

Ministry of Electricity & Energy
Egyptian Electricity Holding Company
Cairo Electricity Production Company

**NEW TEBBIN 2x325 MWe GAS/OIL
THERMAL POWER PROJECT**

*Environmental and Social
Impact Assessment*

EXECUTIVE SUMMARY

October 2005

**Prepared by:
SPEEDOTRANS**

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NEW TEBBIN 2x325 MWe GAS/OIL THERMAL POWER PROJECT

Environmental and Social Impact Assessment

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ABBREVIATIONS AND ACRONYMS

ADMS3	Air Dispersion Modeling System-Version 3
BOD	Biochemical Oxygen Demand
BPIP	Building Profile Input Program
CAA	Competent Administrative Authority
CAPMAS	Central Agency for Public Mobilization and Statistics
CEPC	Cairo Electricity Production Company
COD	Chemical Oxygen Demand
CSEDC	Cairo South Electricity Distribution Company
CWDS	Circulating Water Discharge Structure
DCS	Distributed Control System
DO	Dissolved Oxygen
DS	Dissolved Solids
EAAQLs	Egyptian Ambient Air Quality Limits
EEA	Egyptian Electricity Authority
EEAA	Egyptian Environmental Affairs Agency
EEHC	Egyptian Electricity Holding Company
EGSMA	Egyptian Geological Survey and Mining Authority
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
ENIT	Egyptian National Institute of Transport
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EUPS	Egyptian Unified Power System
FHWA	Federal Highway Administration, (US)
GARBLT	General Authority for Roads, Bridges and Land Transport
GEP	Good Engineering Practice
GDP	Gross Domestic Production
GIS	Gas-Insulated Switchgear
HCM	Highway Capacity Manual

HGVs	Heavy Goods Vehicles
LFO	Light Fuel Oil
LOS	Level of Service
MSDSs	Material Safety Data Sheets
MWe	Mega-Watt electrical
NFRA	National Fire Protection Authority
NRIAG	National Research Institute for Astronomy and Geophysics
OSHA	Occupational Safety and Health Administration
PCBs	Polychlorinated Biphenyls
PCDA	Public Consultation and Disclosure Activities
pcph	passenger car per hour
RIGW	Research Institute for Ground Water
SS	Suspended Solids
STG	Steam Turbine Generator
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TPP	Tebbin Power Plant
TSS	Total Suspended Solids
TWA	Time-Weighted Average
vph	vehicle per hour

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1. INTRODUCTION

1.1 Background

1. SPEEDOTRANS (Egypt) was commissioned by the Egyptian Electricity Holding Company (EEHC) to prepare the technical documents and procedures required by the World Bank Group (WB) and the Egyptian Environmental Affairs Agency (EEHC) concerning the Environmental and Social Assessment of the proposed Tebbin thermal Power Project at the old Tebbin power plant location.

2. EEHC is seeking financial assistance from the WB for the construction and operation of this 2x325 MWe, dual fuel power plant. The proposed plant is designated as a Category A project under WB rules and a Category C project under the Egyptian environmental regulations and therefore requires a full Environmental Impact Assessment. Financing from WB is conditional upon obtaining the environmental clearance from both the Egyptian regulatory authorities and the WB.

1.2 Project Overview

3. Cairo Electricity Production Company (CEPC), a company incorporated in Egypt and affiliated to the Egyptian Electricity Holding Company (EEHC) proposes to construct and operate a new thermal power plant at Tebbin, about 35km south of the city of Cairo on the east bank of the Nile river. The site is within an existing walled compound of the former Tebbin power plant. The overall proposed site area is approximately 100,000 m². Construction of the plant is due to commence in 2006 and will last approximately 37 months. Operation of the power plant will begin in 2009.

4. The proposed power plant will consist of two thermal units, each with a nominal electricity generating capacity of 325 megawatts (MWe), which will be known as New Tebbin Power Plant. The overall generating capacity of the power plant will be 650MWe. The power output from the proposed plant will be sold to the Egyptian Electricity Transmission Company (EETC).

5. The power plant will utilize natural gas as its primary fuel, delivered to the site via an existing pipeline to be operated by GASCO, and also have the capability to operate using mazout (heavy fuel oil) in emergency situations, which will not be used for more than 7 days (or less than 2%) of operating time per year. The ability to "dual-fuel" the power plant (with natural gas or mazout) will provide security of electricity supply in the event that gas supplies are unavailable for any reason.

6. Nile river water, pumped to the plant via an intake structure located on the Nile bank, will be used as non-contact cooling water and for process water following demineralisation. Cooling, water will be returned to the Nile river via a discharge structure located on the Nile bank.

7. The location of the proposed site is shown in *Figure 1*. Also, *Figure 2* depicts this location within the context of the Greater Cairo Region. This map was developed by the Cairo Governorate for land use planning and urban development. This plan has been updated and revised in 2000 to be the Comprehensive Development Long-Term Plan- Cairo 2017. According to this Plan, Tebbin area has been designated as an Industrial Domain. This identification has been adhered to the Tebbin area since mid 1950's.

8. The project comprises, also, the dismantling and demolition of the present El-Tebbin old power plant, which has ceased to operate, and ended to decommissioning on Monday, 8th June 2005. *Figure 3* illustrates a general view for the existing facilities layout where components of the old El-Tebbin power plant are shown in their respective locations within the plant boundaries.

9. Old facilities to be dismantled and demolished include the following main components:

- Gas Turbines
 - 2 x 23 MWe Gas Turbine (France Manuf. – Alsthom)
 - 2 x 30 MVA Generator 11 kV
- Transformers
- 66 kV building
- Circuit Breakers
- Water Treatment Equipment
- Boiler Feed Water Treatment
- Sanitary Wastewater
- Steam Generations Equipment
 - 4 Boilers Hungarian Manufacture
 - 1 Boiler Polish Manufacture
 - Instrument air compressors 3 x 1250 l/m
 - Fuel "heavy oil" pump station 3 x 20 t/h
- Steam Turbines Equipment
 - 3 Steam turbine (15 MWe/h) each
 - Generators 20 MVA 10.5 kV (Ganz – Hungarian Manufacture)
 - 2 Diesel Engine – Power 300 kWe – 380 Volt

Figure 1

*Location of proposed El-Tebbin
Power Plant*

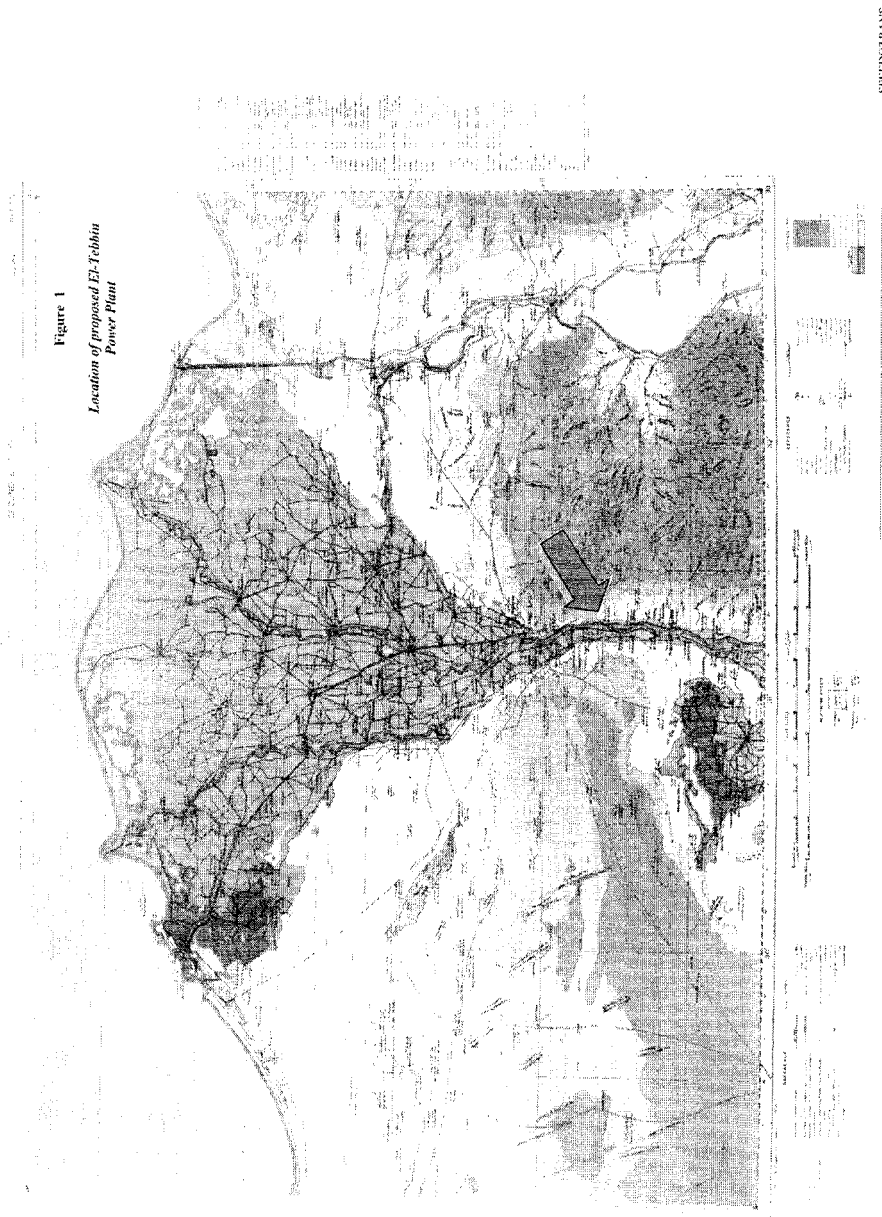


Figure 2

Location of the Proposed Site within the Context of the Greater Cairo Region

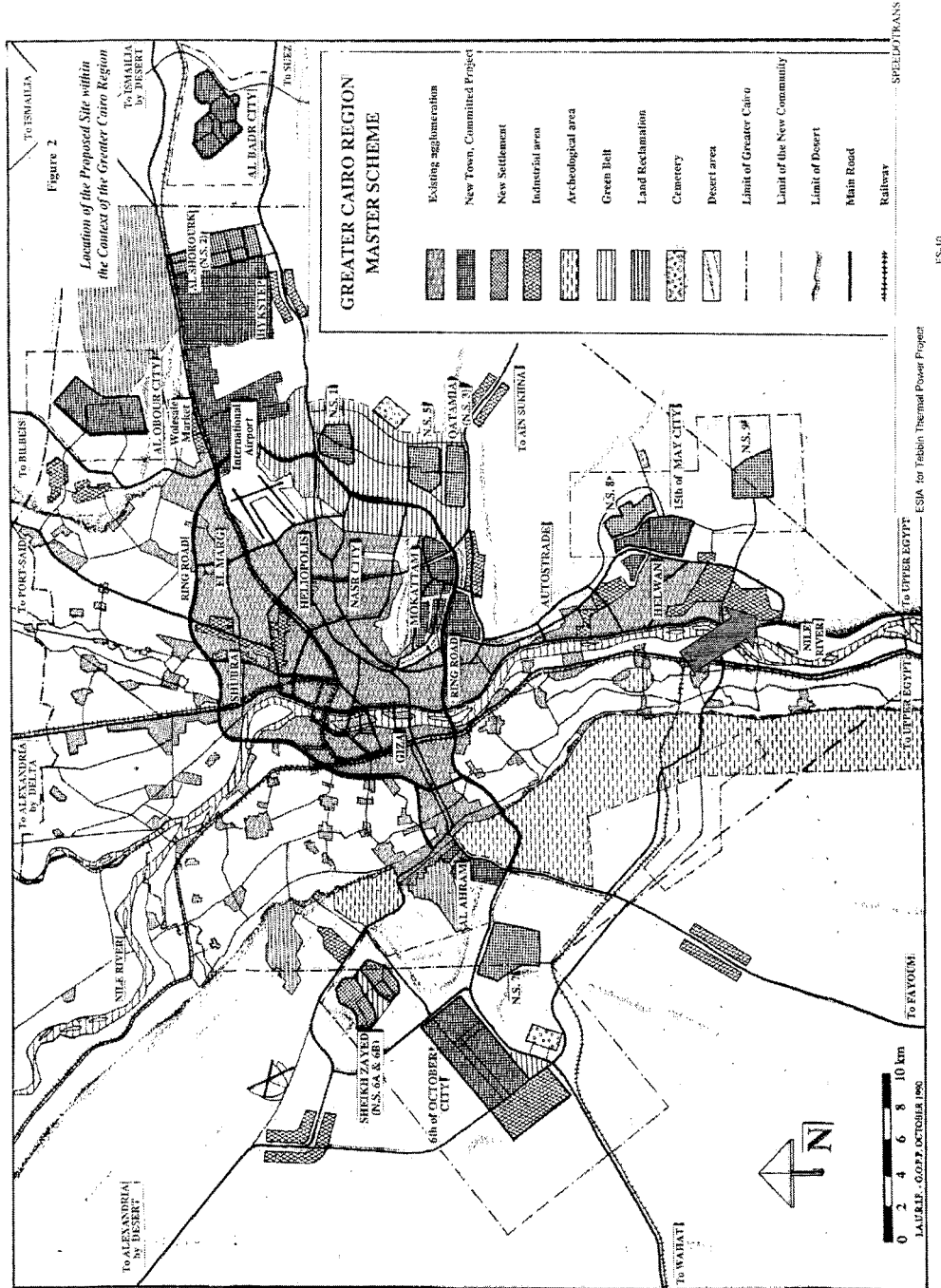
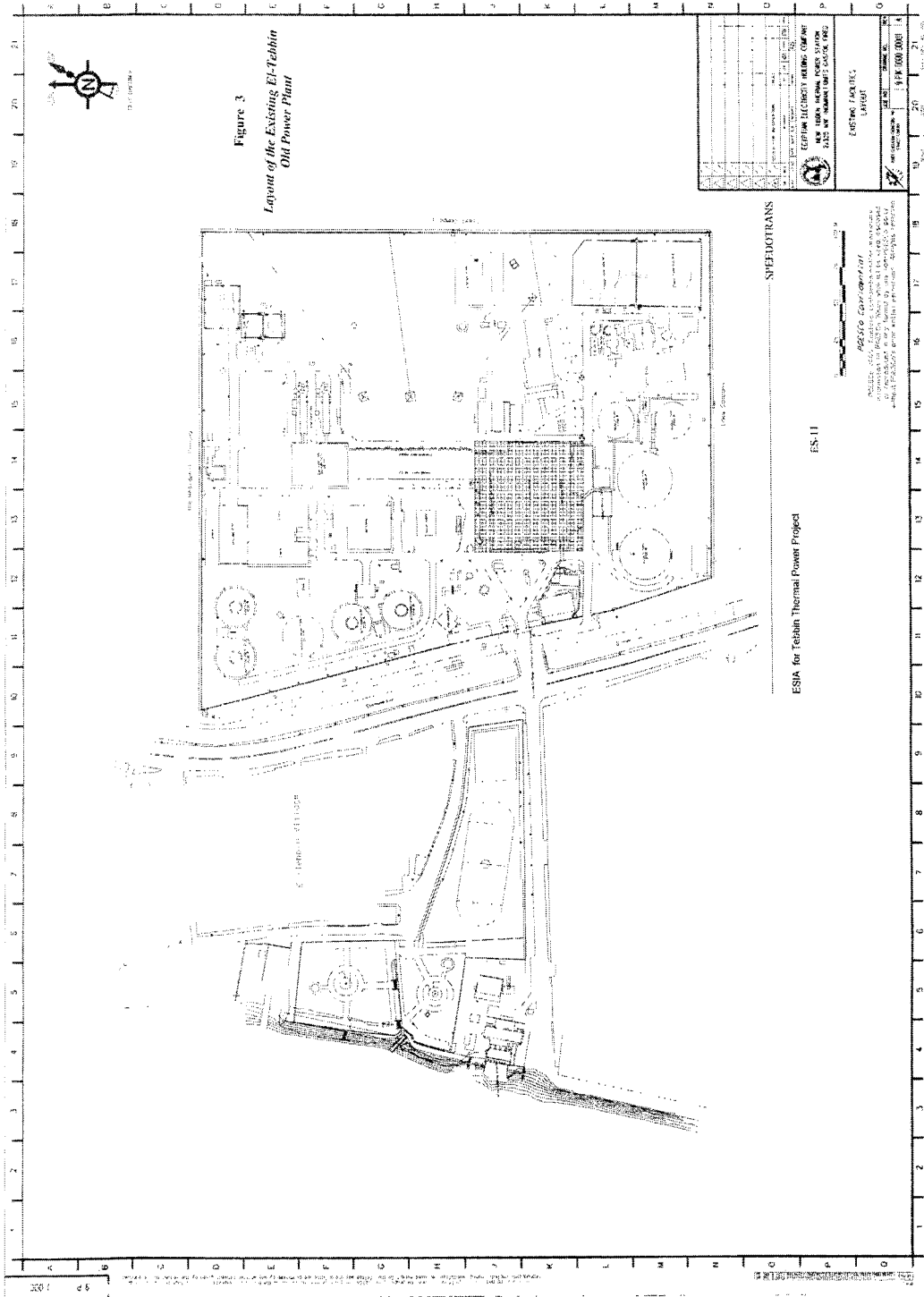


Figure 3

General View for the Existing Facilities Layout



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- Cooling System Equipment
- Storage and Service Fuel Tanks
- Main Building:
Administration building, Boiler building, Turbine building, and 66 kV building
- Clarification Area
- Other Facilities:
Central workshop building, Warehouse buildings, Security fire fighting and transportation buildings, All batteries are Alkali-type, contained in Sealed containers.

10. No Asbestos Containing Materials or PCBs were used in the old Tebbin plant. The Consultant conducted a survey on both materials and concluded to the following:

- Transformers' oil was replaced more than one time before (approximately every 15 years). If it was started in 1958 with PCBs it has ended up with "Diala B oil" since many years ago.
- Irrespective of the fact that no asbestos was found during the survey, asbestos management plan will be undertaken during demolition by the contractor under supervision of CEPC.

2. THE ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

2.1 Contributors to the EIA Report

11. The Environmental and Social Impact Assessment (ESIA) report is prepared by SPEEDOTRANS, a private consulting firm (Egypt), based on many baseline studies undertaken by independent national and international consultants and on information provided by EEHC, CEPC and their sub-contractors. Public consultation activities are undertaken by SPEEDOTRANS and EEHC in conjunction with CEPC. The ESIA report draws heavily on the environmental and social assessment documentation prepared by group of local and international multidisciplinary consultants and submitted to SPEEDOTRANS, for preparing the ESIA report for local permitting purposes and financing requirements. All such documentations were reviewed by SPEEDOTRANS and cleared for inclusion in this report. Most of the relevant local permits for the construction of the power plant have now been received.

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2.2 Scope of the ESIA Report: Legal and Administrative Framework

2.2.1 *Government of Egypt Requirements*

12. Beginning in the 1950s, the Government of Egypt has promulgated several laws and regulations concerning protection of the environment.

13. The Egyptian standards have been drawn from the range of provisions in the following documents:

- Law 4/1994 and the Prime Minister's Decree No. 338 of 1995, which promulgates the Executive Regulations of Law 4.
- Law 48 of 1982 regarding the protection of the River Nile and waterways from pollution and the Decree No. 8 of 1983 promulgating its Executive Regulations.
- Law No. 93 for 1962 regarding the drainage of liquid wastes, particularly sanitary drainage.
- Law of Labor No. 12/2003.
- Law No. 38/1967 amended by Law No. 31/1976 on public cleanliness and collection and disposal of solid waste.

14. Law 4/1994 requires that, for establishments requiring licenses, an environmental impact assessment must be prepared and submitted to the Egyptian Environmental Affairs Agency (EEAA) for review. The environmental impact assessment must be submitted to the EEAA by "the Competent Administrative Authority (CAA) or the licensing authority" for the project in question. For the Power Plant Project, the Competent Administrative Authority is the Cairo Governorate.

15. The Cairo Governorate will send the EIA to EEAA for review and provide its opinion within 60 days. Once EEAA has approved the project, a license to proceed can be issued. No additional environmental or social clearances are required other than the EIA approval to proceed with the project activities. The law requires that any new project should comply with all the relevant articles pertinent to environmental attributes, which could be impacted from project activities.

16. Egyptian EEAA regulations specify the technical scope or contents of an environmental impact assessment. As a matter of practice, environmental impact assessments for power plant projects typically have a scope and organization similar to World Bank environmental assessments.

17. In addition to environmental impact assessment requirements, the Government of Egypt has established air pollution and water pollution limits applicable to the Power Plant project. These limits are discussed in Chapter 6,

along with the actual air and water pollution levels expected from the Power Plant.

2.2.2 *World Bank Guidelines and Safeguard Policies*

18. The World Bank includes environmental impact assessment as an integral part of the evaluations it performs before financing a proposed project. The World Bank's Operational Policy 4.01 (October 3, 1991 and its updates, 1999) provides guidance on the types of assessments that should be performed for different types of projects, and on the scope and content of those assessments. According to Operational Directive 4.01, thermal power plant projects require a full Environmental Assessment (EA).

19. World Bank Environmental Safeguard Policies provide 10 potential issues that may need to be considered in an EA, depending on the specific characteristics of each project. *Table 1* summarizes the expected applicability of the potential Safeguard Policies to the Tebbin Power Plant Project. The Safeguard Policies identified as "applicable" are those which may be triggered and thus considered "Requiring Management". When the detailed design of the Tebbin Power Plant has been determined, the CEPC should prepare project-specific plans to manage these potential impacts.

20. No safeguard policies were triggered except for the Environmental Impact Assessment. *Table 1* shows potential World Bank environmental Safeguard Policies and EI-Tebbin project applicability. The table justifies the applicability or lack thereof for WB Safeguard Policies.

21. Annex B to Operational Directive 4.01 provides an outline of the information that should be included in a full EA. This Environmental and Social Impact Assessment follows the scope of Annex B.

Table 1

***Potential World Bank Environmental Safeguard Policies
and El-Tebbin Power Project Applicability***

No. Safeguard Policy	Applicability to Tebbin Project	Policy Triggered?	Justification
1. Environmental Assessment	Yes	Yes	<ul style="list-style-type: none"> • This policy applies to all projects requiring a Category A Environmental Assessment Under OP 4.01. • All environmental and Social aspects included in El-Tebbin project are adequately examined. • Tebbin project is not likely to have significant potential (reverse) environmental risks & impacts in its area of influence (impacts on the natural environment: air, water & land; human health & safety; physical cultural resources; and transboundary and global environment concerns).
2. Forest	No	No	<ul style="list-style-type: none"> • No forest areas exist.
3. Involuntary Resettlement	No	No	<ul style="list-style-type: none"> • No relocation or loss of shelters. • No loss of assets or access to assets. • No loss of income sources or means of livelihood. • The re-employment of workers program is voluntary and re-employed workers will keep all their benefits (salary, health insurance etc.) and will commute daily from their present locations. Incentives for workers to remain in the El-Tebbin colony are strong as the rent is heavily subsidized. The re-employment program will thus not result in any loss of income or physical resettlement. • All activities related to the construction of the new plant will take place within on CEPC land either on the site or on land directly adjacent to the site. i.e. no land acquisition. Not even temporary will result from the construction. • Experience from a number of similar power plants along the Nile river has shown that the impacts on fisheries of the discharge of warm water into the Nile have been positive. Consultations with the fishermen support this assertion. Impacts will be positive rather than negative, i.e. no loss of livelihood. • Transmission lines which will evacuate power generated by the Tebbin power plant will replace existing 66kV transmission lines. Some short distances ≤ 5 km will connect the power plant to existing substations via underground cables. No land take or resettlement will be associated to the power interconnecting lines.

Table 1 (Contd.)

*Potential World Bank Environmental Safeguard Policies
and El-Tebbin Power Project Applicability*

No. Safeguard Policy	Applicability to Tebbin Project	Policy Triggered?	Justification
4. Indigenous Peoples	Yes	No	<ul style="list-style-type: none"> The project does not affect the indigenous peoples in the project area.
5. Safety of Dams	No	No	<ul style="list-style-type: none"> The project does not involve construction of a large dam. The project is not dependent upon an existing dam.
6. Pest management	No	No	<ul style="list-style-type: none"> Procurement of pesticides or pesticide application equipment is not envisaged. The project will not affect pest management in any way.
7. Physical Cultural Resources	Yes	No	<ul style="list-style-type: none"> Physical cultural resources are adequately examined. The Tebbin project is not likely to have any significant impact on physical cultural resources.
8. Natural Habitats	Yes	No	<ul style="list-style-type: none"> Natural Habitats are adequately addressed and examined. The Tebbin project is not likely to have any significant impacts on natural habitats.
9. Projects in Disputed Areas	No	No	<ul style="list-style-type: none"> The CEPC/EEHC is not involved in any disputes over an area with any of its neighbors. The project is not situated in a disputed area. Any component likely to be financed as part of the project is not situated in a disputed area.
10. Projects on International Waterways	No	No	<ul style="list-style-type: none"> Cooling water abstracted from the Nile river (20-26m³/sec.) is returned totally back to it. Actual water consumption is less than 0.07% of the abstracted water. No disturbance to the Nile flow is expected either upstream or downstream. Hydrological/hydraulic study is carried out and the study revealed that no impact is expected and the mixing zone is limited to 50m distance with 5°C above ambient, which diluted to 3°C at a distance between 100 and 150 m with full compliance with Egyptian Law 48/1983 and WB regulations. MWRI is in full agreement with EEHC regarding its plan for water abstraction.

22. In addition to environmental impact assessment guidelines, the World Bank has established guidelines concerning air pollution and water pollution from thermal power plants (*Pollution Prevention and Abatement Handbook-Part III* (July 1998)). The guidelines were officially published in 1988; since then, several sets of revisions have been proposed, most recently on March 22, 1996. The 1988 and proposed 1996 guidelines are discussed in Chapter 6, along with the actual air and water pollution levels expected from the Power Plant.

23. World Bank's *Pollution Prevention and Abatement Handbook-Part III* (July 1998) also, provides with principles of industrial pollution management, monitoring and air emission & effluent discharge requirements presented in the industry Guidelines including Guidelines for New Thermal Power Plants.

24. Public Consultation Process has been designed in accordance with World Bank Guidance for the Preparation of a Public Consultation and Disclosure Plan (January 1996);

25. The ESIA has assessed the impacts of the demolition of the old El-Tebbin power plant and the construction and operation of the New Tebbin Power Plant and has also considered the cumulative air quality impacts of the plant and other existing industry in the project area. Consideration has also been given to the operation of the transmission line and other outside facilities. Permits will be required from the relevant Competent Administrative Authorities.

26. The ESIA report presents the full assessment of the environmental, social, health and safety impacts of the Tebbin power plant. This Executive Summary presents a short resume of the findings of the ESIA report. For further details, reference should be made to the full ESIA report.

3. GENERAL SETTING OF THE SITE: DESCRIPTION OF THE ENVIRONMENT

27. The Tebbin site is located within an existing walled compound of the former Tebbin power plant. It is situated on a 10 hectare wedge-shaped piece of land located in an industrial area characterized by many heavy industries.

28. The site is located some 35 km southeast of Cairo. The site is delimited by Latitude: 29° 46 N and Longitude 31° 17 E and the elevation is about 22 m above sea level.

29. The project area lies within the hyper arid climatic province of Egypt characterized by a mild winter and hot summer. Assuming equilibrium with average air temperature at Cairo, the river water at Tebbin is estimated to have an average high temperature of 29°C (84°F) in July and August, and an average

low temperature of 14°C (57°F) in January and February.

30. Land cover on the site consists primarily of bare sand, with scattered low-growing vegetation. Only the northern part of the power plant site is characterized by dense vegetation coverage, despite the fact that it is located in a heavily industrialized location.

31. The main transport infrastructure that links the Cairo South area to the country main ports facilities is principally based on road network. The site is accessible through, at least, nine main highways; out of which, most importantly: Cairo-Alexandria desert road, Cairo-Alexandria agricultural road, Cairo-Damietta road, Cairo-Ismailia -Arish road, Cairo-Ismailia-Port Said road, the Maadi-Helwan-Ain El Sukhna highway and Cairo-Suez highway. The road network is supplemented by rail systems to the north of the site.

32. The site is located within a totally urban/urbanized landscape with heavy industrial and infrastructure facilities such as Iron & Steel and cement industries in the Tebbin and Helwan area and the fresh water treatment facility to the north direction of the power plant site.

33. There are no significant habitats within the project's area of influence. Vegetation, an important ecological indicator, is found far from this area although some small patches may be present. The only and most important ecological feature is the Nile river that runs as a corridor to the west of the project site.

34. The water resources in the project area are mainly: the surface water supply which is provided from the Nile river at a distance of about 200m west of the station site, and the ground water in Nile Valley aquifer system which is composed of sands and gravels with interbeds of clay lenses.

35. The proposed site lies within the administrative boundary of the Cairo Governorate. The Cairo Governorate has produced its Long Range Urban Development Master Scheme for the Greater Cairo Region. Both of the investment map of Egypt and the Greater Cairo Region Master Schemes, 2000 update designate Tebbin and Helwan area for industrial activities.

4. PROJECT DESCRIPTION

4.1 Overview of the Power Plant

36. The power plant site will occupy an area of approximately 100,000 m², within a total allocated area of 276,000 m² wedge-shaped piece of land and will include the following main elements:

- Conventional steam power plant, comprising two generating units primarily fired by natural gas, at approximately 7 bar gauge at the interface, but also designed to run on mazout (heavy fuel oil) in emergency situations as a secondary fuel. Each unit will consist of one outdoor boiler for steam generation and one steam turbine generator (STG) providing 325 MWe (nominal) electrical generation capacity per unit at the 100% of the STG output case. Each STG will be fed by steam from the respective steam generator (boiler);
- Circulating water system, with the main pumps and associated piping, the intake and discharge structures, the screening system, the chlorination system and the cathodic protection system;
- Heavy fuel oil and light fuel oil storage tanks;
- Intermediate water storage, the demineralization plant and the make up water system; and
- Power will be generated at the manufacturer's standard voltage and stepped up through main transformers to be connected to the new 220 kV switchgear.

37. The power plant will include the following main components:

- Boiler Unit 1A.
- Boiler Unit 1B.
- Reboiler.
- Auxiliary Boiler.
- Steam Turbine Unit 1A.
- Elec. Bldg. Unit 1A.
- Elec./Control Bldg. Unit 1B.
- Main Transformer Unit 1A.
- Main Transformer Unit 1B.
- Aux. Transformer Unit 1A.
- Aux. Transformer Unit 1B.
- Switchgear Area.
- Diesel Generator.
- Switchgear Control Room.
- Stack Module 1.
- Fuel Gas Receiving/Reducing Station.
- Mazout Fuel Oil Unloading Pumps.
- Sollar Oil Transfer Pumps.
- Mazout Fuel Oil Storage Tank 1.
- Mazout Fuel Oil Storage Tank 2.
- Sollar Oil Unloading Pumps.
- Mazout Oil Heaters/Transfer Pumps.
- Sollar Oil Storage Tank.
- Water Treatment Area.
- Circulating Water/fire Water Pump House.

- Circulating Water Electrical Equipment Bldg.
- Chlorine Tank/Pump.
- Condensate Water Tank.
- Circulating Water Discharge Structure.
- Circulating Water Seal Well.
- Demineralized Water Storage Tank.
- Waste Water Treatment Plant.
- Administration Building.
- Warehouse / Work Shops.
- Security Office.
- Fire Station.
- Hydrogen Generation Building.
- Bottled Gas Storage/Gen. Area.
- Foam Equipment.
- Black Start Facility.

38. The power plant is designed to operate as a base load unit with the STG operating in sliding pressure mode up to approximately 60% load and at fixed pressure for higher loads.

39. The layout and main components for the power plant is presented in *Figure 4*.

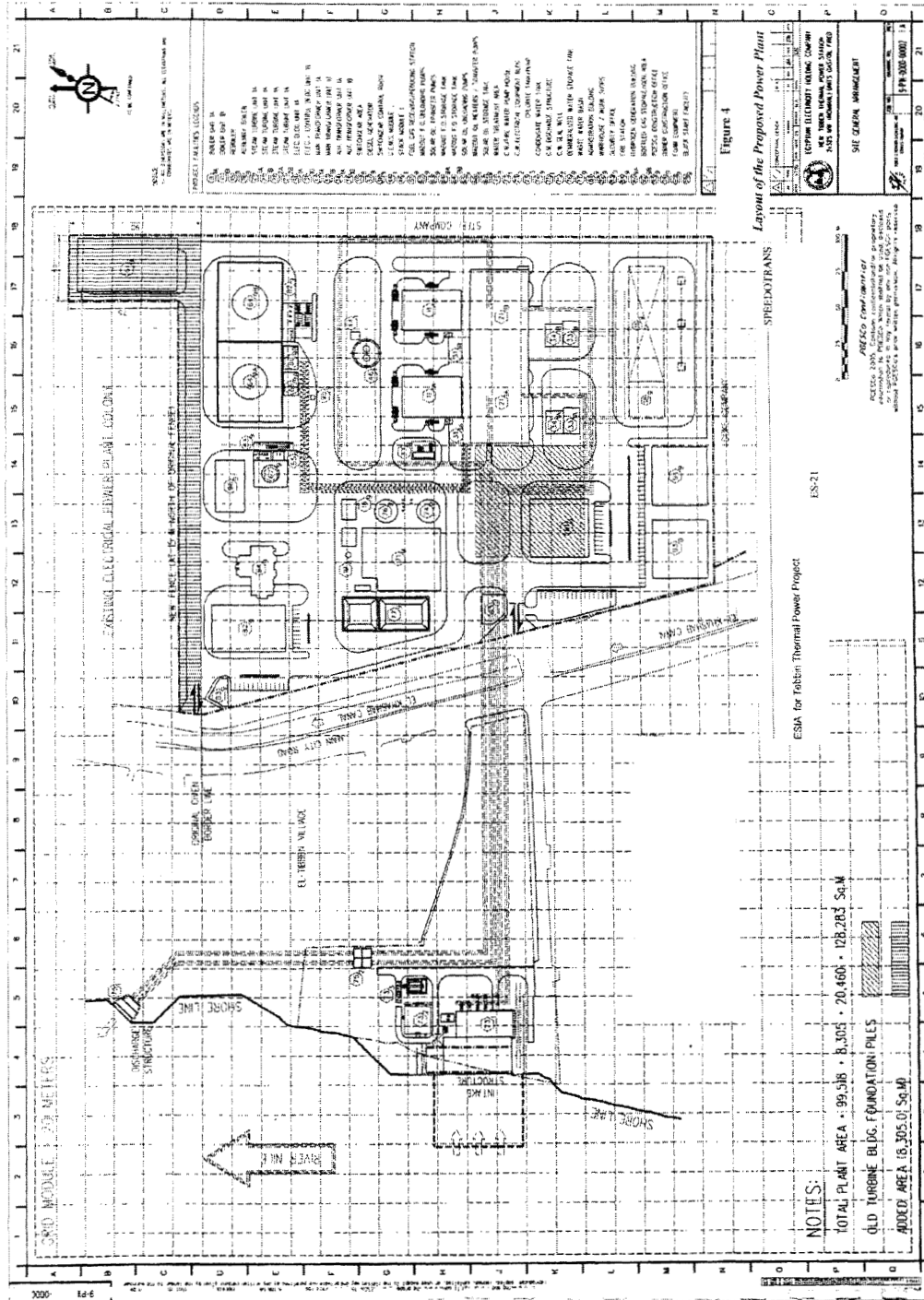
4.2 Process Description

40. The key steps of the generating process of the proposed power plant are as follows:

- The key inputs to the generating process comprise natural gas or mazout oil, (sulfur content 2.5%w on average) which will be delivered to the site via underground pipelines (gas or mazout), together with air and water.
- Natural gas (or mazout oil when natural gas is unavailable) will be mixed with air and combusted to generate steam from demineralized water to drive two turbines serving electrical generators. The combustion of the fuel is supported by injection of air. The process results in the generation of electricity and also produces hot exhaust gases.
- The steam is cycled from the boilers through the turbines to condensers. The condensers are cooled by a direct cooling system, abstracting water from, and discharging the used effluent to, the Nile river. The condensate is then returned for recirculation within the boilers.

Figure 4

Layout of the Proposed Power Plant



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- The final exhaust gases will be discharged to the atmosphere via two flues housed in a single stack in accordance with emission standards set by the EEAA and the W.B. The main by-products from combustion of natural gas are carbon dioxide (CO₂), water vapour, carbon monoxide (CO) and nitrogen oxides (NO_x). Sulfur dioxide (SO₂) and particulates, which are typically associated with coal and oil combustion, will not be produced other than in trace quantities during natural gas firing. When mazout oil is used instead of natural gas (during emergency for no more than 2% of the total operating hours all over the year), SO₂ and particulates will also be key emissions from the power plant.

4.3 Operational Releases from the Power Plant

41. During operation, the key releases into the environment from the power plant will comprise the following:

- Exhaust gases, will be emitted into the atmosphere, normally from the Boilers' stack as result of fuel combustion. Emissions from the combustion of natural gas are carbon dioxide (CO₂), water vapor, carbon monoxide (CO) and nitrogen oxides (NO_x). Sulfur dioxide (SO₂) and particulates, which are typically associated with coal and oil combustion, will only be produced in trace quantities during natural gas firing. In emergencies when heavy fuel oil (mazout) is used instead of gas, SO₂ and particulates will however be key emissions from the power plant.
- Heated cooling water will be discharged into the Nile river via the cooling water discharge structure at a temperature of no more than 8°C at the point of discharge. Process waste water will be treated and discharged into the discharge system, which includes two pathways: one to the City sewer system and the other to the plantation irrigation network. Any oil and residual solids will be removed before discharge and the pH of discharged water maintained at between 6 and 9.
- Chlorine will be added to the cooling water system to control bacterial and algal growth on various surfaces and in the cooling water intake. The cooling water discharge will contain residual quantities of chlorine at concentrations below the World Bank standard for free chlorine of 0.2 mg/l.
- Small volumes of solid wastes will be segregated, collected and disposed of by licensed waste disposal contractors.

42. The power plant incorporates a range of measures to eliminate or reduce operational releases within its design and layout, such as low NO_x burners in the boilers, oil interceptors fitted to the site drainage system and effluent

treatment facilities to treat wastewater prior to discharge. As a result, the power plant is designed to meet high environmental standards and comply with the emission limits of the Arab Republic of Egypt and the World Bank.

5. ANALYSIS OF ALTERNATIVES

5.1 Current Situation (“No Action” Option)

43. The no action alternative to the proposed El-Tebbin power plant would result in the demand for electricity exceeding supply, with an increasing deficit as demand increases in the future. Hence the lack of a secure and reliable electricity generation and supply system, would have significant social and economic implications including constraining existing and future economic development and restricting socio-economic development. As a result, the “no action” option is not considered to be a viable or acceptable alternative to the proposed project.

5.2 Alternative Technologies and Fuels

44. On the basis of security of supply, response to demand and economic advantages, the EEHC has specified that the Tebbin project should be a two gas/oil-fired steam cycle units of 325MWe nominal generating capacity each. The EEHC’s rationale for choosing this technology in preference to other electricity generating technologies as follows:

45. The EEHC generation expansion plan includes provision of the following:

- gas/oil-fired steam units;
- gas/oil-fired combined cycle units;
- gas/oil-fired simple cycle combustion turbine units;
- pumped storage;
- wind farms; and
- integrated solar-thermal generating units.

46. Other possible options include “importing electricity”, “rehabilitation of existing power plants”, “transmission and distribution investment” and “TPPs”.

47. *These technological alternatives constrained by the following:*

- **Importing electricity:** Egypt is interconnected to Libya and Jordan and is exporting electricity to both countries. Interconnection to Libya has a

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capacity of 300 MWe, and that of Jordan has a capacity of 350 MWe, which will be increased to 450 MWe in 2006. Libya and Jordan are currently paying 4 US¢/kWh for the Egyptian power supply. As they are net importers, there is currently not much scope for electricity imports to Egypt from the interconnected networks. In addition, the cost of electricity in both countries is much higher than that of Egypt, making it an uncompetitive alternative. There is currently no south border connection to Sudan, although there is an ongoing discussion in the context of the Nile Basin Initiative (NBI) whereby Egypt could potentially import hydroelectric power starting in 2010-2012, if the price is competitive. However, considering the abundance of natural gas and thus the low cost electricity provision in Egypt, it will be difficult for imported electricity to be competitive.

- **Renewable energy:** The cost of wind based electricity 2.1 US¢/kWh with current grant financing for wind projects, which is higher than the cost from natural gas thermal plants: combined cycle (1.7 US¢/kWh) and steam cycle (1.85 US¢/kWh). Therefore, renewable energy is not competitive unless further subsidies are provided.
- **Rehabilitation of existing power plants:** EEHC has concluded that the rehabilitation option is cost effective in seven of its existing power plants, and these sites have already been or will be rehabilitated. However, these efforts are not enough to cope with the growing demand for electricity. The Tebbin power plant (3 steam units of 15 MWe) is too old (1958 vintage) and not appropriate to rehabilitate.
- **Transmission and distribution investments:** EEHC has developed a transmission and distribution (T&D) development plan and the T&D system is optimized for the current load requirements and generation capacity. To meet the demand growth for the fast track period and medium term expansion, a T&D investment plan has been developed. New electricity generation capacity is required in the network; therefore, strengthening of T&D capacity alone will not replace the need for the generation capacity. Furthermore, T&D losses are at a relatively low level, around 10% on average, and reducing the losses further would not free up the amount of electricity supply required.
- **BOOTs/PPs:** Three BOOT projects (650 MWe each) have been built in Egypt in recent years. The government is encouraging private sector participation in order to attract private investment. However, given the worldwide reduction in investor's interest in the power sector, private financing for power generation in the near term is unlikely.

48. Consistent with the generation expansion plan, the EEHC has stipulated that the Tebbin should be gas/oil-fired steam units of a net 2 x 325

MWe generating capacity. The reasons for the selection of this technology are as follows:

49. The steam cycle (SC) technology, which fires natural gas as a main fuel and mazout as a back-up fuel, has been used for decades in Egypt. The plant efficiency is around 40% with 300 MWe size drum type sub-critical steam cycle. The investment cost of SC plant, based on recent Egyptian experience, is around \$ 530/kWe (EPC basis with multiple packages). The application of large scale (750 MWe) gas turbine combined cycle (CC) technology, which fires natural gas as a main fuel and diesel fuel as a back-up, has just started. Plant efficiency exceeds 50% and the investment cost, based on recent Egyptian experience, is around \$ 300/kWe (EPC basis with multiple packages). Given that CC plants show lower investment cost and higher plant efficiency, there should be a distinguished rationale to justify why the SC technology has been selected for the proposed project. The reasons are the following:

- ***Operational flexibility:*** The EEHC plans to operate large scale (i.e., 750 MWe) CC plants at 100% full flat base-load with a possibility of reducing operations to 50% once a week. This is because the cycling capacity of large-scale CC plants is still to be confirmed (frequent start and stop, and partial load operation capacity). Consequently, SC plants are required to take the role of reducing the load, while CC plants keep 100% full load. EEHC therefore sets the maximum proportion of CC in the generation mix to be 30-35%. As a result, the Electric Generation Expansion Analysis System (EGEAS) model selected the proposed El-Tebbin SC plant as the least cost option based on this generation mix criteria. If the CC technology were selected, it would exceed the limit of CC in the generation mix, requiring CC plant cycling operation beyond what it is capable of.
- ***Grid stability:*** SC turbine has bigger inertia and is therefore more stable to network disturbances. When the CC ratio is too high in the generation mix, CC may overreact to the disturbances and interfere with each other, which could cause load instability.
- ***Unforeseen risk of new technology:*** Applying a new technology to the Egyptian specific climate and environment may have unforeseen risks. For example, recently, dust and humidity caused a quick filter pressure drop in the Cairo North plant, commissioned in May 2004, which was not expected when the CC plant was designed.
- ***Fuel flexibility:*** SC plants use mazout as a back-up fuel, easily available domestically, while CC plants use imported diesel oil that is more expensive. Even though the back-up fuel is not expected to be used often, the SC plant has lower back-up fuel cost.

- *Local manufacturing capacity:* In Egypt only 30% of CC plants are manufactured locally, in comparison to about 40-45% of SC plants manufactured locally. Therefore, the use of SC technology creates more local employment and requires less foreign exchange.

50. Given this rationale, existing and planned generating capacity using gas/oil-fired combined cycle units is already considered sufficient by the EEHC and further reliance on this particular technology is not preferred for reasons of security of supply, response to demand and economics. Actually, almost 14% of installed capacity in 2003/2004 was provided by combined cycle technology. The new combined cycle units at both Cairo North and Nubaria will add more 3000 MWe to the installed capacity within the next 2 years. Also, declared combined cycle additions of both new Kureimat and new Talkha will increase the combined cycle capacity by another 1500 MWe within the same period. The EEHC is implementing a process of meeting and generating increased demand through the provision of conventional steam generation plants in order to generate sufficient demand to install further CCGT capacity in the future. This will result in increased potential to incorporate more CCGT capacity.

51. Hence, with the current policy to limit CC to 30-35% in the generation mix, and with urgent need of supply capacity with load following capability, SC technology has been identified as the most viable option for the Tebbin project. This will ensure operational flexibility, network stability, fuel flexibility, local job creation, and avoid unforeseen risks of applying new technologies too rapidly in Egypt.

52. Natural gas has been selected as the main fuel for the power plant and compared to other fossil fuels generating technologies, steam turbine generators have relatively low emissions of carbon dioxide (CO₂), moderate emission level of nitrogen oxides (NO_x), and lowest emissions, almost traces, of sulfur dioxide (SO₂) and particulates.

5.3 Power Plant Design

53. There are a wide variety of potential designs for the proposed power plant. On the basis of the key design features selected for the power plant, together with the adoption of general good practices within its overall design and layout, fuel and chemical storage facilities and pollution monitoring equipment, the power plant minimizes its potential impacts on the environment whilst ensuring safe, secure and efficient operation. Key aspects of the design, which have been compared with alternatives, are as follows:

- the stack has been designed to maximize buoyancy and dispersion of emissions and its height (152m) exceeds good engineering practice;
- the steam generators will be equipped with low NO_x burners, minimizing

emissions of NOx which is the key pollutant associated with combustion of natural gas;

- direct cooling water will be used to maximize generating efficiency, minimizing visual impact, noise emissions and the potential for visible vapor plumes or ground fogging. Alternatives such as cooling towers and air cooled condensers (open, whilst using less water, result in lower generating efficiencies and also result in impacts such as vapor plumes, visual and noise impacts). The availability of water is not considered an issue for this project given the use of water from the Nile river;
- cooling water will be supplied from a sustainable water supply, namely the Nile river, and the intake and outfall structures can be constructed and operated without significant impacts.

5.4 Alternative Sites

54. The EEHC designated the proposed El-Tebbin site for power plant construction from a group of three alternative sites, namely: Safaga, Damietta and El-Tebbin. The site area was allocated to the Egyptian Electricity Authority (EEA) (today, EEHC) for former El-Tebbin Steam Power Plant by the Government of Egypt (Ministerial Decree no. 402 of the year 1958, issued on 29 September 1958). In selecting the required site, consideration was given to the following criteria:

Economic Factors:

- capital costs;
- operation and maintenance costs;
- requirement for natural gas;
- requirement for cooling water;
- demand loads for electricity; and
- requirements for electricity transmission lines and sub-stations.

Non-economic Factors:

- potential environmental impacts; and
- site development.

55. Potential environmental impacts have been examined for all sites. Screening level assessment during feasibility study indicated that the level of environmental impact will be relatively constant for all three sites.

56. Following negotiations with the concerned authorities, the planned location of El-Tebbin power plant was found to be the most cost effective site for the following reasons:

- minimal additional infrastructure would be required;
- desirable benefits for development of the site area; and
- no workers' colony is required as a local workforce is available.

57. In addition, the power plant will be constructed and operated on a land originally dedicated for power generation activity, thus it will not include any land take. Also, the power plant site will bring socio-economic benefits to the Greater Cairo Region, through employment opportunities, supply contracts and the effects of project expenditure within the local economy.

6. KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

6.1 Introduction

58. A thorough assessment of the impacts of the proposed plant has been carried out based on information provided by EEHC, CEPC and their sub-consultants. A combination of quantitative and qualitative assessment techniques, ranging from computer and/or physical modeling for air, water, noise and traffic impacts to ecological and aquatic surveys and visual evaluation, have been undertaken. The results of the assessment work have been compared with the environmental standards set by the Government of the Arab Republic of Egypt and the World Bank, whichever is the more stringent.

59. The following items are examined in the corresponding sub-sections of the ESIA Study Report:

- Air Quality;
- Aquatic Environment;
- Noise and Vibration;
- Flora and Fauna;
- Land use, Landscape and Visual Impacts;
- Soils, Geology and Hydrology;
- Traffic;
- Socio-economics and Socio-cultural Effects;
- Archaeology, Historical and Cultural Heritage;
- Natural Disaster Risks;
- Major Accident Hazards;
- Solid Waste Management;
- Public Health Effects;
- Occupational Health and Safety; and
- Associated Infrastructure.

60. *Table 2* presents environmental, health and safety issues relating to demolition, construction and operation of El-Tebbin power project.

61. For each of these items, a concise description and evaluation of the significance of potential impacts of the project is presented in the ESIA study report. Where modeling has been undertaken, a description of the model as well as corresponding maps summarizing the results of the assessment are provided.

62. Where potentially significant adverse impacts are identified, possible mitigation measures are suggested wherever possible, to ameliorate the impact to an acceptable level. Where identified, beneficial or positive impacts/effects of the project are also highlighted.

63. The conclusions of the assessment are that (with suitable mitigation measures described in *Tables 4, 5, 6 and 7*) the project is in compliance with the environmental requirements of both the Government of Egypt and the World Bank with respect to demolition process of existing facilities, stack emissions of the new power plant, ambient air quality, discharge quality and noise. *Table 3* provides with a summary of anticipated impacts in relation to the Egyptian and World Bank environmental guidelines for stack emissions, ambient air quality, liquid effluent and noise. The following discussion highlights some of the key considerations and results of the assessment.

Table 2

*Environmental, Health and Safety Issues Relating to
Demolition, Construction and Operation of El-Tebbin Power Project*

Subject Area	Potential Impacts During Demolition and Construction	Potential Impacts During Operation
Air Quality	Dust from construction activities. Traffic-related air quality impacts.	Impacts of emissions from stacks on ambient air quality. Traffic-related air quality impacts. Global warming potential.
Aquatic Environment	Control and management of site drainage. Wastewater discharge. Sewage disposal and foul drainage.	Thermal water discharge. Water requirements for power plant operation. Discharge of process and wastewater. Operation of drainage systems on site. Discharge of storm water, sewage and drainage.
Noise and Vibration	Noise from construction activities.	Noise from power plant operations on surrounding land uses.
Land Use, Landscape and Visual Issues	Land use on site. Land use in the surrounding area. Effects of construction activities on landscape character. Visual impact of construction activities.	Land use on site. Land use in the surrounding area. Effects on landscape character. Visual impact of the power plant and operation activities.
Soils, Geology and Hydrogeology	Effects on soils and geological features. Soil contamination. Effects on groundwater.	Soil contamination. Effect on groundwater.
Flora and Fauna	Loss of habitat or species due to landtake. Disturbance or damage to adjacent habitat of species.	Disturbance or damage to adjacent habitat. Effects of structures on bird migration routes.
Traffic	Traffic conditions/disruption to road users. Traffic-related air quality. Traffic-related noise.	Traffic conditions/disruption to road users. Traffic-related air quality impacts. Traffic-related noise impacts.
Major Accident Hazards	Risk to third-party hazardous industry.	Risk to third-party hazardous industry. Risk to power plant of third-party hazardous industry.
Natural Disaster Risk	Seismic risk. Flood risk.	Seismic risk. Flood risk.
Solid Waste Management	Contamination of soils and water. Hazards to workers health. Accident risks.	Contamination of soils and water. Hazards to workers health. Accident risks.
Occupational Health and Safety	Accidents. Effects on health of workforce. Safety at work.	Accidents. Effects on health of workforce. Safety at work.

Demolition and Construction Dust

64. Demolition and construction activities will result in locally high levels of dust. This may affect residential receptors or sensitive environments which lie in the immediate boundaries of the power plant. Existing concentrations of airborne dust are already high in this urban industrial area. Potential impacts from dust emissions on site will be significantly reduced by careful management and the implementation of mitigation measures to reduce dust generation.

Stack Emissions and Background Air Quality

65. The power plant will burn natural gas as its primary fuel. As a result, the principle pollutant during normal operation will be NO_x. During emergency operation (and for not more than 2% of operating time), the burning of light fuel oil will result in emissions of particulate matter and SO₂ along with trace amounts of other pollutants. Emissions from the plant will meet Egyptian and World Bank Guidelines.

66. In order to analyze the potential impacts of the plant's emissions during normal operation (firing gas) on ambient air quality in the project area, dispersion modeling has been undertaken.

67. The assessment indicates that the highest concentrations for each of the averaging periods under consideration (annual, daily, hourly) are found to the south-east of the site. This is because the winds are overwhelmingly from the north and northwest for most of the time. Maximum annual concentration of NO_x emissions in the ambient atmosphere due to operation of the Tebbin power plant will not exceed 10 µg/m³ (highest annual maximum is 9.6 µg/m³ at the location [300m, - 300m]) and the maximum daily reaches 56.8 µg/m³ at a distance of 141 m southeast the powerhouse. Also, Maximum "One-hour Average" concentration of NO_x emissions in the ambient atmosphere reaches 96.3µg/m³ at the location [130m, 95m] (see *Figure 5*). ***It is recommended that an air quality monitoring system composed of 2 or 3 monitoring stations will be utilized. The monitoring station equipped with meteorological monitoring system will be located near to, or within, the Tebbin power plant site, the other one or two stations will be located one down wind within the designated area of maximum predicted pollutant concentration and the other (if any) upwind.***

Figure 5

El-Tebbin Air Quality Monitoring Locations

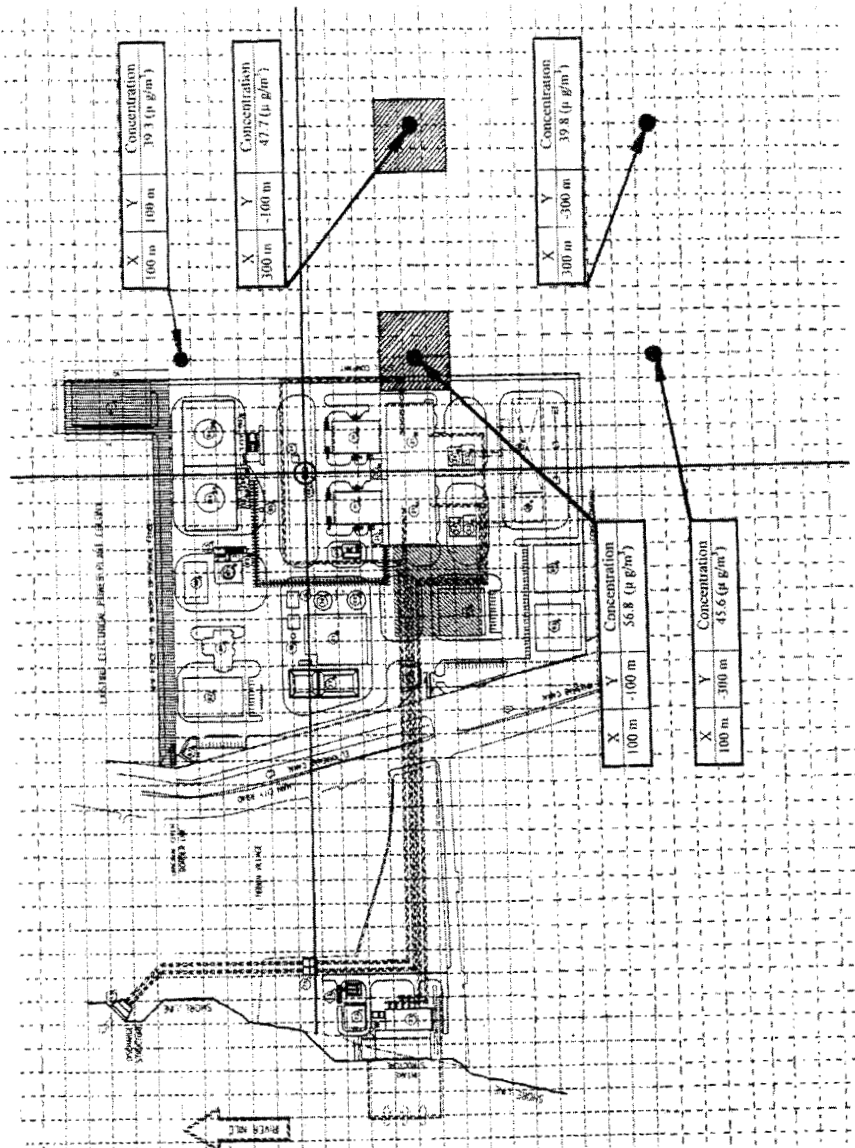


Table 3
Environmental Impacts and Environmental Guidelines

Impact Area	Predicted Max. Concentration from Tebbin Power Plant	Existing Ambient Air Quality (Effect of All Surrounding Industries) ⁽²⁾	Cumulative Air Quality Impact of the Tebbin Power Plant and Surrounding Industries	Egyptian Standard	World Bank Guideline
Stack emissions (100% load) (when firing Natural Gas)					
NOx ⁽¹⁾	300 mg m ⁻³			300 mg m ⁻³ ⁽¹⁾	320 mg m ⁻³
SO ₂	300 mg m ⁻³			2,500 mg m ⁻³	2,000 mg m ⁻³
	50 mg m ⁻³			200 mg m ⁻³	50 mg m ⁻³
TSP – General (all sizes)					
Stack emissions (100% load) when firing Heavy Fuel Oil (<2% of total annual operating time)					
NOx – oil firing	300 mg m ⁻³			300 mg m ⁻³ ⁽¹⁾	460 mg m ⁻³
SO ₂ – oil firing	2,000 mg m ⁻³			2,500 mg m ⁻³	2,000 mg m ⁻³
	50 mg m ⁻³			200 mg m ⁻³	50 mg m ⁻³
TSP – General (all sizes)					
Ground Level Concentration (when firing National Gas)					
NOx – 1 hour	96.6 µgm ⁻³	44.7 µgm ⁻³	141.3 µgm ⁻³	400 µgm ⁻³	-
NOx – 24 hours	56.8 µgm ⁻³	26.62 µgm ⁻³	83.42 µgm ⁻³	150 µgm ⁻³	150 µgm ⁻³
NOx – 1 year	9.6 µgm ⁻³	3.6 µgm ⁻³	13.2 µgm ⁻³	-	100 µgm ⁻³
SO ₂ – 1 hour	Trace	30.45 µgm ⁻³	30.45 µgm ⁻³	350 µgm ⁻³	-
SO ₂ – 24 hours	Trace	17.97 µgm ⁻³	17.97 µgm ⁻³	150 µgm ⁻³	150 µgm ⁻³
SO ₂ – 1 year	Trace	2.44 µgm ⁻³	2.44 µgm ⁻³	60 µgm ⁻³	80 µgm ⁻³
PM ₁₀ – 24 hours	Trace	101.93 µgm ⁻³ ⁽¹⁾	101.93 µgm ⁻³	70 µgm ⁻³	150 µgm ⁻³
PM ₁₀ – 1 year	Trace	13.8 µgm ⁻³	13.8 µgm ⁻³	-	50 µgm ⁻³
Liquid Effluent					
pH	6-9			6-9	6-9
BOD	<30 mg/l			<30 mg/l	-
Chromium				0.05 mg/l	0.5 mg/l
Copper	<0.5 mg/l			1 mg/l	0.5 mg/l
Iron	<1 mg/l			1 mg/l	1.0 mg/l
Zinc	<1 mg/l			5 mg/l	1.0 mg/l
Oil and Grease	<5 mg/l			30 mg/l	10 mg/l
Total Suspended Solids (TSS)	<30 mg/l			-	50 mg/l ⁽¹⁾
Residual Chlorine (total)	<0.2 mg/l			-	0.2 mg/l ⁽¹⁾
Temperature Increase (°C)	≤5°C within 50 m from discharge point and ≤3°C within 150m. Width of plume trajectory ≤ one third of Nile width			(max. absolute temp 35°C at Nile surface, ≤5°C above ambient Mixing zone up to 150°C.	≤3°C at edge of mixing zone ⁽⁵⁾
Noise⁽⁶⁾					
Daytime (max.)	Max. <59.1 dB(A)			60-70 dB(A)	70 dB(A)
Night time (max.)	Max. <59.1 dB(A)			50-60 dB(A)	70 dB(A)

(1) Egyptian standards for NOx are expressed in terms of NO₂.
 (2) Ambient air quality continuous monitoring results measured by the EEA air quality monitoring equipment in Tebbin area during 2004.
 (3) Ambient air quality continuous monitoring results measured by the EEA air quality monitoring equipment in Tebbin area during 2004. The PM₁₀ concentrations resulting from the power plant itself only, is traces.
 (4) "Chlorine shocking" may be preferable in certain circumstances, which involves using high chlorine levels for a few seconds rather than a continuous low level release. The maximum value is 2 mg/l for up to 2 hours, which must not be more frequent than once in 24 hours (and the 24 hour average should be 0.2 mg/l).
 (5) The effluent should result in a temperature increase of no more than 5°C at the edge of the zone where initial mixing and dilution take place. Where this zone is not defined, use 100 m from the point of discharge when there are no sensitive aquatic ecosystems within this distance.
 (6) There are sensitive receptors for noise within 150m of the power plant. The area has been categorised as "Industrial area" with respect to Egyptian ambient noise standards and "Industrial commercial" with respect to World Bank guidelines. It is decided that the northern fence between the power plant and the residential colony will be raised to 5 m height to achieve about 3-5 dB(A) reduction in predicted noise level.

Aquatic Environment

68. Cooling water and process water for power plant operation will be drawn from the Nile river via an intake structure. The quantity of the cooling water that will be returned back to the Nile river is about 20-26m³/sec. Process water that will be abstracted from the Nile river is about 0.07% of this quantity. Potable water will be supplied to the power plant via City potable water system. Cooling water will be returned to the Nile river via a discharge structure whilst waste process water will be disposed of after treatment via discharge system, which includes two pathways: plantation irrigation network and City sewer system. Sanitary waste water will be disposed of via City sewer system. No ground water or other surface water will be used during power plant demolition, construction and operation. The Contractors will be responsible for relevant water/toilet facilities during demolition and construction and the need to provide appropriate services will be specified in their contracts. The key potential impacts of the power plant on the aquatic environment will therefore be impacts to the aquatic flora and fauna during power plant construction and operation.

69. The aquatic environment surrounding the project site is characterized by generally fair water quality. The aquatic flora is characterized by poor biodiversity and no sensitive ecosystems. No commercial fishing and very limited fishing activity occurs in the vicinity of the project.

70. During construction of the power plant dredging and construction of the intake and discharge structures could lead to potential impacts on physical aquagraphy, water quality and removal of, or disturbance to, aquatic habitats, flora and fauna. Given that the area of impact is very localised, losses are in many cases temporary and field survey data available do not indicate significant or sensitive habitats, the impacts of power plant construction on the aquatic environment are not considered to be significant. In addition, good site management and engineering practices during construction will ensure that any residual impacts are reduced to a minimum.

71. Power plant operation will result in a heated plume of waste cooling water being discharged into the Nile river. Process water will be disposed of to the discharge system (identified above). All discharges of process water will be treated prior to discharge to ensure that the Egyptian and World Bank waste water quality guidelines are met. Treatment includes neutralization, oil separation, flocculation and filtration.

72. The returned cooling water will be released at a temperature of no more than 8°C at the point of discharge. Thermal modeling of the discharge plume shows that, during lowest flow at full load operation, the point at which the plume has decreased in temperature to 5°C above ambient, lies at approximately 50 m from the point of discharge. The mixing zone has been

defined by the HRI/MWRI to be 150 m from the point of discharge.

73. The temperature of the returned cooling water at the point of discharge conforms to the Egyptian Standard, and the discharge as modeled satisfies the World Bank standard of a maximum increase of 3°C above ambient at the edge of the mixing zone (100 m from the point of discharge). In addition, the area affected by the highest temperature increases and therefore where aquatic ecology is likely to be most affected, is localized and the aquatic habitats in this area have been found to already be relatively impoverished. Outside this area, more marginal increases in the Nile river water temperature are likely to create new or improved habitats for flora and fauna.

74. Physical aquagraphy, Nile bank access, fishing and navigation are not predicted to be significantly affected by the presence of the intake and discharge structures.

6.4 Noise Impacts

75. The demolition and construction of the Tebbin power plant is expected to generate a maximum noise level of 59 dB(A) during the day at the fence of the power plant and 57dB(A) at night. These worst-case demolition and construction noise levels are both within Egyptian and World Bank⁽¹⁾ guidelines, and for most of the demolition and construction periods, the noise levels will be lower than these values. There are residential receptors within 150m of the plant.

76. Demolition and construction traffic on local roads will also generate additional noise, however noise levels on local roads predicted for peak construction activity (during 2007/2008) is expected to be only 0.3dB(A) above ambient levels. This magnitude of increase is generally not perceptible to the human ear, consequently no construction traffic impacts are predicted.

77. The potential noise emissions from the Tebbin plant during operation have been modeled to provide noise contours in the area around the site. The predicted operational noise levels at the site boundary and at all receptors are below the Egyptian and World Bank guidelines during daytime and night-time. Although this is the case, it is recommended that the fence between the power plant and the residential colony should be elevated to a 5m height.

(1) There are no World Bank Guidelines for demolition and construction noise, therefore Operational noise guidelines are applied here.

6.5 Flora and Fauna

78. No areas protected for their conservation value are located on, or in the vicinity of, the project area. The proposed site itself, excluding its northern part where some valuable old trees exist, and the surrounding land is poorly vegetated with much of the area having been disturbed by urban developments. Given that the potential impacts of demolition, construction and operation on power plant area likely to be localized, and provided that a plantation ecologist expert will be hired for implementing a conservation/replantation program for the old trees at site, and good site management practices will be implemented, no significant effects are predicted.

6.6 Land Use, Landscape and Visual Impacts

79. The land use at the project site is industrial land. There is no loss of this land to the power plant development, as this land is dedicated for a power generation activity since late 1950's, therefore there is not significant land use impacts due to the Tebbin power project.

80. The surrounding land use is generally industrial. As the land is highly urbanized with limited vegetation, all existing views will be in significantly influenced by the power plant and given the surrounding industrial context, the visual intrusion of the power plant will be minimal.

81. Visual impacts of the power plant from the residential areas to the north and northwest are also not expected to be significant given the orientation of the apartments. The potential landscape and visual impacts of the project are therefore expected to be minor and not significant.

6.7 Soils, Geology and Hydrology

82. Due to the characteristics of the soils and geology of the site, in particular the lack of any sensitive features, and the mitigation measures proposed as part of the demolition, construction and operation of the power plant, no significant impacts are predicted to occur. In addition, preliminary land surface investigations confirmed the site as being uncontaminated. However, soil sample testing is recommended for further geotechnical investigation.

6.8 Traffic

83. The assessment of traffic and transport covers the changes in traffic conditions in terms of delay and congestion during construction and operation.

84. The greatest potential for traffic impacts to occur arises during a short period at peak construction. There is some potential for increased congestion on the main roads to the power plant, however the impacts will only occur during the peak construction phase and during peak hours. The overall impact is therefore predicted to be insignificant. Mitigation measures will be put in place to reduce the potential for impacts to arise.

85. During operation, a small number of workers and HGVs are associated with operating the power plant and no impacts are predicted to occur.

6.9 Socio-economics and Soico-cultural effects

86. Re-employment program, associated with the demolition of the existing Tebbin facilities, is already implemented by the CEPC within the entire Cairo Electricity Generation System. All rights of the present workforce of the old Tebbin power plant are reserved.

87. There were 376 workers at the old plant, of which 235 will be retained. In other words 141 workers will start working elsewhere within the overall CEPC facilities. Besides many of these are expected to reply for unpaid leave to be able to work on the construction of the new plant where preference is given to local labor. The re-employed workers will not lose any of their previous rights (employment benefits, insurance, health care etc.).

88. Although a considerable number of workers will be re-employed elsewhere in the greater Cairo metropolitan area, their families/homes will remain in El Tebbin, i.e. no resettlement or loss of income will take place as a result of the re-employment.

89. It is anticipated that the power plant will provide a net positive socio-economic impact through the provision of employment opportunities and attraction of economic investment into the area. In addition, the use of local labor (95% during construction), will maximize these positive impacts through the development of the local skill base and will also generate increased demand for local services, materials and products.

90. In addition to the area specifically designated for the plant, there are large empty spaces next to the power plant site. All activities related to the construction of the new plant will therefore take place within the area belonging to the CEPC, i.e. there will be no off-site activities or associated land acquisition during construction.

91. As indicated in the main document, scientific research has shown that certain species of the fish grow considerably faster in warmer water.

92. The effects on the fisheries of warmer water returned to the Nile from similar power plants along the river are well known. Experience from a dozen other power plants that have operated for a number of years indicates that the overall impacts on fisheries of slightly warmer water actually are positive, and consultations with the fishermen indicate that the catches in these areas have increased rather than decreased. Since this is part-time, small-scale fisheries no statistics are available, but after many years the warmer water around the various points of discharge, is clearly perceived by the fishermen to have positive effects.

93. In line with this recognition, discussions have already been initiated between the EEHC and the General Authority for Fishery Development with a view to jointly take advantage of this, e.g. establishing a fry collection station near the edge of the mixing zone.

6.10 Archaeology, Historic and Cultural Heritage

93. No available information was found which identified any archaeological, historic or cultural remains on the site or in the surrounding area. Consequently, no impact is predicted to occur on any known archaeological, historic or cultural resources.

94. CEPC have incorporated mitigation measures into the construction program to ensure that any potential finds of significance are recorded and are accorded the required protection in consultation with Supreme Council for Antiquities.

6.11 Natural Disaster Risks

95. An assessment of the risks to the power plant from seismic activity has concluded that given the engineering measures incorporated into the design of the power plant, the potential environmental impacts of a seismic event during power plant operation are not anticipated to be significant.

96. Furthermore the power plant will be designed to conform to the Uniform Building Code Zone 2 seismic criteria, according to US regulations for earthquake. These design criteria are therefore considered sufficient to withstand the level of seismic activity experienced in the area.

97. The risks of flooding during power plant demolition, construction and operation were also examined. However, site drainage will be constructed to minimize any risks of contaminated water reaching the surroundings and to properly drain the site, no significant flood risk impacts are anticipated.

6.12 Major Accident Hazards

98. Given the wider land surrounding the Tebbin power plant and the measures incorporated into the design of the plant to minimize the risk from fire and explosion, the plant is not anticipated to pose a potential risk of any significance to any third party facilities.

6.13 Solid and Hazardous Waste Management

99. The management of wastes during demolition, construction and operation of the power plant will include mitigation measures to collect and store waste on-site, record all consignments of solid or contaminated waste for disposal and periodically audit waste contractors and disposal sites to ensure that disposal is undertaken in a safe and environmentally acceptable manner according to the rules set by Law 4/1994 and the Governorate of Cairo.

100. The only hazardous waste expected to be disposed of, if any, is asbestos. During demolition, special management procedure will be followed for any asbestos containing materials, if found, to be disposed of safely.

101. Private sector contractor will be assigned via general bidding process and the contract will include detailed environmental procedures, according to Law 4/1994 and Governorate of Cairo regulations, for demolishing about 20,000m³ of debris materials. The contract covers all fees required.

102. During demolition, construction and operation, all wastes including debris waste, general waste, packaging waste, commercial wastes, raw-water pre-treatment sludge, tank sludge and interceptor sludge will be disposed of by licensed waste contractors according to the rules set by Law 4/1994 and the Governorate of Cairo.

103. Solid and hazardous waste management is not predicted to cause any significant impacts.

6.14 Occupational Health and Safety

104. With the provision of a high standard of health and safety management on site, demolition, construction and operation of the power plant in accordance with good industry practice, the occupational health and safety risks associated with demolition, construction and operation of the power plant will be minimized and are not significant.

6.15 Associated Infrastructure

105. Connections to existing gas, oil and electrical facilities will be the responsibility of GASCO, EGPC, EETC and the CEPC respectively. In regard to the gas connection with the gas reducing station of the site and oil pipeline to the oil tanks on the site no environmental or social impacts are anticipated.

106. EEHC has already submitted a request to GASCO for their needs for the new plant which will necessitate a bigger diameter pipeline, and which will follow the same existing pipeline.

107. The electricity generated by the proposed power plant will be exported via the 220 kV electricity transmission system. The power plant will be connected to the 220 kV switchyard via step-up transformers. The generated power will be evacuated to the national grid via an overhead transmission line. The 220 kV lines will be tied to a 220 kV cables that will be a double circuit of a length about 5 km, extended from El-Tebbin power plant to Tebbin South 220 kV S/S following an existing route.

108. Transmission line upgrades will follow existing routing, i.e. no land will be expropriated. However, the Bank will be notified if any subsequent changes occur as it is recognized that this may have policy procedural implications.

109. EETC and CEPC will submit Screening Form B to the EEAA concerning this interconnection. No significant impacts are anticipated.

6.16 Global Impacts

110. Natural gas has been selected as the main fuel for the power plant. Compared to other fossil fuel generating technologies, gas fired steam generators have a relatively low emissions of carbon dioxide (CO₂), moderate emission levels of nitrogen oxides (NO_x) and the lowest emission levels (almost traces) of sulfur dioxide (SO₂) and particulates.

111. The greenhouse effect is caused by the build-up of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and chlorofluorocarbons (CFCs) in the atmosphere. Water vapor and ozone (O₃) can also act as greenhouse gases. For power generation processes, CO₂ is the key emission of concern, as methane and CFCs are not emitted by power plants and none of the other greenhouse gases are emitted in sufficient quantities from power generation to be considered important in terms of the greenhouse effect.

112. The efficiency of the proposed steam power plant is 40% with natural gas, with associated CO₂ emissions of 54kg/s. This compares with the efficiency of a typical CCGT power plant of 53-54%.

113. Emissions of carbon dioxide are estimated to be up to 1600 kilotonnes per year (expressed as CO₂). This assumes that the plant operates for the whole year and consumes around 65 tonnes of gas per hour. The emissions of CO₂ from fuel burning in Egypt amounted to around 118,262 kilotonnes in 2002/2003 (Ref: Energy in Egypt, 2002-2003; Organization for Energy Planning). Fuel combustion will account for most of Egypt's CO₂ emissions from all sources. Hence, the power plant as proposed will emit up to around 1.3% of the total Egyptian CO₂ emissions in 2002/2003. This is an upper estimate as the plant will not operate 100% of the year or at full load 100% of the time.

114. Natural gas, which is the main fuel to be used in the Tebbin plant, contains very low concentrations of sulfur or particulate matter, therefore the potential for emissions of SO₂ and particulates from the electricity generating process are also very low. Fuel oil however, leads to greater emissions of SO₂ and particulates, due to the relatively high sulfur content of these fuels and the generation of ash during their combustion.

115. Natural gas fuel also has the significant benefit of being able to be delivered by an existing pipeline (even though it may be enlarged in capacity).

7. ENVIRONMENTAL MITIGATION AND MONITORING: THE ENVIRONMENTAL AND SOCIAL MNGEMENT PLAN (ESMP)

7.1 Enhancement and Mitigation Plan

116. The Environmental and Social Management Plant (ESMP) includes mitigation measures, design of monitoring programs where appropriate, and specification of management measures (including institutional responsibility and training requirements).

117. The mitigation measures represent a synthesis of those measures which are part of the basic power plant design and those that have been recommended in Section 6 of the ESIA report for both the construction and operational phases of the power plant. The mitigation measures discussed in this section are summarized in the following three Tables, together with respective environmental monitoring and management arrangements. It should be noted that many of the mitigation measures presented below for the construction phase, will be carried forward into plant Operation.

118. All the mitigation, monitoring and management measures proposed below and in Section 8 of the ESIA report (the Environmental and Social Management Plan (ESMP)), will be adopted by the Project Company and imposed as conditions of contract on the contractor and any sub-contractors

employed to build or operate any part of the power plant. Since many of the mitigation measures presented are considered an essential, integrated component of the construction and operation works, it is not possible to separate the specific costs of their implementation from the overall construction costs.

119. Mitigation measures introduced into the design and construction phase of the power plant will be carried forward into the operational phase by the CEPC Company. Many mitigation measures, as described in Sections 4 and 6 of the ESIA report, have already been integrated into the design of the power plant in order to minimize any operational impacts on the environment. Mitigation measures such as low NOx combustors, noise silencers and water discharge controls are for example considered integral to the design of the power plant.

120. The key features of the ESMP relate to air quality, aquatic discharge and implementation of good site management practice. The ESMP is summarized in *Tables 4, 5, 6 and 7* which relate to demolition, construction and operational phases respectively. *Table 8* summarizes the cost of ESMP which will require to be included in the project financial plan.

Table 4
Institutional Arrangements for El-Tebbin Power Project

Issue/Impact	Mitigation Measures	Implementation Schedule	Type and Frequency of Reporting / Monitoring	Responsibility		Monitoring Indicators	Budget in US\$
				Implementation	Supervision		
Demolition Phase							
Institutional capacity to address environmental and social issues	Basic training of CEPC employees responsible for supervising the demolition.	Prior to starting demolition. Ongoing training	Quarterly to EEHC & EEHC Environmental Coordinating Committee (ECC)	CEPC/TPP (EEHC training facility)	EEHC EEHC Environmental Coordinating Committee (ECC)	Training programs Compliance with ESMP	CEPC responsibility ^(*)
Construction Phase							
Institutional capacity to address environmental and social issues	Establishment of the Environmental Management Unit (EMU), construction phase. Basic training of persons employed to operate the monitoring activities. Basic induction training for all employees on good construction and site management practice.	Prior to starting construction. Ongoing training	Quarterly to EEHC & EEHC Environmental Coordinating Committee (ECC)	CEPC/TPP	EEHC EEHC-ECC	Training programs Compliance with ESMP	Included in air quality monitoring package CEPC responsibility
Operation Phase							
Institutional capacity to address environmental and social issues	Establishment of the Environmental Management Unit (EMU), operation phase. Basic training of persons employed to operate the monitoring activities. Induction, specific and refresher training for all employees on good operation management practice. Training methods, facilities & manuals	Prior to starting operation. Ongoing training	Quarterly to EEHC & EEHC Environmental Coordinating Committee (ECC)	CEPC/TPP	EEHC EEHC-ECC	Training programs Compliance with ESMP	Included in air quality monitoring package CEPC responsibility

Notes:
(*) CEPC responsibility: means that training and capacity building activities are included in the company organizational structure and budget.

**Table 5
Demolition Impact Mitigation, Monitoring and Management Measures**

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Air Quality Dust emissions caused by demolition activities, demolition vehicle movements, and transport of demolished materials.</p>	<p>Implementation of good site practices including:</p> <ul style="list-style-type: none"> • demolition method is not blasting, but is top-down deconstruction, in the reverse order to that of demolition, progressive, level by level having regard to type of demolition; • wherever possible, external non-load bearing cladding shall be removed first; • debris to be removed at frequent intervals and stockpiles shall not be allowed to build up. Waste shall be removed on a daily basis as far as reasonably practicable; • appropriate siting and maintenance of stockpiles of demolished materials so as to minimize dust blow; • minimizing drop heights for material transfer activities; • roads will be kept damp via a water bowser; • roads will be compacted and graveled if necessary; • site roads will be maintained in good order; • regulation of site access; • sheeting of lorries transporting demolished materials and spoil; • limits on dust roads to <35 km/h. 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>Demolition air quality monitoring of NO₂, SO₂, CO, TSP and PM₁₀ monitors. measurements to be undertaken by the NRC⁽¹⁾.</p> <p>Measurements and analysis of these pollutants to be made on an interval basis, e.g. monthly.</p>	<p>CEPC/TPP/Local Consultants (NRC)</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site.</p>	<p>CEPC/TPP Assistant Plant Manager</p> <p>EEHC Environmental Management & Studies Sector</p>	<p>Dust levels (TSP and PM₁₀)</p> <p>NO₂, SO₂, CO, levels</p>	<p>CEPC/TPP to check dust suppression measures daily.</p> <p>NRC to measure pollutants monthly.</p> <p>Monthly reporting of summary results (or more if requested) and submitted to the EEHC and any other concerned authority, if required.</p>	<p>CEPC responsible for management of the air quality monitoring measurements. Basic training of persons employed to operate and maintain the monitoring system.</p> <p>CEPC to ensure the contractor and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good demolition and site management practice.</p>	<p>Mitigation measures and management, Contractor responsibility (included within demolition costs).</p> <p>Air Quality measurements: US\$ 20-40k</p>

Notes:
NRC = National Research Center.

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Table 5 (Contd.)

Demolition Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Water Quality Generation of demolition site run-off. Surplus groundwater during soil remediation and wastewater that may cause adverse water quality impacts on water sensitive receivers.</p>	<p>Mitigation activities will include the following:</p> <ul style="list-style-type: none"> no discharge of effluents into the Nile river or El-Khashab canal - all effluents shall be collected and removed off site for treatment by approved firms; development of a site drainage plan which reduces flow velocity and sediment load; protection of temporary stockpiles of soil from erosion by using a reduced slope angle where practical, sheeting and by incorporating sediment traps in drainage ditches; maintenance of well kept demolition site. proper site management to minimize surface water run-off, soil erosion, soil remediation activities and the impacts of sewage effluents; adequate maintenance of drainage systems to prevent any overflow; critical areas within the Site shall be clearly marked and provided with protective measures to control site run-off. Temporary channels shall be provided to facilitate run-off discharge into the appropriate watercourses, via a silt retention pond; drainage channels shall incorporate sediment basins or traps and baffles to enhance deposition rates; 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>Continuous monitoring is required to ensure the implementation of good management practices during demolition.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of the contractor and subcontractors on site under supervision of the CEPC/TPP.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Fluid effluents within the site. Soil erosion. Surface water run-off. Sewage effluents. Earth, mud and debris depositions on roads.</p>	<p>Monthly reporting of summary results (or more if requested) and submitted to the EEHC and any other concerned authority, if required.</p>	<p>CEPC to ensure the contractor and subcontractors working on site are aware of ESMF and all employees are given basic induction training on good demolition and site management practices.</p>	<p>Costs for mitigation measures included within demolition costs.</p>

**Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures**

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/ monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
	<ul style="list-style-type: none"> wheel washing facilities will be installed to ensure no earth, mud and debris is deposited on roads. Sand and silt in the wash water from such facilities shall be settled out and removed before (in line with effluent discharge standards discharging the used water into water drains; temporary water/toilet facilities will be provided and sewage discharges on site will be connected to the existing sewer or sewage treatment facilities where possible; the contractor shall not discharge directly or indirectly into any public sewer stormwater drain any effluent or contaminated water without the prior written consent of the site engineer in consultation with the Assistant Plant Manager. 								

**Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures**

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p><i>Noise</i> Arising noise impacts related to operation of demolition plant and vehicles.</p>	<p>Implementation of good site practices including:</p> <ul style="list-style-type: none"> enforcement of vehicle speed limits; strict controls of vehicle routing; demolition plant equipment to be fitted with silencers; no noisy demolition activities at night; prohibition of heavy vehicle movements at night; use of protective hearing equipment for workers. 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>Continuous monitoring and supervision by CEPC is required to ensure the implementation of good site management practices by the contractor and subcontractors during demolition.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of the contractor and subcontractors on site under supervision of the CEPC/TPP.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Noise complaints register to identify concerns. Check validity using noise measuring devices already available at CEPC and operated by CEPC noise specialists.</p>	<p>CEPC/TPP will produce a monthly log of valid complaints and actions taken to EEHC.</p>	<p>CEPC to ensure the contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good demolition and site management practices.</p>	<p>Management time and costs (US\$ 5K)</p>

Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p><i>Flora and Fauna</i></p> <p>Site clearance-vegetation removal and habitat disturbance.</p>	<ul style="list-style-type: none"> • Good site management practices will be observed to ensure that disturbance of habitats off-site are minimized. Specific mitigation measures include restricting personnel and vehicles to within demolition site boundaries, lay down areas and access roads; • Plantation ecologist will work closely with the engineer and/or contractors in order to develop a detailed conservation plan for trees at the site; • Plants near the agricultural drainage banks will be kept due to its important role in accumulating pollutants especially heavy metals. This important ecological role was reported in the literature on the same genera; • Trees growing by the fence of the power plant will be kept since they will not obstruct any demolitions and due to their importance as wind shields. 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>Continuous monitoring and supervision by CEPC is required to ensure the implementation of good site management practices by the contractor and subcontractors during demolition.</p>	<p>Plantation Ecologist. Implementation of Good Site Management practices shall be the responsibility of the contractor and subcontractors on site under supervision of the CEPC/TPP.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Good conservation of floral wealth.</p>	<p>Assistant Plant Manager to check status of trees and other floral species daily. No. of trees conserved or replanted.</p>	<p>CEPC to ensure the contractor and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good demolition and site management practices.</p>	<p>Management time and costs plus ecologist specialist (between US\$ 7-9K)</p>

Table 5 (Contd.)

Demolition Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Land Contamination Site clearance, excavation and disposal of material, exposure of potentially contaminated soils, spillage or leakage of substances on land, movement of equipment and vehicles on site.</p>	<p>The potential for impacts are largely dependent on management of the demolition site and activities. The following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> • development of effective site drainage systems; • restriction of access only to demolition site areas; • monitoring and control of spot; • disposal of waste materials unsuitable for reuse at appropriately licensed sites; • provision of oil and suspended solid interceptors; • management of excavations during demolition to avoid the generation of drainage pathways to underlying aquifers; • provision of impermeable bases in operational areas to prevent absorption of spillages. • machinery and/or any other items that are suitable for reuse on other locations or sold out to a licensed contractor will be transported using safe means so as to keep the soil secured against any hazard; • Hazardous wastes will be disposed of by a licensed contractor, with strict adherence to the EIAA regulations and controls of the Law 4/1994. Disposal procedures will be audited by the project engineer and CEPC. 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>Site investigating-ation, including the collection of subsurface samples will be taken at various depths and a contaminated land specialist shall present during all stages of the sampling to instruct and amend sampling strategies at the time of sampling as necessary to take account of particular site conditions. Groundwater samples will also be taken. Samples will be tested at an accredited laboratory in accordance with international methods (USEPA or ASTM or equivalent) in line with best international practice.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of the contractor and subcontractors on site under supervision of the CEPC/TPP.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<ul style="list-style-type: none"> • site drainage. • access only to demolition site areas. • waste materials. • oily waters. • drainage pathways. • potential spillage in operational areas. 	<p>Continuous monitoring is required to ensure the implementation of good management practices during demolition.</p>	<p>CEPC to ensure the contractor and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good demolition and site management practices.</p>	<p>Costs for mitigation measures included within demolition costs with the exception of Management time. Any additional features may incur additional costs of between US\$ 10-30K dependent on the measure.</p> <p>Subsurface sampling and analysis: approx US\$75-100K.</p>

**Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures**

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Traffic and Transport Disruption, noise and increased air pollution due to increased traffic, heavy loads and abnormal loads.</p>	<p>Standard good practice measures will be implemented as follows:</p> <ul style="list-style-type: none"> • adherence of abnormal load movements to prescribed routes, outside peak hours and advance publication of movements if required; • demolition shifts will be staggered; • scheduling of traffic to avoid peak hours on local roads; • transportation of demolition workers by contract bus. • 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>Continuous monitoring is required to ensure the implementation of good site management practices by the contractor and subcontractors during demolition.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of the contractor and subcontractors on site under supervision of the CEPC/TPP.</p>	<p>EEHC Environmental & Studies Sector.</p>	<p>Increased congestion Travel time (compared to reasonable daily commute)</p>	<p>Daily</p>	<p>CEPC to ensure the contractor and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good demolition and site management practices.</p>	<p>Management time</p>

Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Socio-Economic Environment Positive Impacts identified.</p>	<p>Present labor force of the existing old Tebbin power plant have already been granted the right to choose where they will go to work within the overall Cairo Electricity Production Facilities.</p> <p>Quite fair rules for re-employing all members of the old Tebbin staff with no loss of their employment rights, including salaries, overtime, insurance, health care, and social & cultural benefits.</p> <p>Families/homes of considerable number of workers who will be re-employed elsewhere in the greater Cairo Metropolitan area will remain in EI-Tebbin, i.e. no resettlement or loss of income will take place of the re-employment.</p> <p>Public and Industry Relations will be maximized through open dialogue between CEPC (through the Assistant Plant Manager who has direct responsibility for EHS Liaison) and local authority, public and industry representatives.</p>	<p>Before demolition contract commencing 1st Quarter 2006.</p>	<p>Record local employment provided by the project.</p>	<p>CEPC/TPP</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Social satisfaction as measured by staff interviews and complaints submitted.</p>	<p>Interim and closing reports</p>	<p>Responsibility of CEPC.</p>	<p>Responsibility of CEPC.</p>

**Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures**

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/ monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Asbestos Control Potential health hazard due to asbestos contamination.</p>	<p>There is a potential for finding Asbestos Containing Materials (ACM) during dismantling and demolition processes. If found, standard good practice measures will be implemented as follows:</p> <ul style="list-style-type: none"> any ACM present in the stacks and superstructures shall be removed before commencement of the demolition works; removal of asbestos materials in certain locations may run more smoothly if both asbestos contractors and civil demolition contractors work in tandem. This is due to the convenience of the main civil demolition contractor providing access (scaffolding etc.) to the ACM, for the asbestos contractor and avoiding duplication of effort; work actually involving the removal of ACM, that involves the handling of the ACM shall be carried out by a Specialist Asbestos Contractor; all remaining ACM on the site is not accessible to the general public. 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>The multi-party nature of the project and the involvement of non-asbestos contractor increase the risk of accidental disturbance of ACM. The CEPC should ensure that there is a reliable supervision and co-ordination mechanism to guard against any accidental disturbance of the asbestos containing material (ACM) by non-asbestos professionals.</p>	<p>The CEPC will control and monitor work progress and make the necessary adjustment to their workforce to meet the work requirements.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Any ACM to be found</p>	<p>Daily reporting</p>	<p>An Specialist Asbestos Contractor (SAC) shall be totally responsible for completing the asbestos abatement within the given time frame. It is anticipated that a minimum of 5 competent workers in various trades would be employed over the whole period. A full time Safety Supervisor shall be required to assist the contracting regarding safety and health of the site personnel and to keep the necessary records.</p>	<p>Management time and costs plus ACM specialist (between US\$ 10-15)</p>

Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation on Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				

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<p>Waste Management</p>	<p>Recycling, storage, transportation and disposal measures are recommended to avoid or minimize potential adverse impacts. The Contractor will incorporate these recommendations into a Waste Management Plan that incorporates site specific factors, such as the designation of areas for the segregation and temporary storage of reusable and recyclable materials. Good practice measures such as the following:</p> <ul style="list-style-type: none"> wastes should be handled and stored in a manner which ensures that they are held securely without loss or leakage thereby minimising the potential for pollution; only reputable waste collectors authorised to collect the specific category of waste concerned will be employed; appropriate measures will be employed to minimise windblown litter and dust during transportation by either covering trucks or transporting wastes in enclosed containers; necessary waste disposal permits will be obtained from the appropriate authorities, if they are required, in accordance with the Waste Disposal Regulation and the Government Land Ordinance; collection of general refuse will be carried out frequently, preferably daily; waste will only be disposed of at licensed sites and site staff and the civil engineering Contractor will develop procedures to ensure that illegal disposal of wastes does not occur; waste storage areas will be well maintained and cleaned regularly; records will be maintained of the quantities of wastes generated, recycled and disposed, determined by weighing each load. 	<p>During demolition contract commencing 1st Quarter 2006.</p>	<p>Continuous monitoring is required to ensure the implementation of good management practices during demolition.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of the contractor and subcontractors on site under supervision of the CEPC/TPP.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Management contract in place. Functional transfer station.</p>	<p>Monthly reports from management contractor to CEPC and then to EEHC.</p>	<p>CEPC to ensure the contractor and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good demolition and site management practices.</p>	<p>Management time and costs (<US\$ 10K)</p>
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Table 5 (Contd.)
Demolition Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
Occupational Health & Safety	<p>Good local and international demolition/demolition practices in Environment, Health and Safety (EHS) will be applied at all times and account will be taken of local customs, practices and attitudes. Measures include:</p> <ul style="list-style-type: none"> • implementation of EHS procedures as a condition of contract the contractor and subcontractors; • clear definition of the EHS roles and responsibilities of all demolition staff; • management, supervision, monitoring and record-keeping as set out in plant's operational manual; • pre-demolition assessment of the EHS risks and hazards; • completion and implementation of Fire Safety Plan prior to starting demolition to any part of the plant; • provision of appropriate training on EHS issues for all workers; • provision of health and safety information; • regular inspection, review and recording of EHS performance; • maintenance of a high standard of housekeeping at all times. 	During demolition contract commencing 1 st Quarter 2006.	Continuous monitoring is required to ensure the implementation of EHS Policies, plans and practices during demolition.	Implementation of Good Site Management practices and the EHS policies shall be the responsibility of the contractor and subcontractors on site under supervision of the CEPC/TPP.	EEHC Environmental Management & Studies Sector.	Management procedures in place. Workers health and safety as measured by no. of incidents.	Daily	CEPC to ensure the contractor and subcontractors for workers on site include requirements of the ESMP and EHS policies and plans. All employees will be given basic induction training on EHS policies and practices. Contractor is responsible for ensuring that a Fire Safety Plan is prepared and implemented prior to starting demolition to any part of the plant under supervision of CEPC/TPP.	Mitigation measures will require management time plus costs of up to US\$ 10K for preparation of Plans.

Table 6

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Air Quality Dust emissions caused by construction activities, construction vehicle movements, and transport of friable construction materials.</p>	<p>Implementation of good site practices including:</p> <ul style="list-style-type: none"> • appropriate siting and maintenance of stockpiles of friable materials so as to minimize dust blow; • minimizing drop heights for material transfer activities such as unloading of friable materials; • construction phase to begin with construction of access roads; • roads will be kept damp via a water bowser; • roads will be compacted and graveled if necessary; • site roads will be maintained in good order; • regulation of site access; • sheeting of lorries transporting friable construction materials and spoil; • enforcement of vehicle speed limits on unmetalled roads to <35 km/h. 	<p>Before construction and during construction</p>	<p>Initiate baseline air quality survey of NO₂, SO₂, CO, TSP and PM₁₀ using air quality monitors and continue during construction.</p> <p>Two analyzer stations will be electronically connected to the EEA ambient monitoring system.</p> <p>Measurements and analysis of these pollutants to be made on a continuous basis by a trained staff assigned by CEPC/TPP and submitted to EEHC for reporting to any concerned authority.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Dust levels (TSP, PM₁₀) NO₂, SO₂, CO₂ levels.</p>	<p>Quarterly reporting of summary results (or more if requested) and submitted to the EEHC and any other concerned authority.</p>	<p>CEPC responsible for management of the air quality monitoring system. Submission of annual summary reports to EEHC and any other concerned authority.</p> <p>Basic training of persons employed to operate and maintain the monitoring system.</p> <p>CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practice.</p>	<p>Mitigation Measures, Management time and costs (<US\$ 10K) Baseline Air Quality Monitoring: Permanent Continuous Monitoring System-approx. US\$ 1000-1500K plus management time reporting.</p>

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting / monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Aquatic Environment Dredging and construction of the intake structure and pipe-laying for water intake and discharge pipes- increased sediment and pollutant loads, permanent loss and disturbance to aquatic flora and fauna.</p>	<p>The following measures will be taken:</p> <ul style="list-style-type: none"> Construction Method Statement to be produced by the Contractor; dredged areas limited to minimum area required; disposal of dredged sediments to an agreed site; all works will be made clearly visible using flags, beacons and/or signals; bank area will be reinstated following construction. 	<p>During construction of intake and discharge structures</p>	<p>Nile survey undertaken April 2005 along 5 profiles fronting the site. Report to be maintained for later monitoring and evaluation during operation. Water quality will be measured monthly. (3- monthly monitoring of temperature, pH, COD, BOD, TOC, DO, TSS, oil & grease, residual chlorine, heavy metals and other pollutants. Annual monitoring of benthic environment within a 2 km radius of the discharge point (over a 3 year period) Weekly monitoring of fish catches on intake screens including species, numbers and size (over a 1 year period).</p>	<p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Bank line Dredged areas & dredging waste material.</p>	<p>Daily</p>	<p>CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practice. These mitigation measures must be a condition of any construction contracts commissioned.</p>	<p>Mitigation Measures: Management time and costs (included in construction cost). Water quality measurement costs (between US\$ 20-25K)</p>

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/ monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
Contamination of the aquatic environment as a result of construction activities on land e.g. spillages, disposal of liquid wastes, surface run-off, exposure of contaminated soils (see also under "Soils and Hydrology").	<p>Mitigation activities will include the following:</p> <ul style="list-style-type: none"> no discharge of effluents into the Nile river - all effluents shall be collected and removed off site for treatment by approved firms; development of a site drainage plan which reduces flow velocity and sediment load; protection of temporary stockpiles of soil from erosion by using a reduced slope angle where practical, sheeting and by incorporating sediment traps in drainage ditches; maintenance of well kept construction site. 	During construction	Continuous monitoring is required to ensure the implementation of good management practices during construction.	Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.	EEHC Environmental Management & Studies Sector.	Fluid effluents within the site. Soil erosion. Surface water run-off. Sewage effluents. Earth, mud and debris depositions on roads.	Daily	CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practices.	Management time and costs (included in construction cost).

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/Monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Noise</p> <p>Increased noise in the project area as a result of the use of noisy machinery and increased vehicle movements.</p>	<p>Implementation of good site practices including:</p> <ul style="list-style-type: none"> enforcement of vehicle speed limits; strict controls of vehicle routing; diesel engine construction plant equipment to be fitted with silencers; limited noisy construction activities at night; prohibition of heavy vehicle movements at night; use of protective hearing equipment for workers. 	<p>During construction</p>	<p>Continuous monitoring and supervision by CEPC is required to ensure the implementation of good site management practices by all contractors during construction.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Noise complaints register to identify concerns. Check validity using noise measuring devices already available at CEPC and operated by CEPC noise specialist.</p>	<p>CEPC/TPP will produce a monthly log of valid complaints and actions taken to EEHC.</p>	<p>CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practices.</p>	<p>Management time and costs (US\$ 5K)</p>
<p>Flora and Fauna</p> <p>Site Clearance- Vegetation removal and habitat disturbance.</p>	<ul style="list-style-type: none"> Good site management practices will be observed to ensure that disturbance of habitats off-site are minimized. Specific mitigation measures include restricting personnel and vehicles to within construction site boundaries, lay down areas and access roads. CEPC to hire a specialist ecologist to conserve and maintain old valuable trees and vegetation on site during construction phase. 	<p>During construction.</p>	<p>Continuous monitoring and supervision by CEPC is required to ensure the implementation of good site management practices by all contractors during construction.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Good conservation of floral wealth. Assistant Plant Manager to check the status of trees and other floral species daily.</p>	<p>Weekly No. of trees conserved or replanted.</p>	<p>CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practices.</p>	<p>Management time and costs plus ecologist specialist (between US\$ 20-25K)</p>

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Soils and Hydrology Site clearance, excavation and disposal of material, exposure of potentially contaminated soils, spillage or leakage of substances on land, movement of equipment and vehicles on site.</p>	<p>The potential for impacts are largely dependent on management activities. The following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> development of effective site drainage systems; restriction of access only to construction site areas; monitoring and control of spoil; disposal of waste materials unsuitable for reuse on-site, (e.g. for landscaping) at appropriately licensed sites; provision of oil and suspended solid interceptors; management of excavations during construction to avoid the generation of drainage pathways to underlying aquifers; provision of impermeable bases in operational areas to prevent absorption of spillages. 	<p>During construction.</p>	<p>Continuous monitoring is required to ensure the implementation of good management practices during construction.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<ul style="list-style-type: none"> site drainage. access only to construction site areas. spoils. waste materials. oil waters. drainage pathways. potential spillage in operational areas. soil sample test. ground water sample test. 	<p>Continuous monitoring is required to ensure the implementation of good management practices during demolition.</p>	<p>CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practices.</p>	<p>Costs for mitigation measures included within construction costs with the exception of Management time. Any additional features (e.g. bunding, interceptors etc.) may incur additional costs of between US\$ 20-30K dependent on the measure.</p>

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p><i>Traffic and Transport</i> Disruption, noise and increased air pollution due to increased traffic, heavy loads and abnormal loads.</p>	<p>Standard good practice measures will be implemented as follows:</p> <ul style="list-style-type: none"> • adherence of abnormal load movements to prescribed routes, outside peak hours and advance publication of movements if required; • construction shifts will be staggered; • scheduling of traffic to avoid peak hours on local roads; • transportation of construction workers by contract bus. 	<p>During construction.</p>	<p>Continuous monitoring is required to ensure the implementation of good site management practices by all contractors during construction.</p>	<p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Increased congestion Travel time (compared to reasonable daily commute)</p>	<p>Daily</p>	<p>CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practices.</p>	<p>Management time</p>

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Socio-Economic Environment Positive Impacts identified.</p>	<p>All activities related to the construction of the new plant will take place within the area belonging to CEPC, i.e. there will be no off-site activities or associated land acquisition during construction.</p> <p>The entire labor force will be daily commuters, thus no worker housing or associated facilities will be erected on site during construction.</p> <p>The contractors will be responsible for relevant temporary water / toilet facilities during construction and the need to provide appropriate services will be specified in their contracts.</p> <p>Public and Industry Relations will be maximized through open dialogue between CEPC (through the Assistant Plant Manager who has direct responsibility for EHS Liaison) and local authority, public and industry representatives.</p>	<p>During construction.</p>	<p>Record local employment provided by the project.</p>	<p>CEPC/TPP Assistant Plant Manager</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Workers satisfaction as measured by staff interviews and complaints submitted.</p>	<p>Editing a special report</p>	<p>Responsibility of CEPC.</p>	<p>Responsibility of CEPC.</p>

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Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Archaeology Potential chance finds of archaeological remains during construction.</p>	<p>The project site does not lie on, or in the immediate vicinity of any known archaeological areas of interest.</p> <p>If remains are found CEPC is committed to.</p> <ul style="list-style-type: none"> • cease activities and consult Antiquities authority; • protection in situ if possible; • excavation of areas where protection not feasible; • preparation of a Chance Finds Procedure and Method Statement. 	During construction.	Supervision of construction activities.	Construction contractors CEPC will allocate responsibilities in accordance with the Chance Finds Procedure.	EEHC Environmental Management & Studies Sector.	Chance finds (see annex II)	Daily	CEPC to ensure that all workers on site are aware of the importance of archaeological remains and must report any potential finds immediately. Immediate liaison with Competent Administrative Authority should a potential find be uncovered.	Mitigation measures require management time. Should chance finds occur, protection & excavation could add significantly to the cost.
<p>Natural Disasters Flash Flooding.</p>	<p>Good engineering design will incorporate the following mitigation measures:</p> <ul style="list-style-type: none"> • drainage system designed to direct flood water from main plant areas into the City sewer system and direct potentially contaminated waters through the oil interceptor. 	During construction.	No monitoring measures are envisaged.	CEPC/TPP Assistant Plant Manager	EEHC Environmental Management & Studies Sector.			CEPC to ensure that all workers on site receive training in emergency preparedness and response procedures.	Relevant costs are included within the construction costs

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/ monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
Solid Waste Management	<p>Good practice measures such as the following:</p> <ul style="list-style-type: none"> all waste taken off-site will be undertaken by a licensed contractor and CEPC will audit disposal procedure; segregation of wastes and safe storage; recording of consignments for disposal; prior agreement of standards for storage, management and disposal with relevant authorities. 	During construction.	Continuous monitoring is required to ensure the implementation of good management practices during construction.	Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.	EEHC Environmental Management & Studies Sector.	Management contract in place Functional transfer station.	Monthly reports from management contractor to CEPC and then to EEHC	CEPC to ensure all contractors and subcontractors working on site are aware of ESMP and all employees are given basic induction training on good construction and site management practices.	Management time plus costs (< US\$ 10K)

Table 6 (Contd.)

Construction Impact Mitigation, Monitoring and Management Measures

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting / monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
Occupational Health & Safety	<p>Good local and international construction practice in Environment, Health and Safety (EHS) will be applied at all times and account will be taken of local customs, practices and attitudes. Measures include:</p> <ul style="list-style-type: none"> • implementation of EHS procedures as a condition of contract all contractors and sub-contractors; • clear definition of the EHS roles and responsibilities of all construction companies and staff; • management, supervision, monitoring and record-keeping as set out in plant's operational manual; • pre-construction and operation assessment of the EHS risks and hazards; • completion and implementation of Fire Safety Plan prior to commissioning any part of the plant; • provision of appropriate training on EHS issues for all workers; • provision of health and safety information; • regular inspection, review and recording of EHS performance; and • maintenance of a high standard of housekeeping at all times. 	During construction.	Continuous monitoring is required to ensure the implementation of EHS Policies, plans and practices during construction.	Implementation of Good Site Management practices and the EHS policies shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.	EEHC Environmental Management & Studies Sector.	Management procedures in place. Workers health and safety as measured by no. of incidents.	Daily	CEPC to ensure all contractors and sub-contractors for workers on site include reference to the requirements of the ESMP and EHS policies and plants. All employees will be given basic induction training on EHS policies and practices. Contractors are responsible for ensuring that a Fire Safety Plan, which conforms to NFPA 850, is prepared and implemented prior to commissioning of any part of the plant under supervision of CEPC/TPP.	Mitigation measures will require management time plus costs of up to US\$ 50K for preparation of EHS Plans.

Table 7
Operational Impact Mitigation, Monitoring and Management

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
Air Quality Emissions from stack are not expected to exceed standards.	Mitigation measures have already been included in the design of the plant and, given CEPC/TPP's strict commitment to use mazout fuel oil for <2% of operating time, no further mitigation measures are proposed. CEPC/TPP will however demonstrate the validity of the conclusions drawn in the ESIA report.	During first three years of operation.	Automatic monitoring of stack emissions for NOx, SO ₂ , particulate matter and carbon monoxide (CO) via test ports installed in the main stack. Install two continuous NOx, SO ₂ , CO, PM ₁₀ & TSP monitoring stations to monitor short-term concentrations in the area predicted to have the highest impacts on humans (as there are sensitive environments). The analyzer station near or within the site boundaries will include a continuous monitor of meteorological conditions (temperature, wind speed, wind direction and mixing heights). The analyzer stations will be electronically connected to the EEA ambient monitoring system.	The analyzer stations will be owned and operated by CEPC/TPP. Assistant Plant Manager	EEHC Environmental Management & Studies Sector. Report introduced to EEA as requested. Third party inspection.	Stack emissions (at least PM ₁₀ , NOx, SOx and CO). Ambient air pollutants concentrations (at least TSP, PM ₁₀ , NOx, SOx and CO).	Continuous Hourly data acquisition. Quarterly reporting to EEHC.	Records must be kept and summary data (including any deviations from Egyptian and World bank standards) will be submitted to the Government and WB on annual basis (or more frequently if required). Annual reporting by CEPC/TPP to Government and WB etc. (or more frequently if required) highlighting key features and comparing results with air quality standards and prediction in ESIA report	Automatic stack monitors: included in the project cost. Management time for compilation of reports and performance monitoring: included in operation cost. Purchase of Continuous Monitors (see construction management table). Annual servicing, calibration & running costs: included in operation cost.
Ambient air quality affected by emissions from the power plant.									

Table 7 (Contd.)

Operational Impact Mitigation, Monitoring and Management

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Aquatic Environment Discharge of process and cooling water.</p>	<p>The design of the intake and cooling water structures have already incorporated measures to reduce impacts. In addition, good site management practices including the following will be implemented:</p> <ul style="list-style-type: none"> • neutralization, oil separation, flocculation and filtration of any contaminated water before discharge to either city sewer or the plantation irrigation network; • no disposal of solid wastes or waste water into the discharge structure; • regular maintenance of site drainage system to ensure efficient operation; • all discharges will comply with local Egyptian and World Bank guidelines. <p>In addition, CEPC/TPP will demonstrate the validity of the conclusions drawn in the ESIA report. If pollutant concentrations in the discharge or impacts to the surrounding aquatic environment are found to be above local and World Bank standards or unacceptable, options for further mitigation will be discussed.</p>	Lifetime of the plant	<p>Prepare regular water quality monitoring program including:</p> <ul style="list-style-type: none"> • quality of all water prior to discharge (continuous monitoring of all discharged water for temperature and pH, daily monitoring of process water for COD, TSS, oil & grease and residual chlorine and monthly monitoring of heavy metals and other pollutants) • ambient water quality in the area affected by the discharge plume (3-monthly monitoring of temperature, pH, COD, BOD, TOC, DO, TSS, oil & grease, residual chlorine, heavy metals and other pollutants. <p>Annual monitoring of benthic environment within a 2 km radius of the discharge point (over a 3 year period) Weekly monitoring of fish catches on intake screens including species, numbers and size (over a 1 year period).</p>	CEPC/TPP Assistant Plant Manager.	EEHC Environmental Management & Studies Sector.	Basic parameters as per the Law the 48/1982 and Law 93/1962	<p>Monthly reports from CEPC/TPP to EEHC</p> <p>Continuous monitoring of water quality etc.</p> <p>Monthly monitoring of plume.</p> <p>Annual monitoring of benthic environment.</p> <p>Weekly monitoring of Fish Catches.</p> <p>All costs are included in operation cost.</p>	<p>Records will be kept and compared on regular basis against Egyptian and World Bank standards and impacts predicted in ESIA.</p> <p>Summary reports (with any exceptions identified) will be submitted to the Government and WB etc. on annual review basis (or more frequently if required).</p> <p>CEPC/TPP to ensure that all employees are given basic induction training on the requirements of the ESMP, good site management practices and H&S procedures. The Assistant Plant Manager will ensure implementation of procedures.</p>	<p>Management time for implementation of site management practices. (included into operation cost)</p>

Table 7 (Contd.)

Operational Impact Mitigation, Monitoring and Management

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Noise</p> <p>Although noise levels at northern fence of the plant (where residential colony is located beyond it) are complying with law 4/1994, northern fence will be elevated to a height of 5 m for gaining a reduction 3-5 dB(A) in noise levels.</p> <p>Specific design mitigation measures to minimize noise impacts include:</p> <ul style="list-style-type: none"> • steam turbine generators; • air compressors, pumps and emergency diesel engines are enclosed in buildings; • air compressors are equipped with silencers; • noisy outdoor equipment are designed to a noise limit of 85 dB (A) at 1 m. <p>In addition, plant workers will be provided with protective wear in plant areas with high noise levels. The plant will operate in accordance with internationally accepted health and safety measures.</p>	<p>During first year of operation.</p>	<p>Given that sensitive receptors are located in the immediate vicinity of the plant, noise monitoring is envisaged.</p> <p>When the plant is fully operational, noise audit measurements are to be carried out at noise sources and at the fence of the power plant as well as at noise receptors around the plant.</p>	<p>CEPC/TPP</p> <p>Third party audit supervised by Assistant Plant Manager</p>	<p>EEHC</p> <p>Environmental Management & Studies Sector.</p>	<p>Power plant compliance with ESMP.</p>	<p>Quarterly to CEPC and EEHC</p>	<p>Should any complaints be received regarding noise, these will be logged and the Assistant Plant Manager will investigate problem.</p> <p>CEPC/TPP to ensure that all employees are given basic induction training on the requirements of the ESMP, good site management practices and H&S procedures. The Assistant Plant Manager will ensure implementation of procedures.</p>	<p>Costs for raising the height of the northern fence included within construction costs.</p> <p>Minimal costs (up to US\$ 5K per annum) required for provision of protective wear-included in operation cost.</p> <p>No further mitigation or monitoring costs envisaged with the exception of management time.</p> <p>Noise audit US\$ 10-15K</p>	

Table 7 (Contd.)

Operational Impact Mitigation, Monitoring and Management

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Flora and Fauna Disturbance to habitats as a result of noise, vehicle and personnel movements.</p>	<p>The following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> • restrict personnel and vehicle movements to access roads and within boundaries of site only; and • control of noise during operation. 	Lifetime of the plant.	No monitoring is envisaged.	CEPC/TPP Assistant Plant Manager	EEHC Environmental Management & Studies Sector.	Good plantation	Yearly	CEPC/TPP to ensure that all employees are given basic induction training on the requirements of the ESMP, good site management practices and H&S procedures. The Assistant Plant Manager will ensure implementation of procedures.	Management time
<p>Visual Impact Visual image of power plant from surrounding areas.</p>	<p>The visual effect of the power plant will be improved through:</p> <ul style="list-style-type: none"> • creation of landscaped boundary along the fence of the power plant. • <i>Ficus elastica var decora</i> and <i>Ficus nitida</i> will be propagated and the resulting plants will be used for decorating and landscaping the site when completing the new power plant. One may obtain 200-300 individual plants from a single tree. 	Lifetime of the plant.	No monitoring is envisaged.	CEPC/TPP Assistant Plant Manager	EEHC Environmental Management & Studies Sector.	Improved visual image		Considered management of landscaped areas to maximize visual image and habitat creation. CEPC/TPP to contract a suitable firm to manage landscaped areas.	Approx. US\$ 10-25K for landscaping measures (included in operation cost)

Table 7 (Contd.)

Operational Impact Mitigation, Monitoring and Management

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
Soil and Hydrology Spillage of oils, chemicals or fuels on site.	Good site management measures as described under Aquatic Environment will minimize any potential risks. As part of this, regular checks of bunds and drainage systems will be undertaken to ensure containment and efficient operation.	Lifetime of the plant	The Assistant Plant Manager will continuously monitor application of ESMP and good site management practices and take corrective action if required.	CEPC/TPP Assistant Plant Manager	EEHC Environmental Management & Studies Sector.	Quality of bunds and drainage systems. Efficiency of operation.	Monthly reports from management to EEHC	CEPC/TPP, through the Assistant Plant Manager, will implement a Spills Response Plan and all employees will receive corresponding training.	Management time
Solid Waste	Good practice measures undertaken during the demolition and construction phases will be continued into the operation phase..	Lifetime of the plant	Continuous monitoring is required to ensure the implementation of good management practices during operation. Implementation of Good Site Management practices shall be conducted under supervision of the Assistant Plant Manager.	CEPC/TPP Assistant Plant Manager	EEHC Environmental Management & Studies Sector.	Management contract in place. Functional transfer station.	Monthly reports from management to EEHC	CEPC/TPP to ensure all employees are given basic induction training on good operation and site management practices.	Management time and costs (<US\$ 5K per annum) (included in operation cost)

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Table 7 (Contd.)

Operational Impact Mitigation, Monitoring and Management

Issue/Impact	Mitigation Measures	Implementation Schedule	Monitoring	Responsibility		Monitoring Indicators	Type and Frequency of Reporting/monitoring	Management and Training	Indicative Cost Estimate (US\$)
				Implementation	Supervision				
<p>Occupational Health and Safety, Risks and Hazards</p>	<p>Standard international practice on EHS issues shall be employed on site. The mitigation measures summarized in construction management Table apply.</p> <p>In addition, the following measures will be undertaken:</p> <ul style="list-style-type: none"> • Provision of training in use of protection equipment and chemical handling. • Use of protective equipment. • Clear marking of work site hazards and training in recognition of hazard symbols. • Installation of vapour detection equipment and control systems. • Development of site emergency response plans. 	<p>Lifetime of the plant</p>	<p>Regular on-site training. Regular staff checks, system tests and field emergency procedures by on-site management.</p>	<p>CEPC/TPP Assistant Plant Manager</p>	<p>EEHC Environmental Management & Studies Sector.</p>	<p>Management procedures in place. Workers health and safety.</p>	<p>Monthly reports from management to EEHC</p>	<p>CEPC/TPP to ensure that all employees are given basic induction training on H&S policies and procedures, Emergency Preparedness and Response Plan and a Spills Response Plan. The Assistant Plant Manager is to ensure implementation of procedures. CEPC/TPP is responsible for ensuring that the site emergency response plan is complete and implemented prior to commissioning any part of the power plant.</p>	<p>Management time and costs (< US\$ 10K per annum) (included in operation cost)</p>

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Table 8

Summary of Implementation Cost of the ESMP

No.	Phase of Implementation	Cost in US\$
1	Demolition Phase	219 K (upper limit)
2	Construction Phase	1655 K (upper limit)
3	Operation Phase	Included in operation cost
Total		1874 K

121. Table 8 shows that the total implementation cost of the environmental and Social Management Plan is about US\$ 1.87 million, which amounts to about 0.74% of the total project cost.

7.2 MONITORING PROGRAM

Stack Emissions

122. Stack emissions will be monitored continuously during plant operation at a representative point in the stack. Operational monitoring of stack emissions shall comprise monitoring the levels of: Oxides of Nitrogen; Sulfur Dioxide; Carbon Monoxide; and Total Suspended Particles and PM₁₀.

123. The automatic monitoring system used will be linked to an alarm to warn when emission limits (as stated in Section 2) for each pollutant are being approached.

124. Concentrations will be recorded as hourly rolling averages and reports on stack emissions monitoring will compare recorded emissions against predicted levels and Egyptian and WB guidelines (as given in Section 2). Reports will be submitted to the EEAA, the WB and any other concerned authority on an annual basis (or as required).

Ambient Air Quality - Validation of Modeling Predictions Using Continuous NO_x, SO₂ and TSP Analyzer

125. The use of a continuous NO_x, SO₂, CO and TSP analyzer allows for baseline air quality monitoring on a continuous basis. The provision of two continuous monitors (or three: one at the site, one upwind and the third downwind) will provide the basis for “validating” the predictions made in the ESIA. The monitors will also include a weather station providing data on air temperature, wind speed, wind direction and mixing heights on a continuous

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basis. These monitors shall, also, be connected electronically to the EEAA ambient monitoring system.

126. The demolition, construction and operational monitoring of air quality around the Tebbin power project will include the parameters summarized in *Table 9*.

Aquatic Environment

127. Monitoring of impacts of the power plant on the aquatic environment will include monitoring of the quality of the discharge water, river bank and benthic sediments, ambient water quality and the impact on aquatic flora and fauna. The survey techniques and areas will be comparable to the survey undertaken by both of the Hydraulics Research Institute and the National Research Center during April-June 2005. The survey will include the area affected by the thermal plume (i.e. 100m from the discharge point).

Table 9

Monitoring Program for Ambient Air Quality, Noise and Vibration

Item	Monitoring Parameters	Sampling Frequency	Monitoring Locations	Indicative Cost Estimate (US\$)
Demolition and Construction Phases				
Air Quality Dust emissions caused by demolition and construction activities, demolition and construction vehicle movements, and transport of demolition debris and friable construction materials.	NO ₂ , SO ₂ , CO, TSP and PM ₁₀ .	Monthly during demolition. Continuous monitoring during construction.	2 locations minimum: at nearest residence and site boundary during demolition. 2 locations minimum: at nearest residence and site boundary during construction.	Permanent Continuous Monitoring System- approx. US\$ 1000-1500K
Noise	Decibels (dB) A	Monthly	6 locations minimum: at nearest residences	Management time and costs (US\$ 10k)
Operation Phase				
Air Quality Emissions from stack are not expected to exceed standards. Ambient air quality affected by emissions from the power plant.	Automatic monitoring of stack emissions for NO _x , SO ₂ , particulate matter and carbon monoxide (CO) via test ports installed in the main stack. In addition, conduct surrogate performance monitoring . Install (at least) two continuous NO_x, SO₂, CO, PM₁₀ & TSP monitoring stations to monitor short-term concentrations in the area predicted to have the highest impacts on humans (as there are sensitive environments). The analyzer station near or within the site boundaries will include a continuous monitor of meteorological conditions (temperature, wind speed, wind direction and mixing heights).	Continuous and/or 24 hour average Continuous and/or passive samples every 2/4 weeks The analyzer stations will be electronically connected to the EEAA ambient monitoring system.	2 locations minimum: at maximum predicted pollution concentration and downwind. Third location, if any, will be 1 km upwind.	Included in the plant operation
Noise		Bi-annually to annually	6-10 sites at nearest residences and fence around the plant	Noise audit US\$ 10-15K

128. The operational monitoring of cooling water and effluent discharge will include the parameters summarized in *Table 10* below.

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Table 10

Monitoring of the Aquatic Environment During Operation

Issue	Parameter	Method	Frequency of measurements
Water Quality	Temperature & pH of all discharged water	Continuous automatic monitor in discharge structure	Continuous
	COD, TSS, Oil & Grease, residual chlorine of effluent	Sample taken from water in discharge structure and submitted for lab. Analysis	Daily
	Heavy metals & other pollutants of effluent	As above	Monthly
Ambient Water Quality	Temperature, pH, COD, BOD, TOC, DO, TSS, oil & grease, residual chlorine, heavy metals & other pollutants	Grab sampling and analysis within the area predicted to be affected by the discharge plume	3-monthly
Flora & Fauna ⁽¹⁾	Benthic flora & fauna	Transect sampling (following same method as in baseline monitoring) within a 2 km radius of the discharge point	Annual
Entrainment ⁽²⁾	Fish entrainment on screens	Removal and analysis of any debris caught in intake screens	Weekly

Notes:

- (1) To be undertaken for the first 3 years of plant operation.
- (2) To be undertaken for the first year of plant operation.

Abbreviations:

COD: Chemical Oxygen Demand
 BOD: Biological Oxygen Demand
 TOC: Total Organic Carbon
 DO: Dissolved Oxygen
 TSS: Total Suspended Solids

129. Monitoring data will be analyzed and reviewed at regular intervals and compared with Egyptian and World Bank guidelines (as given in Section 2). Records of monitoring results will be kept in a suitable format and will be reported (in summary format with any exceptions identified) to the responsible government authorities and the WB or any other concerned authority as required. As a result, the project company, in discussion with the EEAA, EEHC and the WB or any other concerned authority, will review the need to implement any additional mitigation features, such as provision of further water treatment facilities on site and also on the need to continue monitoring.

Waste Monitoring

130. Wastes generated on site and collected for disposal by skilled firms will

be referenced, weighed and recorded. Environmental audits will be undertaken which will assess the quality and suitability of on- and off-site waste management procedures.

8. PUBLIC CONSULTATION AND DISCLOSURE

131. In order to ensure that the views and interests of all project stakeholders are taken into accounts, public consultation has been carried out according to the EEAA guidelines which require coordination with other government agencies involved in the EIA, obtaining views of local people and affected groups. This consultation has been undertaken as part of the Environmental Impact Assessment process.

132. The objectives of consultation and disclosure are to ensure that all stakeholders and interested parties, are fully informed of the proposed project, have the opportunity to voice their concerns and that any issues resulting from this process are addressed in the EIA and incorporated into the design and implementation of the project.

133. The adopted methodology for the public consultation comprises four elements, namely:

Phase I

- discussions with local stakeholders and interested parties during preparation of the environmental documents for local permitting requirements;
- discussions with local stakeholders during scoping and preparation of this ESIA-Report;

Phase II

- the organization of a Public Meeting in the Cairo Governorate, and
- on-going consultation through an “open-door” policy during construction and operation of the power plant.

134. As far as public disclosure is concerned, major initiatives to inform the public and interested parties about the Tebbin Power project include the following:

- press advertisement describing the project and inviting interested parties to attend the public meeting and review the Draft Final ESIA Report;
- distribution of an invitation and Arabic copy of the Non Technical Summary describing the context of the power plant, the technology employed, the impact on the environment, the mitigation measures and the ESMP; and
- disclosure of the Draft Final ESIA Report locally and the Executive Summary, including ESMP via the Infoshop.

135. The full methodology for consultation and disclosure is presented in the

project's Public Consultation and Disclosure Activities (PCDA), given in Annex D. The purpose of the activities is to establish the process by which CEPC/TPP will consult and involve stakeholders in the planning, development, construction and operation of the power plant.

136. During the preparation of an ESIA-Report for local permitting requirements, SPEEDOTRANS, EEHC and CEPC undertook consultations with a variety of organizations to assist them in the identification of environmental and social concerns and the overall development of the project. These stakeholders included the Egyptian Electricity Holding Company (EEHC), Cairo Electricity Production Company (CEPC), Egyptian Environmental Affairs Agency (EEAA), the Cairo Governorate and the District Council of EL-Tebbin Zone, Egyptian General Authority for Shore Protection, Hydraulics Research Institute and local population leaders.

137. The purpose of these consultations was primarily to provide information regarding the project, identify published and non-published sources of relevant data and information relating to the site and surrounding area, obtain views on the scope of the project, and open channels for ongoing discussions.

138. A scoping session for this ESIA undertaken by SPEEDOTRANS in collaboration with the EEHC and CEPC, took place on Tuesday, 7 June 2005 during which a wide selection of personnel from different orientations contributed actively to its activities.

139. The key objectives of this consultation were to identify primary and secondary stakeholders, ensure that they had received sufficient information about the project during earlier SPEEDOTRANS/EEHC/CEPC consultation activities and to identify their immediate concerns.

140. In addition to the scoping meeting, several mini-meetings were held with some particular affected stakeholders for taking their viewpoints into consideration.

141. Mini-meetings were held with fishermen on the Nile segment fronting the power plant site, the Tabbin Institute for Metallurgical studies (TIMS), Tebbin District Administration, Tebbin power project staff, General Authority for Fish Resources Development and two active NGOs in Tebbin zone, namely El-Ataa Association for Environmental Protection, Haie El-Tebbin El-Bahari and Local Community Development Association, El-Tebbin, Marazique.

142. The key environmental issues raised during this consultation process are summarized in *Table 11* and these issues were subsequently taken into account in the preparation of ESIA documentation both for local permitting requirements and this ESIA report.

143. The main results of phase 1 consultation was to successfully raise the level of local awareness about the plant, to identify the immediate local concerns and to seek stakeholder involvement in the implementation of the project.

Table 11

Key Issues Raised During ESIA Scoping and Public Consultation Meetings

Key issue discussed	Comments
Overall Project	All parties consulted expressed their overall approval for the project. Local Stakeholders commented that the power plant will be central to securing power supply for the industrial and commercial activities in the area and will benefit the local economy through labor opportunities.
Social and Economic Impact	Local stakeholders and council leaders considered the social and economic impact of the plant to be wholly positive.
Demolition Phase	There was need for clarifications on procedures set out for demolishing the existing old Tebbin power plant and for waste disposal.
Cooling Water	EEAA representative raised the issue of algae suppression at the intake structure using chlorine instead of using sodium hypochlorite to avoid salt production. There was scientific discussion on the technical reasons for choice of once-through system instead of using closed-circuit cooling system.
Waste water discharge and the aquatic environment	All local stakeholders expressed concern about the quality of water in the Tebbin Nile segment and the quality of water which will be discharged from the power plant. It was however acknowledged that there are no significant aquatic ecosystems close to the power plant. The suggestion was made that treated wastewater could be used for irrigation of landscaped areas.
Air Quality	There was big concern over the following issues: <ul style="list-style-type: none"> • compliance with air quality standards and the effect that non-compliance and subsequent plant closure could have on security of employment in the area; • accumulated effects of the relatively degraded air quality in the Tebbin atmosphere and the impact of the power project; • back-up heavy fuel oil is prohibited in residential areas, but Tebbin, as identified in several urban planning schemes for Greater Cairo Region since 1950's, belongs to an industrial setting. • connection of the plant monitoring system automatically with EEAA ambient air quality system.
Noise	EEAA representative gave concern about intermittent high noise impact during commissioning period and got clarification on abatement plans.
Ecology of the Site	There was significant attention to keeping a landscape area inside the power plant fence for preserving the old trees already existing within the site.
Hazardous Waste	Some parties expressed their fears of finding asbestos containing materials during demolition.

Environmental Compliance	An underlying concern expressed by all local stakeholders was compliance with environmental regulations. Assurances from CEPC are sought to the effect that CEPC will guarantee implementation of the environmental compliance measures which will be stated in the Environmental and Social Management Plan.
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144. Phase II of the public consultation and disclosure process included the disclosure of information about the project (advertisement, invitation including a copy of the Non-Technical Summary, in Arabic, and public access to the Draft Final ESIA Report) and organization of a public meeting.

145. A public meeting was held in the Cairo Governorate on 4th September 2005. The aim of the meeting was to present and explain the results of the Draft Final ESIA Report to local stakeholders, to provide them with the opportunity to raise any further or additional concerns and to ensure that all issues are taken into account in the Final ESIA Report and corresponding ESMP.

146. The key environmental issues raised during this public scoping and consultation meetings are summarized also in *Table 11*.

Ongoing Consultation and Disclosure

147. TPP’s Assistant Plant Manager, who is responsible for the Environment, Safety and Quality Assurance program for the plant, will have full responsibility for implementing and supervising the ESMP. This role includes ongoing communication with local industrial and commercial interests, local authorities and other interested parties. An “open door” policy will be adopted to allow stakeholders to voice ongoing concerns.

148. The process and results of the public consultation activities held to date are documented in the EISA, Chapter 9 and Annexes A, B, C and D.

149. All issues have been taken into account and addressed in the ESIA through assessment and the inclusion of mitigation, management and monitoring requirements which are detailed within the ESMP.

9. RESPONSIBILITIES AND INSTITUTIONAL ARRANGEMENTS

9.1 Environmental Management Organization

During Demolition, Design and Construction

150. Suitably qualified and experienced contractors will be responsible for the detailed demolition plan and the detailed design and construction of the power plant. Construction workers will be required to demonstrate appropriate skills, qualifications and/or experience prior to employment.

151. During demolition and construction, CEPC/TPP will ensure that all contracts with Contractors and sub-contractors stipulate all demolition and construction management measures (as given in this ESMP), operational design criteria and environment, health and safety standards which must be implemented at the project site.

152. Implementation of these measures will be enforced and supervised by the Assistant Plant Manager who will have direct responsibility for the Environment, Safety and Quality Assurance program on site during demolition, construction and operation. The Assistant Plant Manager is responsible for ensuring that demolition and construction works comply with the requirements of the ESMP and all environmental permits. His key roles will be to:

- assume the interface with authorities for environmental authorizations and permits;
- act as the Assistant Plant Manager for local authorities, industrial and commercial interests and any other interested parties;
- ensure that mitigation measures to reduce impacts during the demolition and construction phases are implemented;
- ensure that monitoring to be undertaken during demolition and construction is implemented;
- ensure compliance with the environmental and social management plan; and
- ensure that health and safety requirements are respected.

During Power Plant Operation

153. During operation, direct responsibility for environmental compliance and the implementation of the mitigation, management and monitoring measures described in this section and in Section 7 of this report, will continue to be with the Assistant Plant Manager. This position, will report directly to the Chairman/General Manager of CEPC/TPP.

154. The Assistant Plant Manager will be based at the site and will be responsible for recruiting, training and managing his staff. He will be responsible for implementing the mitigation and management measures described above and for monitoring and record keeping of the following:

- stack emissions;
- air quality;
- noise emissions;
- quality of water discharge; and
- waste management.

155. In his role, the Assistant Plant Manager will also be responsible for maintaining any pollution control equipment and for developing and implementing procedures for safe handling and storage of any hazardous materials used on site.

156. Chemicals used during plant operation are process-related. Hazardous chemicals to be used include chlorine (267.2 kg/hr), sulfuric acid (15 kg/hr). Handling, storage and application of these chemicals will be used under strict regulations of handling hazardous materials stipulated by Law 4/1994.

157. The Assistant Plant Manager will also have lead responsibility for maintaining a written Environmental Register with respect to environmental impacts as required under Egyptian and World Bank guidelines. The written records will identify the characteristics of discharges and emissions, details of periodic testing including results, procedures for follow-up environmental safety actions and the person in charge of this follow-up. Should any prescribed standards be breached, CEPC/TPP, through the Assistant Plant Manager, will immediately inform the EEAA and disclose the procedures being taken to rectify non-conformity.

158. Results of environmental monitoring as described above, shall be recorded and submitted to the EEAA, EEHC and to any other party (i.e. WB etc.) as required. The EEAA and WB are entitled to audit the project company in order to ensure conformity with environmental standards and requirements.

159. In addition, the project company must keep a record of any significant environmental incidents occurring at the plant including accidents and occupational illnesses, spills, fires and other emergencies. The Assistant Plant Manager will be responsible for ensuring that these records are maintained up to date and are available on site.

9.2 Environmental Training

160. The Project Company will ensure that the power plant is manned 24 hours a day, 7 days per week. All staff employed at the plant will be trained in the following:

- general operation of the power plant;
- specific job roles and procedures;
- occupational health and safety; and
- contingency plans and emergency procedures.

161. Training will include:

- induction training on appointment;
- specialist training (as required for their prescribed job role); and

- refresher training as required.

162. The training program will be designed to ensure that appropriate skilled staff are used to operate the power plant at all times. Aspects of occupational health and safety and emergency procedures are described below.

163. In addition to this environmental training for all staff employed at the plant, special environmental training will be given to the staff employed for the EMU. They will receive training in the following:

- day-to-day monitoring activities;
- monitoring the stack emissions;
- collection and analysis of air quality data;
- monitoring the water effluents;
- collection and analysis of water quality information;
- use of monitoring equipment, operation and maintenance;
- industrial hygiene;
- occupational health and safety; and
- emergency and contingency procedures.

9.3 Occupational Health and Safety

164. CEPC/TPP will establish and integrate policies and procedures on occupational health and safety into the operation of the power plant which meet the requirements of Egyptian and World Bank guidelines as given in Section 2 of the report. The policies and procedures will also be designed to comply with all manufacturers safety data sheets for chemical storage and usage, so as to provide a safe and healthy working environment.

165. Occupational health and safety programs will be supported by staff training for the power plant and the appointment of the Assistant Plant Manager. The training will include, but will not be limited to, the following:

- general area safety;
- specific job safety;
- general electrical safety;
- handling of hazardous materials;
- entry into confined spaces;
- hearing conservation;
- repetitive stress disorders;
- Code of Safe Practices;
- use of personal protective equipment; and
- first-aid.

166. The training will include induction courses when staff are first employed at the power plant, with specialist and refresher training as required by the job role. Training will be updated annually and occupational health and safety procedures will be included within the Operations Manual for the power

plant.

167. The safety record at the power plant will be reviewed each month at a formal meeting, led by the Assistant Plant Manager, where the agenda items, comments and attendance will be recorded and kept on file.

168. In addition, periodic safety audits will be conducted to verify compliance with safe working practices, which will comprise physical inspections, review of plant records and interviews with staff. The audits will assign responsibility for any corrective action necessary to mitigate a potential hazard and allow the tracking of the completion of the corrective measure.

9.4 **Emergency Procedures and Accident Response**

169. Instructions on emergency measures necessary to safeguard employees and the wider environment will be prepared as part of the Operations Manual for the power plant.

Accident Response

170. As part of the preparation of emergency procedures and the plans for accident response arrangements, the project company will carry out the following:

- review industry-specific and Egyptian and World Bank standards and regulations;
- establish general guidelines on potential safety and accident risks;
- prepare job-specific operating instructions where appropriate;
- establish safety and security notices for hazardous materials;
- prepare specific emergency operating instructions;
- provide protective equipment (including clothing, air and ear protection etc.) as required;
- evaluate information and feedback from employees; and
- record and investigate all accidents, injuries and incidents.

171. Contingency plans and emergency procedures are being developed to cover events due to operational failures, natural causes and acts of third parties. The plans and procedures will cover, as a minimum, the following:

- fire;
- explosion;
- bomb alerts;
- leaks and spills of hazardous materials;
- structure or equipment failures;
- injuries and illnesses;
- risk from natural disasters (wind, sandstorm, earthquake); and
- third-party risks (potential impacts of an accident occurring at another

industrial facility which may impact upon the power plant).

Oil Spill Contingency Plan

172. As Good practice and part of the ESMP, CEPC/TPP will prepare an Oil Spill Contingency Plan.

173. Light fuel oil will be delivered to the site by road and stored in:

- two 1,000 m³ tanks for the light fuel oil (oil no. 2 / sollar).

174. These tanks are surrounded contained within separate retention area which is designed to contain 110% of one tank.

175. The plan will cover the following activities.

- delivery;
- handling;
- spills; and
- cleanup.

176. The plan will detail procedures, responsibilities, chains of command, information flows, monitoring and documentation. *Table 4* presents institutional arrangements for El-Tebbin power project.

10. IMPLEMENTATION SCHEDULE AND REPORTING

177. Environmental and social management and monitoring activities will be implemented (according to the ESMP), following the same project schedule, as all activities are mainstreamed in the project design. Achievements/problems will be reported in the project quarterly progress reports and should be timely addressed by the project management and the Bank.

11. CONCLUSIONS

178. The Project Company proposes to develop a new thermal power plant of total capacity 2x325MWe at the area of the existing Tebbin Power Plant on land owned by the CEPC Company. The existing old Tebbin power plant will first be dismantled and demolished. The site is an Industrial Setting and does not contain significant residential environmental sensitivity of importance.

179. The key environmental issues associated with the power plant are as follows:

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- Emission of oxides of nitrogen to the air;
- Generation and disposal of liquid effluents including cooling water; and
- Emission of noise.

180. The Environmental and Social Impact Assessment has evaluated the potential environmental impacts during demolition, construction and operation of the proposed power plant. In particular, the potential impacts of the flue gas emissions to the air, generation and disposal of liquid effluents including cooling water; and the emissions of noise have been assessed using sophisticated modeling techniques, which include consideration of the ambient background environment and the characteristics of the releases or emissions, and predicts the potential impacts which may occur.

181. The assessment indicates that no significant environmental impacts will occur as a result of the construction or operation of the power plant and, when taken together, the overall environmental and social impact will not be significant.

12. REFERENCES AND CONTACTS

References and Documents Consulted

1. Egyptian Government (1994); *Law 4 for 1994 and its Executive Regulations - Law for the Environment*.
2. Egyptian Environmental Affairs Agency (1995); *Guidelines on Egyptian Environmental Impact Assessment*.
3. World Bank Group (1991); *Operational Directive 4.01: Environmental Assessment*.
4. World Bank Group (1994); *Environment, Health and Safety Guidelines: Thermal Power Plants*.
5. World Bank Group (1998); *Thermal Power – Guidelines for New Plants in Pollution Prevention and Abatement Handbook - Part III*.
6. Egyptian Meteorological Authority (1996); *Climatic Atlas of Egypt*. 157 p., Cairo.
7. Geological Survey of Egypt (1983); *Geological map of Greater Cairo area*. Scale 1: 100,000, Cairo, Egypt.
8. Maamoun, K. (1979); *Macroseismic observations of principal earthquakes in Egypt*. Bull. Helwan Institute of Astronomy and Geophysics., 183, 12 p.
9. Swedan, A. H. (1991); *A note on the geology of Greater Cairo area*. Ann. Geol. Surv. Egypt, Vol. XVII, p. 239-251.
10. Boulos L (1995); *Flora of Egypt (Checklist)*.

SPEEDOTRANS

11. Baha Ed-Din SM (1999); *Directory of Important Bird Areas in Egypt*. Bird Life International.
12. Institute of Highways and Transportation (1994); *Traffic Impact Assessment*. IHT.
13. UK Department of Transport et al. (1993); *Design Manual for Roads and Highways*.
14. Bridges; *Environmental Assessment*. Volume II, HMSO.
15. UK Institute of Environmental Assessment (1993); *Guidelines for the Environmental Assessment of Road Traffic*. Guidance Notes No. 1, IEA.
16. UNESCO (1979); *Predicting effects of power plant once-through cooling on aquatic systems*. UNESCO, Paris.
17. US EPA (1986); *Guidance on Air Quality Models (Revised)*.
18. Water Research Center, Research Institute for Groundwater, Ministry of Water Resources and Irrigation (1988); *Hydrogeological Map of Egypt*.
19. INSTITUT D'AMENAGEMENT ET D'URBANISME DE LA REGION D'ILE DE FRANCE (May 1991); *Greater Cairo Region Master Scheme, Implementation Assessment Updating Proposals*. Ministry of Development, New Communities, Housing and Public Utilities.
20. PGESCO (1997); *Sidi Krir Power Plant Environmental Monitoring*. Contract 1001-CP-103, Monthly Reports, October 1996 - September 1997.
21. Arab International Environmental Services Corporation "ENVIRO-PRO" (July 2005); *Geological, Geomorphological and Geohydrological Study for the Site of the Proposed El-Tebbin 2x325 MWe Power Project*.
22. Prof. Dr. Ali A. Toailab (March 2001); *Geophysical and Seismic Hazard Studies at Cairo*. National Research Institute of Astronomy and Geophysics (NRIAG), State Ministry of Scientific Research.
23. Zone Engineering & Survey (July 2005); *Topographic Survey Report of the Existing Power Plant and the Residential Colony*. Engineering Power Systems Company (EPS).
24. Prof. Dr. Kamal T. Hindy and Others (June 2005); *Study of Air Quality in Selected Points at an Area for Construction of a Power Plant at Tebbin*. National Research Center, State Ministry of Scientific Research.
25. Prof. Dr. Osama Ahmed Aly and Others (June 2005); *Assessment of Water Quality along Selected Site for the Construction of Electric Generation Station at "El-Tebbin"*. National Research Center, State Ministry of Scientific Research.
26. Dr. Aly Nasser Hassan (June 2005); *El-Tebbin Power Station : Ecological Baseline Study*. Institute of Environmental Studies, Ain Shams University.
27. Dr. Yasser Shawky, Eng. Ahmed Nada, Dr. M. B. A. Saad (April 2005); *El-Tebbin Power Plant Field Investigations and Hydrothermal Model Design Report*. Hydraulics Research Institute (HRI), Water Research Center, Ministry of Public Works and Water Resources.
28. Eng. Ibrahim El-Desouky, Dr. Yasser Shawki, Eng. Mohamed Abdel-Latif (July 2005); *Hydrothermal Model Study of the Cooling System, El-Tebbin Power Plant*. Hydraulics

Research Institute (HRI), Water Research Center, Ministry of Public Works and Water Resources.

29. EDF Direction Production Ingenierie (August 2005); *Investigation by Modeling into the Atmospheric Dispersion of Nitrogen Oxide (NOx) Emitted by the Project for a Thermal Power Station in Tebbin (Egypt)*.
30. Prof. Dr. Mansour El-Bardisi (June 2005); *Noise Impact Assessment for El-Tebbin Proposed Power Project*. Ain Shams University, Faculty of Engineering.
31. Prof. Dr. Abdallah Wahdan, Dr. Enas Boushra Nashed, Eng. Mohamed Hussein (July 2005); *El-Tebbin Power Plant Traffic Study, Final Report*. Egypt National Institute of Transport, Ministry of Transport.
32. Egyptian Electricity Authority (September 1998); *InterGen Sidi Krir Generating Company – Sidi Krir Units 3 & 4 Power Plant : Environmental Impact Assessment*.
33. Egyptian Electricity Holding Company (October 2000); *EDF Suez Gulf Power SAE: Environmental Impact Assessment of the Suez Gulf BOOT Steam Power Plant*.
34. Egyptian Electricity Holding Company (January 2002); *Cairo North Power Plant 750 MWe Combined Cycle Project, Environmental Impact Assessment*.

Contacts

182. Key persons contacted for comments or further information include the following:

- Chairman of the EEHC: **Dr. Mohamed Awad**
- Executive Board Member for Planning, Research and Service Companies Affairs: **Dr. Kamel Yassin**
- Chairman of CEPC: **Eng. Ahmed Imam**
- Managing Director for Environmental Management and Studies; EEHC: **Eng. Maher Aziz Bedrous**
- General Manager of SPEEDOTRANS: **Eng. Hussein Lotfy**

Annex I

CHANCE FIND PROCEDURES

Chance find procedures will be used as follows:

- (a) Stop the construction activities in the area of the chance find;
- (b) Delineate the discovered site or area;
- (c) Secure the site to prevent any damage or loss of removable objects. In cases of removable antiquities or sensitive remains, a night guard shall be present until the responsible local authorities and the equivalent take over;
- (d) Notify the supervisory Engineer who in turn will notify the responsible local authorities and the General Authority of Antiquities immediately (within 24 hours or less);
- (e) Responsible local authorities and the General Authority of Antiquities would be in charge of protecting and preserving the site before deciding on subsequent appropriate procedures. This would require a preliminary evaluation of the findings to be performed by the archeologists of the General Authority of Antiquities (within 72 hours). The significance and importance of the findings should be assessed according to the various criteria relevant to cultural heritage; those include the aesthetic, historic, scientific or research, social and economic values;
- (f) Decisions on how to handle the finding shall be taken by the responsible authorities and the General Authority of Antiquities. This could include changes in the layout (such as when finding an irremovable remain of cultural or archeological importance) conservation, preservation, restoration and salvage;
- (g) Implementation for the authority decision concerning the management of the finding shall be communicated in writing by the General Authority of Antiquities; and
- (h) Construction work could resume only after permission is given from the responsible local authorities and the General Authority of Antiquities concerning safeguard of the heritage.

These procedures must be referred to as standard provisions in construction contracts, when applicable, During project supervision, the Site Engineer shall monitor the above regulations relating to the treatment of any chance find encountered are observed.

Annex II

LIST OF EIA AND SOCIAL ASSESSMENT TEAM MEMBERS

Position	Name
SPEEDOTRANS	
Project Manager	Eng. Hussein Lotfy
Air Quality Specialist	EDF Direction Production Ingenerie
Hydraulics Specialist	Hydraulics Research Institute
Transportation Specialist	Egypt National Institute of Transport (ENIT)
Noise Specialist	M.B. Consultant
Ecologist	Dr. Ali Nasser Hassan
Geological Specialist	Enviro-Pro Consulting Firm
Air Quality Measurements	National Research Center
Water Quality Measurements	National Research Center
Socio-economic Specialist	Mansour Fouaad
Solid & Hazardous Waste Management Specialist	Milad Dimetry
Health & Safety Specialist	Dr. Ahmed Lotfy
EEHC Supervisor	
Head of Environment Management and Studies Sector	Eng. Maher Aziz Bedrous

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