International Conference on HAZARDOUS WASTE : Sources, Effects and Management
12-16 December 1998, Cairo-Egypt

NP-3

EEA'S MANAGEMENT POLICY FOR BETTER ENVIRONMENTAL PERFORMANCE

By

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1. INTRODUCTION

The supply and use of electric energy has both positive and negative impacts. Pollution is the principal negative aspect with local effects, such as the particulates from power plant chimneys; regional effects such as acid rain; and global effects, of which the main one could be the effect of greenhouse gases such as carbon dioxide and methane on climate.

This has encouraged worldwide a more environmentally concerned approach by electricity generating enterprises, and is giving rise to new policies for fuel utilization and exhaust gas treatment plants.

The environmental aspects of energy production and use in Egypt have become, since the late 70's a subject of wide-ranging debate. Environmental awareness and anti-pollution campaigns have affected the formulation of energy policies: thus, environment has become a decisive factor influencing the day-to-day management as well as the suitability of any power project.

This paper focuses on the policy aspects of the Egyptian Electricity Authority in the field of environment protection as well as management of all environmental impacts resulting from electricity generating systems.

2. EEA'S FOSSIL POWER GENERATION

To meet the growing needs of the country, the installed capacity increased from 4700 MW in 1980/1981 to about 13300 MW in 1996/1997. The number of electricity generating power plants has reached now 34, only three of them are hydraulic which represent about 21% of the total installed capacity and the rest are fossil power plants. The unit size ranges between 15 MW in oldest power station to 600 MW at El-Kureimat power plant commissioned in 1998.

Consequently, fuel oil and natural gas products represent the most important contribution in electricity generation now. The share of hydro power has been reduced from 68% in 1970 to only 21% in 1996/1997. 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 57.7 milliards kWh in 1996/1997 and it is forecasted to reach about 126 milliards kWh in the year 2010.

3. FOSSIL FUEL CONSUMPTION

The existing thermal power plants use natural gas and mazout (heavy fuel oil) as a fuel. The total fuel consumption in 1996/1997 reached 10,214 Mtoe. Mazout represented 28.64% of the total fuel used, where as the share of natural gas was 71.30% and other kinds of fuel (gas - oil) did not exceed 0.06%. The percentage annual increase of the fuel was 6.5% in 1996/1997 (and the percentage increase of thermal energy generated was 6.5% for the same year).

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 untill it reached 71.3% in 1996/1997.

4. EEA'S APPROACH TO ENVIRONMENTAL AND SOCIAL IMPROVEMENTS

4.1 Legislative Commitment

In the past, some laws and decrees issued in Egypt were implicit for environmental considerations. Others were inacted to create instruments and bodies having to do with environmental issues such as the "High Committee for Air Protection" established in 1969. Today, the Egyptian Power Sector complies with the "Law on the Environment" issued in 1994 and its Executive Regulations. Also, in order to comply with the International Agents conditions, the EEA's day practice requires strict adherence to a set of levels for environmental protection dictated by the US-EPA and the international institutions such as US-AID, W.B., and EIB.

4.2 Institutional building

Currently, the EEA environmental unit is located within the studies and research department. Their experience lies mainly with air quality issurs, while water quality considerations are handled by EEA-Central Laboratories Dept. In 1991, EEA has taken the initiative to establish an Environmental Coordinating Committee (ECC) to review all aspects of environmental issues and advise EEA's management. According to the EEA - Chairman instruction no. (389) of 1991 the ECC has to strengthen its environmental capability to be able to carry-out its tasks.

The committee would ensure that all related environmental activities are properly addressed, designed, coordinated and executed. Accordingly, EEA has embarked on Environmental Management plan for which an environmental management organization has been established. The organization of the management unit is shown in Fig. 1 where

its responsibility extends as the project moves from engineering stage to full operation. This unit was already established in some power projects such as Shoubrah El-Kheimah, Cairo West, El-Kureimat, Sidi Krir 1 & 2 (under construction), Ayoun Moussa (under construction) power plants, ... etc. and is being established in the new power projects.

4.3 Environmental Impact Assessment (EIA)

In fact, no attention whatever has been paid to the environmental impact of electric generation in Egypt prior to 1975. However, with the need to construct large size power plants such as the 1300 MW of Shoubrah El-Kheima, or the 900 MW at Abu-Qir (near Alexandria) and the 600 MW at Abu-Sultan (near Ismailiah) after 1975, an Environmental Impact Assessment (EIA) has been strictly imposed at early stages of the feasibility study of any of these power plants and those newer ones to be constructed in the future. The present day practice attach greater importance to the EIA for any power plant, a process of identifying, predicting, interpreting and communicating the potential impacts of proposed plan or a specific project may have on the environment.

The procedures generally describe a process to examine, analyze, and assess the planned activities with a view to ensure environmentally sound and sustainable development. Such a process is essential to ascertain that environmental factors and values are integrated into the utility and Lending Agents decision making process.

The assessment of environmental factors and the identification of both beneficial and adverse impacts resulting from a project also provide the basis for initiating engineering, construction, and operational mitigating measures.

The early assessment of such factors allows greater compatibility of the project with the surrounding environment and permits a far more efficient and cost effective development process.

It is worth mentioning that some environmental corrective measures have been determined with respect to the new power projects as a result of the EIA studies. For instance, the EIA report for Shoubrah El-Kheima 4 x 325 MW power plant was prepared with strict adherence to the US-EPA standards. The EIA air quality study has determined that the optimal rate of dual fuel combustion would comprise 80% natural gas and 20% mazout to satisfy the US-EPA regulations. The stack height of each unit has reached 121m according to "Good Engineering Practice" (GEP) concept and, therefore, the stack plume dispersion model has proved acceptable loadings within the EPA-regulation limits.

4.4 Monitoring of Environmental Pollution

EEA is committed to environmental monitoring programs as an integral part of the EIA process. these programs function as an evidence that mitigation measures in environmental reports and permit stipulations are being adhered to strictly. Environmental monitoring reports become permanent documentation records for regulators compliance.

The first monitoring program for EEA has been with Shoubrah El-Kheima power project to monitor air pollution in the ambient atmosphere over a period of two years 1984-1986. In order to check the best mixing percentages possible to burn the dual fuel composed of natural gas and mazout in the boilers, the program started 6 months ahead of the plant commissioning. As an outcome of the results of the program it has been decided to add a fourth unit similar to 3 others at the Shoubrah site with a power of 325 MW each, without violating the Egyptian as well as the US-EPA limits. moreover, this monitoring program was also the basis of the EIA of expanding the existing Cairo West site of 4 x 88.5 MW power plant with additional 2 x 325 MW fifth and sixth units, within the same limits. Today, monitoring programs are continuously running around El-Kuriemat, Sidi Krir 1 & 2, Ayoun Moussa and other new power plants.

The monitoring programs in all these plants developed to include air quality, air emissions, water quality and water effluents. Table 1 gives the environmental monitoring program for El-Kureimat power plant project.

4.5 Water Pollution Controls

Cooling water discharge into the River Nile is constrained by a water temperature 5°C above the ambient Nile temp. The surface temp. of water would not exceed 35°C as per the existing regulations, where 30°C is the highest average of surface water temp. throughout the year. Cooling water discharge into the sea is constrained by a water temperature 10°C above the ambient sea temperature.

The waste water treatment system in power plants in Egypt is designed to treat the various waste streams resulting from the intake screen debris, clarifier blowdown, filter backwash water, demineralizer regeneration, turbine room sumps, oil storage area, boiler tube cleaning, air preheater cleaning, laboratory and sampling streams, stack cleaning, and washdowns.

The waste water treatment systems, generally adopted for new power plants, consist of the following:

a. Trash baskets for intake screen debris
b. Turbine room sump pumps
c. Clarifier blowdown sump pumps
d. Sludge holding tank
e. Filter backwash water sump pumps
f. Demineralizer effluent sump pumps
g. Demineralizer effluent neutralizer
h. Oil storage area sump pumps
i. Oil - water separator
j. Equalization basin
k. Sulfuric acid storage tank and pumps
l. Caustic storage tank and pumps
m. Sludge pumps
n. Sludge dewatering system
o. Final settling basins
p. Treated effluent pumps

The waste streams are treated to meet the effluent limitation guidelines given by law 4/94 as well as law no. 48 of 1982 issued by the Ministry of Irrigation which stipulates that prior to discharging waters to the River Nile.

A schematic flow diagram for the waste water streams for one 325 MW unit is shown in Fig. 2.

4.6 Solid and Hazardous Wastes

Solid wastes are mainly generated from boiler residuals and scale from the direct cooling system.

Hazardous wastes are limited to few flamables and chemical agents.

A solid and hazardous waste management system including their handling, collection, storage, transport and disposal is already enforced throughout the NUPS.

5. ENVIRONMENTAL IMPLICATIONS IN THE EGYPTIAN POWER SECTOR STRATEGY PRIORITIES

Limited indigenous energy resources in Egypt made it imperative to optimize its use. Thus, the Electricity Sector has crystallized, at the inception of 1980's, a long term strategy to guarantee the capability of meeting entirely the growing demand. The strategy has formulated the basic national goals of electric planning in the following policies:

- 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 & combined cycle (natural gas) 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 clean 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.
- 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 would be environmentally acceptable and a solution for depletable resources.

REFERENCES

[1] Bedrous, Maher Aziz & El-Sharkawi, Emad : Potential of Fossil Power Generation Expansion with Efficient Environmental Improvements: Egypt Case; WEC 15th Congress, Madrid, 20-25 Sept. 1992, Division 1, 1.2.25.

[2] Bedrous, Maher Aziz & El-Sharkawi, Emad: Environmental Impact Assessment for Power Projects in Developing Countries: A Paper Tiger or a Trustworthy Evaluation ?; WEC 16th Congress, Tokyo, Oct. 8-13, 1995, Division 4, 4.3.11.

[3] Kamel. A., Faragallah, F. : "More Efficient Use of Energy in Egypt and its Future Impacts", WEC 16th Congress, Tokyo, Japan, Oct. 8-13, 1995.

[4] Bedrous, Maher Aziz : "Environmental Improvements of the Electricity Industry in Egypt", The Fifth National Conference on Environmental Studies & Research, Cairo, Egypt, Dec. 10-13, 1996.

[5] Abdel Gelil, I. : "Energy Situation in Egypt, Efficiency Perspectives", The Fourth Solar Energy Conference, Cairo, Egypt, 1997.

[6] Abdel Gelil, Ibrahim; Bedrous, Maher and Others : "Environmentally Sound Energy Policies and Technologies for Egypt Sustainable Development", WEC 17th Congiess, Houston, Texas, USA, Sept. 1998.

[7] World Bank: EA Sourcebook, Vol. 1, WB Technical Paper No. 139.

TABLE 1

Environmental Monitoring Program for El-Kureimat Power Plant

Type of Monitoring	Parameters	Frequency	Number of location of stations
Air Quality	Sulfur dioxide particulates nitrogen oxides	Continuous	Points of max. ground level concentration from modeling
Air Emissions	Sulfur dioxide particulates nitrogen oxides	Continuous	Testing of emissions at stack of each unit.
Water Quality	Temp, pH, TSS, oil & grease, sulfur chlorine, copper, iron, BOD	Quarterly	One station upstream and one downstream of the plant
Water Effluents	Temp, pH, TSS, oil & grease, sulfur	Monthly	One station prior to discharge

FIGURE 1

Environmental Management Unit

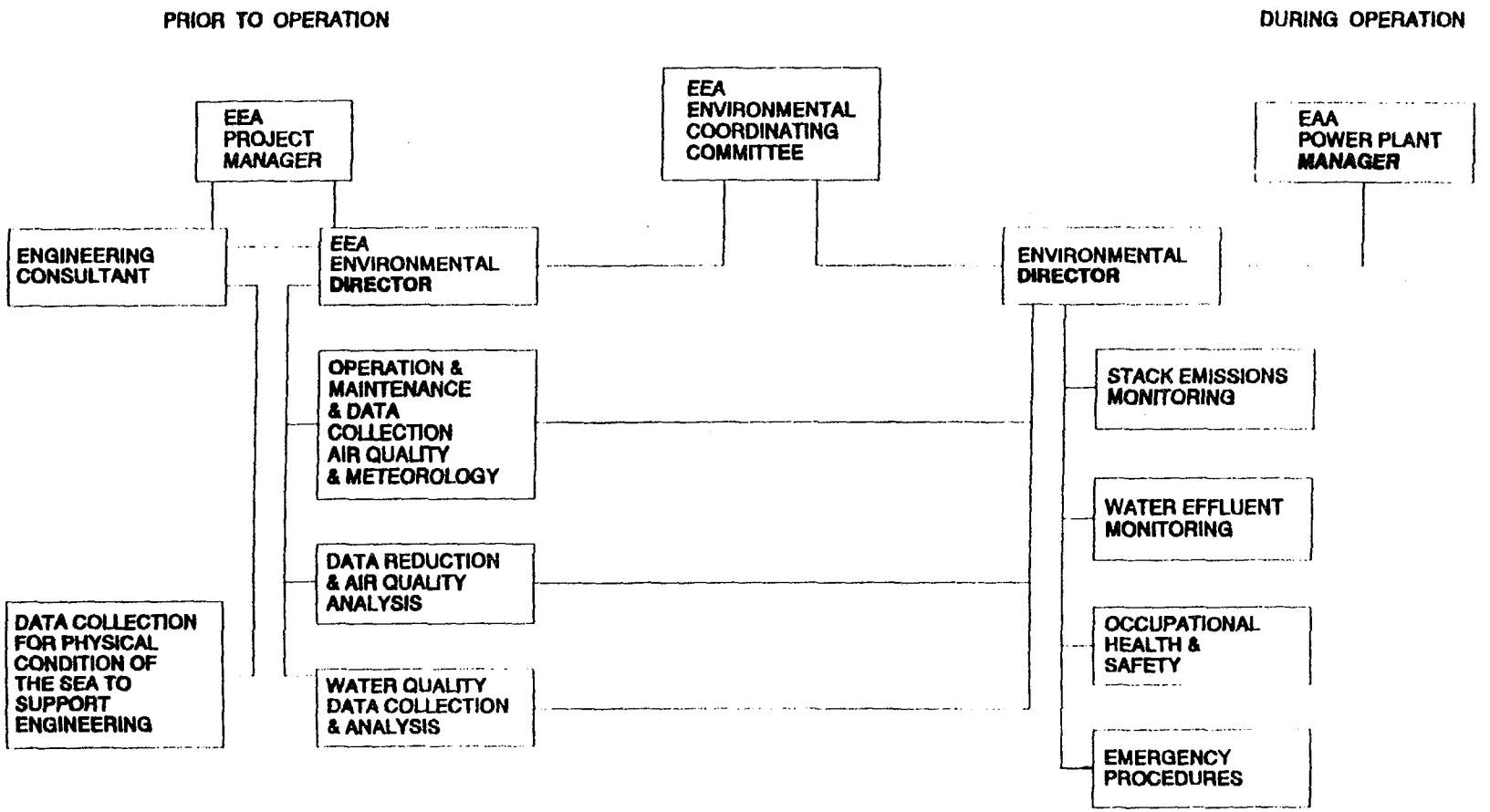
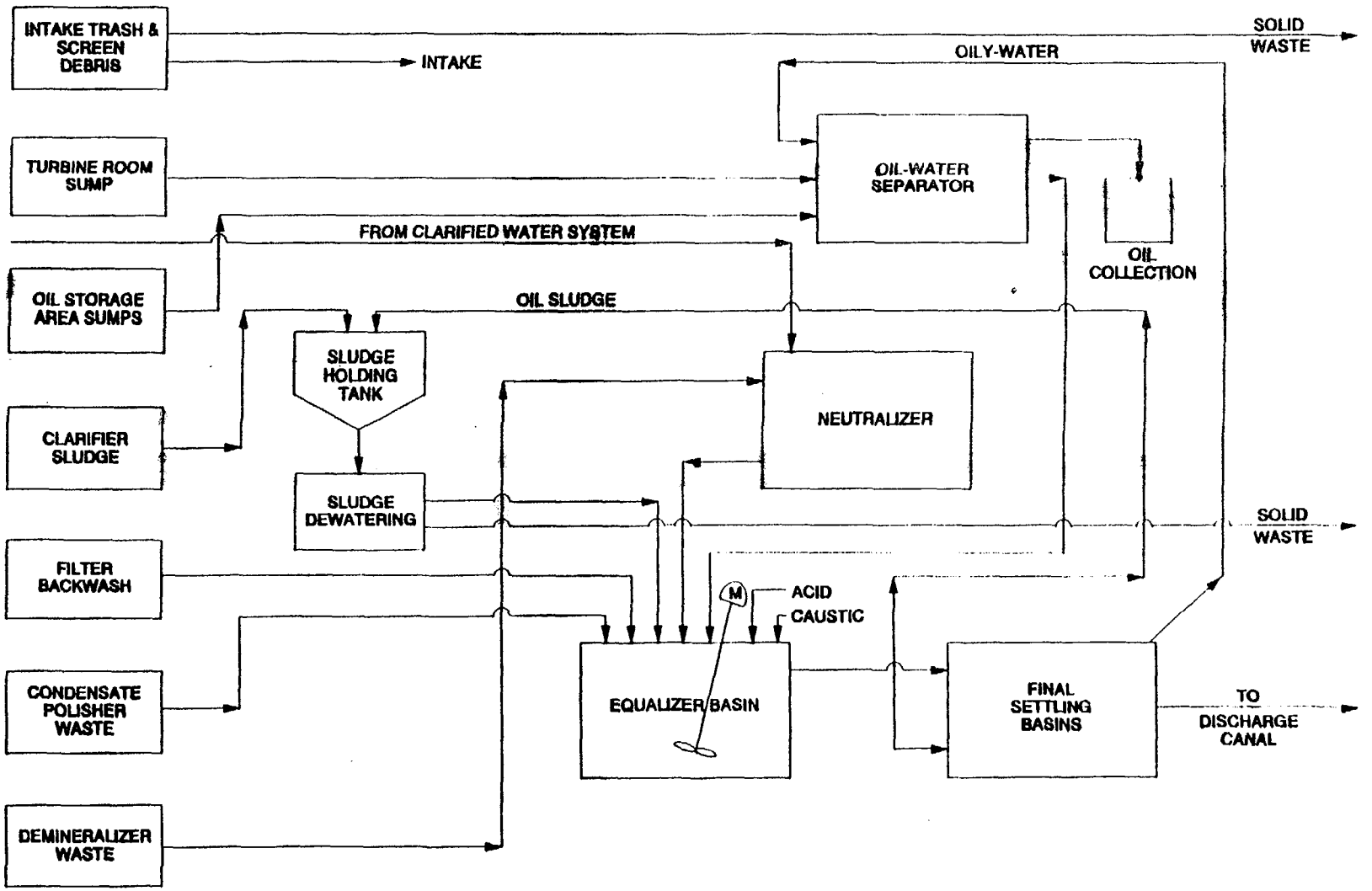


FIGURE 2

Waste Water Streams for One 300 MW Unit



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