ENVIRONMENTAL AND SOCIAL IMPACT REPORT

PERU

ENERSUR POWER PROJECT

(PE-0102)

I. INTRODUCTION

1.1 Over the last five years, Peru has witnessed a significant increase in energy demand. At times averaging more than 9% per year, the demand growth has closely paralleled improvements in the performance of the Peruvian economy. Population growth has also contributed to the increase in energy demand. The Government of Peru ("GOP") projects that energy demand will grow at approximately 5% per year. Faced with an already low percentage of the population that has access to a reliable electricity supply, the GOP is actively pursuing policies that encourage the development of new electric generation assets financed by the private sector.

1.2 The development of the EnerSur Power Project (the "project") will provide a reliable long-term supply of power to an important mining region in Peru, will enhance the reliability of the southern interconnected system of the electricity grid and will assist the GOP in promoting the development of independent power projects.

A. Project summary

1.3 Following an international request for tenders and a competitive bid, Southern Peru Cooper Corporation ("SPCC") sold its existing electricity generating assets to Energía del Sur ("EnerSur" or the "Project Company") a special purpose company owned by Tractebel S.A. of Belgium and contracted to purchase variable amounts (on an escalated basis) of electricity pursuant to a 20-year power purchase agreement ("PPA") signed on April 18, 1997.

1.4 As discussed in more detail below, the project consists of two components: (i) the modernization and rehabilitation of an existing 177 MW of generating capacity transferred from SPCC (which includes a 140 MW (gross) industrial fuel oil fired unit as well as a 37 MW gas turbine fired by diesel); and (ii) the construction of additional generating capacity to be installed by EnerSur to meet future expansion needs (which will consist primarily of two 125 MW coal-fired units). When fully constructed, the combined

generating units of the Project Company will have a total installed capacity of 464 MW. The total cost of the project is approximately US$440 million, composed primarily of costs related to the new generating facilities (i.e., approximately 90 to 95 percent).

B. Project justification

1.5 The mining sector in Peru is largely owned by the private sector, with some remaining government-owned mining assets in the process of being privatized. The project will provide a much needed and reliable supply of electricity to the largest mining region of Peru. The mining sector in Peru accounts for 11% of GDP and contributes significantly to the revenue base of the GOP and the Peruvian economy in general. SPCC is the largest copper producer in Peru and has recently undertaken a US$1.8 billion modernization and expansion program. This program includes substantial capital investments to introduce more advanced equipment and extraction processes to improve mine operation efficiencies, as well as substantial investments in environmental improvements. As part of this modernization and expansion program, SPCC has decided to focus on its core business units and privately contract for ancillary goods and services. Consistent with this strategy, SPCC developed the program of selling its existing generating assets and contracting for long-term power supply. In addition to satisfying this demand, the project will generate additional electricity that can be sold to other companies in the region or to the spot market.

1.6 The existing generating assets of SPCC have been in operation for more than 35 years. SPCC has utilized these units because of the critical dependence their operations place on having a large and reliable supply of electricity. One of the objectives of the project is to enhance the efficiency of the existing generating units, as well as developing new generating units that are more efficient. As an independent power producer, the Project Company will be connected to the South Interconnected System ("SIS") of the grid. In addition to providing a reliable supply of electricity to SPCC, the project will also serve as a reliable peaking unit for the SIS and be available for sales to other mining companies in the region.

1.7 From the standpoint of the SIS and the operation of the Peruvian spot market, this project will enhance the overall reliability of the system in that the current system is largely dependent on hydroelectric generating capacity.

C. Sources of information

1.8 This ESIR is based on various sources of information, consisting of:

(i) the Environmental Impact Assessment for the new generating facilities completed in November, 1997;

(ii) the Environmental Impact Assessment for the pier facilities completed in November, 1997;

(iii) the Programa de Adecuación y Manejo Ambiental ("PAMA") for the existing generating facilities entered into by SPCC and the Ministry of Energy and Mines (MEM) on January 29, 1997;

(iv) internal documents and policies;

(v) monitoring plans included in the different EIAs;

(vi) internal environment audits; and

(vii) EnerSur environmental policy and site visits.

II. PROJECT DESCRIPTION

2.1 The location and project components for the new and existing facilities are described in Sections II.A and II.B respectively. In addition, a description of the analysis of alternatives for the new facilities, both in terms of sources of fuels and site selection is presented in Section II.C.

A. New generating facilities

1. Location

2.2 The site for the new generating units is on land approximately 25 km southeast of the city of Ilo and consists of approximately 297 hectares (see Figure 1). The land is currently undeveloped coastal desert that is owned by the District of Ilo. The coastal highway parallels the eastern boundary of the site and connects Ilo to Tacna. Access to the site is by paved road.

2. Project components

a. Generating units

2.3 The new generating units will consist of two net 125 MW steam generators fueled by low sulphur, pulverized coal. The Project Company is responsible for the procurement of the coal. If in the future natural gas is made available to Ilo at a reasonable cost and in an environmentally appropriate manner, then the proposed project generating units are capable of being modified to utilize gas.

2.4 The coal-fired units will utilize a process known as regenerative Rankine thermodynamic cycle in which steam is produced in a boiler, expanded through a series of turbines and then returns to the boiler to complete the cycle. The boilers are to be designed and fabricated by Hitachi and utilize low NOx burners. The stack height will be 130 meters.

b. Coal handling

2.5 The coal required to operate the coal-fired units will be low sulphur coal imported by ship from Indonesia. Coal sourced from Indonesia is contemplated because of its very low sulphur content, anticipated to be 0.05-1.0 percent sulphur content. Approximately one ship every month will be required

and unloading operations will be completed in a maximum of 2 to 3 days.

2.6 Coal deliveries will be made to an unloading jetty that will extend approximately 1250 meters into the ocean in a "T" configuration with an 80 meter long and 25 meter wide unloading platform which will be perpendicular to the waves. Two level-luffing type cranes with 750 metric tons per hour capacity will be installed on the unloading platform. These cranes will unload coal on a three-part, completely enclosed conveyor system to transfer the coal to the shore and thus prevent dust emissions and release of coal dust. Once delivered to the shore, the coal will be stacked and compacted in 12-meter high piles with a base width of 32 meters and length in excess of 500 meters. The total capacity of the coal storage yard is 200,000 metric tons. The coal storage yard will include a water spray and a dust suppression system to minimize dust emissions.

2.7 Coal delivered into the crusher house will be sieved to remove foreign objects and then will be separated according to size. Coal pieces smaller than 50 mm will be routed directly into the primary air system and transferred to the boiler. Coal pieces larger than 50 mm will be diverted through a hammer-crusher type pulverizer and then into the boiler furnace.

c. Ash management

2.8 Ash will be generated by the boiler system as a residue of coal combustion. Larger ash particles will fall through a throat at the base of the boiler and accumulate as bottom ash in an underlying trough of freshwater. Bottom ash will be continuously transferred from the water trough to the bottom ash storage silo. Bottom ash is expected to account for 10% of total ash generation.

2.9 The remaining 90% of the ash generated will flow along with the combustion gases through the gas circulation system. This fly ash will be collected by high removal efficiency electrostatic precipitators ("ESP") prior to the flue gas emission to the atmosphere. Fly ash removed by the ESP will be collected into a hopper. The bottom and fly ash silos will have a 5-day capacity of ash accumulation, at a rate of 214 tons per day.

2.10 Both bottom and fly ash storage silos will be emptied regularly by trucks and disposed of in the ash landfill. Ash will be able to accumulate in the landfill over the expected 30-year operating life of the plant. The fly ash will be moistened from 10 to 20% by weight prior to loading, transportation, and unloading into the landfill. Moisturizing prevents dust generation and is considered a dry disposal method. Due to the humid nature of bottom ash, it will not require moistening to avoid dust emissions during handling and disposal.

2.11 Assuming the worst case for coal ash content, an average coal firing rate of 66 t/h, two operating boilers, and 8,000 hours of operation per year, 2.3 million tons of ash will accumulate over the expected 30-year operating life of the plant. This mass of ash requires an ash disposal facility with an area of 0.5 km^2 and thickness of 2 to 5 meters, depending on ash density.

d. Water

2.12 All water needs for the project will be satisfied by seawater, either directly or following desalination and demineralization.

2.13 Water for process and other uses will be drawn from the nearby Pacific ocean (approximately 9.56 m^3/sec) via two intake pipes located underneath the pier and extending approximately 850 meters from the shoreline. Approximately 99% of salt water will be used for cooling purposes at the power plant and the remaining one percent will go through desalination units to produce fresh water (approximately 6.4 l/sec) for human consumption (approximately 80%) and industrial purposes (approximately 20%). Chlorine will be injected into the extracted seawater to prevent biological growth within the water pipe/use network.

2.14 Process water will be used for cooling purposes and is a closed non-contact system. The resultant used (waste) water will be discharged to the sea meeting applicable regulatory limits (see sections III and V). The point of discharge will be located south of the pier, approximately 500 to 700 meters from shore in an area of average water depth of 6 meters. A diffuser system will be used to enhance mixing of discharges and minimize environmental impacts. The discharge might eventually be undertaken through an even more efficient alternative: using a jet discharge to ocean surface to obtain the most efficient thermal exchange.

2.15 Approximately 64.24 l/s of seawater will be routed to the desalination plant. Desalinized water will contain no more than 10 mg/l of total dissolved solids. This water will be used for potable water, boiler feedwater, fire protection and industrial uses.

2.16 The feedwater tank provides the water needed for the generation of steam in the boiler. The water entering the boiler will exit either as blowdown, routed to the wastewater treatment plant, or as steam, routed through the turbines for power generation. The steam condensate mixture is then cooled in the condenser and recirculated into the boiler feedwater tank. Boiler make-up water will be produced by desalinizing seawater and routing it to the demineralization plant. Once demineralized, this water will be stored in the boiler feedwater tank along with the condensate return from the condenser.

2.17 Approximately 190 cubic meters of desalinized water will be used for industrial purposes, including the cleaning of equipment and facilities, and ash dust suppression. Used industrial water will be transferred to the wastewater treatment facilities. All waste water generated from the use of desalinized water will be treated in the facility waste water treatment plant prior to discharge to the sea (via the same discharge pipe as for process water). The treatment system will include coagulation, filtration and neutralization. The sludge produced as a result of wastewater treatment will be disposed in a specific separate area at the ash disposal landfill.

e. Unloading jetty

2.18 Coal deliveries will be made to an unloading jetty that will extend approximately 1,250 meters into the ocean in a "T" configuration with a pier face of 250 meters. The pier facility will be supported by piles adapted to sea bottom conditions (eg. rock versus sand). The piles will consist of groups of 3 to 4 20-cm diameter tubes. The distance between the piles will range approximately from 10 to 15 meters and the platform will be placed 6 meters above the average sea level. The piles will be protected against corrosion. The pier structure will not affect the normal current circulation pattern. The unloading jetty is designed to accommodate vessels with capacities of 70,000 dead weight tons.

f. Transmission

2.19 EnerSur intends to construct an upgraded transmission interconnection to accommodate the new generating units and facilitate third party and spot market sales of excess energy. The upgraded transmission will consist of an interconnection between the existing generating units and new generating units, step-up transformers and 2 substations near the new site. Additional transmission lines are likely to be required including approximately 150 km of 138 KV transmission lines connecting to a new substation to be installed in Moquegua and additional transmission lines to be built when EnerSur finalizes other PPA's with mines located in the area.

2.20 For the additional transmission lines to be built, all necessary permits will have to be obtained and an analysis of potential impacts, including appropriate mitigation measures, will have to be conducted and implemented.

g. Construction

2.21 Construction activities will include overall site preparation, emplacement of two steam-turbine units, and erection of a pier, ship-unloading equipment and a coal yard. Associated systems for seawater uptake and desalination/demineralization, fly and bottom ash handling and storage, and steam condensation will also be completed in the course of overall construction activities. The pier will be constructed over 12 months within the overall construction period of the project. The new generating units will be constructed pursuant to an engineer, procure and construct (EPC) contract with Hitachi Ltd. of Japan. The EPC contract obligates Hitachi to construct the new units to precise environmental specifications and provides for extensive liquidated damages and warranty payments for non-compliance. Under the terms of the contract, the first 125 MW coal-fired unit is required to be in operation in April, 2000, and the second unit is required six months later.

B. Existing generating facilities

1. Location

2.22 The site of the existing generating units is on land adjacent to the SPCC smelter located approximately 10 km north of the town of Ilo. The initial existing generating units have been in operation at this site for 39 years. Access to the site is by paved road and by rail.

2. Project components

a. Generating units

2.23 The bulk of the existing generating units consist of four industrial fuel oil-fired boilers each of which provide steam at 1,000 pounds per square inch and 900 degrees Fahrenheit to a 3-common steam header. Additional steam from the SPCC smelter waste heat recovery system is also routed to the common steam header. Steam from the common header is then admitted to four condensing steam turbines which generate electricity. The total installed capacity of these units is 140 MW.

2.24 The existing generating units transferred from SPCC also include a diesel-fired simple cycle combustion turbine (General Electric Frame 6B) that was commissioned in early 1997. The installed capacity of this unit is 37 MW. In addition to this existing unit, the Project Company is now completing a new generating unit that is also fired by diesel. By first quarter 1998, the Project Company anticipates commissioning this diesel-fired simple cycle combustion turbine (General Electric LM6000) with an installed capacity of 37.5 MW.

b. Sources of fuel

2.25 Waste steam is currently produced in four heat recovery steam generators installed on SPCC's copper smelter. This steam also flows to the existing steam turbines. The quantity and quality of the delivered steam is such that it generates approximately 24 MW of electricity.

2.26 Industrial fuel oil (residual #6 fuel oil) is used to fire the four existing boilers which have a total installed capacity of 140 MW. The percent sulphur content (by weight) of the fuel oil is approximately 1.3 percent on average with a maximum of approximately 3 percent. EnerSur has responsibility and ownership of two tanks. SPCC has the ownership of the other tanks while EnerSur only has operating control of those tanks. SPCC currently operates a fuel handling system through which fuel is transported by ship to SPCC's facilities, unloaded through a submarine pipe and then stored in 80,000 barrel steel tanks. SPCC owns and operates the storage tanks and periodically delivers the fuel from these tanks to a designated delivery point adjacent to the generating units. Under the terms of the PPA, SPCC is obligated to provide industrial fuel oil to the project. EnerSur is responsible for unloading the fuel oil from the ships. Maintenance and ownership of the submarine pipelines are under the responsibility of SPCC.

2.27 Diesel will be used to fire the two General Electric combustion turbines with a total installed capacity of 75 MW, as well a stand-by diesel generator. The diesel fuel will contain less than 0.5% sulphur and will be transported to the plant by tanker truck and unloaded into two steel tanks with storage capacity of 5,000 cubic meters each. Diesel will be unloaded by two pumps and transferred to the boiler via a pipe network. A spill containment system is being installed around the diesel storage tanks. Under the terms of the PPA, SPCC is obligated to provide diesel fuel to the project.

c. Water

2.28 The majority of the salt water collected (approximately 95%) is used for cooling purposes at the power plant and the remainder goes through desalinization units to produce fresh water for human consumption and industrial purposes. The average quantity of water pumped from the ocean is approximately 20,000 gallons/minute.

2.29 The primary sources of wastewater resulting from plant activities consists of salt water used for cooling purposes, water to produce steam at the power plant, water used to indirectly condensate fresh water in the desalinization plants, and brine produced as a result of desalinization. Other discharged effluents include drainage water and domestic residual water.

2.30 Water used for cooling at the plant is discharged into the Pacific ocean via shoreline surface discharges.

d. Transmission

2.31 The existing generating units are connected to the electricity grid in Southern Peru through a substation and a transmission interconnection that is owned by SPCC but operated and maintained by EnerSur. The interconnection facilities consist of step-up transformers, a 138 kV double bus gas-insulated substation and 138 kV transmission lines.

C. Analysis of alternatives

2.32 An analysis of alternatives was performed for the new generating facilities in terms of sources of fuel and site selection.

1. Fuel alternatives

2.33 As part of the EIA, an analysis of alternatives for power generation technology and type of fuel was conducted. Alternative power generation technologies analyzed included hydro power, wind energy, solar power, photovoltaic power and biomass energy. Thermal power was selected as the most viable power generation technology.

2.34 Additionally, as part of the pre-feasibility studies of the new generating units (and included in the EIA), an analysis of alternative fuels was performed, including gas, coal, diesel and residual oil. The result of the analysis identified coal as the presently most viable alternative. The following summarizes relevant issues regarding the analysis: Coal is a proven technology and the application of appropriate measures (e.g., use of low sulphur coal, electrostatic precipitators, low NOx burners, etc.) can minimize environmental impacts. Natural gas is the cleanest burning, and typically the most environmentally acceptable fuel; however, currently this fuel is not available in the Ilo/project area. While gas may be available in the future, although there are no guarantees and clearly would not be available at the initiation of project operations, the gas would have to be provided at economically viable rates and under

environmentally acceptable conditions. Diesel does not provide any environmentally significant advantage over the quality of coal that EnerSur is designed to use. Additionally, there is no local supply of diesel fuel in the Ilo area and, most probably, it would have to be imported. On the other hand, sources of the coal are various and reliable allowing a competitive supply. Thus the Project Company selected coal as the more reliable, available, economic, price stable, and viable alternative to power the plant.

2.35 The Project Company contemplates the potential future use of gas with a dual coal/gas fired plant. However, this will depend on local availability of gas under economically and environmentally viable conditions.

2. Site selection for new facilities

2.36 An analysis of site alternatives was performed as part of the EIA.

2.37 Initially, 16 potential sites were selected and evaluated in the Ilo area. Each of these sites were selected and evaluated with respect to:

(i) land ownership, availability and access;

(ii) topography and ground conditions;

(iii) pollution and potential environmental impacts;

(iv) availability of area to build marine facilities;

(v) transportation and equipment; and

(vi) interconnection with regional transmission systems.

2.38 Based on this analysis, four sites were selected for further evaluation. The four possible plant locations included one site north and three sites south of Ilo. Preliminary air quality modeling and an analysis of construction requirements, pier location and environmental considerations were conducted on these sites. In addition, discussions with the Mayor of Ilo were conducted to determine potential issues regarding the location of the power plant and the areas under consideration. One site was rejected in response to concerns related to the location of an additional industrial facility north of the city and also because it would require the relocation of a small artisan fishing facility. The final project site location was selected after consideration of the following:

(i) the site would comply with all Peruvian environmental, health and safety requirements in terms of air emission impacts;

(ii) there will be no resettlement of population;

(iii) the Ilo population will experience minimum inconvenience as the plant will be located at 25 Km southeast of Ilo;

(iv) there will not be any construction of additional roads during construction and operation of the plant;

(v) the interconnection to the existing transmission system will be easily implemented;

(vi) location of the plant adjacent to the Pacific ocean will facilitate the unloading and handling of fuel; and

(vii) there is no constraint in terms of space availability for further expansion.

2.39 A fundamental question associated with the site selection was whether to locate the project site in the south of Ilo or to the north (i.e., near existing industrial operations). Both locations/areas present advantages and disadvantages; for example, the south is an undeveloped area without degraded ambient air quality but industrial development may interfere with potential long-term land use planning, while the north is planned/designated for industrial use but the addition of any new air emission sources to an area already experiencing significantly poor ambient air quality presents potential problems. The ultimate responsibility for site selection rests with the Project Company, the government, and the people of Peru.

III. LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 This Section presents a summary of the environmental, legal and institutional framework applicable to the project, specifically institutional (Section III.A), laws, regulations and standards (Section III.B), and environmental permitting process (Section III.C). Section III.D provides a summary of compliance related to the new generating facilities and presents a summary of the regulatory status for the existing facilities. A description of regulatory requirements and compliance/status related to public participation is presented in Section VII.

A. Institutional

3.2 Peru's Ministry of Energy and Mines (MEM) has ultimate administrative jurisdiction over the project. The Ministry's authority is divided into three directorates:

(i) Director General of Hydrocarbons (DGH);

(ii) Director General of Electricity (DGE); and

(iii) Director General of Environmental Matters (DGAA).

3.3 While DGH and DGE have ultimate authority over projects in their respective sectors (hydrocarbons

and electricity), DGAA must review the environmental aspects of all projects and make recommendations concerning the adequacy of environmental compliance. DGAA is also charged with the establishment, appraisal and amendments of regulations consistent with the policy of protecting the environment, as affected by activities in the electric and hydrocarbons subsectors.

3.4 The GOP has created other authorities in addition to DGAA with jurisdiction over specific activities affecting the environment. The Institute of Natural Resources (INRENA), a department within the Ministry of Agriculture, is responsible for controlling activities which may have adverse impacts to protected natural areas, including national reserves, parks, monuments, and critical habitat. The project has been designed and sited to avoid all protected natural areas, thus it does not fall within INRENA's jurisdiction.

3.5 The GOP recently established the National Environment Council (CONAM) to create general laws for environmental studies, plans, and reports, as well as for environmental standards. CONAM will also serve as an environmental coordinator for all projects and activities. However, as of October 1997, it has no clearly delineated enforcement authority. Nevertheless, EnerSur explained its project to the CONAM in a session held in December 1997.

3.6 The OSINERG (Organismo Supervisor de la Inversión en Energía) was created by law No. 26734 on December 30, 1996. The main function of OSINERG is to monitor the compliance of legal and technical provisions regarding the activities in the electricity and hydrocarbons sectors, as well as compliance with laws related to the preservation of the environment. It is anticipated that when it formally begins operations OSINERG will perform most (if not all) of the supervisory and monitoring functions regarding legal, technical and environmental matters currently under the scope of DGE, DGH and DGAA.

3.7 The National Institute of Culture (INC) has jurisdiction over activities affecting significant archeological and cultural resources.

B. Laws, regulations and standards

1. Electric sector

3.8 The legal framework for the Peruvian electric sector is established in the Electricity Concessions Law, Decree No.25844, which was enacted in November, 1992. Regulations to the Law of Electrical Concessions, Supreme Decree No. 009-93-EM, were enacted in February, 1993. The Electric Concessions Law and its regulations are designed to encourage the flow of private capital into the electric sector.

3.9 Energy projects, depending on their location, specific impacts, and sources of funding, are potentially subject to numerous environmental laws, regulations, and guidelines established by MEM, DGH, DGE, DGAA, INC, INRENA, the Port Authority, the Navy, and the Ministry of Health. Many of these laws are not applicable to this project, however, due to careful site selection, avoidance of certain areas of concern and minimization of adverse environmental impacts.

3.10 Laws and regulations were evaluated to verify the project's compliance with the foundational environmental impact review process. The evaluation covered the following laws and regulations: D.S. No. 016-93-EM, Regulations for the Environmental Protection of Mining and Metallurgical Operations; D.S. No. 046-93-EM, Regulations for the Environmental Protection of Hydrocarbons Operations; D.S. No. 29-94-EM, Regulations for the Environmental Protection of Electric utilities; as well as proposed regulations which would establish air emissions and wastewater effluent standards for the hydrocarbon and electricity subsectors.

2. Environmental

3.11 The Government of Peru has established a substantial body of laws concerning protection of the environment, natural resources, cultural resources, and human health. The laws focus primarily on the EIA process, environmental monitoring, remediation, auditing, and management.

3.12 The MEM has promulgated ambient environmental quality standards for some subsectors and effluent standards for industry in general. More recently, the Ministry, per decree No. 008-97-EM and decree No. 315-96-EM, developed regulations to establish maximum permissible emission, air quality and effluent standards for projects in the hydrocarbons and electricity subsectors.

3.13 The Project Company is also submitted to legal requirements in connection with the construction of the port facilities. The primary legislation regulating marine activities is the Decree No. 26620 which is a law for the control and vigilance of marine and lacustrian activities created in June 1996. Supreme Decree 007-83/SA provides allowable ambient water quality levels in the sea (zones V and VI are applicable to project.

3. International conventions

3.14 The design, construction and operation of the new generating units meet the requirements of the following agreements:

(i) MARPOL Convention, 1973/1977;

(ii) Basel Convention on Control of Trans-Boundary Transportation of Hazardous Waste and their Elimination, March 22, 1989;

(iii) Convention for the Protection of the Ozone Layer, March 22, 1985;

(iv) Declaration of Rio. United Nations Conference about the Environment and Development. May 12, 1992;

(v) Declaration of Manaos about the United Nations Conference on the Environment and Development, February 11, 1992; and

(vi) Convention about Climate Change, June 5, 1992.

4. World bank

3.15 The new project facilities are designed to be in accordance with the 1988 World Bank Environmental Guidelines for thermal power plants.

C. Environmental permitting process

3.16 The environmental permitting process in Peru is premised upon the EIA. The EIA is the foundation for the primary environmental authorizations required for construction of the project, including the following:

(i) Generation Authorization (generation of electricity);

(ii) Definitive Transmission Concession (transmission of electricity); and

(iii) Construction and Installation Permits (all coal-related facilities).

3.17 The project's diversity requires an expanded evaluation of direct and indirect impacts and compliance with multiple environmental laws and regulations. The lead agency for the permitting process is the MEM.

3.18 Before initiating any activities in the hydrocarbons (coal processing, transportation) or electricity (power generation, transmission, distribution) subsectors, EnerSur is required to submit an EIA to the MEM for the power plant component of the project with an addendum to the EIA for the pier facility. The MEM will then transfer the EIA for the pier to the Peruvian Port Authority (DICAPI) that will give a technical opinion.

3.19 The EIA must be submitted to the MEM for approval. DGAA will review and comment on the EIAs though the final authority will be the MEM. Part of the MEM review process includes a public audience where the Project Company and/or the consulting firm that conducted the EIA will present the project and its potential impacts to different companies and organizations. The MEM must issue recommendations to modify and improve the EIA within 60 days, or the EIA will receive automatic approval. Once the MEM review is completed and recommendations are made, it is the sponsor's responsibility to respond by revising the EIA accordingly.

3.20 Assuming the sponsor's response is acceptable, the MEM will issue a resolution confirming that the EIA has satisfied the essential requirements.

3.21 Approval of the EIA is the central environmental element required prior to proceeding with the

project authorization process. With the EIA approval, applications can be submitted to the DGE and DGH for the other material governmental approvals, including construction and installation permits, generation authorization, land title and transmission line.

3.22 The necessary permits for the construction and operation of the new generating facilities consist of:

(i) the EIA, approval expected to be obtained in February, 1998;

(ii) the permit for the land, expected to be issued in early May;

(iii) the pier facility, issue of permit to be determined;

(iv) the plant construction permit, to be issued in early June;

(v) the transmission line permit, to be issued in early June; and

(vi) the plant operation permit, issuance of permit to be determined.

D. Project compliance analysis

1. New generating facilities

3.23 The EIA for the new generating units was submitted for review by the government (MEM) in November, 1997. The EIA addressed both the coal and power project components and included detailed descriptions of baseline conditions, impacts of the proposed project, mitigation, environmental management and monitoring, and a description of consultation with governmental agencies, affected communities and non governmental organizations. The document included a description of the power plant site alternatives, and their associated environmental impacts, and justifications for the selected location. Simulation models, analyses, estimates, and forecasts were performed to quantify impacts and facilitate comparisons with existing conditions and applicable regulatory standards.

3.24 An addendum to the EIA presenting the relevant aspects of the pier was submitted to the MEM in December, 1997. The EIA addendum for the pier component of the project included a description of the project, a detailed description of the baseline conditions, impacts of the proposed project, mitigation, environmental management and recommendations.

3.25 The present EIA for the power plant component of the project only presents the proposed transmission line from the new facility to the existing facility. Upon final selection of the number and location of any additional transmission lines, a complete and specific EIA will be prepared and submitted to the applicable authorities.

3.26 EnerSur has made a substantial effort to comply with the environmental permitting process and the

environmental standards and guidelines established by the GOP and World Bank/IDB. This includes, in addition to the preparation of the EIA, the internal design and operating policies and procedures as well as an extensive public participation program (see Section VII. for public participation activities).

3.27 The Project Company will obtain all environmental necessary permits and authorizations (see paragraph 3.22).

3.28 It is the sponsor's policy to plan and maintain the project's construction and operation activities in a manner so as not to generate any negative environmental impacts within the project's scope. The sponsor will conduct its construction and operation activities in accordance with its environmental policy and in a way so as to enable compliance with all applicable environmental requirements as established by the MEM, the World Bank/IDB, and other authorities.

2. Existing generating facilities

3.29 On January 29, 1997, SPCC and the MEM entered into a voluntary 10-year agreement, the PAMA, under which SPCC is required to ensure the protection of the environment by establishing industrial and hygiene safety programs as well as a comprehensive mitigation program. The PAMA was conducted to determine the existing plant's potential impacts on the environment and establish monitoring programs and associated costs and an implementation schedule. The most significant environmental commitment undertaken by SPCC in the PAMA was the obligation to install a new smelter to reduce emissions at a cost of approximately US$750 million. The PAMA contemplates a number of environmental projects, the largest and most capital intensive of which is the planned modernization of the Ilo smelter. In addition, in April 1996, SPCC began a US$35 million expansion of the Ilo sulfuric acid plant. The expansion will increase the capture of sulphur dioxide emissions from the smelter from 18% to 30%. Submarine pipelines for transportation of fuel to the site will be replaced by steel pipes to prevent leakages in the environment. SPCC recommended the replacement of the existing hydrogen plant which consumes approximately 1,430 liters of hydroxide of potassium. The new system will only consume 50 liters per year producing a 97%-net decrease in the use of hydroxide potassium.

3.30 When SPCC sold the existing generating units to EnerSur, EnerSur assumed the obligation to operate the existing generating units in compliance with the PAMA. Under the terms of the PPA, SPCC is required to indemnify EnerSur for all environmental mitigation costs related to the existing generating units that result from conditions in existence on the signing date of the PPA.

3.31 EnerSur has prepared a modified PAMA and submitted it to the MEM for approval. The MEM is expected to approve the PAMA in December 1997 or early 1998. This PAMA consists of the following requirements:

(i) installation a new gas turbine of 37 MW in 1997 with an estimated cost of US$13.0 million;

(ii) an upgraded hydrogen plant with an estimated cost of US$520,000;

(iii) the installation of an oil/water separator with an estimated cost of US$10,000; and

(iv) the demolition of old buildings with an estimated cost of US$25,000.

3.32 EnerSur's compliance with the PAMA as of December, 1997 is as follows:

(i) the new gas turbine is being commissioned and will be operating in December, 1997;

(ii) the oil/water separator has been installed in 1997;

(iii) EnerSur has completed the demolition of the old buildings in 1997; and

(iv) the hydrogen plant is scheduled to be upgraded in 1998 as planned.

3.33 The PAMA does not include any specific defined allowable air emission limits. The allowable temperature limit for waste water discharges is 50^{o}C.

IV. ENVIRONMENTAL AND SOCIAL CONDITIONS

A. New generating facilities

1. Topography

4.1 The proposed power plant is to be located in the Pampas del Palo, characterized by a flat coastal plain which grades landward into rolling hills (lomas) and eventually into the Cordillera Costanera. Continuing eastward, the terrain rises steeply to the altiplano, an extensive highland plateau at 3,000 to 4,000 meters mean sea level (msl). Selected mountains bordering the altiplano reach elevations greater than 6,000 m msl. The main plant facility will be built inland from the beach and 15 to 30 meters above the beach, but coal unloading and handling facilities will extend to the beach and offshore on the proposed pier.

2. Land use

4.2 The main infrastructure in the immediate area of the site is the coastal highway, which is a two-lane, asphalt highway. In the area north of the facilities, the following infrastructure are present: the Ilo airport (approximately 15 km) and near the urban center of Ilo, the coastal zone is used for recreational purposes.

4.3 The land use at the site is presently defined as tourism. The project sponsor has requested from the municipality of Ilo a change in land use designation and a decision should be finalized by the municipality in December 1997 or January 1998. There are no human settlements at or near (e.g. 15 km) the site.

4.4 Land use immediately north of the site is under active mining concessions (apparently 20 year

concession) for the removal of lime (i.e., deposits from sea). Within the mining concessions is an area called "Bolivia Mar" which was established by the GOP in 1995. This area is available for development under concessions to Bolivians for economic or tourism. There has been no development and there appears to be no specific existing development plans.

4.5 Land unsuited for agriculture adjacent to the city of Ilo is utilized for urban expansion. The agricultural activities in the regional area but not near the project site are of small and medium scale; there is permanent cultivation of olives, peaches and avocado and seasonal cultivation of vegetables, corn and potatoes. There exists some plans to develop portions of the El Algarrobal areas for agriculture via irrigation utilizing water brought by canal. However, these plans are not guaranteed or specifically defined (e.g., feeder irrigation canals are not built, specific agricultural areas to be developed are not selected, etc.).

3. Climate and meteorology

4.6 The southern coast of Peru has a desert climate characterized by extreme aridity. The temperature gradient all along the coast of Peru is considerably moderated by the cold Humboldt Current, which registers a gradual increase in the minimum temperatures in July and in the maximum temperatures in February when moving from south to north. A significant and reoccurring climatic phenomenon in the region is the El Niño Southern Oscillation (ENSO), which appears every two to three years. Currents of the central and eastern tropical Pacific shift and waters of the region become warmer. In 1997, rather strong ENSO conditions have been in place since April.

4.7 The proposed site lies in the tropical tradewind belt, where southeasterly winds predominate. Due to the cold coastal waters of the Humboldt Current, evaporation is reduced and extremely arid conditions dominate the region. The most persistent geomorphic agent in the region is wind, which blows year-round from the southeast. Consequently, fine sand accumulations are common on the leeward side of nearly all relief features.

4. Air quality

4.8 The closest facility that currently affects ambient air quality is approximately 15 km northwest of the proposed plant site for the new generating units and all potential air pollution sources lie downwind of the site. Thus, even though no ambient air quality has been monitored at the site, the anticipated conditions are considered to be unimpacted. Air quality in the city of Ilo has been significantly impacted due to the emissions from the SPCC smelting and refining operations.

5. Soil and geology

4.9 The vicinity of the site is underlain by a complex geology of igneous, metamorphic, and sedimentary rocks spanning more than 500 million years of geologic time. Geomorphic features at and in the vicinity of the power plant consist of the beach slope, ephemeral drainage (quebradas), mudslides (huaycos) which

are natural features of the foothills north of the plant site and dunes.

4.10 Soils in the vicinity of the site are derived from the young alluvial and eolian sediments covering the igneous and metamorphic bedrock. Soil profiles are typically rocky, with interlayered caliche, silts and clays. Surficial soil has little organic matter content and is generally unsuitable for farming or forestry.

6. Hydrology

4.11 There are no perennial drainages at or adjacent to the site. However, there are two ephemeral ravines (quebradas) that remain dry for long periods of time which are located at the site. The presence of ground water beneath the site is unknown, but the extreme aridity of the site and proximity to the ocean strongly suggest that any shallow groundwater at the site would likely be saline.

4.12 The Pacific ocean represents the only body of surface water near the site. As part of the EIA, seawater samples were collected and analyzed at the surface and at 1 meter beneath the surface were analyzed for total suspended solids (TSS), biochemical oxygen demand (BOD), arsenic, cadmium, chromium VI, copper, iron, lead, mercury, molybdenum, nickel, selenium, nitrate, pH. The results showed concentrations typically expected for unpolluted open ocean conditions.

7. Flora and fauna

4.13 The coastal desert ecology supports relatively few species of flora and fauna. Habitat is restricted due to the low organic content in soils, the lack of precipitation, sparse vegetation and limited ephemeral surface drainages. The small amount of vegetation that exists at the site is dominated by bromelia that are ground-dwelling epiphytes which are specially adapted to satisfy their water needs using humidity in the air. Slightly inland from the coast, in the rolling terrain of the lomas, vegetation remains scarce but becomes somewhat more diverse.

4.14 The scarcity of vegetation cover and water severely limit the variety and numbers of native terrestrial fauna. Birds that are the most visible and common include the turkey vulture and sea gulls. A small sand lizard is common along the back shore and intertidal areas. Other indigenous land fauna known to exist in the area include scorpions, spiders, salamanders and field mice.

4.15 A diverse and productive assemblage of phytoplankton were identified in water samples collected from the ocean. A large variety of benthic organisms were identified in the fine sand sediments sampled from the seafloor.

4.16 No threatened or endangered species of plants or animals were identified in the immediate vicinity of the site.

8. Marine use

4.17 Fishing and recreation are the main uses of marine resources in the area of the site. Crustaceans and mollusks are abundant and are collected by non-professional divers to supply the local market and abalone canneries. Beaches along the Pampa del Palo currently do not present any human settlement. In recent years, the beach of Pozo Lizas, located at the northern-most point of Pampa del Palo (approximately 18 km from the proposed plant site), has become increasingly popular.

9. Protected areas

4.18 Punta Coles is a rocky peninsula located at approximately 20 km northwest of the site. It is recognized as one of the "Guano Islands" of Peru and makes a measurable contribution to Peru's economy. Access is reserved to Punta Coles and human activities are non existent. It is home to a rich assortment of marine and aviary life and enjoys protected status under the authority of the Provincial Municipality of Ilo.

10. Population

4.19 The Department of Moquegua is situated along the southern coast of Peru between the departments of Tacna, Puno and Arequipa. It is divided into three provinces, Mariscal Nieto, General Sánchez Cerro and Ilo. It is one of the least populated departments of the country. According to the 1993 census, the total population was approximately 129,000. The population at Ilo is currently estimated to be around 80,000.

11. Economic

4.20 The majority of houses in Ilo are connected to the public water and sanitation system, and 92% of these have electrical lighting. Public utilities are less common within the simple dwellings, as only 37.5% have hygienic services and 31% have electrical lighting. The Province of Ilo has the fewest number of health establishments among the provinces of Moquegua. The most common illnesses among the Ilo population are respiratory infections, pneumonia, and bronconeumonia.

4.21 In 1994, copper accounted for 38% of the department's mining export. Mining accounted for 21% of the GDP of the department in 1990, 1991 and 1992, while at the same time accounting for 5.5% of the total mining sector in Peru. The people of Ilo make their living primarily from fishing. Currently, four fish meal factories are in existence in the area, and commercial fishing is also conducted by traditional fishermen.

12. Archaeologic

4.22 The southern portion of Peru is part of the cultural area known as the Central Andes, which was the center of development of some of the most remarkable Precolombian cultures of the Americas. Archeological resources at the site were surveyed as part of the EIA and inventoried in accordance with the Reglamento de Exploraciones y Excavaciones Arqueológicas of the Instituto Nacional de Cultura. A total of 17 sites were identified all of which were in areas adjoining the proposed site. Of these, 15

consisted of simple accumulations of lithics, projectile points, ceramic fragments, and mollusks. The other two sites included domestic terraces containing abundant cultural material similar to that in the more dispersed areas and one site was previously excavated in 1995. The EIA established that those archeological sites would not be affected by EnerSur activities.

B. Existing facilities

1. Environmental

4.23 The existing power plant is located approximately 15 kilometers north of the city of Ilo in an area known as the Coastal Pampa. The existing EnerSur power plant is situated immediately adjoining the SPCC smelter facility. The plant was built at approximately 33 feet above sea level and at 250 feet from the coast of the Pacific ocean. Topography is similar to that described for the new facilities.

4.24 The area of influence of the project is characterized by a very dry and desert-like climate. Annual precipitation is almost non-existent. Wind blows year-round on average, from the southeast at speeds that range from 6 to 29 km/hour. However, wind direction changes occasionally and blows south towards the city of Ilo especially in the evening or early in the morning.

4.25 The facilities that currently affect ambient air quality are the SPCC smelter and the SPCC refinery, which is at approximately 10 km north of the city of Ilo (i.e., approximately 5 km south of smelter). No specific ambient air quality data was available. However, ambiental air quality in the city of Ilo is known to be severely impacted due to sulphur dioxide.

4.26 The soil consists of sand and lime over volcanic rock. Surficial soil has little organic matter content and is generally unsuitable for agriculture.

4.27 Most drainages in the area are ephemeral ravines (quebradas) that remain dry for long periods of time. There is no groundwater beneath the site or river body near the facilities. The main water body near the plant is the Pacific ocean.

4.28 The aridity and the scarcity of water limit the number and variety of terrestrial fauna. Birds that are the most common terrestrial fauna include sea gulls, cormorants and pelicans. Other indigenous land fauna such as small lizards, scorpions and spiders are known to exist in the area.

2. Socioeconomic

4.29 The poor quality of the soils and the dry climate do not provide any opportunity for agriculture or cattle raising. The Pacific ocean enables the existence of a significant local fishing industry. Even at higher altitudes, where the transmission lines and substation facilities are located, agriculture or cattle raising opportunities are limited or non existent. No archeological resources are known within the site area.

V. ENVIRONMENTAL AND SOCIAL IMPACTS

5.1 The following sections summarize direct and indirect impacts of the construction and operation of the new (Section V.A) and existing (Section V.B) project generating facilities.

A. New generating facilities

1. Construction phase

5.2 Environmental impacts during the construction phase are expected to be minimal and the principal ones are summarized below.

5.3 The site is currently undeveloped and the land is unoccupied. The construction of the power plant complex will not dislocate any inhabitants. The land use designation will have to be changed from tourism to industrial which may affect other future land uses in the area. General impacts to geology and soil resources for both the power project components include soil disturbance associated with construction, localized changes in topography, and the potential for erosion. Earthmoving and excavation will cause dust, noise, temporary traffic impacts and general construction debris. Soil erosion is expected to be minimal given the lack of precipitation in that area. Landslides are not anticipated given the general low relief of the site.

5.4 Construction of the power transmission line is expected to have a minor environmental impact on the area as it will be very localized and will not involve extensive excavations. Temporary and localized impacts are expected along this route.

5.5 Construction activities will result in temporary emissions of particulate materials and vehicle emissions. Minor emissions of fugitive particulate matter will be generated by site disturbance. Additional potential impacts may result from the release of volatile compounds from materials such as solvents, paints and adhesives. Elevated levels of noise due to vehicles, etc. are also expected on the site.

5.6 Potentials impacts associated with the worker camps include increased discharges of synthetic detergents toxic to aquatic organisms and sewage discharges.

5.7 No significant impact on water resources is anticipated as surface and subsurface water resources are absent at the site. Potential minor impacts are an increase in demand for water supply and stormwater runoff (however, very low probability of rainfall events). The Ilo public water system will be the water provider for construction workers as well as for construction activities. No dredging is required to construct the pier. Minimal impact associated with sediment re-suspension due to the pile driving activity for the construction of the pier is anticipated.

5.8 No significant impacts on the flora and fauna are expected as the coastal desert supports few species

of flora and fauna. The transmission line is not expected to impact biological resources. The construction of the pier will cause a temporary and localized disruption of the physical characteristics of the sea floor.

5.9 During construction, an estimated 250 jobs will be created resulting in a positive economic benefit.

5.10 Construction activities will not require the development of new facilities or significantly disrupt the existing infrastructure in Ilo. The coastal highway is a paved two-lane road used by trucks to haul minerals and goods to and from the Ilo Tax Free Zone to Tacna. Temporary periodic increases in traffic will occur during the various construction phases.

5.11 Construction activities should result in no impact on archeological resources.

2. Operation phase

5.12 Several potential environmental impacts exist related to the operation phase, primarily related to air emissions, water discharges and waste management.

a. Air emissions

5.13 The EIA includes an air dispersion modeling analysis for the major air pollutants (NOx, SO_2, CO, PM_{10}) to evaluate potential impacts on air quality from power plant operation. The dispersion program used is the Industrial Complex Short Term-ISCST3. This model is regularly used in the United States to conservatively estimate ambient air impacts from emission sources and conforms to the US EPA's guidelines. The receptor grid height was created from 100-meter topographic data. These data were collected during an El Niño year which, given the site characteristics will likely result in conservative modeled estimated ambient air quality concentrations. The model used meteorological data collected over a 10-month period from the Pampa Inalambrica station located at approximately 80 masl with a 10-meter tower which is the closest tower to the proposed plant stack with a similar altitude.

5.14 The table below shows the results of the air dispersion model for short term (daily) and long term (a period of 10 months) concentrations. Yearly concentrations were not calculated due to lack of complete (i.e., one-year) meteorological data. The concentrations shown represent conservative estimates based upon assuming a coal sulphur content of 1.0% and the operation of 2 boilers at 100% capacity for 24 hours a day. The estimated concentrations are conservative since the plant will only be operating 8,000 hours per year, will have an average load factor of 80%, and may have a lower average coal sulphur content.

COMPARISON BETWEEN AIR DISPERSION MODEL HIGHEST CALCULATED CONCENTRATION AND AIR QUALITY GUIDELINES

Parameter		Guidelines DGM[1]	World Bank	Maximum Concent. Two 125 MW Units	Maximum Concent. Predicted at the City of Ilo
PM_{10}	Daily (g/m^3)	350	500	15	-
	Annual (g/m^3)	150	100	02	-
NOx	Daily (g/m^3)	--	--	205	4
	Annual (g/m^3)	--	100	31	1
SO_2	Daily[2](g/m^3)	--	500	423	9
	Annual[3](g/m^3)	572	100	65	1

[1] DGE has not established air quality limits to date

[2] Maximum daily SO_2 concentrations based on coal sulphur content of 1.0%

[3] Maximum daily SO_2 concentrations based on coal sulphur content of 1.0%

5.15 The highest predicted concentrations were observed in the area of Cerro Redondo and Pampa Mesa Chica which are inhabited areas. This is the result of predominant south to southeast winds. The SPCC smelter, refinery and the current existing power plant do not contribute to the concentrations at Pampa Mesa Chica or Cerro Redondo. The northern area of Ilo, where the industrial sources are located, has dispersion scenarios under which high ambient air concentration may occur in the city of Ilo and Pueblo Nuevo. Those dispersion patterns will not affect the Pampa Mesa Chica area due to the presence of the southeast sea breeze south of Punta Coles and the distance (10 to 14 km).

5.16 The highest 10-month SO_2 estimated concentration occurs in the Cerro Redondo area. Maximum daily SO_2 estimated concentrations for the Algarrobal are 72 g/m^3. The daily estimated concentrations at the reserve of Punta Coles are close to zero and approximately 9 g/m^3 at Ilo. El Algarrobal area presents 10-month period estimated concentrations of approximately 18 g/m^3. 10-month estimated concentrations for the Punta Coles reserve and at Ilo were approximately zero.

5.17 PM_{10} predicted ambient air concentrations are low and do not reach sensitive areas such as the Punta Coles or the city of Ilo.

5.18 NOx estimated concentrations above 100 g/m^3 can only be observed in the area of Cerro Redondo. The 10-month NOx estimated concentrations are well below 100 g/m^3. The El Algarrobal area had daily NOx estimated concentrations in the order of 35 g/m^3 and 10-month period concentrations of 8.6 g/m^3.

5.19 The concentrations predicted by the model for Ilo and Pueblo Nuevo for SO_2 were below 9 g/m^3 for 24 hours and below 1 g/m^3 for a 10-month period. Daily NOx estimated concentrations within the city of Ilo were calculated to be below 4 g/m^3. The 10-month NOx estimated concentrations for the city of Ilo are below 1 g/m^3.

5.20 Based upon the geographical location of the population (i.e., in Ilo and uninhabited areas near the site) and the estimated air quality model results, no additional significant human health impacts are anticipated either in the city of Ilo or by plant workers.

b. Water discharges

5.21 Marine resources adjacent to the power plant will be impacted mainly by outfall from the plant's water circulation and processing system. The types of water discharge consist of non-contact cooling water, brine from desalination plant, and wastewater treatment effluent. More than 99% of the effluent will consist of non-contact cooling water.

LIQUID EFFLUENTS FROM POWER PLANT OPERATIONS

Waste Type	Estimated Quantity	Parameter	Discharge Limits	Temperature increase
Non-contact cooling water	34,431 m^3/hr	Chorine	0.25 ppm	<10°C
		Temp. Change		
Wastewater	23 m^3/hr	pH	6 to 9	
Treatment Plant		TSS	10 mg/l	
		BOD	50 mg/l	
		Oil and grease	20 mg/l	
Brine(1)	208 m^3/hr			
Total Outfall	34,662 m^3/hr			

(1) Brine will not have concentrations higher than 10% above inlet concentrations.

5.22 Mathematical modeling performed as part of the EIA showed that cooling and waste water discharged from the plant will likely form a plume which is expected to extend on a maximum of four hectares. The plume is likely to move to the southeast which is the dominant flow direction of nearshore current adjacent to the site. Although the temperature of the discharged water at the pipe may be as much as 8 to 10^{o}C above that of ambient seawater, a difuser system and rapid cooling across the large surface area of the plume is expected to reduce this temperature difference within a short distance from the outfall. It is worthwhile noting that the El Niño phenomenon created a three degree temperature difference in the ocean without altering significantly the benthic fauna. The impact of this temperature difference on the marine biota is expected to be low.

5.23 In addition, discharged cooling seawater will have higher levels of chlorine. Chlorine is injected into the circulating cooling water to suppress biological activity. Low intensity impacts are expected due to the elevated chlorine concentrations. However, chlorine concentrations of the discharged water will be less than 0.25 ppm above the chlorine content of the sea water. The resulting brine produced during desalinization will be discharged into the seawater at a rate of 57.88 l/s.

5.24 The discharges from the waste water treatment plant will have slightly higher salinity, nutrient concentrations, and biochemical oxygen demand than the ambient seawater. However, due to the strong dilution of the wastewater by non-contact cooling water, the chemical differences are expected to have relatively low impact on sea water quality.

5.25 Altered current and sediment dynamics near the cooling water intake and outfall pipes will redistribute sediments and slightly alter the fine-scale bathymetry of the seafloor.

5.26 Potential spills of hydrocarbons could occur associated with the ships activity at the pier which may impact aquatic biota directly or may disrupt the transmission of solar radiation and reduce oxygen levels.

c. Waste management

5.27 Three types of solid wastes will be generated during the operation of the plant which include ash, office and industrial solid wastes and wastewater sludge. More than 99.9% of solid waste produced during operation will consist of ash which will be disposed of in a landfill on the site (which can extend to an area of 1 km^{2}). The estimated quantities of the different solid wastes are presented in the table below:

SOLID WASTE GENERATION FROM POWER PLANT OPERATIONS

Waste Type	Units	Estimated Quantity

Fly Ash[1]	t per year	84,204
Bottom Ash[2]	t per year	9,358
Office and Industrial Solid Wastes[3]	Kg per day	90
Waste Water Treatment Plant Sludge	Kg per day	To be calculated

[1] Assumes 14.8% coal ash content and 90% generation as fly ash

[2] Assumes 14.8% coal ash content and 10% generation as bottom ash

[3] Assuming a daily rate of 0.93 kg per person for 97 employees

5.28 Leaching of ash to groundwater bodies is not a concern at the site due to the extreme aridity of the area. Some ash dust may be generated and transported due to wind action.

5.29 The office waste will be disposed of at the municipality landfill. The industrial waste will be disposed in the industrial waste disposal area located at the existing SPCC smelter facility. The wastewater sludge will be used as a soil additive at the site assuming acceptable levels of heavy metals.

d. Local population

5.30 Positive impacts (benefits) associated with the power plant include increased employment and the benefits of the electricity produced. Hiring of local workers and associated wage spending as well as purchasing of materials and services within the region will have the greatest impacts on the local economy. EnerSur currently has 90 employees, the vast majority of which were previously employed by SPCC as operators of the existing generating facilities. With the completion of the new generating units, total employment by EnerSur is anticipated to reach 180 persons, nearly all of which will be from the local workforce. Long term benefits of employment income may include an increase in the local standard of living and stimulation of additional local business activity.

e. Economic

5.31 EnerSur's employees will live within the Province of Ilo thereby creating a need for housing, food and services. EnerSur will purchase good and services within the Province of Ilo which are expected to amount to US$20.0 million per year. Other indirect impacts include those associated with housing, food supplies, and facilities or materials. Direct purchases from firms selling tools and construction consumable, utility services, inspection and repair services for plant component equipment, and chemicals will also occur.

5.32 The sale of energy by EnerSur is subject to an 18% value added tax (VAT). The VAT will be

distributed among the central government (16%) and the local municipality (2%). This new income will enable them to increase expenditures on local infrastructure and poverty reduction programs. Income taxes (30% of EnerSur's gross profits) will also benefit the central government.

f. Infrastructure

5.33 The power plant will use mostly its own infrastructure for its operation. Local infrastructure that may be used include the municipal landfill, public roads, hospitals and housing facilities for employees. Power plant operation will result in an increase in traffic. However, to reduce traffic congestion, all shipping of materials and equipment will be done during off-peak traffic hours.

g. Archeological resources

5.34 There are no anticipated impacts associated with archeological resources since no archeological sites were identified within the limits of the proposed power plant area.

B. Existing facilities

5.35 The primary negative impacts identified in the PAMA associated with the existing facilities are related to the level of air emissions, water intake and discharge and waste disposal and are summarized below.

1. Air emissions

5.36 EnerSur has emissions associated with this power plant but those emissions are clearly extremely minimal compared to SPCC's. The identified air contaminants consist of particulate matter, oxides of sulphur (SO_x), carbon monoxide (CO), and oxides of nitrogen (NOx) resulting from the burning of the bunker oil in the boilers. The bunker oil used at the plant contains low levels of sulphur (e.g., 1 to 3 percent by weight). Based upon an initial air emission inventory, the estimated emissions for the four principal existing boilers in 1995 was: 358 tons/year particulate matter, 1,585 tons/year nitrogen oxides, 4,179 tons/year sulphur dioxide, 117 tons/year carbon monoxide, and 8.76 tons/year hydrocarbons. These results were used in conjunction with an air dispersion model (Industrial Source Complex Short Term, version 3) to predict ambient air quality at Ciudad Jardín, which is an inhabited area closest to the existing power generating facilities. The predicted model ambient concentration were (estimates are for the second highest 24 hour concentration since Peruvian air standards allow for one excedance per year): 14.39 g/m^3 SO_2, 1.07 g/m^3 PM_{10}, 5.47 g/m^3 NOX, 0.41 g/m^3 CO and 0.02 g/m^3 HC. The existing power plant is not subject to any air emission limits since the Peruvian Ministry of Energy and Mines has not yet established limits for the energy sector.

2. Water discharges

5.37 The principal waste water impact is related to temperature changes due to discharges of cooling

water. In addition there are discharges of brine solution as a result of the desalinization process and suspended solids collected in the sedimentation wells. Cooling water, brine and storm water runoff are discharged to the sea via shoreline (beach) discharges. Sanitary waste water is discharged to the SPCC sanitary waste water collection system.

3. Waste management

5.38 Solid wastes are generated during the operation of the plant which include industrial solid wastes, waste chemicals associated with maintenance and repair of vehicles and project components and miscellaneous wastes such as discarded food and cooking waste. Industrial wastes are disposed at the SPCC industrial waste disposal area and other wastes are disposed in the municipal landfill.

5.39 Eight small transformers containing polychlorinated biphenyl (PCBs) are currently located at the power plant. EnerSur has the obligation to comply with a specific procedure related to the handling and storage of PCBs "Procedimiento para la Manipulación del Aceite PCB". EnerSur does not own or have the responsibility for any PCB-containing transformers which are presently in storage (i.e. not in use).

5.40 Waste asbestos (i.e., from pipes and boiler insulation) is placed in plastic bags and disposed in the industrial disposal area of SPCC.

VI. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

6.1 Descriptions of the mitigation measures and corresponding monitoring plan for the new and existing generating facilities are presented in Sections A and B respectively.

A. New generating facilities

The Environmental and Social Management Plant (ESMP) for the new generating facility includes mitigation measures (Section VI. A1), monitoring programs (Section VI. A2), estimated costs for mitigation and monitoring measures (Section VI.A3) an environmental audit (Section VI. A4), worker health and safety (Section VI. A5), social economic programs (Section VI. A6), and emergency and contingency plans (Section VI. A7).

1. Mitigation measures

a. Construction phase

i. Air resources

6.2 All vehicles and machinery operating on the site will have mufflers. Workers will be provided hearing protection in those areas where high noise levels are expected. All the storage piles will be kept moist to avoid dust generation. Frequently travelled roads will also be kept moist in order to avoid dust generation

during traffic. All fine materials will be kept in closed containers.

6.3 EnerSur will use paints and finishes with a low volatile organic compounds content. All containers with solvents, paints and thinners will be kept closed at all times.

ii. Fresh waster resources

6.4 Water for construction will be purchased from the city of Ilo water system. The desalination plant at the existing plant may be used as a source of water to avoid water shortages in Ilo.

iii. Land resources

6.5 The construction of the plant and the high voltage transmission lines will fix the land use for the next 30 years. Construction will be planned so that the area outside the property is not affected. The construction of the pier facilities will reduce access to the beach. Safety measures (e.g., signs) will be implemented to avoid public entrance into construction areas.

iv. Terrestrial biological resources

6.6 Flora and fauna are concentrated at the bottom of the quebradas where moist soils can support their needs. There will be no activities or storage or disposal of any type of materials in the quebradas.

v. Infrastructure

6.7 EnerSur will coordinate the transportation of heavy equipment with local transportation authorities.

vi. Cultural resources

6.8 Reporting of archeological discoveries, if any, will follow regulatory standards for basic recording and reporting of archeological sites. Site protection measures will depend on the nature of the disturbance and the potential impact on archeological resources, the nature and significance of the site.

b. Operation phase

6.9 Most of the mitigation measures for the operation phase of the new plant have been incorporated into the design of the power plant in order to comply with EnerSur's policy on prevention of environmental degradation rather than mitigation of impacts (see Section II.A for additional information on facility design).

i. Air resources

6.10 The mitigation measures controlling air impacts consist of a low coal sulphur content, electrostatic precipitators, low NOx burners, and coal and ash pollution prevention and control systems.

6.11 Coal sulphur content has a significant effect on the plant SO_2 emissions. The plant will burn coal with a maximum sulphur content of 1.0%. In addition, EnerSur will establish a program to purchase coals with as low (i.e., lower than one percent) a sulphur content as possible which will reduce the impacts to air resources and comply with EnerSur's pollution prevention policy.

6.12 Low NOx burners (e.g., in-flame NOx reduction method developed by Babcock-Hitachi) will prevent the generation of large quantities of NOx during coal combustion, resulting in NOx emissions which will not exceed World Bank guideline limits of 725 mg/Nm^3. Performance of the burners will be monitored on a permanent basis.

6.13 The incomplete combustion of coal generates CO emissions. A distributed control system will minimize the CO emissions by modifying the air-fuel mix for combustion efficiency. The distributed control system will utilize O_2 and CO monitoring to automatically adjust CO concentrations below 200 ppm.

6.14 Particulate matter will be controlled by electrostatic precipitators (ESP) which will operate at removal efficiencies of greater than 99 percent. Each boiler will have an ESP.

6.15 The plant will use enclosed conveyor belts to reduce the entrainment of coal particulate during coal handling activities. In addition, the coal pile will be compacted and will have a dust suppression system. The compaction and moistening of fly ash during handling and disposal will reduce dust generation. Water sprayed over the ash pile surface will reduce the emissions thereby reducing potential impacts associated with those emissions. In addition, characteristics of the ash are such that, when moistened, it will form a superficial crust that will make the material even more resistant to wind erosion.

6.16 Noise levels will be controlled by the enclosure of mechanical equipment. Equipment specifications indicate a maximum 85 dBA noise pressure level at a distance of 1 meter. In addition, the plant has guaranteed noise levels below 60 dBA during the day and 55 dBA at night.

ii. Water resources

6.17 Non-contact cooling water will be discharged directly to the sea. Industrial and sanitary waste water will be collected and treated prior discharge to the sea. The waste water treatment will include coagulation, sedimentation and neutralization. All discharges will meet applicable Peruvian regulatory requirements and World Bank guidelines. Effluent that may contain toxic materials such as ESP washing drain, heater washing drain and boiler scraper water will be discharged to a lined concrete evaporating pond and then to the wastewater treatment plant. The wastewater treatment plant will discharge its effluent in a drop box to the cooling seawater outfall, thereby diluting by 1,500 times the effluent concentrations. Wastewater treatment plant sludge will be used as a soil additives (assuming acceptable

heavy metal concentrations) for green areas within the property.

6.18 There will not be any leachate from the ash disposal facility due to the use of dry disposal methods and the lack of rain in the Ilo area.

6.19 The diesel storage tanks farm (Diesel #2 fuels are used as back-up or emergency fuels) will have secondary containment equivalent to 110% of the storage capacity of the largest tank. In addition, a synthetic impervious liner will protect the ground in case of eventual fuel spills.

iii. Waste management

6.20 All sanitary/municipal waste will be disposed in the municipal waste landfill. Industrial solid waste will be disposed in the SPCC industrial waste disposal area.

iv. Ash landfill

6.21 The ash landfill will be designed and operated to minimize potential impacts (see Sections II and IV for details).

6.22 Ash storage silos will be emptied regularly and disposed of in a 1 km ash landfill on the site property. The expected life of the landfill is 30 years.

v. Land resources

6.23 Prevention of contamination will reduce the restriction for future land uses after the plant is decommissioned. EnerSur's low coal sulphur content purchasing program will have a positive impact on land resources as there will be less ash generated because low sulphur content coals also have a lower ash content. Reduction in ash generation will minimize the area used for the ash disposal facility. A waste reduction program will be implemented by the Project Company.

vi. Biological resources

6.24 There will not be any disposal or storage of solid wastes, ashes or wastewater in the quebradas to protect this micro environment.

2. The Environmental Monitoring Plan

a. Continuous emission monitoring

6.25 A continuous emission monitoring (CEM) system will be placed on the stack to permanently record the emission concentrations of each of the pollutants and operation parameters listed below. The CEM system will be submitted to a performance specification test (PST) to measure the system performance

under the physical and environmental conditions of the plant. The purpose of the PST is to check the accuracy of the readings and check for drifts in the measurements. A quality assurance /quality control program will be prepared for the CEM which will specify a minimum frequency of zero-span checks, precision checks, system auditing and preventive maintenance. Continuous emission monitoring parameters, technology and frequency are presented in the table below:

CONTINUOUS EMISSION MONITORING PARAMETERS, TECHNOLOGY, AND FREQUENCY

Parameter	Technology	Frequency
Particulates (opacy)	Absorption spectroscopy	Continuous
SO_2	Ultraviolet fluorescence	Continuous
$NO/No_2/No_x$	Chemical luminescence	Continuous
CO	Gas filter infrared	Continuous
O_2	Electrocatalysis or paramagnetism	Continuous

b. Source testing monitoring program

6.26 In addition to the CEM emission records, a semi-annual source testing of the stack emissions will be performed. The results of the source test will validate the CEM data. The records should include the sampling port location, the measuring method, the equipment used, the calibration protocol for the instrument and the results of the source test.

c. Atmospheric emissions inventory

6.27 EnerSur will develop an emission inventory for PM_{10}, SO_2 and NOx concentrations based on the integrated CEM data for reporting quarterly atmospheric emissions. Fuel consumption information for each boiler will be used to estimate the emission rates at the plant.

d. Ambient air quality monitoring program

6.28 The objective of the ambient air monitoring program is to measure the effects of the plant on the populated areas of the Province of Ilo. One ambient monitoring station with meteorological equipment will be installed at the to monitor SO_2, wind speed, wind direction, temperature and relative humidity. A minimum of at least one additional monitoring station will be installed down- gradient from the site. In addition, a 20-meter meteorological tower will be installed at the plant to collect data for future air quality monitoring if necessary.

e. Coal sulphur content monitoring program

6.29 EnerSur, as part of its pollution prevention policy, will purchase coal with low sulphur content. This

program will track the Project Company's compliance with the established maximum daily and monthly coal sulphur content limitations set in this EIA. It will also demonstrate EnerSur's commitment to pollution prevention through the acquisition of better quality fuel. This program will be implemented in addition to any coal quality control program that EnerSur may implement as part of its normal operations. Coal purchase contracts will be submitted to the Bank for its review.

f. Operation monitoring

6.30 Operational monitoring will include monitoring of NOx burners, combustion system (efficiency), and electrostatic precipitators.

g. Ash disposal monitoring program

6.31 The ash disposal facility will be inspected quarterly for containment structures, slope stability and signs of fly ash wind erosion.

h. Water quality monitoring program

6.32 The water monitoring programs for DGE are regulated by Directorial Resolution No 008-97-EM. These regulations specify reporting pH, oil and grease, total suspended solids (TSS) and temperature at each discharge point. In addition, EnerSur will monitor seawater down current from the discharge point.

6.33 The waste water treatment plant will be monitored on a monthly basis.

6.34 The cooling water discharge to the ocean will be monitored initially to ensure no significant impacts. After one year of operations, a marine study will be performed to measure any potential impacts on benthic organisms. The EPC contract requires a study of the circulating water intake that includes site investigation and data collection to determine the layout and the temperature of the cooling water plume emerging from the outfall.

i. Noise monitoring program

6.35 A noise survey will be conducted every six months to show compliance with the EPC guarantees parameters. The surveys will include noise readings at the boundary of the facilities, at the beach and within the plant.

j. Construction monitoring program

6.36 This program will focus on the prevention of impacts and will consist of inspections of the construction activities, recording of data and follow-up on those impacts. The monitoring activities and their frequency during construction are presented in the following table:

MONITORING ACTIVITIES AND FREQUENCIES DURING CONSTRUCTION

Activity	Parameter	Frequency
Check for correct muffler operation and emission of machinery	Inspection of correct operation of machinery	Daily
Check for moistening of storage piles and traffic roads	Inspection of construction site	Daily
Check for use of hearing protection on noisy areas		
Check for evidence of dumping of any materials	Inspection of quebradas	Weekly
Check for water shortages at the city of Ilo	Record construction water sources	Weekly
Check for dewatering	Record water discharges	As needed
Check that Ilo workers are hired and register amount of income into the region	Record of worker's precedence and salary	Monthly
Check for complaints	Record of complaints	As needed
Create action items to prevent/solve social problems due to construction		
Check for correct waste disposal	Record of waste disposal quantities and destination	As needed
Keep archaeologist on-site to monitor for archaeological evidence during earth movement activities	Record archaeological finds	Daily during earth movement activities

k. Monitoring reports

6.37 Quarterly monitoring reports containing 24-hour data values for each measured air quality parameter as well as monthly summaries will be submitted to the MEM within 30 days of the end of the calendar quarter or as otherwise approved by the MEM. The annual monitoring report will be presented to the MEM by March 31 of the following year. Monitoring reports for liquid effluent will be presented to the DGE quarterly.

3. Mitigation and monitoring cost

6.38 The total cost for mitigation measures during construction is approximately US$ 2.5 million. The estimated annual operating costs (does not include capital costs) for mitigation measures during operation are (costs are in US dollars/year):

Enclosed coal conveyor belt system 60,000

Coal pile dust suppression system 30,000

Electrostatic precipitators 97,000

Low NOx burners 42,000

Purchase of low sulphur coal 2,250,000

Distributed control system 60,000

Equipment enclosure for noise reduction 60,000

Waste water treatment plant 150,000

Diesel spill prevention and mitigation system 20,000

Evaporation pond 15,000

TOTAL 2,784,000

6.39 The estimated annual cost for construction monitoring is approximately US$ 24,000. The estimated annual monitoring costs for operation monitoring is (costs are in US dollars/year):

Air emissions system 60,000

Chimney emission direct sampling 5,000

Emissions inventory 3,600

Air quality modeling 3,600

Regional air quality monitoring 24,000

On-site meteorological station 6,000

Coal sulphur monitoring program 0

Noise monitoring program 2,000

Water monitoring 12,000

Marine flora/fauna survey 4,000

Coal ash disposal site inspections 2,800

TOTAL 105,000

4. Environmental auditing

6.40 As required by Peruvian law, the sponsor will retain an Environmental Auditor to evaluate compliance with applicable environmental laws and standards. Although the auditor is hired and paid by the sponsor, the auditor will actually function as an extension of the MEM, reporting directly to DGAA, DGE and DGH. All environmental auditors must be registered annually with DGAA. By law, an Environmental Auditor cannot audit or work for a particular company for more than two years, presumably to avoid conflicts of interest. An auditor's charge is to identify existing environmental issues and problems, anticipate any future problems, develop rehabilitation plans, establish goals to improve environmental operations and control and minimize adverse environmental impacts. The results of the Environmental Audit will also be provided to the Bank.

5. Worker health & safety

6.41 The MEM has authority to establish worker health and safety requirements for the hydrocarbons and electricity subsectors. The DGE and DGH have developed health and safety regulations in their respective jurisdictional competencies. In general, the goal of the regulations is to prevent work accidents and sicknesses, and to maintain a high degree of physical, mental, and social well-being. Compliance with worker health and safety requirements is the responsibility of the project sponsor, as well as its contractors and subcontractors.

6.42 Companies must appoint an individual to direct the health and safety program, which includes proposing measures, monitoring compliance, and reporting accidents to responsible officials. The program shall outline objectives and actions to reduce and eliminate risks to health and safety of workers. It should also emphasize safety procedure and its importance, training supervisors on specialized techniques, and training emergency personnel for firefighting, evacuation and first aid. Worker health and safety programs must be approved by the DGE and DGH.

6.43 DGAA reviews the quarterly reports and compliance activities, and makes recommendations to DGE and DGH, as appropriate. If violations of the EIA or EMP occur, DGAA may recommend warnings,

fines, or, in extremely rare situations, cease and desist orders.

6. Socioeconomic programs

6.44 One of the critical positive impacts resulting from the project relates to socio-economic programs. Job generation during construction and operation is one of the important socioeconomic benefits associated with the project. Local workers will be hired for 80 percent of the unskilled labor at approximately double the prevailing wages.

6.45 The project sponsor has agreed to develop, in conjunction with local groups and regulators, and fund the implementation of social programs (e.g., green areas or park, beach access for fisherman, educational programs, etc.). The exact programs will be determined during project construction.

7. Emergency contingency plans

a. New generating facilities

6.46 As part of the EIA, the MEM requires a risk analysis and contingency plan for all new hydrocarbon and electricity activities. This plan for the project is presented as part of the EIA and is summarized below for the construction and operation phases of the new generating facility.

i. Construction phase

6.47 A risk assessment was conducted for construction phase, and due to the isolated area of the plant, the risk to off-site human health during this phase is minimal. The greatest risk during this phase is injury to a site worker. Construction work is among the most hazardous types of work. Work performed during this phase will involve more high-risk aspects of construction, such as work in excavations and on elevated platforms and ladders. Construction of the pier present certain risks for worker health and safety while working in and over water. Methods to control a spill or release of fuel will be present on site, and workers will be properly trained to manage such an incident.

6.48 During the construction phase, the emergency and contingency plans will focus largely on accident and injury prevention and management, and spills or releases of fuel. The contingency plan for the construction phase of the project will include the following elements: (a) emergency contacts; (b) pre-emergency planning; (c) personnel roles, lines of authority and communications; (d) emergency recognition and prevention; (e) a description of site topography, layout and prevailing weather conditions; (f) site evacuation procedures; (g) emergency decontamination and medical treatment; (h) emergency response critique and follow-up; and (i) environmental concerns.

6.49 During the construction phase, employee training will consist primarily of safety training. Training will include topics such as hazard communication, spill control and containment, first aid, protective equipment and site contingency plan.

ii. Operation phase

6.50 Risk assessment for the operation phase includes the following:

Coal handling with the risks inherent to it, such as combustible dust, black lung disease, spill into the ocean, and health and environmental risks from metals removed from coal.

Diesel unloading and handling: the risk is a diesel spill or release during pumping or in pipelines.

Boiler systems: the heat and pressure present in a boiler system involve risks to employees working on those systems.

Boiler air and gas flow: this is a relatively low-risk system. However, an uncontrolled environmental release of gas containing contaminants is a possible risk in this system.

Boiler water and steam flow: the primary risk for this system is worker health and safety from an uncontrolled steam release.

Turbine-generator system: this is a relatively low-risk system.

Fly ash and bottom ash handling system: disposal of fly ash is a potentially significant environmental issue, and for worker health and safety, due to the presence of heavy metal contaminants in the ash.

Compressed air: compressed air must be managed properly for worker health and safety.

Water circulating and processing system: this is a relatively low-risk system.

Wastewater: this is a potentially high-risk system due principally to the use of chlorine gas in wastewater treatment.

Electrical system: this is a potentially high-risk system.

Emissions: potential for hazardous emissions into the environment are present. Potential sources of environmental emissions include failure of the wastewater treatment system, fuel spill into surface water or ocean, or release from diesel storage tank.

6.51 The contingency plan for the operation phase will address all the potential hazards associated with the operation of the plant. The plan will include the following elements: (a) pre-emergency planning and coordination with outside agencies; (b) job descriptions, lines of authority, and communication methods for personnel responsible for emergency response; (c) how to recognize and prevent emergencies; (d) procedures for alerting all workers during an emergency; (e) evacuation routes and procedures; (f) safe

distances and places of refuge; (g) methods for providing medical treatment and first aid; (h) decontamination procedures; (i) site security and control; (j) personal protective equipment and emergency equipment; (k) evaluation and follow-up for response actions; and (l) procedures for reporting any incidents.

6.52 To address safety and emergency procedures for specific areas and aspects of plant operations, the following additional elements will be covered in the contingency plan: (a) coal unloading and handling system; (b) pier: material handling and docking procedures; (c) cranes: inspection and use; (d) enclosed conveyor system: maintenance, inspection and storage; (e) diesel unloading and handling system; (f) boiler system; (g) turbine generator system; (h) fly ash and bottom ash handling system; (i) water circulating and processing system; (j) wastewater; (k) environmental emissions; and (l) chemical use.

6.53 Worker training during this phase will be essential. Training will include: (a) process safety management training for working with pressurized systems; (b) spill control and containment; (c) hazards of working with coal and protective measures available; and (d) fire prevention.

iii. Site closure

6.54 At the end of the useful service life of the project, the equipment will be removed and the site restored to its original condition. A site closure plan will be developed to identify all potential sources of significant risks to the workers and the surrounding environment, and define procedures for the mitigation of any adverse impacts. Prior to the implementation of the site closure plan, a comprehensive environmental assessment of the site will be performed to identify all potential contamination present on the site.

6.55 The major elements of the site closure plan will include: (a) worker safety program; (b) accident prevention plan; (c) contamination remediation program; (d) environmental protection plan; (e) dust control program; and (f) noise reduction program.

b. Existing generating facilities

6.56 The PAMA contains a contingency plan that defines procedures for the mitigation of potential adverse impacts and a site closure plan.

B. Existing facilities

1. Mitigation measures

6.57 The PAMA for the existing site consists of the following mitigation measures: installation of a new 41 MW diesel gas turbine, the replacement of the hydrogen plant, the installation of an oil/water separator and the demolition of old buildings.

6.58 Bunker oil currently acquired by the project company has a low sulphur content (between 1.5% and 2.5 %). However, the installation of the 37.5 MW gas turbine fired by diesel #2 will contribute to reducing the level of SO_2 emissions as diesel #2's sulphur content is below 1%. It is estimated that approximately 4,770,000 liters of bunker oil with a 2% sulphur content will be replaced by Diesel #2 with a 1% sulphur content.

6.59 EnerSur will replace the current hydrogen plant in 1998 with a more modern system. The current hydrogen plant consumes approximately 1,430 l of potassium hydroxide. The new plant will only consumes 50 liters per year resulting in a reduction of 97% in the use of potassium hydroxide.

6.60 An oil/water separator was installed to reduce oil and grease discharges in the environment.

6.61 Several old administrative buildings were demolished thereby reducing the quantity of contaminants originating from those facilities and eliminating the maintenance requirements.

6.62 A chronogram for the implementation of the above mitigation measures as well as an estimate of the costs associated with this implementation is presented below:

CHRONOGRAM FOR THE IMPLEMENTATION OF THE MITIGATION MEASURES

MITIGATION MEASURES	YEAR OF COMPLETION	ESTIMATED COSTS
		(in US$ thousand)
New 41 diesel gas turbine	1997	13,000
Replacement of the hydrogen plant	1998	520
Installation of an oil/water separator	1997	10
Demolition of old buildings	1997	25
	TOTAL	**13,555**

2. Environmental monitoring

6.63 The PAMA includes a monitoring plan for water and air quality to avoid, minimize, control and compensate potential negative impacts.

a. Water quality monitoring plan

6.64 Results of the analysis of water samples, carried out twice a month at 4 different discharge points, are regularly compared to the applicable maximum permissible effluent limits. Those results have shown

satisfactory levels of quality with respect to discharged wastewater.

b. Air quality monitoring plan

6.65 Air quality is monitored on a regular basis at different locations within the plant area including the smelter and the refinery. Ambient air quality is monitored regularly in the vicinity of the plant to determine general meteorological conditions (temperature, wind velocity, humidity) and the presence of particulate matters and sulphur dioxide.

VII. PUBLIC CONSULTATION AND COMMUNITY INTEGRATION

7.1 The following presents a summary of the various project actions (activities) related to public participation and consultation. These actions include various meetings to present the proposed project (e.g., via project summaries, preliminary EIA, etc.) to concerned parties at early stages (e.g., before submittal of the final EIA) in order to solicitate comments which could be incorporated into the final EIA.

April 18, 1997: Initial discussions between EnerSur's general manager and the mayor of Ilo when EnerSur obtained ownership of the plant.

August 5, 1997: Application for the construction of the new facilities south of Ilo.

August 27, 1997: EnerSur's general manager meets with the Ilo municipality officials to finalize a decision on the location of the new facilities and to request procedures for changing land use designation.

August 29, 1997: EnerSur invites the municipality officials to visit the Tocopilla power plant in Chile.

September 11, 1997: Press conference in Ilo followed by the visit of Tocopilla.

September 24, 1997: EnerSur delivers the preliminary EIA to the mayor of Ilo and copies were made available to local affected groups;

September 30, 1997: EnerSur organizes another visit of Tocopilla for the officials of the Province of Ilo.

October 29, 1997: EnerSur presents the project and the preliminary EIA to the municipality council of the city of Ilo.

November 5, 1997: EnerSur presents the project to different company representatives of Ilo.

November 6, 1997: EnerSur participates in a public hearing attended by 250 participants. Municipal council votes in favor to initiate process to review request for land use change.

November 25, 1997: EnerSur submits the final EIA to the MEM which incorporated changes and enhancements based upon comments received from various groups (e.g., refinements in air quality modeling).

November 26, 1997: EnerSur delivers the final EIA to the municipality of Ilo. The EIA is made available to local affected groups.

November 27, 1997: EnerSur makes a presentation to the CONAM in Lima.

November 29, 1997: EnerSur meets with the fishermen in Ilo.

December 2, 1997: EnerSur participated in the conference "Energy generation for the third millennium".

December 4, 1997: EnerSur makes a presentation of the final EIA in the auditorium of the Casa de la Cultura.

December 16, 1997: EnerSur presents EIA addendum for the pier facility providing additional information (e.i., in response to comments received) such as modeling of wastewater discharges.

December 19, 1997: EnerSur presented the EIA at a public session in the District "Pampa Inalambrica".

7.2 In January prior to the proposal date for presentation of the project to the IDB Board of Directors, two additional actions are anticipated:

(i) the official MEM regulatory public hearing should be held to allow other governmental agencies and established organizations to provide written comments on the EIA; and

(ii) the ILO Comisión de Desarrollo Urbano should provide a final recommendation on the application for the change of land use at the site. This recommendation is taken after public meetings and discussion take place and comments are received.

7.3 In addition, EnerSur plans to continue with a public information campaign which includes meetings with affected groups, information dissemination, etc.

VIII. RECOMMENDATIONS

8.1 The project team and the Bank Committee on Environment and Social Impact recommend that the sponsor satisfy the following requirements prior to consideration of the operation by the Bank Board of Directors:

(i) provide a list of all necessary regional, federal, state and local permits and approvals required for the project;

(ii) ensure that the EIA Addendum for the pier facility is made available to affected groups;

(iii) provide the Bank with a summary detailing any additional (subsequent) public consultation activities performed in connection with the project;

(iv) provide details related to environmental monitoring and auditing program that contains the elements necessary to verify compliance during project construction and operation, including compliance with air emission standards (local and World Bank), management of liquid and solid wastes, management of the coal supply; and

8.2 Prior to financial closing, the sponsor will have to satisfy the following requirements:

(i) provide evidence of the approval of the EIA by the MEM;

(ii) provide the final ESMP (as approved by local authorities) for Bank approval;

(iii) provide evidence of governmental approval of change in land use designation;

(iv) provide finalized detailed budget for the identified environmental and social mitigation measures and monitoring programs and evidence of availability of the required resources;

(v) provide the implementation plans for each activity under the ESMP, specifying the parties responsible for implementation and any corresponding institutional agreements for implementing activities by parties other than the Project Company;

(vi) provide the detailed risk assessment and contingency plan for the construction phase of the project;

(vii) provide a plan to ensure quality control in implementing the project environmental and social mitigation measures and monitoring programs;

(viii) provide evidence that all necessary regional, federal, state and local permits and approvals related to construction have been issued; and

(ix) provide evidence that the PAMA has been approved by MEM and all mitigation and monitoring requirements have been implemented.

8.3 Prior to initiation of operations at the new generating facility, the sponsor will have to satisfy the following requirements:

(i) evidence that all necessary governmental permits, authorizations, and approvals related to operation

phase have been issued;

(ii) submittal to the Bank for review of the detailed contingency plan for operation phase; and

(iii) submittal of social programs (including description, cost and responsibility) to be funded by EnerSur;

8.4 During the entire disbursement period of the project, the sponsor will prepare and submit an annual Environmental and Social Compliance Report. This report will be reviewed by the Bank to assess compliance with the ESMP and other project related requirements, and including the following:

(i) certification by the sponsor that all design and operational regulatory requirements for all the project phases and activities have been complied with according the regulations;

(ii) any material deviation from the original construction plan, including a brief technical description and major reasons for such changes, as well as any adjustment to the relevant environmental and social measures that have been taken;

(iii) description of any environmental or social problem or issue, actions taken to correct the problem, and measures taken to prevent its occurrence in the future.

(iv) description of any existing or anticipated environmental or social liability. risk or non-compliance; and

(v) copies of any major environmental or social report or document prepared in order to satisfy regulatory requirements, including regulatory environmental audit report.

8.5 The loan agreement will contain the following provisions:

(i) compliance with the ESMP, any associated regulatory requirements, and any other environmental and social conditions;

(ii) compliance with all applicable GOP regulatory requirements and applicable World Bank guidelines for thermal power plants;

(iii) Bank review and approval of EIA, associated ESMP, and required governmental permits and authorizations for all proposed transmission line segments prior to initiation of construction;

(iv) seek to obtain ISO 14000 certification for new generating facilities;

(v) independent auditing of environmental conditions to be reported at least annually describing the implementation of environmental measures presented in the EIA and the ESMP;

(vi) obligation of the sponsors to make information on emissions and discharges, contingency plans, accidents and any other information relevant to the public welfare available to local groups and to local authorities;

(vii) provisions for Bank notification (in writing) within 30 days of any project non-compliance, significant accident, environmental or social impact, or environmental or social liability; and

(viii) provisions for Bank review and approval of any substantive changes in the project that have potential environmental and social impacts.