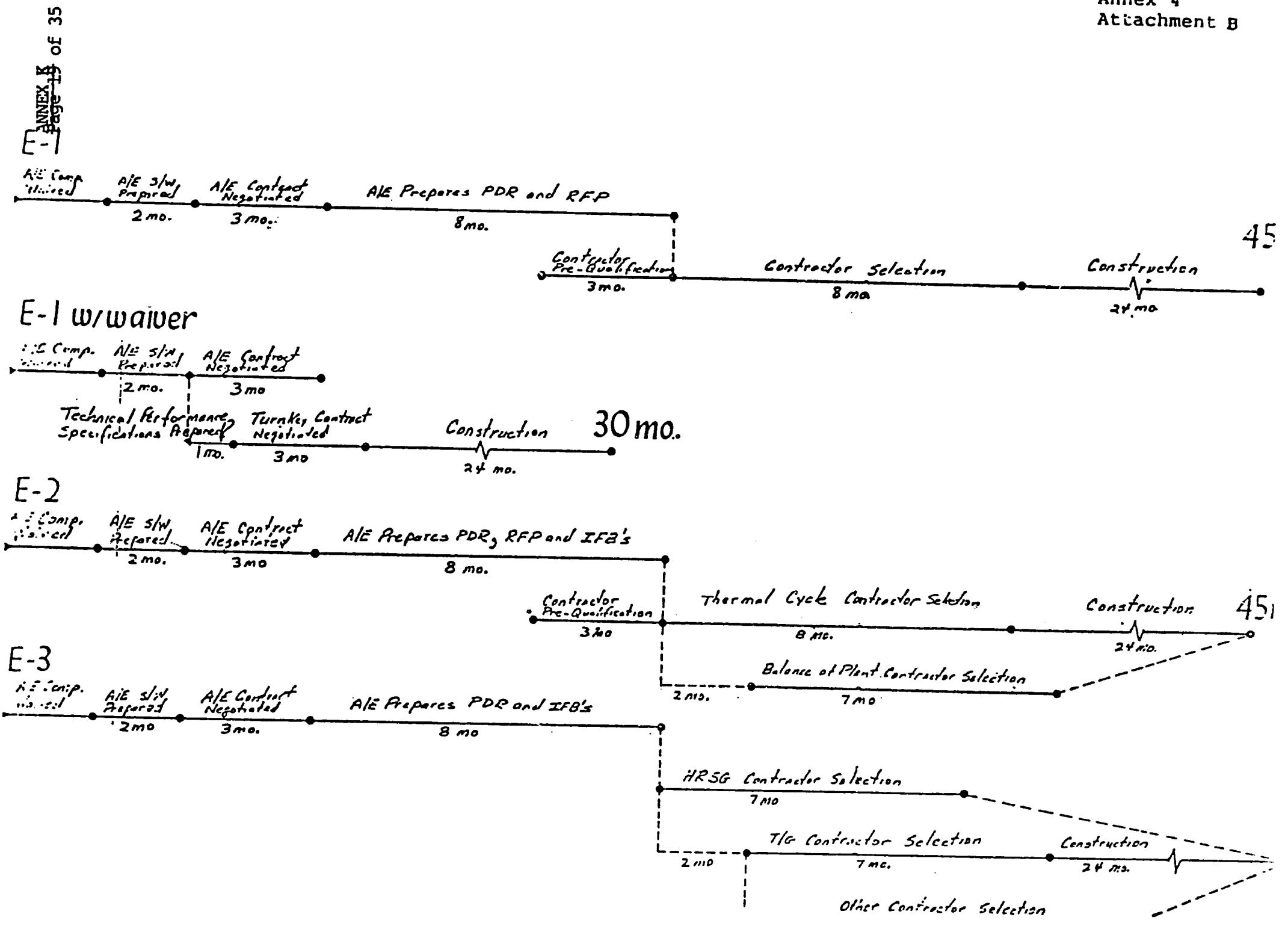
Attachment:

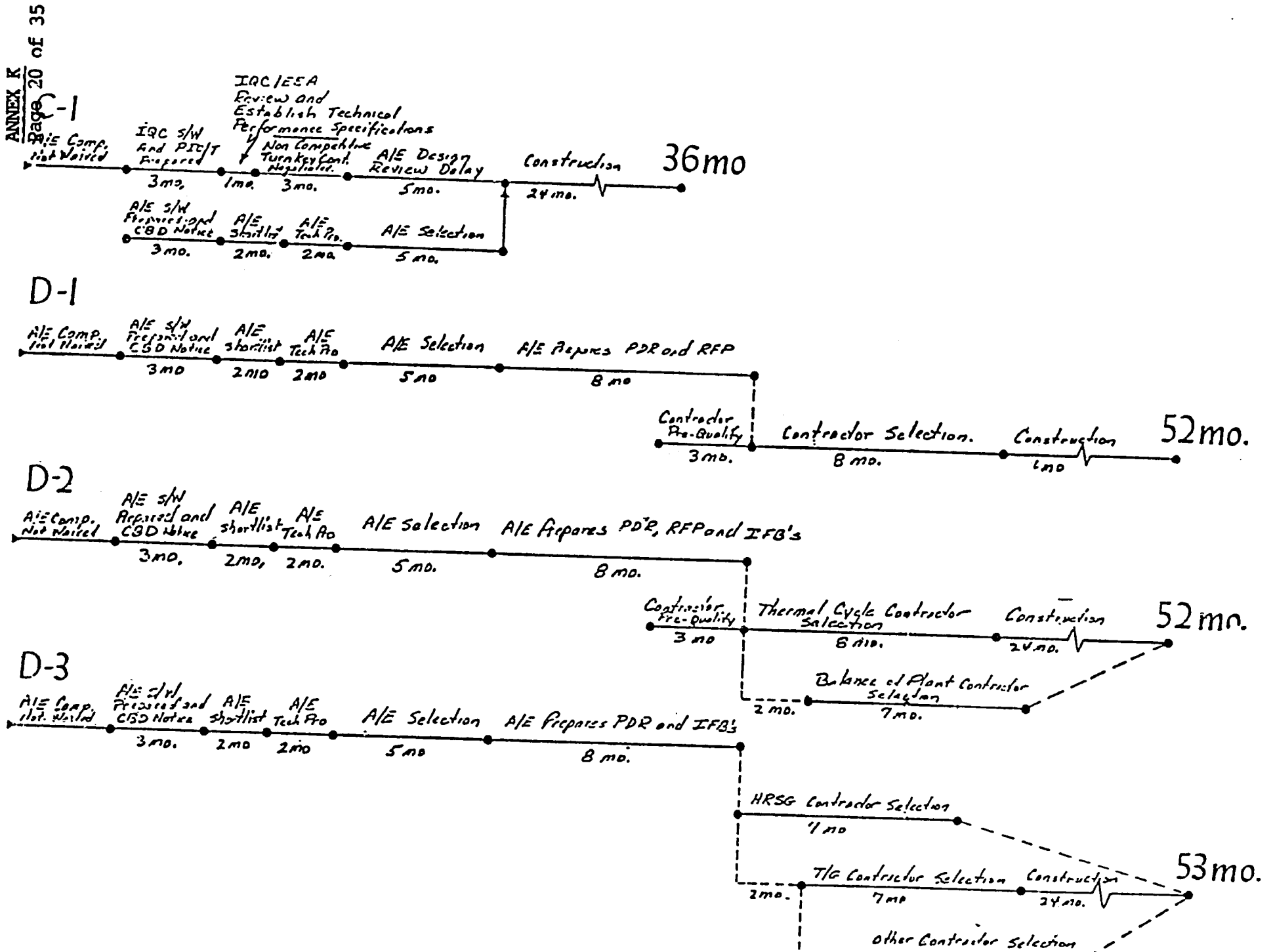
A: Comparison of Time Requirement for Competitive Selection of Contractor.
B: Option Plan Schedules

ANNEX 4
Attachment A

Comparison of Time Requirements in Calendar Days for Competitive Selection of Contractor

		Experience		
	Target	Talkha	Ismailia	Shoubrah El Kheima
Preparation and Publication of CBD Notice	15			
Preparation & Submission of Prequalification Data	45	30	45	45
Evaluation of Prequalification Data and Short List Approval	40	40	31	44
Initial Review of RFP/IFB and Pre Bid Meeting	30	30	29	37
Preparation and Submission of Technical Proposal/Bid	90	90	88	134
Evaluation of Proposal/Bid and Contractor Selection	90	90	98	228
Contract Negotiations and Contract Execution	40	40	39	39
Total (days)	335	320	330	361
(months)	11	10	11	12


E-1
A/E Comp. Waived
A/E S/W Prepared
2 mo.
A/E Contract Negotiated
3 mo.
A/E Prepares PDR and RFP
8 mo.
Contractor Pre-Qualification
3 mo.
Contractor Selection
8 mo
Construction
24 mo.
45
E-1 w/waiver
A/E Comp. Waived
A/E S/W Prepared
2 mo.
A/E Contract Negotiated
3 mo
Technical Performance Specifications Prepared
1 mo.
Turnkey Contract Negotiated
3 mo
Construction
24 mo.
30 mo.
E-2
A/E Comp. Waived
A/E S/W Prepared
2 mo.
A/E Contract Negotiated
3 mo
A/E Prepares PDR, RFP and IFB's
8 mo.
Contractor Pre-Qualification
3 mo
Thermal Cycle Contractor Selection
8 mo.
Construction
24 mo.
45
E-3
A/E Comp. Waived
A/E S/W Prepared
2 mo
A/E Contract Negotiated
3 mo.
A/E Prepares PDR and IFB's
8 mo
Balance of Plant Contractor Selection
2 mo.
7 mo
HRSG Contractor Selection
7 mo
T/G Contractor Selection
2 mo
7 mo.
Construction
24 mo.
Other Contractor Selection


C-1
A/E Comp. Not Waived
IQC S/W And PIC/T Prepared
IQC/EEA Review and Establish Technical Performance Specifications
Non Competitive Turnkey Cont. Negotiation
A/E Design Review Delay
Construction
36mo
3mo.
1mo.
3mo.
5mo.
24 mo.
A/E S/W Prepared and CBD Notice
A/E Shortlist
A/E Tech Pro.
A/E Selection
3 mo.
2mo.
2mo.
5 mo.
D-1
A/E Comp. Not Waived
A/E S/W Prepared and CBD Notice
A/E Shortlist
A/E Tech Pro
A/E Selection
A/E Prepares PDR and RFP
3mo
2mo
2mo
5mo
8 mo
Contractor Pre-Qualify
Contractor Selection.
Construction
52mo.
3mo.
8 mo.
1mo
D-2
A/E Comp. Not Waived
A/E S/W Prepared and CBD Notice
A/E Shortlist
A/E Tech Pro
A/E Selection
A/E Prepares PDR, RFP and IFB's
3mo.
2mo.
2mo.
5mo.
8 mo.
Contractor Pre-Qualify
Thermal Cycle Contractor Selection
Construction
52 mo.
3 mo
6 mo.
24 mo.
Balance of Plant Contractor Selection
2 mo.
7 mo.
D-3
A/E Comp. Not. Waived
A/E S/W Prepared and CBD Notice
A/E Shortlist
A/E Tech Pro
A/E Selection
A/E Prepares PDR and IFB's
3 mo.
2mo
2mo
5mo
8 mo.
HRSG Contractor Selection
4 mo
T/G Contractor Selection
Construction
53mo.
2mo.
7mo
24 mo.
Other Contractor Selection

ANNEX 5

TALKHA COMBINED-CYCLE ADDITION - SUMMARY OF ANNEXES 1 THROUGH 4

The Talkha Combined-Cycle project, due to its fuel conservation character, is a national priority. Egypt's foreign exchange earnings are decreasing due to curtailed worker remittances, reduced revenues from oil exports caused by lower oil prices, and reduced revenues from Suez Canal tolls. As a result, the GOE is considering ways to implement expeditiously projects which will enhance foreign exchange income and/or savings.

Proceeding according to Option E-1 with waivers would result in new generation within an estimated 30 months from the beginning of project implementation. Proceeding according to Option D-3 the implementation period would be 53 months. Since EEA can utilize the additional generation as soon as it is available and since the energy will be produced without any increase in fuel consumption, the average monthly savings is estimated at $4.9 million per month *. Thus there is a calculated savings of approximately $29 million over Option C-1 (36 months implementation period) and $112 saving over Option D-2. While these estimates are based on the price of oil being $25.40 per barrel, even if the price of oil falls by 20% ($20.32 per bbl) then the savings for selecting Option E-1 with waivers over its nearest competitor would be a substantial $23.4 million.

Considering the administrative complications of proceeding with the selection of the engineer as proposed by Option C-1 and the confusion which might result from transferring responsibility from the IQC contractor to the A/E selected by competition, particularly if two firms are involved, precludes serious consideration of this approach over Option E-1 with waivers. Thus from the practical point of view proceeding with Option E-1 with waiver should be compared to Option D-1 or D-2, both of which require an estimated 52 month implementing period which permits time for competitive selection of the A/E and construction contractors. Accordingly, it is reasonable to assume that savings should be accumulated for a 22 months period in amount of $85.8 million if the cost of fuel falls to $20.32 since the Combined - Cycle plant will be operated as a base load plant (ie 24 hours per day everyday except for maintenance down time).

* Assuming alternate source or energy requires oil as fuel. All other EEA generating capacity requires oil ~~as a full capacity~~ except some hydo capacity which is limited.

or natural gas as fuel.

The benefit to the GOE in a non-competitive approach and using "turnkey" contracting, is in essence the potentially significant foreign exchange savings, as discussed above. The disadvantages are the possibilities that competition, to be forgone, would bring lower prices and/or earlier dates for completion than that used in this analysis.

EGYPTIAN ELECTRICITY AUTHORITY
NASR CITY, ABBASSIA, CAIRO, EGYPT.
Telegram : Electrocop — Telex 92097 POWER U.N.

10th December 1985.

Mr. F.P. Kimball
Director,
USAID
Cairo Center
2, Abdel Kader Hamza St.
Garden City,
CAIRO, EGYPT.

787

15/CS
ACTION TO DL DPPE
ACTION TAKEN ✓ DATE 12/19
NAME _____ INITIALS JH

SUBJECT: TALKHA COMBINED CYCLE ADD ON PROJECT.

Dear Mr. Kimball,

Concerning the subject in caption and following our letters in May and August 1985, promoting the project as top priority and urgent, and in reference to your letter dated November 27, 1985, we have reviewed all material available related to the subject.

Considering the project as energy enhancement and to meet the energy gap beginning in 1988, the appropriate procedure for contracting could be as follows:

1. We should go Turn-key to fulfil single responsibility, overall plant guarantee for Add-on and upgrading, and securing proper after sale services.

2. To negotiate contracts in the shortest time possible for the supervisory consultant services and supplies procurement in order to save time, as the savings for fuel-free 100 MW power generated is over $ 40 million per year. If these contracts are competed, we estimate a delay in realizing the objectives of not less than 18 months.

3. To select Gilbert Associates for consultancy, having substantial previous experience, in Egypt with EEA, in Talkha-gas turbine project funded by AID in 1977 and in that time assisted in the changes in the site to allow for the Add-on, and in combined-cycle plant at Talkha.

4. To select General Electric, having good experience in combined cycle plants which can meet our selection criteria of experience having more than 3 plants in service for more than 5 years, and as the designer, supplier and erector of the Talkha gas turbine plant could provide pertinent up-grading for the running gas turbines with necessary guarantees.

EEA therefore kindly requests your concurrence to proceed negotiating these contracts to reach satisfactory prices and conditions.

Thanking you for your good cooperation.

Yours sincerely,

Eng. Abdel Hamid El Sayyad

perick 12/11/85 113

UNITED STATES AGENCY for INTERNATIONAL DEVELOPMENT

CAIRO, EGYPT

December 12, 1985

ACTION MEMORANDUM FOR THE MISSION DIRECTOR

THRU: G. R. van Raalte-AD/DR

FROM: John P. Hunt-ID

SUBJECT: Proposed Talkha Combined Cycle Addition (263-0196): Project Procurement Plan

I. ISSUE:

The Egyptian Government has requested AID assistance in financing the addition of equipment at the Talkha gas turbine plant to permit operation as a combined-cycle plant and thereby produce an additional 775 million kWhrs of energy per year with no additional fuel consumption. The Talkha Combined-Cycle project, due to its fuel conservation character, is a national priority. Egypt's foreign exchange earnings are decreasing due to curtailed worker remittances, reduced revenues from oil exports caused by lower oil prices, and reduced revenues from Suez Canal tolls. As a result, the GOE is considering ways to implement expeditiously projects which will enhance foreign exchange income and/or savings. An important basic design issue therefore is to determine, with due regard for the principle of competition in procurement, the appropriate method for the expeditious procurement of the goods and services needed under the project.

II. BACKGROUND:

In 1977, AID financed the consultant service and turnkey construction of a gas turbine generating plant at Talkha. The plant, consisting of eight 24 MW General Electric gas turbine-generators and auxiliary equipment, was conceptually designed by Gilbert Associates, Inc., the project consultant, and designed and built by the General Electric Company (GE), the turnkey contractor. It was completed and placed in service in 1979.

During the design, it was decided to expand the site and arrange the gas turbines to allow for future addition of combined-cycle facilities. In 1979, EEA requested AID assistance to finance additional consultant services, equipment and construction services for the design and installation of waste heat recovery boilers utilizing the exhaust gases from the gas turbines as the heat source, steam turbine-generators and auxiliary equipment to make the plant a combined-cycle facility and increase the plant capacity.

Due to conditions prevailing at that time including other financial commitments and lack of studies which examined the benefits of the proposed addition, USAID deferred action on the request. EEA completed a study in late 1981 demonstrating the fuel savings to EEA of a combined-cycle addition at Talkha. In 1982, the combined-cycle addition at Talkha was incorporated in the GOE's Five Year Development Plan and accorded a priorty second only to the Abu Sultan Unit 4 in 1983 and the Shoubrah El Kheima Unit 4 in 1984. With financing of both add-on units assured, EEA then turned their attention to securing financing and implementing the Talkha Combined-Cycle Addition at the earliest possible time.

In early 1985, Ebasco completed a feasibility study of the Combined-Cycle addition at Talkha. The study concluded that the combined-cycle addition, including two 46.5 MW steam turbine generators would provide in excess of 590 million kWhrs of energy annually and would result in a fuel savings in excess of $51 million per year. DR/ID has calculated that upgrading the existing gas turbines and adding two 55 MW steam turbine-generators would provide in excess of 775 million kWhrs of energy and would result in a fuel savings in excess of 2.3 million barrels per year equivalent to $59 million per year**. Given this information and the urgent need to conserve petroleum fuel and increase foreign exchange earnings/savings, the GOE believes it is essential to implement this project immediately. Accordingly, on August 5, 1985 the GOE again requested AID assistance to finance the Combined-Cycle addition at Talkha.

** See discussion in Annex 1 of attachment A for detail.

The combined cycle addition to Talkha is now a top priority project of the GOE, and is contained in the GOE's Five Year Development Plan. Given the urgent need to conserve petroleum fuel, increase foreign exchange and, at the same time, increase the country's power generation capacity, the GOE believes it is essential to implement this project immediately. For similar reasons and because USAID has, for some time now, been trying to encourage the GOE to initiate actions necessary to increase foreign exchange earnings/savings, the proposed project is now considered a high priority activity within USAID and represents the only new USAID power project for FY 86. By recycling energy that is otherwise lost, the proposed project increases the efficiency of existing thermal generating facilities and therefore complements our efforts to assist Egypt to conserve its natural energy resources and is consistant with our policy dialogue. Preparation of the Project Paper is underway. Authorization of the Project is scheduled for February 1986.

EEA also asked USAID to comment on a proposal it had received from the General Electric Company to design, supply and construct the additions at Talkha to make the over-all generating plant a combined cycle facility. In response to EEA's request an analysis of the various methods of contracting for necessary services, equipment and supplies was made, as a conceptual approach to proceeding, without reference to any specific proposal. (Subsequently, a proposal has also been submitted, informally, by Brown & Root U.S.A.). The response to EEA which you signed and the analysis is attached as Tab A.

EEA by letter dated December 10, 1985 (Tab B) has requested USAID agreement to a project procurement plan as follows:

Consulting Services:

> Non-competitive selection of Gilbert Associates for providing conceptual design parameters, detailed cost estimate, assisting EEA to negotiate, administer, monitor and supervise testing of the completed plant.

Detailed Design, Supply and Installation (Turnkey):

> Non-competitive selection of General Electric Company for detailed design, supply and installation of equipment, testing and startup of the completed plant (i.e. "turnkey" contracting).

After your approval of a procurement plan, DR/ID will proceed to complete the Project Paper. In that paper any waivers necessary to carry out the approved procurement plan will, in accordance with standard AID practice, be included for consideration at the time of project authorization.

III. DISCUSSION OF THE PROCUREMENT PLAN:

A. PROJECT IMPLEMENTATION:

1. DISCUSSION:

An important threshold decision concerning the design of a procurement plan for the proposed project is the contracting method to be utilized for the equipment procurement and site construction since the method selected has an impact on the scope of the consulting services contract. Annex 3 of Attachment A (Tab A-3) is an analysis of three basic types of contracting options:

(a) Lump sum turnkey (single-firm with responsibility for design, supply and install, test and place in operation). In this option, the consulting engineer provides initial technical specifications, cost estimate and assists in the negotiation of the turnkey contract and provides construction supervision and monitors performance tests.

(b) Lump sum Thermal Cycle supply/install contract coupled with "balance of plant" supply/install contracts. In this option, the consultant provides detail design and specifications, procurement documents, cost estimate for each procurement action, evaluation of bids, assists in negotiation of contracts, monitors contracts and construction supervision and monitors performance tests.

(c) Multiple lump sum equipment procurements and one civil, mechanical and electrical installation contract. In this option the consultant performs the same services as in option (a) above except there are more procurement contracts to develop.

EEA recognizes its own institutional limitations to manage effectively the installation of Egypt's first Combined-Cycle plant facility and wants to minimize any opportunity for implementation problems. EEA's preference for implementing the project utilizing a "turnkey" contract is, in our judgement, sound. On projects of this nature, experience has proven the benefits of the centralization of responsibility in a turnkey contract versus other methods which tend to bifurcate responsibility with more than one supplier and/or construction contractors working on a relatively congested site on which there is an operating plant.

The analysis (Tab A-3) clearly supports EEA's desire to proceed following the "turnkey" approach.

2. CONCLUSION:

It is the opinion of DR/ID that any cost and quality benefits to be achieved through a non-turnkey approach would be minimal at best while the potential for implementation delays associated with a non-turnkey contract appear quite real. Given Egypt's critical balance-of-payment situation **, such delays would be highly undesirable and would result in the forgoing of foreign exchange opportunities amounting to $4.9 million each month.

B. NON-COMPETITIVE PROCUREMENT OF CONSULTANT SERVICES:

1. DISCUSSION:

As described in Annex 2 of Attachment A (Tab A-2), the competitive selection of a consultant alone would delay implementation by seven months. Considering the potential fuel savings this would result in savings to Egypt of an estimated $34 million in foreign exchange. Under AID regulations (HB 11, Chapter 1, Sections 2.4.2.a.1 and 2.4.2.a.5) waivers of competition are possible where, inter alia:

> "The Borrower/Grantee can demonstrate the existence of an emergency situation in which the requirements for competition would result in unacceptable project delay" or where:
>
> "Adherence to competitive procedures would result in the impairment of the objectives of the United States foreign assistance program or would not be in the best interests of the United States."

While the Combined-Cycle Addition is arguably not a true "emergency", it is a very high priority GOE activity. Any significant delay would be viewed by the GOE as highly undesirable and we believe, should be viewed by AID in the same light. In particular, we believe that AID insistence on competition would both impair the objectives of our program and would be inconsistent with our interests in Egypt, particularly in view of President Mubarak's effort to increase hard currency earnings in the coming years to be able to make payment on Egypt's foreign debt.

** The latest Congressional Presentation for Egypt, dated October 1985, points out that Egypt is now in a significant deficit position ($1 billion in 1984/85) and that its external debt servicing requirements are reaching unmanageable levels. Such debt burden is now 35% of the GOE's foreign exchange earnings and represents a growing and major burden on the economy.

As to EEA's specific preference for Gilbert Associates Inc. (GAI):

There are two U.S. consulting firms who have prior knowledge of the Talkha plant. They are Ebasco Services Inc. (Ebasco) and GAI. However, GAI has unique experience directly related to the proposed project of such importance that it would almost certainly win any open competition for the Combined-Cycle addition A&E services. In particular, GAI provided engineering, engineering administration and construction monitoring services for the construction of the Talkha gas turbine plant. Direct familiarity with the existing plant means that GAI would be able to commence services promptly, whereas Ebasco or any other contractor would have to invest, say, four months in familiarizing itself with site and project details. Also, GAI has served as Architect/Engineer on four combined-cycle plants constructed at two sites for electric utilities in the U.S. making them very strongly if not uniquely qualified to do the work. GAI has an established office in Cairo and is providing technical services for EEA for the construction of the Abu Sultan Thermal Power Station. GAI has developed a positive association with EEA through their previous consultant services for the Talkha and Abu Sultan projects. Ebasco cannot offer this range of special qualifications for the Talkha project. For good reason, therefore, GAI is the consultant preferred by EEA.

2. CONCLUSIONS:

GAI's unique experience developed as a result of its detailed involvement in the Talkha gas turbine plant construction and construction of similar combined-cycle plants would certainly give that firm a very strong, if not decisive, preference in any open competition. The delay inherent in competitive procedures, with GAI almost certain to be chosen at the end of the evaluation process, would be both unnecessary and inconsistent with the need, on developmental and economic grounds, for the Combined-Cycle addition project to be implemented promptly. In this situation adherence to normal AID competitive regulations would clearly impede the objectives of our program and be inconsistent with special U.S. interests in Egypt.

C. NON-COMPETITIVE PROCUREMENT OF CONSTRUCTION SERVICES AND RELATED EQUIPMENT:

1. DISCUSSION:

Waivers of competition with regard to construction services (which includes related equipment procurement) are discouraged and unusual but not illegal or impossible**. EEA by letter dated December 10, 1985 (Tab B) has requested such a waiver to negotiate with the General Electric Company.

HB 11, Chapter 2, Section 2.3.3 states that for construction services procurement, competition may be waived when:

> "The Borrower/Grantee wishes to utilize the contractor for additional work outside the scope of the original contract and the contractor is still mobilized at the site or for some other reason the contractor is so closely related to the project that utilization of that contractor would effect a substantial saving of time or money". (HB 11, Chapter 2, Section 2.3.3.a.1)
>
> "Adherence to competitive procedures would result in the impairment of the objectives of the United States foreign assistance program or would not be in the best interest of the United States". (HB 11, Chapter 2, Section 2.3.3.a.3)

**Section 611 (c) of the Foreign Assistance Act states that: "To the maximum extent practicable, all contracts for construction ...shall be made on a competitive basis". Under HB 11, Chapter 2 , "unique capability" per se is not a ground for waiver of competition.

Also of relevance are the following sole-source procurement criteria**:

> "The Contracting Agency can demonstrate the existence of an emergency situation in which the requirement for competition would result in unacceptable project delay." (HB 11, Chapter 3, Section 2.2.6.a.1)

> "Proprietary procurement is justified and the necessary equipment, materials or spare parts are available from only one source taking into account any special requirements such as the need for in-country service capability." (HB 11, Chapter 3, Section 2.2.6.a.2)

> "Proprietary procurement is justified for reasons such as:
>
> (2) compatibility with equipment on hand is required; or
>
> (3) special design or operational characteristics are required".
>
> (HB 11, Chapter 3, Section 2.2.5.b)

There is a common criterion in Chapters 2 and 3 of HB 11 which, where satisfied, supports a waiver for negotiation with a single source. This criterion (Chapter 2, Section 2.3.3.a.3 and Chapter 3, Section 2.2.6.a.3) relates to the compelling need for expeditious implementation of the project. As discussed in Annex 4 of attachment A (Tab A-4) the time saved by permitting sole-source negotiations is estimated to be a minimum of 13 months. Thus the time saved represents an earning/saving of hard currency to the GOE of $64 million. The GOE's need to realize such earnings/saving has been previously discussed.

EEA's request to use GE as the turnkey contractor also meets HB 11, Chapter 2, Section 2.3.3.a.1 criteria for a waiver to permit sole source negotiations. GE provided the same services for the existing plant. Thus the main components in the plant were manufactured by GE and the upgrading of the existing gas turbines would have to be done by GE since they are the only supplier of parts (see HB 11, Chapter 3, Section 2.2.6.a.2). Since the overall plant - the gas turbine-generator, boiler and steam turbine-generator in combined

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**These criteria are technically applicable to equipment procurement under Chapter 3, not construction services and related equipment procurement under Chapter 2. The criteria on which the waiver would depend are those quoted above from HB 11, Ch. 2. HB 11, Chapter 3 criteria are mentioned to support the reasonableness of EEA's preference for non-competitive procurement generally and for GE as the awardee in particular.

operation - must meet a specified operating efficiency and since the installation of the steam cycle equipment will affect the existing gas turbine operation, it is important that a single contractor accept full responsibility. Since so much of the operation will affect the existing GE equipment and controls, GE is the logical firm to expect acceptance of such responsibility. As a practical matter, any other contractor would probably only be willing to provide at best, a performance guarantee for the new steam cycle based on stated exhaust conditions of the GE gas turbines. More likely performance would only be guaranteed for each individual item of equipment. Overall efficiency is important to the realizing optimum savings.

Research on combined cycle plants being operated by U.S. utilities indicates a predominent preference for having the same manufacturer provide as much as possible of the major components for each plant. That is the gas turbines, steam turbine-generators as well as the steam generators were provided by the same manufacturer. GE equipment has been installed at 25 out of 40 combined cycle units on electric utility systems in the U.S.

Technically, other contractors could perform the services EEA wishes GE to perform and equipment could be provided by different manufacturers. It is possible that a competitor would make a lower bid for the project. However, the turnkey contracting method would apply (if you accept our recommendations in this regard). Therefore, the total contract would be bid on a lump-sum basis and, with an estimated total cost of $62 million for the total contract, it is most unlikely that any cost savings resulting from competition would compensate for the $64 million lost by the GOE through delayed implementation. Nor could any bidder, in our judgement, offer either services or equipment comparable to GE's in terms of the plant's qualitative requirements.

2. CONCLUSIONS:

For AID to foreclose the GOE from the projected savings by adherence to regular AID competitive procurement procedures would, under the circumstances discussed above, be unduly restrictive and unreasonable. Such AID action would both impair the objectives of our program here and not serve U.S. interests. EEA's preferred choice of GE as the sole-source contractor is compelling in light of GE's expertise in the design, supply and construction of plants similar to the proposed Talkha modifications and the need to insure an integrated plant addition. Any benefits possibly resulting from competition would not offset the substantial savings to the GOE inherent in a much earlier start of construction pursuant to a sole source award.

IV. AUTHORITY:

This Action Memorandum is not a formal waiver document; such will be included with the Project Authorization, as noted. However, in view of the decisions in principle this Memo asks you to take, we note the following.

Redelegation of Authority 113.8, as amended, paragraph 11 gives you the authority to exercise all implementation functions which would affect the Egypt Mission, to the extent they are redelegable. This includes, certainly, choosing among the above-discussed contracting approaches (turnkey vs. other modes). Redelegation of Authority 113.8, paragraph 7 also provides you the authority to waive competition in accordance with the criteria set forth in Handbook 11, after consultation with the Mission Non-Competitive Review Board.

Finally, since the procurement plan discussed in this Memo is obviously a significant issue, AID/W views have been informally solicited. An earlier - but substantively unchanged - version of this Memo has been shared with senior ANE officials. We understand you have spoken with the Administrator. AID/W has confirmed that the decisions rest with you and has not objected to the proposed turnkey/sole source outcome.

V. NON-COMPETITIVE REVIEW BOARD:

Since your approval of the following recommendations will, in all probability, eventually require the granting of waivers to implement the approved procurement plan, the Mission Non-Competitive Review Board has (as required under ROA 113.8) been consulted. The Board concurs in the following recommendation (Option A).

SLA/LEG:K.F.O'Donnell _____ Date: 12/12/85

IS/CS:A. Bjorlykke _____ Date: 12/12/85

OD/CMT:R. B. Richardson _____ Date: 12/12/85

VI. RECOMMENDATION:

We recommend that you approve the "Turnkey" approach to implementing the project and, in view of the time and money savings - equivalent to about $100 million - permit EEA to negotiate on a sole-source basis with the stated firms of their choice. Should you approve the recommended Option A below, we will proceed to complete the Project Paper including the necessary waivers for your authorization at the time you authorize funding for the project.

Contracts negotiated under this procedure would in due course be processed for Mission approval which would include a determination that costs had been reviewed and found reasonable. In this regard, despite the absence of competition, we are confident of EEA's ability to negotiate reasonable prices with both GAI and GE because of EEA's recent and continuing experience with both contractors and because of EEA's (and USAID's) good knowledge of market conditions. Nonetheless, cost negotiations deserves - and would get - close USAID attention.

Please indicate your decision, for procurement planning purposes, below:

Option A: Implement the project utilizing the "turnkey" procedure as described para III A.1.(a) above and negotiation on a non-competitive basis with Gilbert Associates Inc. and General Electric Company of the necessary contracts for supply of goods and services.

Approved [signature]

Disapproved _____

Date Dec 17, 1985

Option B: Implement the project utilizing the "Turnkey" procedure as described para III A.1.(a) and utilizing competitive procurement procedures to obtain contracts for the supply of goods and services.

Approved _____

Disapproved _____

Date _____

Option C: Use of another procurement approach (please specify).

Approved _____

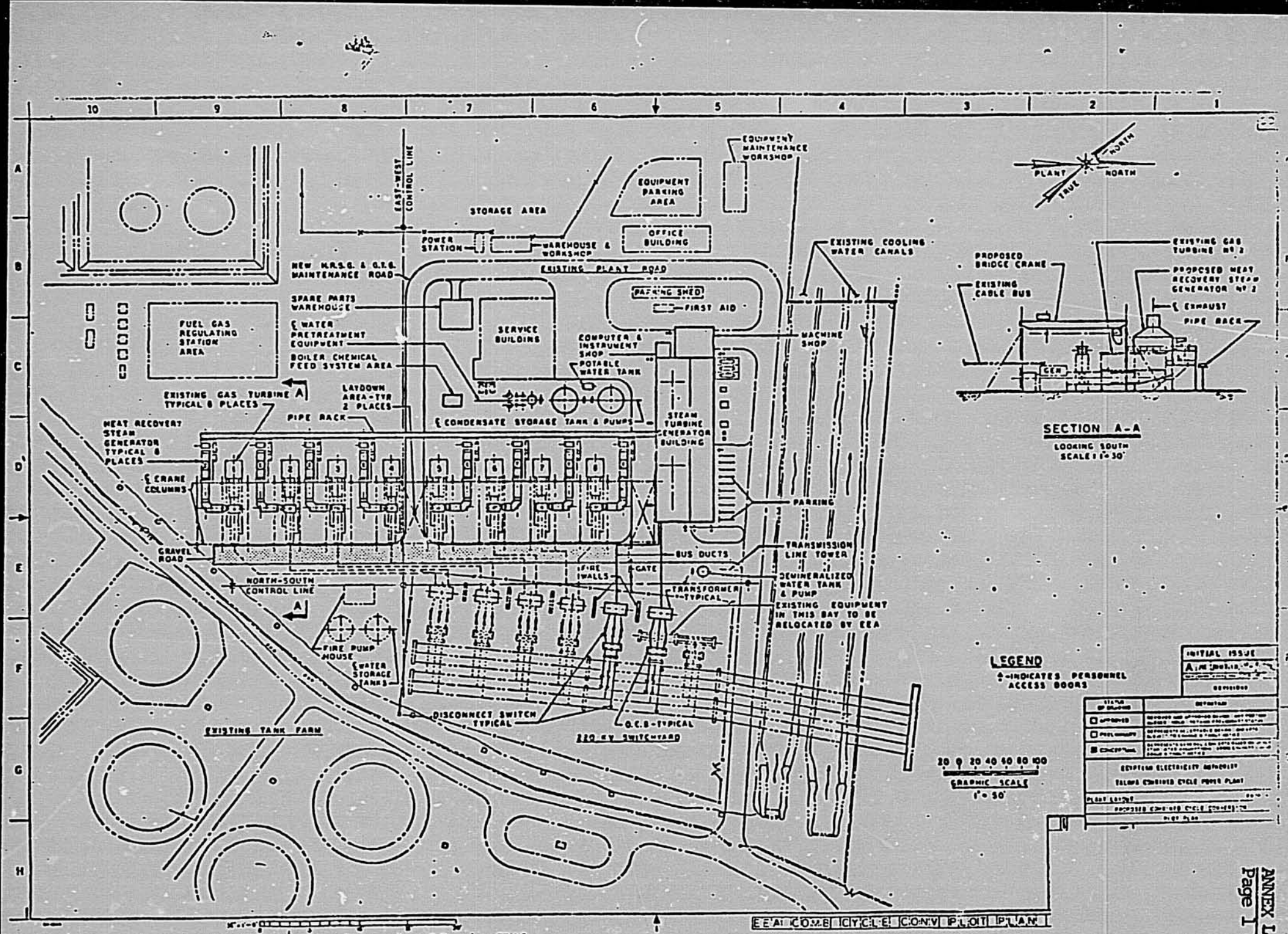
Disapproved _____

Date _____

Attachments:
Tab A: Letter to Eng. Abdel Hamid El Sayyad dated November 27, 1985.
Tab B: Letter from Eng. Abdel Hamid El Sayyad dated December 10, 1985.

ID:[illegible]:12/12/85:sy:(Doc. #3300A)

Clearances:
DR/ID:TCHammann _____ Date 12/12/85
OD/ID:TPearson _____ Date 12/12/85
DD:AHandly _____ Date 12/12/85
LEG:KO'Donnell _____ Date 12/12/85



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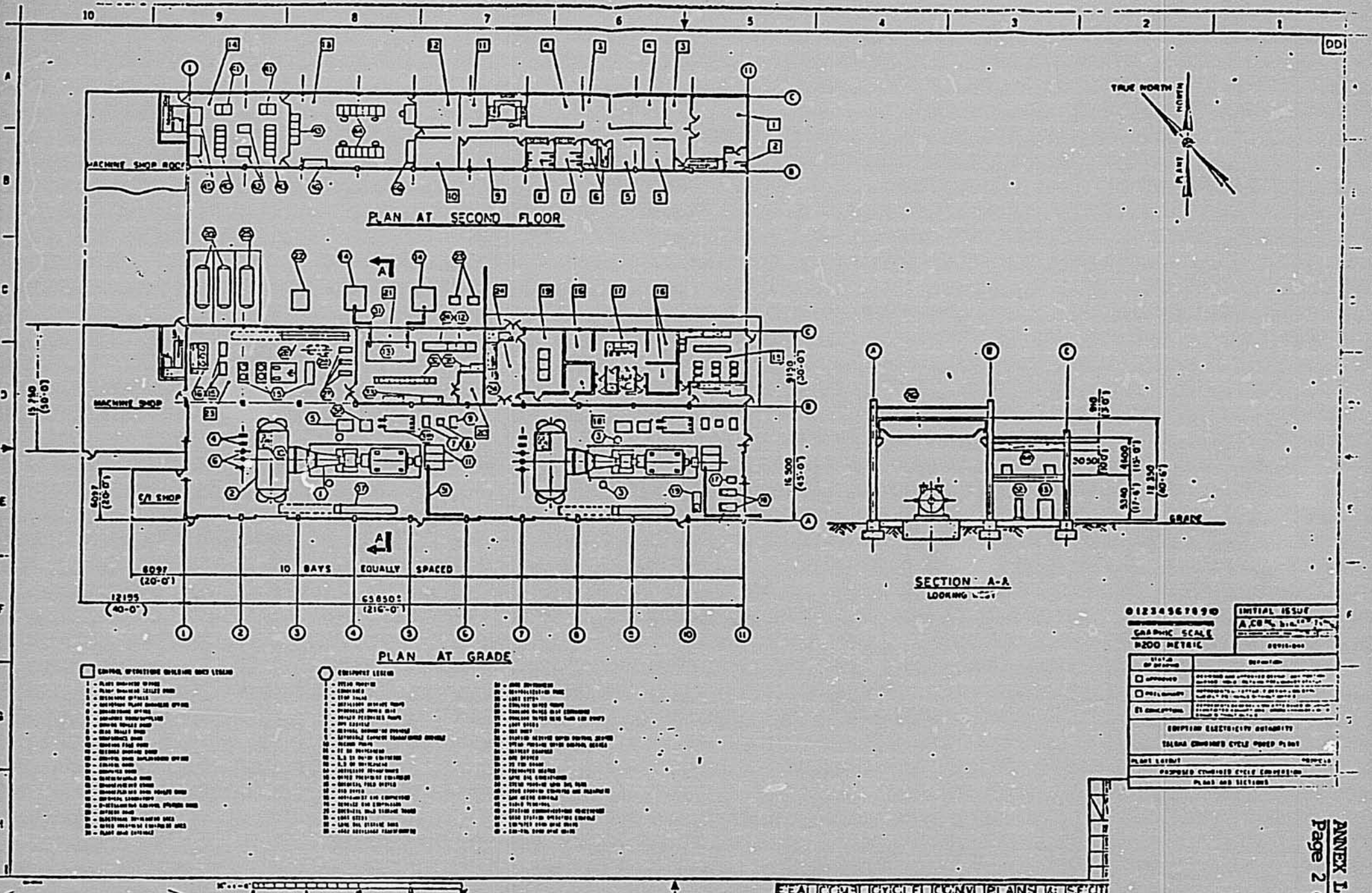

SEA CCPP CYCLE CONV PLANS & SECT

ANNEX I
Page 2 of 2

TECHNICAL ANALYSIS

A. Site

The Talkha Combustion Turbine Plant is located in the Governorate of Al Dokohliyah on the West bank of the Damietta branch of the Nile River, three kilometers north-east of the village of Talkha and adjoins the Talkha Thermal Power Station. During the design of the Combustion Turbine plant in 1977, the site was expanded from 0.8 hectares (2 acres) to more than 3.8 hectares (9.4 acres) to accommodate additional facilities required for future modification of the combustion turbine plant to a combined-cycle plant. The site is bounded on the north by the El Sahel Canal, on the west by agricultural land and on the south and east by the Talkha thermal power station and fuel tank farm. A water intake structure serving the thermal power plant is located on the west bank of the Damietta branch of the Nile.

B. Existing Combustion Turbine Plant

The eight Model PG 5341P General Electric gas turbine-generator package power plant units were installed at Talkha in 1979. The units are compact, simple-cycle, single-shaft gas turbine-generator units. Each unit consist of four main components: the compressor, combustion chamber, turbine and generator.

The 17 stage axial air compressor, on a common shaft with the turbine, draws in air at atmospheric pressure, raises it to a pressure of 10 atmospheres and delivers the pressurized air to the reverse-flow combustion chamber. In the combustion chamber the fuel, either natural gas or Solar (No. 2 Oil), is atomized and injected continuously into the airstream and ignited where combustion takes place, raising the temperature of the air to nearly 1000°C (1900°F). The volume of heated air and exhaust gases expand and are discharged from the combustion chambers, at greatly increased pressure and velocity, through the transition sections to the turbine nozzles.

The heated air and exhaust gases expand through the two stage turbine section and are then exhausted to atmosphere through an exhaust plenum at temperatures in the range of 480°C (900°F). As the heated air and exhaust gases expand through the turbine they cause the turbine to rotate and provide mechanical energy to drive the generator and compressor. The turbine shaft speed is 5100 rpm. The 24MW air cooled generator is coupled to the turbine through a reduction gear and runs at 3000rpm and generates energy at 11.5KV. The output of two generators is delivered to the 220KV network through a .56MVA 11.5kV/220kV transformer.

C. Proposed Combined-Cycle Addition

Substantial energy can be recovered from the gas turbine exhaust gases and used to produce additional electric energy. The exhausted gases are diverted into a heat recovery steam generator (HRSG) where the thermal energy of the exhaust gases converts water to steam which is discharged through a steam turbine coupled to a generator to produce the additional electrical energy. The steam exhausted from the steam turbine is condensed to water and returned to the HRSG for reheating to produce steam.

When a gas turbine cycle is integrated (combined) with a steam turbine cycle, the resulting system is commonly referred to as a combined-cycle. A combined-cycle plant can generally produce 50 percent more energy than would be possible with gas turbines alone. This additional energy is produced without the consumption of additional fuel. The combined-cycle heat rate (efficiency) is comparable to the most efficient steam driven power generating plants.

In the combined-cycle plant, the gas turbines exhaust into the HRSG's rather than the atmosphere resulting in higher turbine back pressure. The normal practice of boiler feedwater heating to achieve optimum efficiency, common in conventional steam turbine cycle design, is not utilized in the combined-cycle so that the maximum energy conversion can be achieved from the exhaust gasses.

The Talkha gas turbines currently exhaust upward through an exhaust plenium to the stack. The exhaust plenium will be modified to serve as a bypass stack and a bypass damper will be installed on the top of the stack and an inlet duct and isolation damper will be added to direct the gas turbine exhaust gases to the HRSG. During operation of the gas turbines in a simple cycle mode, the isolation damper will be closed and the bypass damper will be open. During the start up of the steam cycle, heat input to the HRSG will be modulated by control of the isolation and bypass dampers. Once HRSG heat up is achieved and the plant is ready for combined-cycle operation, the bypass damper will be fully closed and the isolation damper will be fully open so that the full volume of gas turbine exhaust will be directed into the HRSG.

During combined-cycle operation the gas turbine exhaust gases are discharged through the inlet duct and into the bottom of the single pressure level Heat Recovery Steam Generator (HRSG) consisting of heat transfer modules for economizers, evaporators and superheater section, steam drums, feedwater transfer pumps with interconnecting piping, deaerator and related ducting, valves and controls. The exhaust gases flow upward through the series of finned tubes, first through the superheater bank and then through the evaporator and economizer banks and then exhaust to the atmosphere.

Feedwater, chemically treated, for the steam cycle is pumped from the condenser hot well to the deaerators of the HRSG's where any entrapped air is removed and is then circulated through the evaporator where it is heated and converted into saturated steam. Leaving the evaporator, the saturated steam is circulated to the economizer and superheater where the saturated steam is further heated by the gas turbine exhaust gases to produce superheated steam. The steam leaving the superheater enters the high pressure header where it is combined with steam from the other HRSG's in the group to supply steam to the associated steam turbine.

The two steam turbines are indoor design, straight condensing single flow, non-reheat axial exhaust units.

Steam exhausting axially from the turbine will be condensed in the single shell, two pass, non-divided water box condenser where the saturated steam is condensed to water and is collected in the hot well. The temperature of the circulating water from the Nile will be increased less than 10°C.

Each air cooled generator will be directly connected to its associated turbine and shall have a minimum rating of 70,000KVA, 50Hz, 11,500V at 0.85 power factor. Each generator will be connected to the UPS through a transformer rated 11.5/220KV.

The steam turbine-generators will be positioned in a parallel arrangement to maximize the area available for maintenance lay down space. The steam surface condensers will be arranged on the same axis as the turbine and will utilize a common draw out space for condenser tube pulling.

The condenser circulating water system equipment will be located adjacent to the existing steam plant intake structure on the Nile River. Water will be taken from the Nile River by vertical pumps in the intake structure through prefabricated concrete pipe to each condenser water box and then discharged to the Nile by either pipe or through the Salia canal passing adjacent to the turbine building. The circulating water will be treated by chlorine, and solids will be removed by traveling screens.

The make up water treatment system will consist of pretreatment, including clarification, and ion exchange demineralization. The demineralized water from the demineralizer is piped to the condensate storage tank. The make up water treatment equipment for the combined-cycle plant will be located in the turbine building. The pretreatment equipment, service water clarifier and chemical bulk storage tanks and condensate storage tank will be located outdoors adjacent to the turbine building.

A full capacity service air and a full capacity instrument air reciprocating air compressors with receivers will be provided for the combined-cycle plant. Both compressors and the instrument air dryer will be located on the ground floor of the turbine building.

A turbine room bridge crane will be provided for both units. The crane's capacity will be based upon the heaviest piece to be lifted during the operating life of the plant.

A bridge crane will be provided in the gas turbine HRSG area. The crane's capacity will be based upon the heaviest piece of equipment to be lifted during the operating life of the gas turbines and HRSG's.

A turbine lubricating oil tank will be provided with each turbine and will be located on the turbine room floor. Each tank will be provided with tube oil coolers, AC and DC motor-driven oil pumps and associated controls.

A lube oil conditioner for each unit will be located adjacent to the lube oil storage tank. A single clean/dirty lube oil storage tank with sufficient capacity to store one fill of clean lube oil and to receive one fill of used lube oil will be located outside the turbine building.

The existing fire protection system will be extended to the main power transformers and turbine building. An automatic deluge sprinkler system will be installed around the main step-up transformer, auxiliary transformers and the turbine lube oil storage and conditioning areas. A fire main with hydrants will be provided around the turbine building and both the existing service building and the new turbine building will be supplied with hose stations and fire extinguishers.

The 3.3KV and 400V switchgear needed for the turbine generators and their auxiliaries will be located in the turbine building.

The control room for turbine generators and HRSG's controls will be located at the end of the turbine building above the auxiliary equipment. The existing gas turbine control panels in the service building will interface with the combined-cycle control system.

Since the combined-cycle addition will include equipment for two steam cycles, the present operators and additional operators and maintenance staff will be trained to operate and maintain the new equipment. This training will be provided in the United States and/or Egypt. (EEA will be required, through a condition Precedent, to commence training of the additional staff sufficiently in advance of the equipment installation and check out, so that the EEA staff will be knowledgeable in the equipment and can participate in the check out and start up of the plant). The additional operating staff will be trained using classroom instruction, and on-the-job study instruction and hands-on experience.

The supply contractor start-up staff will be required for the duration of the start-up period until the combined-cycle plant have been accepted by EEA.

E. Fuel Supply

EEA plans to fuel the combined-cycle plants gas turbines with natural gas as the preferred fuel. Solar (No. 2 fuel oil) will be used only at times of natural gas supply limitations. In 1985, 95 percent of the plants fuel requirements were supplied from natural gas with Solar providing the balance of the fuel.

When operating at full-load capacity each combined-cycle plant will consume approximately 500 million cubic meters of natural gas per year from the gas field in the Delta. The total natural gas required for a full-load operation of both combined plants will be approximately 500 million cubic meters per year, 1.37 million cubic meters per day. The existing pipe line facilities delivered in excess of 482 million cubic meters of natural gas to the Talkha gas turbines in 1985 and have delivered natural gas in excess of 1.6 million cubic meters per day.

in the succeeding months. Flow measurements at Talkha were unavailable for this stage of the study, however, flow was conservatively estimated at one-quarter of the Nile main stem flow below Aswan. On this basis, the approximate high flow is 69,000 cfs (1,954 m^3/sec), while the approximate low flow is 4,600 cfs (130 M^3/sec). The existing Nile environment at Talkha includes the cooling water discharges of the presently operating 127.5 MW generating unit. On the basis of the planned usage of 90,000 GPM (340 m^3/min) for 93 MW of newly installed power, present river water utilization by existing units is estimated at 91,100 GPM (343 m^3/min). Temperature rises in the existing condensers were not obtained and therefore discharge temperatures were not available for this study, however, it is clear that a thermal plume already exists in the river at Talkha.

The Nile River at Talkha contains a diverse fish fauna, the most important of which include the Nile Perch, bolti (tilapia), barbel, several species of catfish, elephant snout fish, and tiger fish. Most of the fish species of the Nile migrate seasonally. The life histories of the important species and their seasonal use of the river at Talkha have not been investigated for the present study.

Environmental Impact Discussion

It is assumed, based on available information, that the only significant potential environmental impacts due to plant construction and operation are related to thermal discharges. During construction and operation, construction runoff, chemical releases, demineralizer regenerant flows and other plant flows will be contained, and treated as necessary to minimize adverse impacts and comply with existing standards.

As a result of passage through the El Sahel Canal which is 400 meters (1312 ft) long and 10 meters (33 ft) wide, some heat loss will occur from plant cooling water prior to discharge to the Nile. This loss

can be quantified using Le Bosquet's formula[1] and assuming a high value of heat dissipation, K, typical of swift streams. Such an analysis shows that only about 0.2°C in cooling water temperature will be lost in the discharge canal. Assuming a design condenser rise of 10.0°C (18°F), this indicates that the cooling water discharge will be less than 10°C (18°F) allowed above ambient temperature (Egyptian Presidential Decree Law No. 93 for 1962). The new plume would likely combine with the existing discharge to create a larger thermal plume.

Lower river flow occurs in December and January when ambient water temperature are estimated to be 25°C (57°F). It is probable that December and January would be the periods of greatest thermal impact to the river. Although river water temperatures are highest in July and August 29°C (84°F) river flow is substantially increased at those times. The importance of evaluating water temperature elevations above ambient is that tropical and subtropical aquatic biota typically have a maximum thermal tolerance only slightly above the normal maximum ambient water temperature experienced.

Further investigation is needed to determine whether the Nile at Talkha is used as a spawning, nursery or feeding ground, or a migration route during the months of May and June by important fishes. Such information will make it possible to determine whether the thermal discharge is having significant ecological effects on those species. It should be noted that the additional discharge planned at Talkha will augment any effect which the existing discharge may have. It should also be noted that the planned discharge will be located on the same side of the river as the existing discharge, likely leaving an unaffected zone for fish passage.

[1]LeBosquet, M (1946) Cooling water benefits from increased river flows. New England Waterworks Association Journal, Vol. 60, 111-116.

In the implementation of the project, an Environmental Assessment will be performed in accordance with 22 CFR 216, "A.I.D. Environmental Procedures". Approvals from other Egyptian governmental agencies, such as The Ministry Of Irrigation are to be obtained by EEA.

MANAGERIAL/ADMINISTRATIVE ANALYSIS

A. Ministry of Electricity and Energy

Electric power was first introduced into Egypt in 1895. Through 1964, the generation, transmission and distribution of electric energy was the responsibility of a large number of independent governmental and private organizations. In 1964, the Ministry of Electricity and Energy was formed in accordance with Law No. 60 of 1963, which consolidated all individual electric generating facilities into a single state-owned and controlled organization. The Ministry of Electricity and Energy has continued to evolve to meet the expanding energy requirements of Egypt. The Ministry of Electricity and Energy directs and coordinates the activities of six Authorities each headed by a Chairman and a Board of Directors. The Ministry of Electricity and Energy is responsible for the establishment of energy policies in support of the GOE's overall plans for Egypt, development of 5, 10 and 20 year forecasts and plans and coordination between the Authorities.

B. Egyptian Electricity Authority

In 1965, Presidential Decree No. 3726 was issued establishing the General Egyptian Electric Corporation (GEEC) with authority to manage, operate and maintain power stations and networks and to construct facilities for the production, transmission and distribution of electric energy in all parts of Egypt. In 1976, the People's Assembly approved Law No. 12 which established the Egyptian Electricity Authority (EEA) as the successor to GEEC. The senior policy and decision making unit within EEA is the Board of Directors. The Chairman is appointed by Republican Decree. Members of the Board of Directors are appointed by order of the Prime Minister upon the recommendation of the Minister of Electricity and Energy.

EEA is operating authority for the Ministry of Electricity and Energy and is responsible for planning, construction, operation and maintenance of bulk power which constitutes the Unified Power System transmission facilities interconnecting the generating plants.

EEA is divided into five administrative divisions and five operational zones. The five administrative divisions are: Commercial Financial and Economic affairs, Administrative Affairs, Operation, Studies and Research, and Projects. The five operational zones are: Alexandria, Cairo, Canal, Delta and Upper Egypt.

C. Unified Power System

The Unified Power System (UPS) is operated as a multi-area system based on historical development of the network, operating experience, system structure and the territory covered by each operating economy and security of the major generation and transmission systems are evaluated on a total system basis.

The UPS is supervised and controlled by the National Energy Control Center (NECC), located in Imbaba northwest of Cairo. Information necessary for control of the interconnected system is transmitted from generating plants and substations by either microwave or power-line carrier to the NECC where on-line digital computers perform economic dispatch computations and automatic generation control, security assessment, post-disturbance review, and system state estimation; collect, compute, display, alarm and log all data necessary for the real-time supervision and control of the operation of the major generators and the 500KV and 220KV transmission systems.

D. Delta Zone

The Delta Zone was established in 1964 and provides electric service to the governorates of Kafr El Sheikh, Gharbiah, Dokohliyah, Menoufiah, Damietta, El Sharkiah, El Kaliyobiah and El Beherah following the acquisition of a number of independent governmental and privately owned utility organizations of the electrical system from a French company. The Delta Zone is responsible for the operation and maintenance of all generation and transmission facilities in the Nile Delta and includes four power stations composed of 38 generating units ranging in size from 12.5MW to 110MW with a total installed capacity of 1,367MW, 1378Kms of 220KV transmission lines and 1840MVA of transformer capacity in substations which supply the 66KV and 33KV subtransmission and 11KV distribution networks.

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ACTION: AID-3 INFO: A/DCM ECON /5

VZCZCCR0200
RR RUEHEG
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ZNR UUUUU ZZH
R 200213Z MAY 86
FM SECSTATE WASHDC
TO AMEMBASSY CAIRO 8294
BT
UNCLAS STATE 158299

LOC: 149 183
20 MAY 86 0559
CN: 35676
CHRG: AID
DIST: AID

IFC
ACTION TO DR DPPE
ACTION TAKEN ✓ DUE DATE 5/27
MAN INITIALS JZ

27 MAY 86

AIDAC

E.O. 12356: N/A
TAGS: N/A
SUBJECT: EGYPT - TALKHA COMBINED CYCLE POWER PLANT PROJECT (263-0196) - ENVIRONMENTAL ASSESSMENT

REF: (A) LINTNER-HUNT-STARNES TELECON 5/19/86
(B) LINTNER-PATALIVE MEMO 3/9/85

1. FOR DR/IDPS, JOHN HUNT, ENGINEERING ADVISOR AND DR/UAD, JOHN STARNES, MISSION ENVIRONMENTAL OFFICER.

2. ANE/PD/ENV, STEPHEN F. LINTNER, ENVIRONMENTAL COORDINATOR HAS DELEGATED ENVIRONMENTAL CLEARANCE FOR THIS PROJECT TO MISSION ENVIRONMENTAL OFFICER.

3. AS PER GUIDANCE PROVIDED IN REF. A, THE ASSESSMENT SHOULD BE A CONCISE AND TARGETED DOCUMENT. IT SHOULD REFLECT THE CONCERNS RAISED IN THE LINTNER-PATALIVE MEMORANDUM OF 9 MARCH 1985 WHICH WAS COPIED TO HUNT AND STARNES WHEN IT WAS ISSUED. IN ADDITION, IT SHOULD ADDRESS POTENTIAL IMPACTS TO AQUATIC SPECIES IN THE VICINITY OF THE DISCHARGE POINT.

3. ANE/PD/ENV REQUESTS STARNES PROVIDE ENVIRONMENTAL

COORDINATOR WITH TEXT OF FINAL ENVIRONMENTAL ASSESSMENT AND HIS CLEARANCE MEMORANDUM WHEN AVAILABLE. SHULTZ
BT
#8299

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FW UNCLASSIFIED STATE 158299

MEMORANDUM

Date: March 9, 1985

To: NE/PD/EGYPT, Charles Patalive, Project Officer

From: NE/PD/ENV, Stephen F. Lintner, Environmental Coordinator SFL

Subject: EGYPT - Talkha Generating Station Combined Cycle Conversion Study - Environmental Concerns

I have reviewed the Talkha Generating Station Combined Cycle Conversion Study prepared by Ebasco Services Incorporated (Contract IQC OTR-1406-I-00-1181-00, Work Order No. 07 - March 1985). This study includes a section entitled "Environmental Considerations" (pages 36 - 38) which provides a generalized review of environmental issues assocated with the proposed combined cycle conversion. It should be noted that the provisions of 22 CFR 216, "A.I.D. Environmental Procedures" require the preparation of an Environmental Assessment for all power projects. It is recommended that USAID include the preparation of such a study as an element of the scope of work for design services if it is decided to proceed with development of a more detailed feasibility study and/or a project paper.

It is requested that the Mission consider having Ebasco prepare a review of what design modifications would be required to bring the temperature of the water discharged from the plant into compliance with the provisions of Presidential Decree, Law No. 93 of 1962. This review should identify the recommended design changes, capital cost, recurrent cost and training requirements for this intervention. It should be noted that the study does not discuss permit requirements for the use of water from the Nile and its subsequent discharge after use in the Talkha plant.

It should be noted that both NE/PD/ENV and Mission environmental personnel are prepared to any provide assistance required for tne preparation of the scope of work for the Environmental Assessment and planning of the "scoping session" for the assessment.

cc: GC/NE, R. Johnson
AID/Cairo, J. Starnes, Mission Environmental Officer
AID/Cairo, J. Hunt, Mission Project Officer
AID/Cairo, K. O'Donnell, Senior Legal Advisor