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THE EGYPTIAN EXPERIENCE IN APPLYING ENVIRONMENTAL NORMS AND STANDARDS IN THE AREAS OF ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION

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BACKGROUND PAPER

THE EGYPTIAN EXPERIENCE IN APPLYING ENVIRONMENTAL NORMS AND STANDARDS IN THE AREAS OF ELECTRICITY GENERATION, TRANSMISSION AND DISTRIBUTION

By

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1. INTRODUCTION

With the increased awareness of the effects of pollution on human health, many countries and other organizations have adopted standards for the limitation of pollutant emissions and impacts from sources. Environment quality standards may be considered as an expression of a country's primary environmental quality targets, which frequently serve as a reference base for other regulations and standards (emissions, fuel quality, control technology) designed to achieve a given desirable level of environmental quality. These regulations and standards can affect the costs and schedules for constructing, operating, and maintaining an industrial or utility source.

Fossil fueled electric generating plants and industrial facilities emit combustion gases to the atmosphere which may contain suspended solid, gas, or liquid pollutants. Other negative impacts on the environment, such as water thermal pollution, wastewater discharges, solid & hazardous wastes and ambient noise are also emitted. Environmental laws and regulations define the levels of air pollutants, as well as other pollutants, and which compounds can be emitted to the ambient ecological system without harming the environment or human health. These laws and regulations are becoming increasingly stringent placing increased emphasis on environment pollution control for power plants.

This paper summarizes the experience of Egypt in implementing environmental standards and regulations in the areas of electric power generation, transmission and distribution. It addresses the main issues requirements associated with the enforcement and applicability of the regulations as well as their relationships with the regional and international ones.

Also, this paper tries to investigate the impact of present standards and regulations on the current trend, in power sector, towards privatization.

A number of recommended approaches for harmonization of environmental standards and regulations on subregional and regional level are finally concluded.

2. EGYPT POWER SECTOR AND THE ENVIRONMENT

In Egypt, to meet the growing economic and social needs of the country, the installed capacity increased from 4700 MW in 1980/1981 to about 14,000 MW in 1997/1998. The number of electricity generating power plant has reached now 35, only three of them are hydraulic and the rest are fossil power plants. The unit size ranges between 15 MW in oldest power plant to 600 MW at El-Kureimat power plant commissioned in 1998. The share of hydro power has been reduced from 68% in 1970 to only 20% in 1997/1998. Aswan II with 270 MW and Isna with 90 MW were only hydro addition since 1980, while all system expansion has been totally dependent on oil and natural gas. The total generation reached

about 62 milliards kWh in 1997/1998 and it is forecasted to reach about 126 milliards kWh in the year 2010.
The total fuel consumption in 1997/1998 reached 11,250 Mtoe. The evolution of fuel consumption proves the continuous substitution of mazout by natural gas over the last decade. Accordingly, the percentage share of natural gas increased significantly until it reached 71.3% in 1997/1998. The percentage annual increase of the fuel was 6.5% in 1997/1998 (and the percentage increase of thermal energy generated was 6.5% for the same year).
Since the late 1970's, environment has become a decisive factor influencing the day-to-day management as well as the suitability of all power projects.
Limited indigenous energy resources in Egypt made it imperative to optimize its use. Thus, the Electricity Sector, forwarded by nationwide environmental goals as well as national guidelines for sustainable development, has crystallized, at the inception of 1980's, a long term strategy to guarantee the capability of meeting entirely the growing demand. The policy has formulated the basic national goals of sustainable electric planning in the following strategies:

- Maximize utilization of non-combustible resources, e.g. hydro, NRSE and also, mini-hydro, as well as any hydro-pumping storage to utilize efficiently available thermal & natural gas-fired combined cycle plants.
- Efficient use of resources on production side as well as on conversion, transmission, and utilization side.
- Minimize (reduce) losses at all stages of energy production, conversion, transmission and distribution.
- Maximize utilization of natural gas as a benign fuel, taking macro-economic considerations in effect.
- Obtain most efficient and most modern environmentally oriented technologies for new plants, and for the end use equipment.
- Promote regional energy planning for creating opportunities for Egypt and its neighbours and enhancing across border cooperation, e.g. electrical interconnections for the Arab countries and Mediterranean as well as for huge hydro-resources in Africa which would be environmentally acceptable and a solution for depletable resources.

3. EGYPT ENVIRONMENTAL STANDARDS AND REGULATIONS RELATED TO THE POWER SECTOR

In Egypt, many laws and regulations are in action for controlling air pollution, water pollution, industrial hazardous and non-hazardous wastes and urban & occupational noise.

3.1 Legislative Data System Prior to the Law 4/94

In the past, laws and decrees issued in Egypt were implicit for environmental consideration. Others were inacted to create instruments and bodies having to do with environmental issues such as the "High Committee for Air Protection" (HCFAP) established in 1969 and the "Egyptian Environmental Affairs Agency" (EEAA) established in 1982. But many of the 1980's-early 1990's in-action laws and decrees could no longer cope with the requirements of protecting the environment as was known by eighties and early nineties practice.
In the area of air protection, while few laws addressed air pollution control exclusively, 25 laws and decrees within several ministries contained sections on the subject. Penalties and enforcement procedures often overlapped among agencies and tended to be poorly defined.
In the area of water protection, Egypt has passed, since 1946, eight laws pertaining to water quality and wastewater discharges. In most cases, the new law has replaced a previous law.
Before 1995, the Egyptian Power Sector had to comply with the Ministerial Decrees No. 470 of 1971 and No. 240 of 1979 issued by the Ministry of Health for air quality standards as

well as Law No. 93 of 1962 and Law No. 48 of 1982 passed by the Parliament for water quality controls.
Exhibits 1, 2, 3 and 4 present the legislative data system comprising energy related environmental standards developed in Egypt prior to 1995.

3.2 Legislative Data System Developed by the Law 4/94

The Egyptian power sector complies, today, with the Law Number 4 for the year 1994: "LAW FOR THE ENVIRONMENT" which has been issued on February 3, 1994. The executive regulations implementing the law have been promulgated by the Prime Minister's Decree No. 338 of the year 1995. The Law established the Egyptian Environmental Affairs Agency (EEAA) which replaced the Agency established by virtue of Presidential Decree No. 631 of the year 1982 with its rights and obligations. EEAA has a clear mandate to coordinate all efforts for the protection of the environment.
Although the First Article of the Law states that: "Along with compliance to the regulations and provisions mentioned in the special laws (i.e. all previously issued laws), provisions of the law shall apply to the environment", the Law unified the previous regulations and defined both ambient air quality/emissions standards for a sizable list of gaseous and particulate components as well as a list of parameters that comprehensively identifies water quality.
Following is the legislative structure of the Law:

INTRODUCTORY PART
PART ONE : PROTECTION OF LAND ENVIRONMENT FROM POLLUTION
- Chapter 1: Development and Environment
- Chapter 2: Dangerous (Hazardous) Substances and Wastes

PART TWO : PROTECTION OF AIR ENVIRONMENT FROM POLLUTION
PART THREE : PROTECTION OF WATER ENVIRONMENT FROM POLLUTION
- Chapter 1: Pollution from Ships
  - *Section 1. Pollution with Oil*
  - *Section 2. Pollution with Harmful Substances*
  - *Section 3. Pollution with Wastes of Sanitary Drainage and Garbage*
- Chapter 2: Pollution from Land Sources
- Chapter 3: International Certificates
- Chapter 4: Administrative and Judiciary Procedures

PART FOUR : PENALTIES

4. EGYPT KEY ENVIRONMENTAL STANDARDS/REGULATIONS RELATED TO THE POWER SECTOR IN COMPARISON WITH INTERNATIONAL STANDARDS

The Egyptian and International environmental standards and regulations (particularly those have been set by International Finance Corporation [IFC]/World Bank and the United States Environmental Protection Agency [US-EPA]) relevant to the construction and operation of a power project cover the following issues:

- atmospheric emissions and ambient air quality;
- liquid effluent discharges to the aquatic environment;
- noise emissions and ambient noise levels;
- solid waste management;
- solid hazardous waste management;
- operation management: health and safety, air quality and noise levels;
- construction management;
- other environmental management issues.

The Egyptian standards have been drawn from the range of provisions in the Law 4 and the Prime Minister's Decree No. 338 of 1995, which promulgate the Executive Regulations of Law 4.

The IFC guidelines have been taken from the IFC Pollution Prevention and Abatement Handbook - Part III (July, 1998). Supplementary to the guidelines set out in the IFC Pollution Prevention and Abatement Handbook, reference has also been made to the World Bank guidelines as set out in the World Bank Environment, Health and Safety Guidelines: Thermal Power Plants (1994).
The US-EPA guidelines have been extracted from EPA available publications, especially 40CFR and 62FR. Any other standards and regulations have been provided through concerned international corporations and agencies.
The following items present the main standards and regulations pertaining air pollution, water pollution and noise control.

4.1 Air Pollution Standards (Atmospheric Emissions and Ambient Air Quality)

Air pollution standards include both air pollutant emission standards and ambient air quality standards applicable to fossil-fueled fired power plants.
The major pollutants of concern covered by legislation are as follows:

- Sulfur Dioxide (SO2)
- Nitrogen Oxides (NOx)
- Particulate Matter or Total Suspended Particulates (TSP) (or Dust)

Ambient Air Quality Standards

Ambient air quality standards define the limits at which pollutant effects will not be detectable. Data on effects of pollutants that have been observed after different exposure times have led to the establishment of primary standards to protect health only and secondary standards to protect against effects on other systems. Standards are established for various sample averaging periods, because effects are dependent upon pollutant concentration and exposure time.
It is usually defined in terms of maximum yearly, daily and hourly average concentrations (or "emissions") of specified pollutants, sometimes also as maximum concentrations for short-term episodes. The legally-binding force of standards may be differentiated, for instance, as between stringent, health-related standards and indicative "nuisance" standards.
Exhibit 5 gives the Egyptian-EEAA ambient air quality standards for main pollutants. Also, Exhibit 6 gives the World Bank ambient air quality guidelines and Exhibit 7 gives the ambient air quality standards enforced by the United States Environmental Protection Agency (EPA). Also, Exhibit 8 gives the Egyptian-EEAA ambient air quality standards for main pollutants in comparison with US-EPA and the World Bank.
Where observed air quality is worse than the adopted air quality standards, vigorous air pollution control programs are underway to reduce pollutant emissions. Control programs may include regulations to control fuel quality, enforcement of emission control standards, paving roads to reduce dust reentrainment into the atmosphere, and many other techniques.

National Emissions or Performance Standards

Emission standards essentially place a limit on the amount or concentration of a contaminant that may be emitted from a source.
In order to maintain or improve the existing ambient air quality within a region to comply with air quality standards, it is frequently necessary for certain industries, which include electricity industry, to be regulated by emission standards promulgated by the government. These performance standards usually reflect the maximum degree of emission control deemed achievable with the present technology in the industry (or borrowed from another industry). As a consequence, emission standards based on the
"best practical means" could become more stringent as the state-of-the-art of control equipment improves with time. Exhibit 9 presents emission standards for fossil-fueled electric utility steam generating units set by the Egyptian EEAA in 1995. Exhibit 10 presents the World Bank air emissions guidelines for thermal power plants and Exhibits 11 and 12

present the US-EPA new source performance standards (NSPS) limits, and emission limits for combustion turbine plant respectively.

4.2 Liquid Effluent Discharge Standards

Law 4 states that all establishments are prohibited from polluting the marine environment. Subsequently, no permit will be granted for an establishment on, or near, the coastline, which may result in discharges of polluting substances.

Annex 1 of the Executive Regulations of Law 4 sets out the Egyptian standards concerning the concentration of pollutants in effluent discharged to the marine environment. A selection of the standards, relevant to thermal power plants, is shown in Exhibit 13. In addition, the Exhibit also presents the equivalent IFC/World Bank guidelines. It should be noted that IFC guidelines relate to all liquid effluent discharges, not solely to those to the marine environment.

Further to these guidelines, the Law 4 also applies certain planning conditions for developments along or adjacent to the coastline:

- Any measures which are likely to cause changes in the natural coastline (erosion, sedimentation, coastal currents and pollution from the project or associated works) are restricted, except with the approval of the CAA.
- Any development within 200m of the coast must gain approval from the CAA.

For further comparison with the international standards and regulations, Exhibit 14 presents the U.S. federal chemical effluent guidelines for new power plants.

4.3 Noise Emissions And Ambient Noise Level

Law 4 stipulates that a developer must ensure that an establishment is compatible with the character of its setting. Amongst other issues, this involves limiting the effect of combined noise from all site sources on the surrounding environment to acceptable ambient limits. Guidance levels for ambient noise is dependent upon the land use surrounding the site, and Egyptian ambient noise guidelines are set with respect to five different land use categories. The Egyptian ambient noise guidelines and related land uses are shown in Exhibit 15.

The World Bank ambient noise guidelines differ from those of the Egyptian Government in that they only differentiate between two land use categories, as presented in Exhibit 16.

4.4 Electromagnetic Fields Of Transmission And Distribution Networks

4.4.1 Egyptian Requirements

In a typical electric power system, electricity is generated in power stations, transmitted, at a high voltage, by overhead lines, distributed, at various intermediate voltages, to industry, towns and villages, and finally supplied, at a low voltage, to individual buildings, homes, and farms.

Transformers often located in substations. For any of those transmission lines and transformers voltage levels, there is a right of way surrounding the transmission lines and/or transformers where it is prohibited to build or plan any structures/activities within this area. In Egypt, this area is defined by the law No. 63 for the year 1974.

The law 63/74, as well as the Egyptian experience, defines the width of the right of way from each side of the conductors and/or transformers of transmission and distribution networks measured from the center of the tower and/or the transformer for voltage levels of : 500 - 220 - 132 - 66 - 33 - 22 - 11 kV, with a special consideration for the tower types used, weather conditions and other necessary factors, as follows:

Voltage Level, kV	500	220	132	66	33	22	11
Right of Way (ROW), m	25	23	20	15	13	10	5

4.4.2 International Guidelines

From time to time the question of possible effects of extremely-low-frequency electric and magnetic fields on health is reviewed by concerned international agencies such as: World Health Organization (WHO), International Radiation Protection Association (IRPA), and

CIGRE. They all stated a guideline for the magnetic fields not to exceed 10 mA/m^2. Exhibit 17 provides the IRPA international guidelines for limits of exposure to electric and magnetic fields.

5. REGULATORY STRATEGIES FOR ACHIEVING STANDARDS OBLIGATIONS IN THE EGYPTIAN POWER SECTOR

This section highlights the major legal strategies that have been used to achieve environmental goals in the Egyptian power sector. It provides some legal and planning actions used to implement the standards objectives set by law.

5.1 Regional Development Planning

The guidelines for EIA produced by the EEAA specify that the power project should demonstrate compliance with national, regional and local development plans with respect to the following key aspects: (1) land use planning and control; (2) siting; (3) protection of environmentally sensitive areas; and (4) protection of endangered species.

5.2 Environmental Impact Assessment

The ultimate aim of impact assessment legislation is typically to enhance the congruence of future actions with broad environmental goals. Such goals are already be adequately expressed in existing environmental legislation.

A flexible system for the management of EIA for projects has been developed. The system encompasses a flexible screening methodology and projects are classified into three groups or classes reflecting different levels of environmental impact assessment according to severity of possible environmental impacts. Therefore, a list approach is adopted depending on screening projects into three categories as follows:

1. White list projects for establishments/projects with minor environmental impact.
2. Gray list projects for establishments/projects which may result in substantial environmental impact.
3. Black list projects for establishments/projects which require complete EIA due to their potential impacts.

The environmental impact must be evaluated before any construction works are initiated or a license is issued by the CAA or licensing authority.

Egyptian Requirement for an EIA

The development of a new power plant can only commence if a permit has been granted by the appropriate Competent Administration Authority (CAA). Egyptian Law 4/1994 stipulates that applications for a license from an individual, company, organization or authority, subject to certain conditions, require an assessment of the likely environmental impacts. The EEAA is the authority responsible for determining the type of development that requires an environmental appraisal and the level of detail at which the study should be conducted. The EEAA publication "Guidelines for Egyptian Environmental Impact Assessment" establishes all criteria required for implementing an EIA study.

IFC/World Bank Requirement for an EIA

The IFC follows a policy that stipulates that all operations are carried out in an environmentally responsible manner and that projects must comply with appropriate IFC guidelines or, if these have not been specifically developed, World Bank guidelines.

The World Bank sets out its procedures and policies with regard to conducting environmental assessment in Operational Directive 4.01: Environmental Assessment (October 1991). Annex E of the Directive identifies the process by which the level of investigation required in the environmental assessment is determined. It provides an illustrative list of Category "A" developments which require a full EIA, which includes thermal and hydro power projects.

SCOPE of the EIA

The requirements for the scope of the EIA under Egyptian and IFC procedures is described in Exhibit 18.

6. EGYPTIAN POWER SECTOR PRACTICE IN THE COURSE OF ENVIRONMENTAL PERFORMANCE

Since it started to comply with environmental legislation, the Egyptian Power Sector responded overwhelmingly to an environment protecting performance stimulated by the development of environmental policies and programs.

The first step in the government's environmental protection management program had been the preparation of the Egyptian Environmental Action Plan (EEAP) (Arab Republic of Egypt: "Environmental Action Plan", May 1992). This EEAP clearly identified targets for improving energy related environmental aspects especially switching to utilizing environmental friendly energy sources.

As mentioned previously, the passage of Law Number 4 of the year 1994 has apparently significantly altered the institutional framework for implementing environmental protection. However, the enactment of the law had been followed by the formulation of executive regulations in 1995 which formed the crux of the implementation mechanism and determined the actions required to develop the country in an environmentally sound manner.

In 1997, the Egyptian Environmental Affairs Agency (EEAA) conducted a comprehensive Environmental Compliance Action Plan (ECAP) for all industrial and commercial enterprises to harmonize their environmental conditions under a grace period up to February 2000. Under this ECAP, the power sector has undertaken necessary audit programs in all power plants of the unified power system to implementing required corrective actions which have been found essential to achieving compliance with the requirements of the Law 4/94.

Alongwith his endeavour to seriously follow the legislatorial guidelines, the Egyptian power sector experience with environmental standards and regulations revealed some incompatibilities and barriers. Section 7 discusses, in brief, major aspects of these incompatibilities and barriers. The aim of this discussion is to abstract useful lessons that may help achieve successful harmonization of environmental standards and regulations among different countries of a particular geographic, economic, or political region.

7. PROBLEMS FACING ENFORCEMENT OF ENVIRONMENTAL STANDARDS IN THE POWER SECTOR

Legislators often think that their work is near to perfect, or even perfect, and do not expect that this work could have some deficiencies. But practice soon reveals lack of conformity, in some aspects, between standards and regulations on the one hand and the reality and actual situations on the other hand.

In fact, there were some problems/barriers have been experienced by the Egyptian power sector (the Egyptian Electricity Authority) in the course of achieving compliance with the environmental standards and regulations. Following is a discussion for salient problems/barriers faced the enforcement of environmental standards and regulations in Egypt power sector.

7.1 Compliance With Multiple Standards (Case Of Pre-Law 4/94 Compliance)

Prior to the enactment of Law 4/94, the Egyptian power sector had to commit with more than one regulatory system.

It had to comply, first, with the Ministerial Decrees no. 470 of 1971 and no. 240 of 1979 issued by the Ministry of Health for air quality standards (see Exhibit 5). It also had to comply with the Law no. 48 of 1982 issued by the Minister of Irrigation for water quality controls (see Exhibit 18), but many of the required regulations were not developed yet. In order to comply with the Lending Agents conditions, the Electricity Sector practices required strict adherence to a set of levels for environmental protection dictated by the United States

Environmental Protection Agency (US-EPA) and the international financing institutions such as the World Bank (WB), the United States Agency for International Development (US-AID) and the European Investment Bank (ýEIB).
This has led to a situation where compliance must be attained considering more than one legislatorial/regulatory system. Thus, the Egyptian Electricity Sector has committed, for compliance with all applied legislatorial/regulatory systems in a particular case, to the stricter one, for full fulfillment of the requirements of the standards and regulations.
This could be illustrated through the following two examples.

Case of Shoubrah El-Kheima Power Project

There were no Egyptian air pollutant emission standards at the time of the "Shoubrah El-Kheima Proposed Unit 4 Extension Environmental Feasibility Study", i.e. 1985, and the Egyptian air quality standards were too stringent to be committed with, especially in the absence of enforcing authorization in the 1980's. Alternatively, compliance was required with both World Bank and US-EPA standards and regulations. As the World Bank standards and regulations were more elaborated, strict adherence to the US-EPA standards and regulations was imperative. For instance, the total SO2 maximum 24-hour average for the operational case of three oil-fired and one natural gas-fired units at full load, 382.1 $\mu g/m^3$, exceeded the US-EPA standard value of 365 $\mu g/m^3$. Hence, the operational case of four units, fuel (80% gas, 20% oil) at full load, which resulted in total SO2 maximum 24-hour average of 115.9 $\mu g/m^3$ was selected to fully satisfy the requirements of the regulations and achieve extremely strict compliance with the standards, not only for the ambient air quality but also for the emissions from the stacks (Exhibits 19 & 20).

Case of El-Kureimat Power Project

United States regulations require USAID, when granting finance, to follow prescribed environmental procedures when involved with foreign assistance projects. Also, the World Bank is required to evaluate the adequacy and effectiveness of pollution control measures for projects involving industrial operations.
When the World Bank was considering financing El-Kureimat power project, EA study report yielded to the World Bank review. The World Bank limits for particulate depends on the level of the background dust pollution. If the background levels of dust are high, the stipulated limit is 100 mg/m^3, the concentration of 150 mg/m^3 is therefore acceptable for El-Kureimat which is a rural site area which has a low background dust pollution, then firing of 100% natural gas in the boilers poses no problems, however, if 100% fuel oil (mazout) is fired in the boilers at El-Kureimat plant site and assuming 3% oxygen in the excess air supplied to the burners, the resultant particulate emissions (comprising fuel ash, fuel additives, acid mist, unburnt carbon and soot) amount to a loading of about 250 mg/m^3 against the stipulated limit of 150 mg/m^3. To reduce this emission loading to 150 mg/m^3, at least 40% of the fuel fired in the boilers should be natural gas and the balance 60% of the fuel being fuel oil (mazout) with a maximum sulfur content of 2.5%. Thus, the project was approved based on the assurance of Egyptian General Petroleum Corporation (EGPC) that it would supply natural gas to cover 50% of the fuel requirements (about 3 Million m^3/day) of the El-Kureimat power plant. With Such an assurance from EGPC, the particulate emission standards of the World Bank would, therefore, be fully complied with. Also, this satisfied the requirements of the US-AID.
Exhibit 21 gives comparison of air pollutant emission rates of the El-Kureimat power plant and emission standards. Exhibit 22 also gives comparison of maximum air quality pollutant concentrations of the El-Kureimat power plant and maximum air quality standards.
In the El-Kureimat case, compliance was imperative with the World Bank standards for acquiring eligibility for finance.

In general, there are some technical barriers usually arise when complying with more than one legislatorial/regulatory system. Most importantly:

1. In many situations, it is unfair that the most stringent standards should prevail.
2. Inconsistencies in unit systems used for each distinctive legislatorial/regulatory structure makes it difficult, in many cases, to compare standards on a unified basis. Some standards give concentrations of pollutants per energy units and others per time ones. Some provide it per volume units and others per million or billion of particles. Furthermore, some standards when using common unit system they may differ in defining the same piece of unit such as in referring to normal cubic meter and actual cubic meter. In most of these cases, it is usually not easy to make transformation from one unit system to another, and consequently the comparison among standards becomes not an easy task.

7.2 Conflict Or Inconsistency Among Standards

Conflict/inconsistency among standards establishes uncertain position which cause some confusion or disturbance to the regulated community. Such a condition usually arise when two different sets of standards are applicable for the same kind of emissions or effluents. This, certainly, creates a problematic situation where enforcement of environmental standards may face a real barrier which weaken the required commitment to the stipulated norms and regulations.

Along the course of the Egyptian Electricity Sector practices under present environmental standards and regulation, the following example may illustrate this condition.

Case of Kafr El-Dawar Power Plant

Kafr El-Dawar 4 x 110 MW natural gas / fuel oil - fired steam power plant located at Damanhour, West Delta Electricity Company, EEA started to discharge industrial liquid effluent to the Safar Western Drain in 1978 and sewage effluent, to the same Drain in 1979. Upon the passage of Law 48/1982 regarding the protection of the River Nile and waterways from pollution and its Executive Regulations (ER) promulgated by the Ministerial Decree No. 8/1983, Kafr El-Dawar power plant committed to the Article 66 of the ER regarding discharge into brackish and saline surface water bodies (see Exhibit 18) which reflected the condition of safar Western Drain. Accordingly, discharge liquid effluent samples have been analyzed periodically to demonstrate compliance with the Law requirements.

Under the Environmental Compliance Action Plan (ECAP),Enforced by the EEAA for the period 1998-2000, The Kafr El-Dawar power station management installed a new wastewater treatment plant and, therefore, applied once again for obtaining permit for discharging liquid effluents in compliance with the standards stipulated by the Article 61/ER (The maximum limits of constituents in treated industrial liquid effluents discharged to Nile branches, main canals, ditches and groundwater reservoirs) instead of the standards stipulated by the Article 65/ER (standards that drain water must comply with before lifting to/mixing with fresh surface water bodies).

The later (Article 65/ER) is more stringent, and the power station wastewater plant could only satisfy the requirements of the previous one (Article 61/ER).

Conflict has been arisen between the two sets of standards which actually serve one purpose. The drain water standards (Article 65/ER) define the specifications of treated industrial liquid effluents discharged to the drains going to the fresh surface water bodies and so do the maximum limits of constituents in treated industrial liquid effluents discharged to main canals (Article 61/ER). But regarding treated sewage liquid effluents of the power plant, an agreement has been signed between the local administrative authorities and the power plant for drainage to the Kafr El-Dawar town sanitary discharge network.

7.3 Miss-Applicability Of Standards

Applicability of standards/regulations becomes questionable when enforcement of their requirements face miss-guidance or miss-interpretation. This will certainly create a situation where the application of the standards/regulations could not be attained, and consequently, the concerned party could not acquire the necessary permit for carrying out certain activity.

The Egyptian Electricity Sector has already experienced two major conditions regarding this barrier. The summary of each of them is provided below.

Case of Sidi Krir Units 3 & 4 BOOT Power Project

The Egyptian Electricity Authority's (EEA's) power generation expansion plan for the period 1996/97 - 2005 / 2006 included the construction and operation of a 4x325MW gas/oil - fired steam power plant on the coastline of the Mediterranean Sea at Sidi Krir, west of Alexandria. The construction of units 1 & 2 started mid 1997 by EEA using government investment supplies and the InterGen Sidi Krir Generating Company (private proponent/developer) commenced with the construction of units 3 & 4, under BOOT system, late 1998.

Due to land use limitations on the Mediterranean coastline, the RFP specifications of civil-mechanical structures for the abstraction and discharge of cooling water defined the distance that must be left inwards from the shoreline by one hundred meters.

Law 4/94 stipulates in Article 73 that: "It is forbidden to construct any establishment within 200 meters of the Egyptian coastline **without the permission of the concerned administrative authority and in coordination with EEAA"** . The Executive Regulations (ER) of this Law regulate the procedures and the conditions that should be followed in such cases (Article 59).

Although the ER clearly specifies the condition of granting a permit for construction works within the prohibited 200 m inwards from the shoreline, the Egyptian Authority for Shores Protection refused to grant a permit to EEA and InterGen under pretension that the Law 4/94 absolutely prohibits such an activity.

Miss-applicability of the Law context, in this respect, could be surely treated through defining urgent conditions of excuse, which will certainly include power generation projects on top of listed activities.

Case of Walidia Power Plant

Under the previously mentioned ECAP, enforced by the EEAA, local environmental authorities at Assiut Governorate criticized the quality of cooling water discharged to the River Nile from Walidia 2 x 300 MW oil-fired steam power plant, Middle Egypt Electrical Company, EEA. They also applied penalties to the power plant management to satisfy enforcing requirements mandated by Law 4/94.

In once-through power generating systems, as is the case of Walidia power plant, cooling water abstracted from the Nile (or the sea) is the same cooling water discharged to the Nile (or the sea). Ideally, the only change is limited to 5-10^{o}C temperature rise, and actually, an extremely slight change may occur in some parameters which never affect the original water quality.

For the above operational conditions, enforcing water quality standards could be best achieved when analyzing samples of both abstracted and discharged cooling water.

Misapplicability of standards occurred when testing only characteristics of the discharged water under pretension that the Law only regulated liquid effluents from the power plant disregarding the source of these effluents and the process through which it circulates.

7.4 Ambiguity Of Definitions

When some concepts are addressed and/or defined in vague forms or in misleading words application of standards and/or regulations face certain barriers.

Case of TABA Golden Coast Power Project

In the central part of the Sinai Riviera, 24 kms south of Taba, the Egyptian Ministry of Tourism has designated for development, a particular area denominated "Taba Golden Coast". A central service area will be built to supply all supporting services as well as common facilities and amenities.

Under BOOT system, many developers introduced their offers to construct and operate 30 MW Sollar (oil no. 2)/Mazout (heavy fuel oil) 18V28/32H Diesel Engine Power Plant.

Competitive prices of these offers have been established on burning Mazout as a main fuel and Sollar as an emergency one. But all of these offers have been rejected by TABA Golden Coast Company.
The Executive Regulations of the Law 4/94 stipulate that: "Use of Mazout and other heavy oil products, as well as crude oil, shall be prohibited in residential areas" (Article 42).
At that end, big debate and hot discussions have evolved regarding the questions: What are the residential areas? What are their specifications? Could the tourist areas, which usually are flat, less populated with people in and out for short periods and occasionally occupied, could it be considered residential areas?
Ambiguity of defining the term "Residential Area" created a critical issue and consequently obstacled some appropriate developmental opportunities.

7.5 Too-Exaggerated Strictness Of Standards

Not for all the cases or situations one may consider strictness as a required character or as a preferred condition. Sometimes, further strictness lead to an anti-development situation, where projects, under specific technological and financial settings, lack implementation possibility.
When standards and/or regulations become stricter than normal settings it transforms to just another bureaucratic stumbling-block in the path of development. Also, in case of imposing stricter standards and/or regulations from outside the country, especially the developing one, this may be seen that they are used as a sinister means by which the developing country is kept from escaping poverty.
Regardless the degree of intensity of such statements, the root still the same: a perceived dichotomy between stricter standards and/or regulations and developing activities.

Case of SO2 and PM10 Standards

The Egyptian-EEAA ambient air quality standards for Sulfur Dioxide (SO2) annual average is 60 $\mu g/m^3$ while the same standard values of both the World Bank and the US-EPA is 80 $\mu g/m^3$ (see Exhibit 8).
Not only the annual average but also the 1 HR average and the 24 HR average. Although the World Bank specifies the ambient air quality standards for SO2-1 HR average with the term "No Limit", the Egyptian standards specifies a value for the same averaging period equal to 350 $\mu g/m^3$. For the SO2- 24 HR average the US-EPA adopts a standard value of 365 $\mu g/m^3$ while the Egyptian value does not exceed 150 $\mu g/m^3$.
Considering the developing situation of Egypt, there has been no justification at all for such a level of strictness.
Also, the Egyptian standard for Small Particulates (PM10)- 24 HR average equals 70 $\mu g/m^3$ while the same standard value of the World Bank equals 70 $\mu g/m^3$ and of the US-EPA equals 150 $\mu g/m^3$ (see Exhibit 8).
This condition strongly raises the following interrogation point: Is it appropriate, for a developing country like Egypt, to adopt environmental standards much more stringent than those of an industrialized country such as the United States of America?

7.6 Unrealistic Standards/Regulations

To be fairly adopted, standards and regulations must be realistic.
In one aspect, the term "Realistic" addresses the case of responding to the standards/regulations: it is unrealistic to apply too stringent standards/regulations that may obstacle developing projects, which is the case already highlighted above.
The term "Realistic" means, in another aspect, that the standards and regulations should not create a critical situation where the use of natural resources of a country becomes ultimately prohibited: it is unrealistic to have a conflict between environmental standards/regulations and the national wealth.

Case of "Sulfur Content of Fuel Used" Regulations

The Egyptian Executive Regulations of the Law 4/94 stipulate that: "the sulfur percentage of fuel used in urban areas and near residential areas shall not exceed 1.5%".

It is well known that sulfur content of the Egyptian Mazout ranges between 2.3 - 3%. Such a stipulation above means that the Egyptians should get rid of their Mazout and import another Mazout from outside the country or the Petroleum Sector should change its product.

For sure, it is unrealistic to get rid of national wealth. Even industrial areas quickly become a composite of industrial and residential communities where mazout will not be utilized at all. How could a developing country that possesses a highly precious economic commodity and find itself, at the same time, not able to use it, or to get benefited of it, due to unrealistic environmental standards or regulations.

The legislator when aimed at protecting the environment disregarded that this noble objective could be attained without sacrificing national wealth. Many technologies (pollution minimization techniques, end of pipe treatment, ... etc.) are being used today for abating sulfur oxides, or even eliminating them all, in the flue gases exhausted through industrial and power plant stacks. But non of all these technologies is to sacrifice a national resource.

8. ENVIRONMENTAL STANDARDS/REGULATIONS IN RELATION TO LIBERALIZATION OF EGYPTIAN POWER SECTOR

8.1 Egypt Independent Power Initiative And Environmental Regulations

In 1995, the MOEE and the EEA started the design of the process of developing procedures required to introduce private-sector generation into Egypt. In June 1996, Law No. 100/1996 (amending provisions of Law No. 12/1976, the enabling legislation establishing EEA) was approved. Law 100/1996 authorizes EEA to take actions and activities necessary to enter into contracts/agreements with private generation developers and provide concessions to allow private power developers to establish, manage, operate and maintain electric generation plants. The actions already taken for the first BOOT project 2 x 325 MW Gas/Oil-fired steam units included the site selection study based on economic, technical, and environmental considerations, and "Sidi Krir" had been identified as most appropriate site for 2 x 325 MW steam dual fuel-fired (Gas/Oil) units.

The Request for Proposal (RFP) documents included a special volume on the "Preliminary Environmental Impact Assessment" (EIA) for the proposed power plant which specified extensively the requirements that should be fulfilled by the proponent to prepare a full EIA study report. The RFP included also basic environmental criteria of the proposed plant, particularly those regarding air and water emissions.

The winner proponent, "InterGen Sidi Krir Generating Company", yielded completely to the requirements for an EIA stipulated by both the EEAA and the WB.

The EIA report has been prepared to accompany the applications for permits and consents from the Egyptian Government and local authorities to construct and operate the power plant. The first, and most important one, the environmental permit, has been obtained through a permitting process specified by the Law 4/94 and the "Guidelines for Egyptian EIA" published by the EEAA in early 1996.

Egyptian Electricity Authority has contracted, up till now, other two BOOT power projects, one at Suez Gulf North western area and the other at Port Said East on the Mediterranean Sea coastline. Both power projects are 2 x 325 MW dual fuel (i.e. Gas/Oil) fired power plants.

The environmental volume, within the RFP documents, has got benefited of the InterGen BOOT Sidi Krir power plant experience, where adherence to the national and international (WB) standards and regulations became stricter.

8.2 Impact Of Privatization On Environmental Standards And Regulations (Driving Forces for IPPs Environmental Performance)

Environmental standards and regulations rank the top of key factors driving environmental performance which include, besides laws and regulations, competitive advantage, social policy, and liability exposure. For instance, in their responses to the United Nations 1993 Environmental Report, the companies responding overwhelmingly reported that the existence of laws and regulations was the key factor in stimulating the development of environmental policies and programs.

Social policies also play a significant role in the development of corporate environmental policies. Many companies place a major emphasis on setting an example for the community, the country, and the family. Compliance with applicable laws and regulations is seen as both socially and financially advantageous.

Reduction or elimination of pollution can also be cost effective. The research and development divisions of many companies increasingly seek ways to minimize waste or to identify benign uses for waste products resulting from industrial activities.

In countries with established regulatory programs, the fines associated with noncompliance of environmental regulation can have a significant adverse impact on a company's profits or price of stock.

Major environmental catastrophes also have a major impact on company environmental policies and on the development of environmental regulations.

In its report on the Benchmark Corporate Environmental Survey, the United Nations summarized the key factors identified by corporations as critical to furthering environmental objectives. The ten most important factors, in order of priority, are:

1. Reduction in differences in environmental regulations.
2. Establishment of international policy guidelines.
3. Establishment of international technical standards.
4. Compilation of international laws and regulations.
5. Creation or strengthening of national regulatory systems in developing countries.
6. Reporting on corporate leadership and achievements.
7. Assistance in review of voluntary corporate performance standards.
8. Mediating between corporations and governments on environmental conflicts.
9. Creating or strengthening national inspection systems in developing countries.
10. Establishing norms and procedures for public disclosure.

Efforts to enhance coordination among developers and developing governments will focus on these objectives to foster commitment to national and global sustainable environmental management.

9. CONCLUSION AND RECOMMENDATIONS

9.1 General Findings

9.1.1 Rational for Environmental Legislation and Regulations

Environmental legislation is needed to protect the health and welfare of society, and market incentives alone will probably never work. Another reason for environmental legislation is that long-term protection of the life-support systems is important for economic development. Investment decisions can rarely be made to take into account long-term protection of the life-support systems which belong to everyone__a property ultimately leading to the problems of the commons.

Also, the market will tend to encourage consumption of exhaustible resources too fast. Consequently, a corrective public intervention___or regulations aimed at slowing down this consumption-needs to be structured. This can be accomplished through compulsory conservation or a system of graduated severance taxes.

9.1.2 Shortcomings of Environmental Legislation and Regulations

There are, indeed, a number of concerns regarding many environmental regulations. These concerns are shared by many who feel that environmental regulations can be structured so that they minimally affect efficiency and productivity of the industry, minimally interfere with essential national programs, and still achieve reasonable environmental protection goals. Some of the concerns related to environmental regulations are:

- Regulations seem to be structured in a way that the costs are often excessive as compared to the benefits they generate.
- In general, the regulations are command-and-control type, i.e., they lack properly structured incentives for achieving social goals and may generate inefficiencies, both at the micro-and macroeconomic levels. Consequently, in a free-market economy, they are ineffective and do not preserve elements of voluntary choice.
- Some environmental regulations require unnecessary paperwork and cause unnecessary delays in completion schedules which, in turn, create additional costs.
- Many regulations at different government levels, are duplicative and, at times, incompatible with each other; consequently, they create unnecessary work and inefficiencies.

9.2 Recommended Approaches For Harmonization Of Environmental Standards And Regulations On Subregional And Regional Level

Approach 1: INTEGRATED RESOURCE PLANNING (IRP)

Integrated national, as well as regional, energy planning and policymaking (INEP) is a process implemented, basically, through a set of energy supply and demand management policies which analyze energy resources on global, macro, intermediate and micro levels and integrate all possible actors, criteria, multilevel analyses, policy instruments, impediments and final aim into the decision making process.

This INEP provides a quite reasonable approach to harmonizing environmental standards and regulations.

Approach 2: SUSTAINABLE DEVELOPMENT MECHANISMS

Sustainable development is an approach to development that combines some key development principles (factors that are necessary to ensure long-term economic, political, or social viability such as appropriate technology and community participation), with factors necessary to ensure environmental viability (impact assessment, consideration of the particular environmental context, etc.).

Consistency of environmental standards and regulations across regional boundaries is a key element in achieving the regional cooperation required to implement the approach of sustainable development management, i.e. "Conducting business to meet the needs of the enterprise and stakeholders which protecting, sustaining and enhancing human and natural resources needed tomorrow". (United Nations, 1993). Vast differences in standards will encourage companies to "shop" for the least restrictive regulatory atmosphere in which to conduct business. Regional (as well as international) approximation of standards on industrial activities will also facilitate sustainable development management. The sharing of standards/regulations on technological advancements such as techniques for using non-toxic materials in standard processes or enhanced methods for pollution control can accelerate pollution reduction.

Approach 3: BALANCING ECONOMIC AND ENVIRONMENTAL COST

This approach depends upon adjustments in the national and regional roles which are likely to increase participation in the enforcement and administration of harmonization guidelines. Balancing of economic and environmental goals is likely to take the form of moderation in achieving environmental goals while promoting economic activities. It will help regulations move away from the command-and-control type of approach presently used in most cases. This may provide a viable basis for harmonizing environmental standards and regulations on subregional and regional level.

Approach 4: ESTABLISHMENT OF REGIONAL POLICY GUIDELINES

The development of a set of environmental requirements for a power project involves decisions of two distinct kinds. First, there are the specific requirements for the power project itself. These are the responsibility of the project developer in collaboration with relevant local or other environmental authorities. The related standards and regulations focus on the issues that should be addressed in arriving at project-specific emission standards and other requirements.

Second, there are requirements which relate to the operation of the power system as whole. These strategic issues must be the concern of national or regional authorities with the responsibility for setting the overall policy framework for the development of the power sector. Examples of such requirements include measures to promote energy conservation via better demand-side management, to encourage the use of renewable sources of energy rather than fossil fuels, and to meet overall targets for the reduction of emissions of sulfur dioxide, nitrogen oxides, or greenhouse gases.

In the context of harmonizing legislatorial system pertaining to energy and environmental issues, it is the responsibility of policy makers to develop the policy framework to implement such environmental requirements for the power sector as a whole. One step in this process could be the preparation of a Sectoral Environmental Guidelines. These guidelines should assume that the project is consistent with broad sectoral policies and requirements that have been promulgated by the relevant authorities in order to meet national and international obligations and other environmental goals affecting the power sector.

Approach 5: REDUCTION IN DIFFERENCES IN ENVIRONMENTAL REGULATIONS

This approach may be the most effective one. It could be achieved, successfully, through processing eight fundamental issues. These issues are:

Issue 1 : Approximating Environmental Management Criteria

Environmental management criteria provide specific requirements and principles for environmental protection. These criteria are intended to harmonize standards. They are designed to help environmental authorities establish their nationwide environmental obligations. The criteria define management requirements and/or processes to be followed for controlling the impact an organization will have on the environment and identify what environmental impacts are acceptable within the legal framework.

Approximating environmental management criteria will be the first normal step or the logic access to harmonizing environmental standards and regulations. Suitability, adequacy and effectiveness are three main factors that management criteria should focus as a base for harmonization process.

Issue 2: Approximating Basic Determinants For Standards And Regulations

Consistency of environmental axioms, rudiments and definitions, which determine basic terminology of the environmental subject, across regions and states boundaries is a key element in achieving harmonization among standards and regulations of these states.

Hence, differences among standards and regulations could usually be minimized, or may be fully eliminated, when basic determinants, i.e. axioms, rudiments and definitions, are as approximated as possible.

Issue 3 : Approximating Standards And Regulations

To provide a successful harmonization, approximation among standards and regulations themselves should be achieved.

Environmental standards and regulations, which form an action-forcing mechanism for implementing the intent of the enabling legislation, can have a profound effects on economic activity and these effects are to be included in assessment of the implementation of this harmonization process.

Issue 4 : Initiating Standards And Regulations For Non-Defined Parameters

Incomplete standards/regulations systems lead to enforcing other standards and regulations, established within other legislatorial and regulatory systems, in case of necessity under urgent financing conditions. This will consequently lead to a situation where harmonization among standards and regulations is unattainable.

Standards and regulatory systems should define all parameters without inadvertence of some of them.

Issue 5 : Specifying Optimum Condition Of Strictness
(Rational Compromise Between Environment And Development)

Amongst all critical issues in regard to harmonization of environmental standards and regulations the issue of: "For what extent the environmental standards and regulations are to be so stringent?" acquires an important consideration.

It is now beyond debate that a way has to be found, through the concept of sustainable development, to reconcile the vital demands for economic growth with the equally legitimate concern to protect the society, as well as the planet, and its people.

In fact, Upgrading standards and regulation over the time, in harmony with the economic and social settings, will attain the required level of stringency in the correct time along with the development avenue.

Issue 6 : Unifying Unit-Systems Of Standards And Regulations

Unit-systems are used to define standards/regulations values that limit a particular parameter in the ambient ecosystem.

Differences among these unit-systems create difficulties in comparing standards and regulations, and on the contrary, the more the nearness the unit-systems have, the more applicable they usually are.

Issue 7 : Simplifying Specification Base Of Standards And Regulations

Clear and simple legislation base for specifying standards and regulations is a profound necessity for their mandatory application by all concerned parties.

In many cases, multi-leveled standards/regulations and/or complex-conditioning of them may create a failure-to-compliance situation, and will certainly lead, if found in an environmental legislation system, to a profound difficulty in harmonization with other environmental legislation systems.

Issue 8 : Approximating Procedural Actions For Achieving Compliance With Standards And Regulations

These procedures or compliance action instruments include administrative systems of permits, licenses, certificates of approvals and control orders, intended to control pollution before it occurs. It includes administrative powers to require clean up after pollution has occurred and/or imposed clean obligations. It also includes requirements to provide environmental assessments for developmental projects as well as to provide information, for example through submitting to inspection and self reporting.

As environmental legislative procedural actions or compliance instruments constitute an essential complementary part of the standards and regulatory system of a country, their harmonization among different countries enhances, to a far extent, the general harmonization of standards and regulatory systems of those countries.

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Exhibit 1

Laws and Regulations for Control of Air Pollution

Law Number / Year	Subject of Law
Presidential Decree 864-1969	Establishes the Supreme Committee to protect air from Pollution. Its mandate includes setting the standards and criteria for air quality.
Minister of Health Decree 470-1971; amended by Decree 240-1979	Sets standards for ambient and workplace air. Includes: Dust Fallout Residential areas not more than 20 tons/mile^2/month Industrial ores not more 40 tons/ mile^2 / month
Decree of Minister of Housing number 380-1975	Specifies the general conditions for industrial buildings. Article 24 deals with furnaces, chimneys and stacks.
Law number 3-1982 implemented by Minister of Housing's decree 600-1982	An urban planning law that "gives specifications for industrial areas".
Law 137-1981, implemented by decree issued by the Minister of Manpower number 55-1983	For labor, this legislation determines the amount of fresh air per person in the workplace, the suitable temperature and humidity levels.
Law 59-1960, implemented by Minister of Health decrees 630-1962, 444-1972, 87-1984.	Regulates use and protection from ionizing radiation, setting maximum exposure limits.
Decree of the Minister of Industry number 380-1982	Necessitates the use of protective equipment to prevent pollution resulting from the use of technology in new industrial projects.

Exhibit 2

Laws and Regulations for Water Pollution Control

Law Number / Year	Subject of Law
Supreme Committee for Water*, Annex IV 1-7-75 Established by the Presidential Decree 27/03-1996	Establishes specifications, standards and maximum permissible limits of potable water. Indications of pollution: the increase in ammonia, nitrates, COD, BOD chlorides, phosphates. Bacterial Standards: Chlorinated water: should be free from coliform group in 95% of samples during the year. No sample should have more than 10 parts per 100 cc. All samples should be free from fecal coliform in 100 cc samples. No two consecutive samples should contain coliform groups. In non-chlorinated water, the maximum number of coliform groups should not exceed 5 parts per 100 cc.
Minister of Housing and Utilities decree 643-1962 implementing Law number 93-1962	Section 6 refers to (1) specifications and standards that must be fulfilled for wastewater discharged to public sewers and (2) specifications for disposal in the sea and on land . Section 7 describes the methods and frequency of taking samples of wastewater for analysis.
Law 48-1982	Concerns protection of the Nile River and Egypt's waterways from pollution, it defines the surface waters and regulates discharge of wastes to bodies of water by a permit from the Ministry of Public Works and Irrigation after fulfilling certain criteria, to be monitored by periodic analyses.
Minister of Irrigation decree number 8-1983 implementing Law 48-1982	Section 6 sets regulations, standards and specifications for treated wastewaters before discharge to surface waters as detailed by exhibit 13

* The table contains laws that are relevant to the power sector

Exhibit 3

Laws and Regulations for the Control of Industrial Hazardous and Non-Hazardous Solid Waste

Law Number / Year	Subject of Law
A. Solid Waste	
Law number 38-1967, amended by Law 31-1976	Concerns public cleanliness, regulates collection and disposal of solid wastes from houses, public places and commercial and industrial establishments.
Minister of Housing decree 134-1968 implementing Law 38-1967	Identifies garbage containers, methods of transport, schedule for solid waste collection. Sets specifications and locations of dumping places and methods of treatment (sanitary dumps, composting, incineration).
B. Industrial Toxics and Workplace Safety	
Law number 137-1981	On "labor" and workplace safety. Article 115 concerns security of the work environment against mechanical, natural and chemical hazards together with dangers resulting from lack of security precautions. Article 118 necessitates the use of protective devices. Article 125 and 126 concern occupational safety and health inspection by specially trained bodies, whereas Articles 127, 128, 129 deal with internal inspection by a committee for occupational safety and health.
Minister of Manpower decree number 55-1983	Concerns precautions and conditions necessary for occupational safety and health in the work place. The decree contains 6 Tables: • Table 1 deals with heat stress • Table 2 deals with light intensity • Table 3 deals with noise • Table 4 deals with safety standards of hazardous chemicals in the workplace (134 substances). • Table 5 deals with standards of inorganic dust in the workplace: silica, asbestos, Portland cement, talcum powder, natural graphite powder, coal dust. • Table 6 deals with substances with a possible carcinogenic effect.
Law 21-1958	Concerns industrial hazard regulations. Sets standards and specification for production, handling and importing dangerous chemicals as well as for their transported storage.

Exhibit 4

Laws and Regulations for the Control of Urban and Occupational Noise

Law Number / Year	Subject of Law
Urban and Occupational Noise	
Law 137-1981	Concerns labor. Article 115 deals with physical dangers, including noise.
Minister of Manpower decree 55-1983	Sets the standards for noise in working locations as follows: Noise intensity in dB(A) 90 95 100 105 110 115 Exposure time in hours 8 4 2 1 1/21/4 For noise arising from heavy hammers: Noise intensity in dB(A) Number of hammerings/day 140 100 130 1,000 120 10,000 No noise intensity higher than 140 dB(A) is allowed.

Exhibit 5

Egyptian Ambient Air Quality Standards for Main Pollutants

Pollutant	Averaging Period	Air Quality Standards, µg/m^3	
		Law No. 470/1971 & Law No. 240/1979 (Historical Record)	EEAA[a] (Law 4/1994)
SO2	1 HR	N/A[b]	350
	24 HR	200	150
	Annual	60	60
TSP	1 HR	N/A[b]	N/A[b]
	24 HR	150	230
	Annual	N/A[b]	90
Small Particulates (PM10)	1 HR	N/A[b]	N/A[b]
	24 HR	N/A[b]	70
	Annual	N/A[b]	N/A[b]
NOx	1 HR	N/A[b]	400
	24 HR	200	150
	Annual	N/A[b]	N/A[b]

(a) EEAA = Egyptian Environmental Affairs Agency
(b) N/A = Not Available

Exhibit 6

World Bank Ambient Air Quality Guidelines

	SO2 Limits (µg/m^3)			NOx Limits (µg/m^3)			Particulate Matter Limits (µg/m^3)					
							Total Suspended (TSP)			Small (PM10)		
	Long Term	Short Term		Long Term	Short Term		Long Term	Short Term		Long Term	Short Term	
Version	Annual avg.	24 Hr avg.	1 Hr avg.	Annual avg.	24 Hr avg.	1 Hr avg.	Annual avg.	24 Hr avg.	1 Hr avg.	Annual avg.	24 Hr avg.	1 Hr avg.
1988 (1)	100	500	No limit	100	No limit	No limit	100	500	No limit	No Separate limit	No Separate limit	No Separate limit
1994 (2)	50	125	350	No limit	150	400	No limit	No limit	No limit	70	110	No limit
1995 (3)	50	125	350	No limit	150	400	60-90	120	No limit	No limit	70	No limit
1996 (4)	No new proposal for ambient air quality guidelines (same as 1995)											

Exhibit 7

US-EPA Ambient Air Quality Standards For Selected Pollutants

Criteria Pollutant	Standards Type	NASQS limit		Compliance Determination Basis [a]
		$\mu g/m^3$	ppm	
Ozone	Primary and secondary	-	0.08	3-year average of fourth highest daily maximum 8-hour average concentrations.
	Primary and secondary	235[b]	0.12[b]	Maximum hourly average concentration; one exceedance allowed per year [c]
CO	Primary	10,000	9	8-hour average concentration; one exceedance allowed per year
	Primary	40,000	35	1-hour average concentration; one exceedance allowed per year
PM - 2.5	Primary and secondary	65	-	3-year average of the 98th percentile 24-hour average concentrations
	Primary and secondary	15	-	3-year average of annual arithmetic mean concentrations
PM - 10	Primary and secondary	150	-	3-year average of the 99th percentile 24-hour average concentrations
	Primary and secondary	150	-	Maximum 24-hour average concentration; one exceedance allowed per year [c,d]
	Primary and secondary	50	-	3-year average of the annual arithmetic mean concentrations
SOx[e]	Primary	80	0.03	Annual arithmetic mean
	Primary	365	0.14	Maximum 24-hour concentration; one exceedance allowed per year
	Secondary	1,300	0.5	Maximum 3-hour concentration; one exceedance allowed per year
NOx	Primary and secondary	100	0.053	Annual arithmetic mean
Lead	Primary and secondary	1.5	-	Maximum arithmetic mean measured over a calendar quarter

Exhibit 8

Egyptian - EEAA Ambient Air Quality Standards for Main Pollutants in Comparison with US-EPA and the World Bank Guidelines

Pollutant	Averaging Period	Air Quality Standards, μg/m³		
		EEAA[a] Law 4/94	WB[b] 1998	EPA[c]
SO2	1 HR 24 HR Annual	350 150 60	No Limit 150 80	N/A[d] 365 80
TSP	1 HR 24 HR Annual	N/A[d] 230 90	No Limit 230 80	N/A[d] 150 50
Small Particulates (PM10)	1 HR 24 HR Annual	N/A[d] 70 N/A[d]	No Limit 70 No Limit	Same as TSP
NOx	1 HR 24 HR Annual	400 150 N/A[d]	No Limit 150 100	N/A[d] N/A[d] 100

(a) EEAA = Egyptian Environmental Affairs Agency (Law 4/94)
(b) WB = World Bank
(c) EPA = United States - Environmental Protection Agency
(d) N/A = Not Available

Exhibit 9

Egyptian Emission Standards for Fossil-Fueled Electric Utility Steam Generating Units

Pollutant	Emission Standards (milligram/m^3 of exhaust)
SO2 Source Existed before the issuance of Law 4/94 New Sources	4000 2500
TSP	200
NO2	300
Fly Ash (Suspended Particles) Sources in urban areas or near residential areas Sources far from inhabited urban areas	250 500

Exhibit 10

World Bank Air Emission Guidelines for Thermal Power Plants

Version	SO2 Limits	NOx Limits				Particulate Limits
		Gas	Oil	Coal	Lignite	
1988 (1)	100 to 500 t/d	86 ng/J	130 ng/J	300 ng/J	260 ng/J	100-150 mg/Nm^3
1994 (2)	100 t/d and 1.7 lb/mmBtu	86 ng/J	130 ng/J	260 ng/J	No separate guideline	50 mg/Nm^3
1995 (3)	0.2 t/d per MWe (<1000 MWe) and 2000 mg/Nm^3	65 ng/J and 240 mg/Nm^3	100 ng/J and 360 mg/Nm^3	230 ng/J and 650 mg/Nm^3	No separate guideline	50 mg/Nm^3 and 99% removal (coal plants)
1996 (4)	0.2 t/d per MWe (<1000 MWe) and 2000 mg/Nm^3	86 ng/J and 320 mg/Nm^3	130 ng/J and 460 mg/Nm^3	260 ng/J and 750 mg/Nm^3	No separate guideline	50 mg/Nm^3 and 99% removal (coal plants)

Exhibit 11

New Source Performance Standards (NSPS) Limits Applicable to Utility Boilers in the USA

Pollutant	Emission Limit	Fuel
Nitrogen Oxides (NOx)	1.6 lb/MWhr (based on 0.15 lb/MBtu and 30% efficiency)	Any type of fossil fuel
Sulfur Dioxide (SO_2)	0.8 lb/MBtu, and at least 90% SO2 removal; or 0.2 lb/MBtu, and no SO2 removal	Oil or Gas
Total Particulates (TSP)	0.03 lb/MBtu, and 20% opacity, and at least 70% particulate removal	Oil
	0.03 lb/MBtu, and 20% opacity, and no particulate removal	Gas

Exhibit 12

US-EPA Emission Limits for Combustion Turbine Plant

	NSPS Limit	Typical BACT Limit
NOx		
Emissions	75 ppm	3 ppm
Technology	Dry combustors	SCR
CO		
Emissions	150 ppm	3 to 5 ppm
Technology	Combustion controls	CO catalyst
VOC		
Emissions	No Limit	5 ppm
PM10		
Emissions	No Limit	0.007 lb/MBtu

Exhibit 13

Water Quality Standards and Specifications Mandated by the Egyptian Laws in Comparison with the World Bank Guidelines (mg/liter-unless otherwise indicated)

Parameter	Standards and Specifications Mandated by Law 48/1982		
	The fresh water bodies in which it is permitted to discharge treated industrial liquid effluents must remain within the following quality standards	The maximum limits of constituents in treated industrial liquid effluents discharged to (Art. 61)	
		River Nile from its Southern Egyptian Border to the Delta Barrages	Nile Branches, main canals, branch canals, ditches & groundwater reservoirs
Temperature	5°C above normal (Art-60)	35°C	35°C
pH	7-8.5	6-9	6-9
Color	Not to exceed 100 degrees	No Col. substance	No Col. substance
Biochemical Oxygen Demand (BOD)	Not to exceed 6	30	20
Chemical Oxygen Demand (COD) (Dichromate)	Not to exceed 10	40	30
Total Dissolved Solids	500	1200	800
Fixed (Ash of) Dissolved Solids		1100	700
Suspended Solids		30	30
Turbidity			
Sulfides		1	1
Oils and Grease	Not to exceed 0.1	5	5
Hydrocarbons, of oil origin			
Phosphates		1	1
Nitrates	Not more than 45	30	30
Phenolates			
Fluorides	Not to exceed 0.02	0.5	0.5
Aluminum			
Ammonia (Nitrogen)	Not to exceed 0.5		
Mercury Compounds	Not to exceed 0.001	0.001	0.001
Lead	Not to exceed 0.05	0.05	0.05
Cadmium	Not to exceed 0.01	0.01	0.01
Arsenic	Not to exceed 0.05	0.05	0.05
Chromium, total	Not to exceed 0.05	0.05	0.05
Copper	Not to exceed 1	1	1
Nickel		0.1	0.1
Iron	Not to exceed 1	1	1
Manganese	Not to exceed 0.5	0.05	0.05
Zinc	Not to exceed 1	1	1
Silver		0.05	0.05
Barium			
Cobalt			
Pesticides			
Cyanide	Not to exceed 0.1		
Fecal Coliform Count (No in 100ml)			
Dissolved Oxygen	Not less than 5		
Organic Nitrogen	Not to exceed 1		
Total Alkalinity	20-150		
Sulphate	Not to exceed 200		
Synthetic Detergents	Not to exceed 0.5	0.05	0.05
Phenol	Not to exceed 0.02	0.002	0.001
Selenium	Not to exceed 0.01		
Chemical Oxygen Demand (Permanganate)		15	10
Total Heavy Metals		1	1
Total Residual Chlorine		1	1
Total Coliform (MPN/ 100ml)			
Odour			
Tannin + lignin			
Carbon derivatives (chloroform)			

Exhibit 13 (Contd.)

Water Quality Standards and Specifications Mandated by the Egyptian Laws in Comparison with the World Bank Guidelines (mg/liter-unless otherwise indicated)

Parameter	Standards and Specifications Mandated by Law 48/1982		
	Maximum Limit to the quality of treated industrial liquid effluent discharged in: (Art. 62) (Volume discharged is not greater than 100m^3/day)		Drain Water must comply with the following standards before lifting to (mixing with) fresh surface water bodies. (Art.65)
	River Nile from South. limits up to Delta Barrage	Branches, Ryah, canals, groundwater reservoirs	
Temperature			5°C above normal average
pH			7-8.5
Color			Not to exceed 100 units
Biochemical Oxygen Demand (BOD)	40	30	Not to exceed 10
Chemical Oxygen Demand (COD) (Dichromate)	60	40	Not to exceed 15
Total Dissolved Solids	1500	1000	500
Fixed (Ash of) Dissolved Solids	1000	900	
Suspended Solids	40	30	
Turbidity			
Sulfides			
Oils and Grease	10	10	Not to exceed 1
Hydrocarbons, of oil origin			
Phosphates			Not to exceed 1.0
Nitrates	40	30	Not to exceed 45
Phenolates			
Fluorides			Not to exceed 0.5
Aluminum			
Ammonia (Nitrogen)			Not to exceed 0.5
Mercury Compounds			Not to exceed 0.001
Lead			
Cadmium			Not to exceed 0.01
Arsenic			Not to exceed 0.01
Chromium, total			Not to exceed 0.01
Copper			Not to exceed 1.0
Nickel			
Iron			Not to exceed 1.0
Manganese			Not to exceed 1.5
Zinc			Not to exceed 1.0
Silver			
Barium			
Cobalt			
Pesticides			
Cyanide			Not to exceed 0.1
Fecal Coliform Count (No. in 100ml)			
Dissolved Oxygen			Not less than 5
Organic Nitrogen			
Total Alkalinity			50-200
Sulphate			
Synthetic Detergents			Not to exceed 0.5
Phenol	0.005	0.002	Not to exceed 0.02
Selenium			
Chemical Oxygen Demand (Permanganate)	20	15	Not to exceed 6
Total Heavy Metals			
Total Residual Chlorine			
Total Coliform (MPN/ 100ml)			Not to exceed 500
Odour			2 degrees
Tannin + lignin			Not to exceed 0.5
Carbon derivatives (chloroform)			Not to exceed1.5 g/l

Exhibit 13 (Contd.)

Water Quality Standards and Specifications Mandated by the Egyptian Laws in Comparison with the World Bank Guidelines (mg/liter-unless otherwise indicated)

Parameter	Standards and Specifications Mandated by Law 48/1982		Limits & Specifications for draining and disposing of certain substances in the marine environment mandated by Law 4/1994(a)
	Discharge into Brackish and Saline Surface Water Bodies (Art. 66)		
	Sewage Effluent	Industrial Liquid Effluent	
Temperature	35°C	35°C	Not more than 10 degrees over existing level
pH	6-9	6-9	6-9
Color			Free of colored agents
Biochemical Oxygen Demand (BOD)	60	60	60
Chemical Oxygen Demand (COD) (Dichromate)	80	100	100
Total Dissolved Solids	2000	2000	2000
Fixed (Ash of) Dissolved Solids			1800
Suspended Solids	50	60	60
Turbidity			NTU 50
Sulfides	1	1	1
Oils and Grease	10	10	15
Hydrocarbons, of oil origin			0.5
Phosphates			5
Nitrates	5	40	40
Phenolates	-	10	1
Fluorides	-	0.5	1
Aluminum			3
Ammonia (Nitrogen)			3
Mercury Compounds			0.005
Lead			0.5
Cadmium			0.05
Arsenic			0.05
Chromium, total			1
Copper			1.5
Nickel			0.1
Iron			1.5
Manganese			1
Zinc			5
Silver			0.1
Barium			2
Cobalt			2
Pesticides	nil	nil	0.2
Cyanide	-	0.1	0.1
Fecal Coliform Count (No. in 100ml)			5000
Dissolved Oxygen	Not less than 4	-	
Organic Nitrogen			
Total Alkalinity			
Sulphate			
Synthetic Detergents			
Phenol	-	0.005	
Selenium			
Chemical Oxygen Demand (Permanganate)	40	50	
Total Heavy Metals	1.0	1.0	
Total Residual Chlorine			
Total Coliform (MPN/ 100ml)	5000	5000	
Odour			
Tannin + lignin			
Carbon derivatives (chloroform)			

Exhibit 13 (Contd.)
Water Quality Standards and Specifications Mandated by the Egyptian Laws in Comparison with the World Bank Guidelines (mg/liter-unless otherwise indicated)

Parameter	World Bank Wastewater Effluent Guidelines (1996)
Temperature	3oC increase above ambient (b)
pH	6-9
Color	
Biochemical Oxygen Demand (BOD)	-
Chemical Oxygen Demand (COD) (Dichromate)	
Total Dissolved Solids	
Fixed (Ash of) Dissolved Solids	
Suspended Solids	50
Turbidity	
Sulfides	
Oils and Grease	10
Hydrocarbons, of oil origin	
Phosphates	
Nitrates	
Phenolates	
Fluorides	
Aluminum	
Ammonia (Nitrogen)	
Mercury Compounds	
Lead	
Cadmium	
Arsenic	
Chromium, total	0.5
Copper	0.5
Nickel	0.5
Iron	1.0
Manganese	
Zinc	1.0
Silver	
Barium	
Cobalt	
Pesticides	
Cyanide	
Fecal Coliform Count (No. in 100ml)	
Dissolved Oxygen	
Organic Nitrogen	
Total Alkalinity	
Sulphate	
Synthetic Detergents	
Phenol	
Selenium	
Chemical Oxygen Demand (Permanganate)	
Total Heavy Metals	-
Total Residual Chlorine	0.2 (c)
Total Coliform (MPN/ 100ml)	
Odour	
Tannin + lignin	
Carbon derivatives (chloroform)	

Notes:

(a) Law 4/1994 states in the commencement of Annex 1, which gives these limits and specifications, the following: "Giving due consideration to the provisions of Law No. 48 of 1982 concerning the protection of the River Nile, and its Executive Regulations, the amounts of drained substances indicated hereunder shall not exceed the limits indicated next to each of them".

"In all cases, draining into the marine environment shall not be permissible except at a minimum distance of 500 meters from the coast line. Nor shall drainage be permitted in fishing zones or swimming zones or in the natural reserves in order to maintain the economic or aesthetic values of the zones".

(b) Applicable at the edge of a designated zone of mixing and dilution.

(c) 2.0 mg/l for up to two hours per day may be allowed (same limits apply to bromine and fluorine).

Exhibit 14

U.S. Federal Chemical Effluent Guidelines for New Power Plants

Waste Stream Parameter	Limit [a]	
	Average	Maximum
Once-Through Cooling Water		
Chlorine (total residual)[b]	-	0.2
Cooling Tower Blowdown		
pH	6 to 9	6 to 9
Chlorine (free available)	0.2	0.5
Chromium (total)	0.2	0.2
Zinc (total)	1.0	1.0
Other cooling tower maintenance chemicals [c]	No detectable	amount
Low Volume Wastes		
Total suspended solids	30.0	100.0
pH	6 to 9	6 to 9
Oil and grease	15.0	20.0
Metal Cleaning Wastes		
Total suspended solids	30.0	100.0
pH	6 to 9	6 to 9
Oil and grease	15.0	20.0
Copper (total)	1.0	1.0
Iron (total)	1.0	1.0
Material Storage Runoff		
Total suspended solids	-	50.0
pH	6 to 9	6 to 9
Bottom Ash Transport Water		
Total suspended solids	30.0	100.0
pH	6 to 9	6 to 9
Oil and grease	15.0	20.0
Fly Ash Transport Water	No discharge	allowed

Notes:
(a) All limits are in mg/L except for pH, which is in standard units.
(b) In addition to the numerical limit, no individual unit may discharge chlorine for more than 2 hours per day, and chlorination of more than one unit simultaneously is prohibited.
(c) Any chemicals other than chlorine, chromium, or zinc added to prevent biofouling, scaling, or corrosion.

Exhibit 15
Egyptian Ambient Noise Limits for Intensity in Different Land Use Zones

Receptor	Daytime [(a)] dB (A)	Evening [(b)] dB (A)	Night [(c)] dB(A)
Industrial areas (heavy industries)	60-70	55-65	50-60
Commercial, administrative and "downtown" areas	55-65	50-60	45-55
Residential areas, including some workshops or commercial businesses or on public roads	50-60	45-55	40-50
Residential areas in the city	45-55	40-50	35-45
Residential suburbs having low traffic	40-50	35-45	30-40
Rural residential areas (hospitals and gardens)	35-45	30-40	25-35

Notes:
(a) Daytime from 7 am to 6 pm.
(b) Evening from 6 pm to 10 pm.
(c) Night-time from 10 pm to 7 am.

Exhibit 16
World Bank Ambient Noise Guidelines for Intensity in Different Land Use Zones

Receptor	Maximum Allowable L_{Aeq}, 1-hour dB(A) [(a)]	
	Daytime 07:00-22:00	Night-time 22:00-07:00
Residential, institutional and educational	55	45
Industrial and commercial	70	70

Notes:
(a) Noise abatement measures should achieve either the IFC guidelines or a maximum increase of background levels of 3 dB(A). Measurements are to be taken at noise receptors outside the project property boundary.

Exhibit 17
Guidelines of the International Radiation Protection Association (IRPA) for Electric and Magnetic Fields

Limits of Exposure to 50/60 Hz Electric and Magnetic Fields		
Exposure characteristics	Electric field strength kVm^{-1} (rms)	Magnetic flux density mT (rms)
• **Occupational**		
Whole working day	10	0.5
Short term	30[(a)]	5 [(b)]
For Limbs	-	25
• **General Public**		
Up to 24 hrd [-1(c)]	5	0.1
Few hours per day [(d)]	10	1

Notes :
(a) The duration of exposure to fields between 10 and 30 kVm^{-1} may be calculated from the formula $t \leq 80/E$, where t is the duration in hours per working day and E is the electric field strength in kVm^{-1}.
(b) Maximum exposure duration is 2 hr per working day.
(c) This restriction applies to open spaces in which members of the general public might reasonably be expected to spend a substantial part of the day, such as recreational areas, meeting grounds, and the like.
(d) These values could be exceeded for a few minutes per day provided that precautions are taken to prevent indirect coupling effects.

Exhibit 18
Location of Specified Information in the EIA Report

EEAA Guidelines for Egyptian Environmental Impact Assessment	IFC/World Bank Guidance for Preparation of an Environmental Assessment
1. Description of the proposed plant and process.	Description of the proposed project:
2. Description of the environment, including baseline conditions and any changes expected in the future prior to development	Description of the baseline environment, using graphical presentation where possible.
3. Review of legislative and regulatory considerations, including regulations and standards at national, regional and local levels.	Identification and outline of all applicable regulations and standards, including numerical standards.
4. Determination of the potential impacts of the proposed plant, covering construction and operation, positive and negative, direct and indirect, immediate and long term impacts, including (but not limited to).	Description of potential impacts of the proposed plant, including all significant environmental, socio-economic, human health and safety impacts, covering construction and operation, positive and negative, direct and indirect, immediate and long term impacts.
5. Description of alternatives to the proposed plant, including the "no action" alternative, and comparison of potential environmental impacts, capital and operating costs, suitability for local conditions and monitoring requirements.	Comparison of the impacts of alternative sites and processes, and key factors in decisions to select the proposed site and process
6. Development of a management plan to mitigate adverse impacts, including potentially significant construction and operational impacts and accidental events.	Proposals for mitigation of any significant adverse impacts and plans for ongoing management:
7. Development of a monitoring plan covering the implementation of the mitigation measures and impacts during construction and operation, including budget estimates of capital and operating costs	Preparation of a detailed plan for monitoring to allow determination of rates and concentrations of emissions and waste discharges, occupational health and safety, effectiveness of mitigation measures, capital and operating costs, including (but not limited to).
8. Securing of inter-agency co-ordination and public/NGO participation, including keeping of records of meetings, other activities, communications and comments	Consultation with local NGOs, affected communities and other affected groups including keeping of records of steps taken to consult local interested parties, consultation meetings, other activities, communications, comments, key concerns of local interested parties and actions taken to modify the project and EIA in response to public and community inputs
9. Preparation of an Environmental Impact Assessment (EIA) report, organized	Outline of an Environmental Impact Assessment (EIA) report:

Assessment (EIA) report, organised according to the following outline.	Assessment (EIA) report:

Exhibit 19

Comparison of Air Pollutant Emission Rates Per Unit (325 MW) of Shoubrah El-Kheima Power Plant and Emission Standards, 1985, (LB/10^6 BTU)

Pollutant	Shoubrah El-Kheima Power Plant		Emission Standards					
			Egypt (a)		World Bank		US-EPA (b)	
	Mazout	Natural Gas	Mazout	Natural Gas	Mazout	Natural Gas	Mazout	Natural Gas
Sulfur Dioxide (SO2)	5.524	0.0006	-	-	2.55	2.55	0.80	0.80
Particulates (TSP)	0.371	0.009	-	-	0.12	0.12	0.03	0.03
Nitrogen Oxides (NOx)	0.735	0.652	-	-	0.30	0.20	0.30	0.20

Notes:
(a) Egypt had no emission standards during 1980's.
(b) For percent reductions and other specific requirements, refer to U.S. New Source Performance Standards.

Exhibit 20

Comparison of Maximum Air Quality Impact of Shoubrah El-Kheima Power Plant and Maximum Air Quality Standards, 1985, ($\mu g/m^3$)

Pollutant	Type and period of averaging	Ambient air quality criteria			Contribution from the Shoubrah El-Kheima Station		Average Back-ground
		Egypt	World Bank	US-EPA	Three Oil-Fired Units and One Natural Gas Fired Unit at Full Load	100% Load, Four Units, Fuel (80% gas, 20% oil)	
Sulfur Dioxide (SO2)	Max Annual Max 24-hour	- 200	100 500	80 365	14.0 382.1[(a)]	1.79 115.9[(a)]	54.4
Particulates (TSP)	Max Annual Max 24-hour	- 150	100 500	60 150	1.0 22.2	0.15 5.0	308.3
Nitrogen Oxides (NOx)	Max Annual Max 24-hour	- 200	100 -	100 -	2.6 56.5	0.61 21.2	24.0

Notes:
(a) Maximum impact occurred 0.4 km southwest of the plant.

Exhibit 21

Comparison of Air Pollutant Emission Rates of the El-Kureimat Power Plant and Emission Standards, 1991

Pollutant	Operating Mode		Standards		
	Gas	Mazout	EMH (a,b)	WB (c)	US-EPA (d)
Sulfur Dioxide (SO2) (tons per day for 2x600 MW)	0.13	377	N/A (e)	500 (unpolluted background)	38
Particulate (TSP) (mg/m^3 @ 3% O2)	7	252	N/A (e)	150	39
Nitrogen Oxides (NOx) (nanograms/joule)	86	130	N/A (e)	86 (Gas) 130 (Liquid)	86 (Gas) 130 (Liquid)

Notes:
(a) EMH = Egyptian Ministry of Health
(b) Egypt had no emission standards during 1980's.
(c) WB = World Bank
(d) US-EPA = United States Environmental Protection Agency
(e) N/A = Not Available

Exhibit 22

Comparison of Maximum Air Quality Pollutant Concentrations of the El-Kureimat Power Plant and Maximum Air Quality Standards, 1991, ($\mu g/m^3$)

Pollutant	Operating Mode (a)			Air Quality Standards,		
	100% Gas	100% Mazout	50% Gas 50% Mazout	EMH (b)	WB (c)	US-EPA (d)
Sulfur Dioxide (SO2)						
* 24 HR	0.06	143.8	71.9	200	500	365
* Annual	0.01	15.3	7.7	60	100	80
Particulates (TSP)						
* 24 HR	0.30	10.2	5.3	200	500	150
* Annual	0.03	1.1	0.6	N/A (e)	100	50
Nitrogen Dioxide (NO2)						
* 24 HR	13.9	15.7	14.6	200	500	365
* Annual	1.5	1.7	1.6	N/A (e)	100	100

Notes:
(a) Values do not Include Background Concentrations
(b) EMH = Egyptian Ministry of Health
(c) WB = World Bank
(d) US-EPA = United States Environmental Protection Agency
(e) N/A = Not Available

Exhibit 23

ABBREVIATIONS

ARE	Arab Republic of Egypt
BACT	Best Available Control Technology
CAA	Clean Air Act
CAA	Competent Administrative Authority
CFCs	Chlorofluorocarbons
CO	Carbon Oxide
dB(A)	Decibel (noise measuring unit)
ECAP	Environmental Compliance Action Plan
ECEP	Energy Conservation & Environmental Protection Project
EEA	Egyptian Electricity Authority
EEAA	Egyptian Environmental Affairs Agency
ERP	Egyptian Reform Program
FGD	Flue Gas Desulfurization
HCFAP	High Committee for Air Protection
hrd^{-1}	Hour per day
IEC	International Electrotechnical commission
IFC	International Finance Corporation
IRPA	International Radiation Protection Association
kV	Kilo Volt
kVm^{-1}	Kilo Volt per meter
lb/MBtu	Bound per Million British Thermal Unit
lb/MWhr	Bound per Million Watt Hour
mg/l	Milligram per liter
$\mu g/m^3$	Microgram per cubic meter
mg/Nm^3	Milligram per Natural cubic meter
MOEE	Ministry of Electricity and Energy
MOH	Ministry of Health
MSDSs	Material Safety Data Sheets
N/A	Not Available
NAAQS	National Ambient Air Quality Standards
ng/J	Nanogram per joule
NOx	Nitrogen Oxides
NSPS	New Source Performance Standards
PCBs	Polychlorinated Biphenyls
PM-2.5	Particulate matter with an aerodynamic diameter less than or equal 2.5 microns
PM-10	Particulate matter with an aerodynamic diameter less than or equal 10 Microns
ppm	particle per million
RFP	Request for Proposal
rms	root mean square
ROW	Right of Way
SCR	Selective Catalytic Reduction
SIP	State Implementation Plan
SNCR	Selective Non Catalytic Reduction
SO2	Sulfur Dioxide
t/d	Ton per day
TSP	Total Suspended Particulates
US-EPA	United States Environmental Protection Agency
WB	World Bank
WHO	World Health Organization