

## **NON-TECHNICAL SUMMARY**

### **INTRODUCTION**

#### **Background**

*Environmental Resources Management (ERM) was commissioned by EDF Port Saïd East Power SAE (EPSEP) to prepare the technical documents and procedures required by the International Finance Corporation (IFC) concerning the environmental and social assessment of the proposed dual fuel steam power plant east of Port Saïd City. EDF is seeking financial assistance from the IFC for the construction and operation of this 2 x 341MW<sub>e</sub> power plant.*

*The proposed facility has been designated as a Category A project under World Bank/IFC rules and therefore requires a full Environmental Impact Assessment (EIA). Financing from IFC is conditional upon obtaining the environmental clearance from both the Egyptian regulatory authorities and the IFC.*

#### **Project Overview**

*EPSEP, a company incorporated in Egypt and owned by EDF International, proposes to build, own, operate and transfer the power plant at Port Saïd East, some 45 km south east of Port Saïd City and on the coast of the Mediterranean Sea. The site was allocated to EEA by Presidential Decree of the Arab Republic of Egypt. The EEA has given exclusive rights of use of the site to EDF. Construction of the plant is due to commence in May 2000 and will last approximately 33 months. Operation of the power plant will begin in 2003.*

*The proposed steam turbine power plant will consist of two identical gas-oil fired units designed for a rated capacity of 341.25 MW<sub>e</sub> net output each. The power plant will utilise natural gas as its primary fuel, delivered to the site via a new pipeline to be constructed by the Egyptian Natural Gas Company (Gas Co.). Heavy fuel oil (mazout) will be used as backup fuel for emergency use only and will not be used for more than 400 hours (or less than 5%) of operating time per year. The power output from the proposed plant will be sold to the EEA.*

*Sea water, pumped to the plant via a pipeline located offshore, will be used as non-contact cooling water and for process and sanitary water following desalination and demineralisation. Cooling water will be returned to the sea via a discharge pipeline.*

*The location of the proposed site is shown in Figure 1.*

### **THE ENVIRONMENTAL IMPACT ASSESSMENT**

#### **Contributors to the EIA Report**

*The Environmental Impact Assessment (EIA) report was prepared by ERM, based on information provided by EDF and its sub-contractors. Public consultation activities*

are being undertaken by ERM and Environmental Resources (Egypt) in conjunction with EDF. The EIA report draws heavily on the environmental assessment documentation prepared by EDF and submitted to the Egyptian Competent Administrative Authorities in March 2000, for local permitting purposes.

### **Scope of the EIA Report**

The EIA has been carried out in accordance with IFC 'Thermal Power - Guidelines for New Plants' (July 1, 1998), Egyptian 'Law 4 of 1994, Law for the Environment' and the Egyptian Environmental Affairs Agency's 'Guidelines for Egyptian Environmental Impact Assessment'.

The EIA has assessed the impacts of the construction and operation of the Port Saïd East power plant and has also considered the cumulative impacts of the plant and other developing industry in the project area. Consideration has also been given to the construction and operation of the gas pipeline and transmission lines which do not form part of the present project. Permits for these will be required from the relevant Competent Administrative Authorities.

The EIA report presents the full assessment of the environmental, health and safety impacts of the Port Saïd East power plant. This Non-Technical Summary presents a short resumé of the findings of the EIA report. For further details, reference should be made to the full EIA report.

## **PROJECT DESCRIPTION**

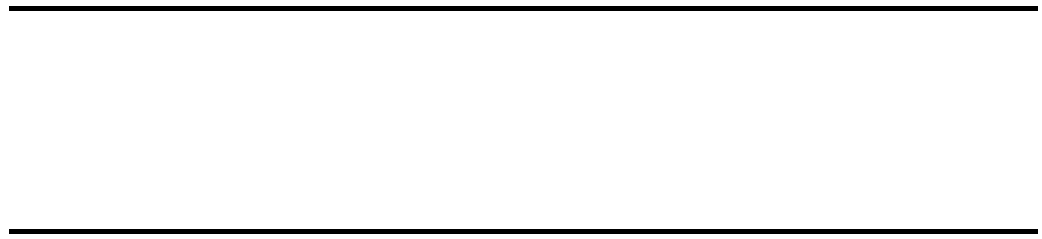
### **Overview of the Power Plant**

The power plant site will occupy an area of approximately 210,000m<sup>2</sup> and will include the following main elements:

- conventional steam power plant, comprising two steam turbine generators capable of delivering an output of 2 x 341.25 MW<sub>e</sub> which will be fed into the EEA grid system. Two boilers, fired by natural gas or heavy fuel oil in emergencies, will feed the turbines and exhaust fumes will be expelled through a stack 152 m high;
- cooling and process water pipelines with desalination, demineralisation and storage facilities; and
- supporting site infrastructure, switchyard, offices and workshops.

The layout for the power plant is presented in Figure 2.

*Figure 1 Location of the proposed Port Saïd East Power Plant*



Back of Fig. 1

*Figure 2*      *Layout of the proposed power plant*



Back of Fig 2.

## **Process Description**

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

- *Natural gas (or mazout in emergencies) will be mixed with air and combusted using low NO<sub>x</sub> technology, to generate steam from desalinated and demineralised sea water. This will drive two turbines serving electrical generators. The combustion of the fuel is supported by injection of air which is reheated by two air heaters before combustion. The process results in the generation of electricity and also produces hot exhaust gases.*
- *The steam is cycled from the boilers through the turbines to condensers. The condensers are cooled by a direct cooling system, abstracting water from, and discharging the used effluent to, the Mediterranean Sea. The condensate is then returned for recirculation within the boilers.*
- *The final exhaust gases will be discharged to the atmosphere via a 152 m high stack connecting both main boilers and the auxiliary boiler.*

## **Operational releases from the power plant**

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

- *Exhaust gases, will be emitted into the atmosphere from the stack as a result of fuel combustion. Emissions from the combustion of natural gas are carbon dioxide (CO<sub>2</sub>), water vapour, carbon monoxide (CO) and nitrogen oxides (NO<sub>x</sub>). Sulphur dioxide (SO<sub>2</sub>) and particulates, which are typically associated with coal and oil combustion, will only be produced in trace quantities during natural gas firing. In emergencies when heavy fuel oil (mazout) is used instead of gas, SO<sub>2</sub> and particulates will however be key emissions from the power plant.*
- *Heated cooling and process water will be discharged into the Mediterranean Sea via the discharge structure at a temperature of no more than 8°C at the point of discharge. Any oil and residual solids will be removed before discharge and the pH of discharged water maintained at between 6 and 9.*
- *Small volumes of solid wastes will be segregated, collected and disposed of by licensed waste disposal contractors.*

*The power plant incorporates a range of measures to eliminate or reduce operational releases within its design and layout, such as low NO<sub>x</sub> combustion equipment in the boilers, oil interceptors fitted to the site drainage system and effluent treatment facilities to treat wastewater prior to discharge. As a result, the power plant is designed to meet high environmental standards and to comply with the emission limits of the Arab Republic of Egypt and the World Bank.*

## **ANALYSIS OF ALTERNATIVES**

### ***Current Situation ('No Action' Option)***

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

### ***Alternative Technologies and Fuels***

*On the basis of security of supply, response to demand and economic advantages, the EEA has specified that the project must be a dual-fuel conventional steam turbine plant, and this is the system which EPSEP is obliged to provide under contract. The EEA have explained their rationale for choosing this technology in preference to combined cycle gas turbines as follows:*

- *conventional steam turbines are a proven technology for which expertise and manufacturing facilities already exist in Egypt. Capabilities in combined-cycle technologies is relatively low in Egypt. Local manufacture of the turbines will bring additional social and economic benefits to the country;*
- *existing and planned generating capacity using gas/oil-fired combined cycle units is already considered sufficient by the EEA and further reliance on this particular technology is not preferred;*
- *the Port Saïd plant will be a base load power station which is an appropriate use of steam plant;*
- *capital costs of steam plant are comparatively low; and*
- *heavy fuel oil is readily available. The use of light fuel oil would be economically prohibitive.*

*Natural gas has been selected as the main fuel for the power plant and compared to other fossil fuel generating technologies, gas-fired steam generators have one of the lowest emissions of carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) sulphur dioxide (SO<sub>2</sub>) and particulates.*

### ***Power Plant Design***

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

- *the stack has been designed to maximise buoyancy and dispersion of emissions and its height exceeds good engineering practice;*

- *the gas boilers will be equipped with low NO<sub>x</sub> burners, minimising emissions of NO<sub>x</sub> which is the key pollutant associated with combustion of natural gas;*
- *direct cooling water will be used to maximise generating efficiency, minimising visual impact, noise emissions and the potential for visible vapour plumes or ground fogging. Alternatives such as cooling towers and air cooled condensers, whilst using less water, result in lower generating efficiencies and also result in impacts such as vapour plumes, visual and noise impacts. The availability of water is not considered an issue for this project given the use of water from the Mediterranean; and*
- *cooling water will be supplied from a sustainable water supply, namely the Mediterranean Sea.*

### ***Alternative Sites***

*The BOOT contract awarded to EPSEP, designated the proposed site for power plant construction. The site area was allocated to EEA by the Government of Egypt. In selecting the required site, consideration was given to the following criteria:*

- *capital costs;*
- *operation and maintenance costs;*
- *requirement for natural gas;*
- *requirement for cooling water;*
- *demand loads for electricity;*
- *requirements for electricity transmission lines and sub-stations;*
- *potential environmental impacts; and*
- *site development.*

*The Arab Republic of Egypt has designated the whole Port Saïd East area as a Free Industrial Zone for industrial, tourist and urban activities and the area is currently undergoing development. As a result, the Port Saïd East area was identified as the centre of load for current and future electricity demand in the region.*

*Following negotiations with the Governorate of Port Saïd, the planned location of the Port Saïd East power plant was found to be the most cost effective site for the following reasons:*

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

*In addition, the power plant site will bring socio-economic benefits to the area, through employment opportunities, supply contracts and the effects of project expenditure within the local economy.*

## KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

### **Introduction**

*A thorough assessment of the impacts of the proposed plant has been carried out based on information provided by EDF and its sub-consultants. A combination of quantitative and qualitative assessment techniques, ranging from computer modelling for air, water and noise impacts to ecological and marine surveys and visual evaluation, have been undertaken. The results of the assessment work have been compared with the environmental standards set by the Government of the Arab Republic of Egypt and the World Bank, whichever is the more stringent.*

*The conclusions of the assessment are that (with suitable mitigation measures described in Tables 2 and 3) the project is in compliance with the environmental requirements of both the Government of Egypt and the World Bank. Table 1 provides a summary of anticipated impacts in relation to the Egyptian and World Bank environmental guidelines for stack emissions, ambient air quality, liquid effluent and noise. The following discussion highlights some of the key considerations and results of the assessment.*

### **Air Quality**

#### *Construction Dust*

*Construction activities will result in locally high levels of dust however no residential receptors or sensitive environments lie in the vicinity of the power plant. Existing concentrations of airborne dust are already high in this arid area. Potential impacts from dust emissions on site will be significantly reduced by careful management and the implementation of mitigation measures to reduce dust generation.*

#### *Stack Emissions*

*The power plant will burn natural gas as its primary fuel. As a result, the principle pollutant during normal operation will be NO<sub>x</sub>. During emergency operation (and for not more than 5% of operating time), the burning of heavy fuel oil will result in emissions of particulate matter and SO<sub>2</sub>, along with trace amounts of metals. Emissions from the power plant will meet Egyptian and World Bank Guidelines.*

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

*Atmospheric Dispersion Modelling was also undertaken of the power plant when fired on Heavy Fuel Oil (Mazout) which will occur for less than 5% of the operating time. The results of this atmospheric dispersion modelling show that each parameter (SO<sub>2</sub>, NO<sub>2</sub>, CO and PM10) comply with both Egyptian regulations and World Bank guidelines. The impact of the power plants while burning natural gas 95% of the running time and HFO the remaining time (5%) is considered as minor.*

Table 1

## Environmental Impacts and Environmental Guidelines

Impact Area	Predicted Max. Concentration from Port Said East Power Plant	Egyptian Standard	World Bank Guideline
<b>Stack emissions (100% load) (when firing Natural Gas)</b>			
NO <sub>x</sub>	<300 mg Nm <sup>-3</sup>	- (1)	320 mg Nm <sup>-3</sup>
SO <sub>2</sub>	<300 mg Nm <sup>-3</sup>	2,500 mg Nm <sup>-3</sup>	2,000 mg Nm <sup>-3</sup>
TSP - General (all sizes)	<50 mg Nm <sup>-3</sup>	500 mg Nm <sup>-3</sup> [2]	50 mg Nm <sup>-3</sup>
<b>Stack emissions (100% load) (when firing Heavy Fuel Oil (&lt; 5% of total annual operating time))</b>			
NO <sub>x</sub> - oil firing	460 mg Nm <sup>-3</sup>	-	460 mg Nm <sup>-3</sup>
SO <sub>2</sub> - oil firing	4,600 mg Nm <sup>-3</sup>	2,500 mg Nm <sup>-3</sup>	2,000 mg Nm <sup>-3</sup>
TSP - General (all sizes)	300 mg Nm <sup>-3</sup>	500 mg Nm <sup>-3</sup> [2]	50 mg Nm <sup>-3</sup>
<b>Ground Level Concentration (when firing Natural Gas)</b>			
NO <sub>x</sub> - 1 hour	15 µgm <sup>-3</sup> [3]	400 µgm <sup>-3</sup>	-
NO <sub>x</sub> - 24 Hours	6 µgm <sup>-3</sup> [3]	150 µgm <sup>-3</sup>	150 µgm <sup>-3</sup>
NO <sub>x</sub> - 1 year	0.7 µgm <sup>-3</sup>	-	100 µgm <sup>-3</sup>
SO <sub>2</sub> - 1 Hour	0	350 µgm <sup>-3</sup>	-
SO <sub>2</sub> - 24 Hours	0	150 µgm <sup>-3</sup>	150 µgm <sup>-3</sup>
SO <sub>2</sub> - 1 Year	0	60 µgm <sup>-3</sup>	80 µgm <sup>-3</sup>
PM <sub>10</sub> - 24 Hours	1 µgm <sup>-3</sup> [3]	70 µgm <sup>-3</sup>	150 µgm <sup>-3</sup>
PM <sub>10</sub> - 1 Year	0.15 µgm <sup>-3</sup> [3]	-	50 µgm <sup>-3</sup>
<b>Liquid Effluent</b>			
pH	6 - 9	6-9	6 - 9
BOD	< 60 mg/l	60 mg/l	-
Chromium	< 0.5 mg/l	1 mg/l	0.5 mg/l
Copper	<0.5 mg/l	1.5 mg/l	0.5 mg/l
Iron	<1 mg/l	1.5 mg/l	1.0 mg/l
Zinc	<1 mg/l	5 mg/l	1.0 mg/l
Oil and Grease	<10 mg/l	15 mg/l	10 mg/l
Total Suspended Solids (TSS)	< 50 mg/l	60 mg/l	50 mg/l
Residual Chlorine (total)	< 0.2 mg/l	-	0.2 mg/l [4]
Temperature Increase (°C) [5]	≤ 8°C at discharge point and < 3°C at 300 m	≤ 10°C at discharge point	≤ 3°C at edge of mixing zone (300m)
<b>Noise [6]</b>			
Daytime (max)	max. 57 dB(A)	60-70 dB(A)	70 dB(A)
Night time (max)	max. 54 dB(A)	50-60 dB(A)	70 dB(A)
(1) The Egyptian Standards for Nitrogen Oxides are given in NO <sub>2</sub> ..			
(2) The Egyptian Standard for TSP (all sizes) refers to emissions far from inhabited urban areas which is relevant to the proposed project site.			
(3) 98 <sup>th</sup> Percentile			
(4) 'Chlorine shocking' may be preferable in certain circumstances, which involves using high chlorine levels for a few seconds rather than a continuous low level release. The maximum value is 2 mg/l for up to 2 hours, which must not be more frequent than once in 24 hours (and the 24 hour average should be 0.2 mg/l).			
(5) The effluent should result in a temperature increase of no more than 3 °C at the edge of the zone where initial mixing and dilution take place. Where this zone is not defined, use 100 m from the point of discharge when there are no sensitive aquatic ecosystems within this distance.			
(6) There are no sensitive receptors for noise within 2 km of the power plant. The area has been categorised as 'industrial area-heavy industry' with respect to Egyptian ambient noise standards and 'Industrial commercial' with respect to World Bank guidelines.			

*The assessment indicates that maximum ground level concentrations of NO<sub>2</sub> (the key pollutant), are predicted to occur approximately 2 km south of the power plant. This area is uninhabited and currently undeveloped, and does not support any sensitive environments or habitats. The maximum concentrations reached expressed as an annual mean and daily mean concentrations, and shown in Table 1, are a very small fraction of the value required to equal that which would cause an exceedence of either World Bank or Egyptian guidelines.*

### **Marine Environment**

*Cooling water and process water for power plant operation will be drawn from the Mediterranean pipelines. Potable water will be supplied to the power plant via jerry cans. Waste cooling and process water will be returned to the sea via a discharge pipeline whilst sanitary waste water will be collected in septic tanks. These will be emptied periodically by a licensed contractor. No ground water or other surface water will be used during power plant construction and operation. The key potential impacts of the power plant on the aquatic environment will therefore be impacts to marine flora and fauna and littoral drift during power plant construction and operation.*

*The marine environment surrounding the project site is characterised by generally good water quality. The subtidal region is biologically deteriorated with very poor biodiversity and no coral reefs or sensitive ecosystems. No commercial fishing occurs in the vicinity of the project. The coast at the project site is an area of sediment accretion.*

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

*Power plant operation will result in a heated plume of waste cooling and process water being discharged into the sea. All discharges of process water into the Mediterranean will be treated prior to discharge to ensure that the Egyptian and World Bank waste water quality guidelines are met. Treatment includes neutralisation, oil separation, flocculation and filtration. Effects on ambient water quality will be further reduced through implementation of good site management practices including adequate site drainage.*

*The resulting discharge will be released at a temperature of no more than 8°C. Thermal modelling of the discharge plume shows that the point at which the plume has decreased in temperature to 3°C above ambient, lies at approximately 100 m from the discharge. The mixing zone has been defined by the EEA to be 300m from the point of discharge.*

*With regard to physical oceanography, the presence of the intake and discharge pipelines have been designed to minimise any local changes to the current regime and attendant changes in scouring and deposition.*

*Beach access, fishing and navigation are not predicted to be significantly affected by the presence of the intake and discharge structures. The channels will be clearly marked with beacons to minimise any hazard risks.*

### **Noise Impacts**

#### *During Construction*

*The construction of the Port Saïd East power plant is expected to generate a maximum noise level of 57 dB (A) during the day at the nearest receptor (Fish/Shrimp farm) and 54 dB (A) at night. These worst-case construction noise levels are both within Egyptian and World Bank <sup>(1)</sup> guidelines, and for most of the construction period, the noise levels will be lower than these values. There are no residential or sensitive receptors within 2 km of the plant.*

*Construction traffic on local roads will also generate additional noise, however noise levels on local roads predicted for peak construction activity (end 2002) is expected to be only 0.3 dB (A) above ambient levels. This magnitude of increase is generally not perceptible to the human ear, consequently no construction traffic impacts are predicted.*

#### *During Operation*

*The potential noise emissions from the Port Saïd East plant during operation have been modelled to provide noise contours in the area around the site. The predicted operational noise levels at the site boundary and at all receptors are below the Egyptian and World Bank guidelines during daytime and night-time.*

### **Flora and Fauna**

*No areas protected for their conservation value are located on, or in the vicinity of the project area. The proposed site itself and the surrounding land is poorly vegetated with much of the area having been disturbed by mine clearance. Given that the potential impacts of construction and operation of the power plant are likely to be localised, and good site management practices will be implemented, no significant effects are predicted.*

### **Land Use, Landscape and Visual Impacts**

*The land use at the project site is un-used, infertile desert scrub land. The loss of this land to the power plant development is therefore not significant.*

*The surrounding land use is sparsely developed with industrial/agro-industrial activities and tourist developments to the south east. As the land is flat with limited vegetation, all existing views will be strongly influenced by the power plant, however*

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

*given that the only sensitive receptor in the area is the tourist complex 7 km to the south east, the visual intrusion of the power plant will be minimal.*

*The potential landscape and visual impacts of the project are therefore expected to be minor and not significant.*

### ***Soils, Geology and Hydrology***

*Due to the characteristics of the soils and geology of the site, in particular the lack of any sensitive features, and the mitigation measures proposed as part of the construction and operation of the power plant, no significant impacts are predicted to occur.*

### ***Traffic***

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

*The greatest potential for traffic impacts to occur arises during a short period at peak construction in 2002. Although there is some potential for increased congestion on the main roads to the power plant, since these impacts will only occur during the peak construction phase and during peak hours, the overall impact is not considered to be significant. Mitigation measures will be put in place to reduce the potential for impacts to arise.*

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

### ***Socio-economics and Socio-cultural Effects***

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

### ***Archaeology, Historical and Cultural Heritage***

*From a baseline study conducted by EDF, no available information was found which identified any archaeological, historic or cultural remains on the site or in the surrounding area including the area alongside the access road. Consequently, no impact is predicted to occur on any known archaeological, historic or cultural resources. EPSEP has submitted a Permit request to the Supreme Council of Antiquities in order to verify that the site is not of archaeological interest.*

*EPSEP have incorporated mitigation measures into the construction programme to ensure that any potential finds of significance are recorded and are accorded the required protection in consultation with the Competent Administrative Authority.*

### ***Natural Disaster Risks***

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

### ***Major Accident Hazards***

*Given the land uses surrounding the Port Saïd East power plant and the measures incorporated into the design of the plant to minimise the risk from fire and explosion, the plant is not anticipated to pose a potential risk of any significance to any third party facilities.*

### ***Solid Waste Management***

*The management of wastes during construction and operation of the power plant will include mitigation measures to collect and store waste on-site, record all consignments of hazardous or contaminated waste for disposal and periodically audit waste contractors and disposal sites to ensure that disposal is undertaken in a safe and environmentally acceptable manner.*

*During both construction and operation, all wastes including general waste, packaging waste, commercial wastes, raw-water pre-treatment sludge, tank sludge, interceptor sludge and septic tank sludge will be disposed of by licensed waste contractors.*

*Solid waste management is not predicted to cause any significant impacts.*

### ***Occupational Health and Safety***

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

### ***Associated Infrastructure***

*Connections to existing gas and electrical facilities will be the responsibility of Gas Co. and the EEA respectively. Both will require permits from the EEAA.*

*The gas connection, approximately 10 km long, traverses an area of desert lands with no settlements and all area has been obtained by the Governorate of Port Saïd by Presidential Decree. No environmental or social impacts are anticipated.*

*Three transmission lines, to be constructed by the EEA, will connect the plant to substations to the north west and south east of the plant. The routes for these transmission lines have not yet been established. However given the location of the substations, the undeveloped desert location and the lack of known traditional or seasonal uses in this area, no significant impacts are anticipated. Permits will be*

*required from the EEAA, the Port Saïd Governorate and the Supreme Council of Antiquities which will ensure that any potential impacts are minimised.*

## **ENVIRONMENTAL MANAGEMENT AND MONITORING - THE ENVIRONMENTAL ACTION PLAN (EAP)**

*The Environmental Action Plan (EAP) includes mitigation measures, design of monitoring programmes where appropriate, and specification of management measures (including institutional responsibility and training requirements).*

*The key features of the EAP relate to air quality, marine discharge and implementation of good site management practice. The EAP is summarised in Tables 2 and 3 which relate to construction and operational phases respectively.*

## **PUBLIC CONSULTATION AND DISCLOSURE**

*Public consultation has been carried out according to the Public Consultation and Disclosure Plan (PCDP) for the project. The main elements of public consultation and disclosure include:*

- *discussions with local stakeholders and interested parties during preparation of the environmental documents for local permitting requirements;*
- *discussions with local stakeholders during scoping and preparation of the EIA;*
- *press advertisements describing the project and inviting interested parties to attend the public meeting and review the Draft Final EIA Report;*
- *the organisation of a Public Meeting in the Port Saïd Governorate with full participation of the Governor;*
- *preparation of this non-technical summary in Arabic, describing the project, its potential environmental impacts and the measures to address them and disclosure of this document, together with disclosure of the EIA report locally and in Cairo for 60 days; and*
- *on-going consultation through an 'open-door' policy during construction and operation of the power plant.*

*The process and results of the public consultation activities held to date are documented in the EIA.*

*A number of environmental concerns were raised during consultation activities undertaken including:*

- *the potential for polluted discharge water to affect tourist activities to the south east;*
- *the potential effect to turtle populations in the Mediterranean;*

- *the potential impact of the thermal discharge on local fish populations; and*
- *the potential for the inlet and discharge structures to affect sediment erosion and accretion and the resulting effects of sediment supply to beaches down-current.*

*These issues have been taken into account and thoroughly addressed in the EIA through assessment and the inclusion of mitigation, management and monitoring requirements which are detailed within the EAP.*

### ***Ongoing Consultation and Disclosure***

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

**Table 2 Construction Impact Mitigation, Monitoring and Management Measures**

Issue/Impact	Mitigation Measures	Monitoring	Management and Training
<i>Air Quality</i>			
Dust emissions caused by construction activities, construction vehicle movements, and transport of friable construction materials.	<p>Implementation of <i>good site practices</i> including:</p> <ul style="list-style-type: none"> <li>• appropriate siting and maintenance of stockpiles of friable materials so as to minimise dust blow;</li> <li>• minimising drop heights for material transfer activities such as unloading of friable materials;</li> <li>• construction phase to begin with construction of access roads;</li> <li>• roads will be kept damp via a water bowser</li> <li>• roads will be compacted and gravelled if necessary;</li> <li>• site roads will be maintained in good order;</li> <li>• regulation of site access;</li> <li>• sheeting of lorries transporting friable construction materials and spoil;</li> <li>• enforcement of vehicle speed limits on unmetalled roads to &lt; 35 km/h.</li> </ul>	<p>Initiate baseline air quality survey of NO<sub>2</sub> and SO<sub>2</sub> using diffusion tubes. (See Section 8.2.1) and continue for 1 year.</p> <p>Measurements and analysis of NO<sub>2</sub> and SO<sub>2</sub> to be made on a monthly basis by a contracted analytical laboratory and submitted to EPSEP.</p> <p>Annual reporting of summary results (or more if requested) and submitted to the EEAA and IFC.</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP responsible for management of firm contracted to undertake diffusion tube monitoring and analysis. Submission of annual summary reports to EEAA and IFC.</p> <p>Basic training of person employed to collect and change tubes.</p> <p>EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practice.</p>

<b>Issue/Impact</b>	<b>Mitigation Measures</b>	<b>Monitoring</b>	<b>Management and Training</b>
<i>Marine Environment</i>			
Dredging and construction of the intake structure and pipe-laying for water intake and discharge pipes - increased suspended sediment and pollutant loads, permanent loss and disturbance to marine flora and fauna	<p>The following measures will be taken:</p> <ul style="list-style-type: none"> <li>• Construction Method Statement to be produced by the Contractor.</li> <li>• dredged areas limited to minimum area required</li> <li>• disposal of dredged sediments to an agreed site</li> <li>• all works will be made clearly visible using flags, beacons and/or signals</li> <li>• beach area will be reinstated following construction</li> </ul>	Benthic survey undertaken February 2000 along 4 profiles fronting the site to a distance of 700m. Report should be maintained for later monitoring and evaluation during operation.	EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practice.
Protection of Turtle populations <sup>(1)</sup>	<ul style="list-style-type: none"> <li>• no long term storage of material or equipment on the beach</li> <li>• use of strong light kept to a minimum with use of red light if feasible</li> <li>• adopt a stringent solid waste collection, storing and disposal system</li> <li>• restore the beach area to its natural state following construction and avoid the creation of pits</li> <li>• workforce educated not to collect or disturb turtle eggs if encountered and any finds to be reported to the EEAA</li> </ul>	Ongoing monitoring of beach erosion, water quality and oil pollution.	These mitigation measures must be a condition of any construction contracts commissioned.

(1) Precautionary measures only, since it is not considered that the project will have any impact on turtle populations in the Mediterranean.

<b>Issue/Impact</b>	<b>Mitigation Measures</b>	<b>Monitoring</b>	<b>Management and Training</b>
Contamination of the marine environment as a result of construction activities on land e.g. spillages, disposal of liquid wastes; surface run-off, exposure of contaminated soils ( <i>See also under "Soils and Hydrology"</i> )	<p>Mitigation activities will include the following:</p> <ul style="list-style-type: none"> <li>• no discharge of effluents into the sea - all effluents shall be collected and removed off site for treatment by approved firms;</li> <li>• development of a site drainage plan which reduces flow velocity and sediment load, to ensure that even during storm events, only minimal amounts of sediment reach the sea;</li> <li>• protection of temporary stockpiles of soil from erosion by using a reduced slope angle where practical, sheeting and by incorporating sediment traps in drainage ditches.</li> <li>• maintenance of well kept construction site</li> </ul>	<p>Continuous monitoring is required to ensure the implementation of good management practices during construction.</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practices.</p>
<b>Noise</b>			
Increased noise in the project area as a result of the use of noisy machinery and increased vehicle movements	<p>Implementation of <i>good site practices</i> including:</p> <ul style="list-style-type: none"> <li>• enforcement of vehicle speed limits</li> <li>• strict controls of vehicle routing</li> <li>• diesel engine construction plant equipment to be fitted with silencers.</li> <li>• limited noisy construction activities at night</li> <li>• prohibition of heavy vehicle movements at night</li> <li>• use of protective hearing equipment for workers</li> </ul>	<p>Continuous monitoring and supervision by EPSEP is required to ensure the implementation of good site management practices by all contractors during construction.</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practices.</p>
<b>Flora and Fauna</b>			
Site Clearance - Vegetation removal and habitat disturbance	<p>Good site management practices should be observed to ensure that disturbance of habitats off-site are minimised. Specific mitigation measures include restricting personnel and vehicles to within construction site boundaries, laydown areas and access roads.</p>	<p>Continuous monitoring and supervision by EPSEP is required to ensure the implementation of good site management practices by all contractors during construction.</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practices.</p>

<b>Issue/Impact</b>	<b>Mitigation Measures</b>	<b>Monitoring</b>	<b>Management and Training</b>
<i>Soils and Hydrology</i>			
Site clearance, excavation and disposal of material, exposure of potentially contaminated soils, spillage or leakage of substances on land, movement of equipment and vehicles on site.	<p>The potential for impacts are largely dependent on management of the construction site and activities. The following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> <li>• development of effective site drainage systems</li> <li>• restriction of access only to construction site areas</li> <li>• monitoring and control of spoil</li> <li>• disposal of waste materials unsuitable for reuse on-site, (e.g. for landscaping) at appropriately licensed sites</li> <li>• bunding (with at least 110% capacity) around proposed storage areas for fuel and chemicals</li> <li>• provision of oil and suspended solid interceptors</li> <li>• management of excavations during construction to avoid the generation of drainage pathways to underlying aquifers</li> <li>• provision of impermeable bases in operational areas to prevent absorption of spillages</li> </ul>	<p>Continuous monitoring is required to ensure the implementation of good management practices during construction.</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practices.</p>
<i>Traffic and Transport</i>			
Disruption, noise and increased air pollution due to increased traffic, heavy loads and abnormal loads.	<p>Standard good practice measures will be implemented as follows:</p> <ul style="list-style-type: none"> <li>• adherence of abnormal load movements to prescribed routes, outside peak hours and advance publication of movements if required</li> <li>• construction shifts will be staggered</li> <li>• scheduling of traffic to avoid peak hours on local roads</li> <li>• transportation of construction workers by contract bus</li> </ul>	<p>Continuous monitoring is required to ensure implementation of good management practices during construction.</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practices.</p>

<b>Issue/Impact</b>	<b>Mitigation Measures</b>	<b>Monitoring</b>	<b>Management and Training</b>
<i>Socio-Economic Environment</i>			
Positive Impacts identified	Public and Industry Relations will be maximised through open dialogue between EPSEP (through the Assistant Plant Manager who has direct responsibility for EHS Liaison) and local authority, public and industry representatives	Record local employment provided by the project.	Responsibility of EPSEP
<i>Archaeology</i>			
Potential chance finds of archaeological remains during construction	<p>The project site does not lie on, or in the immediate vicinity of any known archaeological areas of interest.</p> <p>If remains are found EPSEP is committed to:</p> <ul style="list-style-type: none"> <li>• cease activities and consult Antiquities authority;</li> <li>• protection in situ if possible;</li> <li>• excavation of areas where protection not feasible;</li> <li>• preparation of a Chance Finds Procedure and Method Statement.</li> </ul>	Supervision of construction activities.	<p>EPSEP to ensure that all workers on site are aware of the importance of archaeological remains and must report any potential finds immediately.</p> <p>EPSEP will allocate responsibilities in accordance with the Chance Finds Procedure.</p> <p>Immediate liaison with Competent Administrative Authority should a potential find be uncovered.</p>
<i>Natural Disasters</i>			
Flash Flooding	<p>Good engineering design will incorporate the following mitigation measures:</p> <ul style="list-style-type: none"> <li>• construction of drainage system equipped for 1:25 year event;</li> <li>• drainage system designed to dissipate flood waters from main plant areas and direct potentially contaminated waters through the oil interceptor</li> </ul>	No monitoring measures are envisaged	EPSEP to ensure that all workers on site receive training in emergency preparedness and response procedures.

<b>Issue/Impact</b>	<b>Mitigation Measures</b>	<b>Monitoring</b>	<b>Management and Training</b>
<i>Solid Waste Management</i>	<p>Good practice measures such as the following:</p> <ul style="list-style-type: none"> <li>• all waste taken off-site will be undertaken by a licensed contractor and EPSEP will audit disposal procedure</li> <li>• segregation of wastes and safe storage</li> <li>• recording of consignments for disposal</li> <li>• prior agreement of standards for storage, management and disposal with relevant authorities</li> </ul>	<p>Continuous monitoring is required to ensure the implementation of good management practices during construction.</p> <p>Implementation of Good Site Management practices shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP to ensure all contractors and sub-contractors working on site are aware of EAP and all employees are given basic induction training on good construction and site management practices.</p>
<i>Occupational Health &amp; Safety</i>	<p>Good local and international construction practice in Environment, Health and Safety (EHS) will be applied at all times and account will be taken of local customs, practices and attitudes. Measures include:</p> <ul style="list-style-type: none"> <li>• implementation of EHS procedures as a condition of contract all contractors and sub-contractors;</li> <li>• clear definition of the EHS roles and responsibilities of all construction companies and staff</li> <li>• management, supervision, monitoring and record-keeping as set out in plant's operational manual</li> <li>• pre-construction and operation assessment of the EHS risks and hazards</li> <li>• completion and implementation of Fire Safety Plan prior to commissioning any part of the plant;</li> <li>• provision of appropriate training on EHS issues for all workers</li> <li>• provision of health and safety information;</li> <li>• regular inspection, review and recording of EHS performance; and</li> <li>• maintenance of a high standard of housekeeping at all times.</li> </ul>	<p>Continuous monitoring is required to ensure the implementation of EHS Policies, plans and practices during construction.</p> <p>Implementation of Good Site Management practices and the EHS policies shall be the responsibility of all contractors on site under supervision of the Assistant Plant Manager.</p>	<p>EPSEP to ensure all contractors and sub-contractors for workers on site include reference to the requirements of the EAP and are aware of working on site are aware of EAP and the EHS policies and plans., and aAll employees should be given basic induction training on EHS policies and practices.</p> <p>EPSEP is responsible for ensuring that a Fire Safety Plan, which conforms to NFPA 850, is prepared and implemented prior to commissioning of any part of the plant.</p>

**Table 3 Operational Impact Mitigation, Monitoring and Management**

Impact/Issue	Mitigation Measure	Monitoring	Management and Training
<i>Air Quality</i>			
Emissions from stack are not expected to exceed standards	Mitigation measures have already been included in the design of the plant and, given EPSEP's contractual commitment to use heavy fuel oil for <5% of operating time, no further mitigation measures are proposed.	Automatic monitoring of stack emissions for NO <sub>x</sub> , SO <sub>2</sub> , particulate matter and carbon monoxide (CO) <i>via</i> test ports installed in the main stack.	Records must be kept and summary data (including any deviations from Egyptian and World bank standards) will be submitted to the Government and IFC on an annual basis (or more frequently if required).
	EPSEP will however demonstrate the validity of the conclusions drawn in the EIA report.	In addition, conduct surrogate performance monitoring.	Annual reporting by EPSEP to Government and IFC (or more frequently if required) highlighting key features and comparing results with air quality standards and prediction in EIA report.
Ambient air quality affected by emissions from the power plant	EPSEP will demonstrate the validity of the conclusions drawn in the EIA report. If ground level concentrations are found to be above local and World Bank standards options for further mitigation will be discussed.	Install one continuous NO <sub>x</sub> , SO <sub>2</sub> & TSP analyser to monitor short-term concentrations in the area predicted to have the highest impacts on humans (as there are no sensitive environments). The analyser will also include a continuous monitor of meteorological conditions (temperature, wind speed and direction) The analyser will be owned and operated by EPSEP.	

<b>Impact/Issue</b>	<b>Mitigation Measure</b>	<b>Monitoring</b>	<b>Management and Training</b>
<p><i>Marine Environment</i></p> <p>Discharge of process and cooling water to sea</p>	<p>The design of the intake and cooling water structures have already incorporated measures to reduce impacts. In addition, good site management practices including the following will be implemented:</p> <ul style="list-style-type: none"> <li>• neutralisation, oil separation, flocculation and filtration of any contaminated water before discharge;</li> <li>• no disposal of solid wastes into the discharge structure;</li> <li>• regular maintenance of site drainage system to ensure efficient operation;</li> <li>• all discharges will comply with local Egyptian and World Bank guidelines.</li> </ul> <p>In addition, EPSEP will demonstrate the validity of the conclusions drawn in the EIA report. If pollutant concentrations in the discharge or impacts to the surrounding marine environment are found to be above local and World Bank standards or unacceptable, options for further mitigation will be discussed.</p> <p>Avoidance of strong lights facing the beach area which might otherwise attract nesting turtles.</p> <p>Educate workforce not to collect or disturb any turtles or eggs if encountered and to report all finds to the EEAA.</p>	<p>Prepare regular water quality monitoring programme including:</p> <ul style="list-style-type: none"> <li>• quality of all water prior to discharge (continuous monitoring of all discharged water for temperature and pH, daily monitoring of process water for COD, TSS, oil &amp; grease and residual chlorine and monthly monitoring of heavy metals and other pollutants)</li> <li>• ambient water quality in the area affected by the discharge plume (3-monthly monitoring of temperature, pH, COD, BOD, TOC, DO, TSS, oil &amp; grease, residual chlorine, heavy metals and other pollutants).</li> </ul> <p>Annual monitoring of benthic environment within a 2km radius of the discharge point (over a 3 yr period)</p> <p>Weekly monitoring of fish catches on intake screens including species, numbers and size (over a 1 yr period).</p>	<p>Records will be kept and compared on regular basis against Egyptian and World Bank standards and impacts predicted in EIA.</p> <p>Summary reports (with any exceptions identified) will be submitted to the Government and IFC on annual review basis (or more frequently if required).</p> <p>EPSEP to ensure that all employees are given basic induction training on the requirements of the EAP, good site management practices and H&amp;S procedures. The Assistant Plant Manager will ensure implementation of procedures.</p>

<b>Impact/Issue</b>	<b>Mitigation Measure</b>	<b>Monitoring</b>	<b>Management and Training</b>
<i>Noise</i>	<p>Specific design mitigation measures to minimise noise impacts include:</p> <ul style="list-style-type: none"> <li>• steam turbine generators, air compressors, pumps, black start and emergency diesel engines are enclosed in buildings</li> <li>• air compressors are equipped with silencers;</li> <li>• noisy outdoor equipment are designed to a noise limit of 85 dB(A) at 1 m.</li> </ul> <p>In addition, plant workers will be provided with protective wear in plant areas with high noise levels. The plant will operate in accordance with internationally accepted health and safety measures.</p>	Given that no sensitive receptors are located in the vicinity of the plant, no monitoring is envisaged	<p>Should any complaints be received regarding noise, these should be logged and the Assistant Plant Manager should investigate problem.</p> <p>EPSEP to ensure that all employees are given basic induction training on the requirements of the EAP, good site management practices and H&amp;S procedures. Assistant Plant Manager to ensure implementation of procedures.</p>
<i>Flora and Fauna</i>			
Disturbance to habitats as a result of noise, vehicle and personnel movements	<p>The following mitigation measures should be implemented:</p> <ul style="list-style-type: none"> <li>• restrict personnel and vehicle movements to access roads and within boundaries of site only</li> <li>• control of noise during operation</li> </ul>	No monitoring is envisaged.	<p>EPSEP to ensure that all employees are given basic induction training on the requirements of the EAP, good site management practices and H&amp;S procedures. Assistant Plant Manager to ensure implementation of procedures.</p>

<b>Impact/Issue</b>	<b>Mitigation Measure</b>	<b>Monitoring</b>	<b>Management and Training</b>
<i>Visual Impact</i>			
Visual image of power plant from surrounding tourist areas	<p>The visual effect of the power plant will be improved through:</p> <ul style="list-style-type: none"> <li>• creation of landscaped entrance along new access road to the site;</li> <li>• creation of landscaped buffer zone along the southern edge of the site to shield view from tourist areas.</li> </ul>	No monitoring is envisaged	<p>Considered management of landscaped areas to maximise visual image and habitat creation.</p> <p>EPSEP to contract a suitable firm to manage landscaped areas.</p>
<i>Soil and Hydrology</i>			
Spillage of oils, chemicals or fuels on site.	<p>Good site management measures as described under <i>Aquatic Environment</i> will minimise any potential risks. As part of this, regular checks of bunds and drainage systems should be undertaken to ensure containment and efficient operation.</p>	The Assistant Plant Manager should continuously monitor application of EAP and good site management practices and take corrective action if required.	EPSEP, through the Assistant Plant Manager, will implement a Spills Response Plan and all employees will receive corresponding training.
<i>Solid Waste</i>	<p>Good practice measures undertaken during the construction phase will be continued into the operation phase. See <i>Table 8.1</i></p>	<p>Monitoring of waste consignments will continue as described under Construction in <i>Table 8.1</i>.</p>	See <i>Table 8.1</i>

<b>Impact/Issue</b>	<b>Mitigation Measure</b>	<b>Monitoring</b>	<b>Management and Training</b>
<i>Occupational Health and Safety, Risks and Hazards</i>	<p>Standard international practice on EHS issues shall be employed on site. The mitigation measures summarised in <i>Table 8.1</i> apply.</p> <p>In addition, the following measures will be undertaken:</p> <ul style="list-style-type: none"> <li>• Provision of training in use of protection equipment and chemical handling</li> <li>• use of protective equipment</li> <li>• Clear marking of work site hazards and training in recognition of hazard symbols.</li> <li>• Installation of vapour detection equipment and control systems.</li> <li>• Development of site emergency response plans.</li> </ul>	<p>Regular on-site training.</p> <p>Regular staff checks, system checks and field tests of emergency procedures by on-site management.</p>	<p>EPSEP to ensure that all employees are given basic induction training on H&amp;S policies and procedures, Emergency Preparedness and Response Plan and a Spills Response Plan. The Assistant Plant Manager is to ensure implementation of procedures.</p> <p>EPSEP is responsible for ensuring that the site emergency response plan is complete and implemented prior to commissioning any part of the power plant.</p>