

**PROJECT PROFILE**

**LAMMA POWER STATION**

**UNITS L4 & L5**

**FLUE GAS DESULPHURIZATION PLANT**

**RETROFIT PROJECT**

**September 2005**

**Revision 0**



***The Hongkong Electric Co., Ltd.***

香港電燈有限公司

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## 1. **INTRODUCTION**

The Hongkong Electric Company, Limited (HEC) is planning to retrofit the two existing 350MW coal-fired generating Units L4 and L5 of Lamma Power Station with Flue Gas Desulphurization (FGD) plant for reducing sulphur dioxide emission in support of Government policy objective to improve the air quality of the Pearl River Delta.

Having considered the site constraints and current development of the emission control technologies, HEC proposes to adopt the “Wet Limestone- Gypsum” process for Units L4 & L5 FGD plant retrofit project. This technology has been proved reliable and effective based on operating records of FGD plants of the same technology installed for existing coal- fired Units L6, L7 & L8.

The proposed FGD retrofit work involves directing of the flue gas from the boilers of Units L4 and L5 to FGD plants, in which limestone slurry is introduced to react with flue gas for removal of SO<sub>2</sub>, before discharging to the chimney. As a result, the temperature of flue gas entering the chimney will be reduced, waste water from the FGD absorber will be produced and gypsum will also be produced as by-product. These are regarded as a material change to an exempted designated project (the existing Lamma Power Station) under the Schedule 2 – Part I of the Environmental Impact Assessment Ordinance Chapter 499.

To provide space for installing the proposed FGD plants, two existing Nos. 4 & 5 Light Oil Tanks each of 250m<sup>3</sup> capacity located in front of Units L4 & L5 boiler will be demolished. This is a designated project under the Schedule 2 – Part II of the EIA Ordinance.

This Project Profile serves to outline the environmental information of the proposed FGD plants to be retrofitted to Lamma Units L4 & L5 for application for an EIA Study Brief to proceed with an EIA Study for the project.

## 2. **BASIC INFORMATION**

### 2.1 **Project Title**

Units L4 & L5 Flue Gas Desulphurization Plant Retrofit Project.

### 2.2 **Purpose and Nature of the Project**

Lamma Power Station has an installed capacity of 3,420MW comprising 3x250MW and 5x350MW coal-fire units, 1x365MW oil-fired combined cycle unit, and 1x55MW and 4x125MW oil-fired open cycle gas-turbine units. The latest three 350MW coal-fired units, Units L6, L7 & L8, are equipped with FGD plants. The proposed retrofit project will include the installation of FGD plants with flue gas desulphurization efficiency of 90% for the two 350MW coal-fired Units L4 & L5 to reduce the overall SO<sub>2</sub> emissions from Lamma Power Station.

### 2.3 **Name of Project Proponent**

The Hongkong Electric Company, Limited (HEC).

### 2.4 **Location of Project**

*Figure 2.4a* shows the location of the proposed FGD plants.

Making use of the area by demolishing the existing Nos. 4 & 5 Light Oil Tanks and relocating some of the services pipe work located in front of the respective boiler, a FGD plant will be installed for each coal-fired unit to remove SO<sub>2</sub> in the boiler flue gas.

### 2.5 **Number and Types of Designated Projects**

This Project Profile covers the following designated projects:

- (1) Demolition of two existing Nos. 4 & 5 Light Oil tanks, each of 250m<sup>3</sup> storage capacity at Lamma Power Station (Schedule 2 – Part II of EIA Ordinance).
- (2) Retrofit of FGD Plants to two existing 350MW coal-fired Units L4 & L5 of Lamma Power Station (Schedule 2 – Part I of EIA Ordinance).

### 2.6 **Name and Telephone Number of Contact Person**

Ms. Mimi Yeung, General Manager (Public Affairs)  
Tel. no: 2843 3268

Ms. Catherine Sing, Public Affairs Manager (Corporate Communication)  
Tel. no: 2843 3205

### 2.7 **Proposed Addition, Modification and Alteration**

At present, the flue gas from Units 4&5 Boilers is directly discharged to the atmosphere via a 210m high chimney. The retrofit work will involve demolishing the existing Nos. 4 & 5 Light Oil Tanks (each of 250m<sup>3</sup> capacity) and relocating some of the pipeworks located in front of the respective boiler to provide areas for installing FGD plant for each of Units L4 & L5. The flue gas from the boiler will be directed to the FGD absorber inside which removal of SO<sub>2</sub> will take place by reaction with limestone slurry.

After passing through the absorber, the treated flue gas will be heated up by a gas heater to over 80°C at boiler rated capacity and directed back to the existing chimney for discharge to the atmosphere.

As majority of the existing common limestone powder/gypsum handling and storage facilities for Units L6, L7 & L8 FGD plants have spare capacity to cater for two more

350MW units, the additional equipment required for Units L4 & L5 FGD retrofits will be limited to the extension of the existing gypsum dewatering system.

Figure 2.6a shows the additional equipment to be installed for the proposed retrofit project for Units L4 and L5 which includes:

- a) Two sets of FGD absorbers and associated ductworks
- b) Two sets of booster fans
- c) Two sets of gas-gas heaters
- d) FGD Switchgear and Equipment Building
- e) Gypsum dewatering system comprising two sets of hydrocyclones and belt filters

Figure 2.6b shows the layout of the two existing Light Oil Tanks to be demolished.

### **3. PROJECT PLANNING AND IMPLEMENTATION**

Based on the lead time required for design, delivery and construction, the targeted key dates for the proposed FGD retrofit project are as follows:

Commencement of demolition of Nos. 4 & 5 L.O. Tanks	1 April 2006
Commencement of civil works	1 September 2006
Commencement of plant erection for L5 Unit	1 October 2007
Commencement of plant erection for L4 Unit	1 August 2008
Commercial operation of L5 FGD Plant	1 July 2009
Commercial operation of L4 FGD Plant	1 April 2010

### **4. POSSIBLE IMPACT ON THE ENVIRONMENT**

#### **4.1 Outline of Processes Involved**

The “Wet Limestone - Gypsum” process being employed for Units L6, L7 and L8 of Lamma Power Station will be adopted for the proposed retrofit project. This technology has been proved reliable and effective, and the operating and maintenance (O&M) costs are low. Adopting the same technology for Units L4 & L5 will have synergy benefits on O&M and utilizing most of the common limestone/gypsum storage and handling facilities already in place for the existing FGD plants.

Figure 4.1a shows the schematic diagram of the FGD plant.

Limestone is mixed with water to form slurry and fed to the scrubber to absorb SO<sub>2</sub> from the flue gas. The by-product is withdrawn for dewatering to produce saleable gypsum. The clean flue gas is reheated before entering the chimney to regain buoyancy for better dispersion and to prevent acid condensation in the chimney.

Boiler flue gas is directed to the absorber tower inside which SO<sub>2</sub> reacts with the limestone slurry in the suspension to calcium sulphite which is oxidised to calcium sulphate in the absorber sump. Recycle slurry in the absorber sump is maintained in motion by agitators to enhance gypsum crystal growth, achieve a high degree of sulphite oxidation and promote limestone dissolution.

A booster fan is provided to overcome the draft loss of the flue gas passing through the FGD system. Three sets of dampers and a pair of guillotine shutters are used to bypass and isolate the FGD plant. Gas heater is adopted to heat up the clean gas leaving the absorber to minimise the effect of condensation of flue gas and to ascertain its effective dispersion of the remnant pollutants to the atmosphere.

The reacted limestone slurry in the absorber sump, called gypsum slurry, which is no longer useful is bled off to a set of hydrocyclones and vacuum belt filters located inside the existing gypsum dewatering building for dewatering and gypsum in cake form is produced as a result. The filtrate generated thereof is directed to the existing wastewater treatment system.

Gypsum discharged from the belt filters with a purity of 90%, moisture of 10% and chloride of 200ppm is carried through a set of belt conveyors into the existing gypsum silo for off-site disposal/industrial application by barges.

The FGD plants of the proposed retrofit project are capable of removing 90% of the SO<sub>2</sub> in the boiler flue gas.

## 4.2 **Potential Environmental Impacts**

### 4.2.1 Construction Phase

#### a) Air Quality

Although the emissions from construction equipment has the potential to cause air quality impacts, the number of construction equipment to be used during the construction phase is small due to the relatively small size of the retrofit project, gaseous emissions during construction phase are expected to be localised and temporary only and the nearest Air Sensitive Receivers are located far away from the proposed site and separated by other industrial activities at Lamma Power Station. Hence, no adverse air quality impacts during the construction impact are envisaged.

#### b) Noise Impact

Noise would be generated during construction from piling and operation of the construction equipment. Settlement on the northern end of Lamma Island (mostly one to three storey residential buildings) is largely concentrated around the harbour at Yung Shue Wan and the adjacent villages of Yung Shue Long, Sha Po, Ko Long, Wang Long and Tai Wan San Tsuen. These residences are shielded from construction site noise to varying degrees by the intervening hill (Kam Lo Hom), and the general construction noise at the NSRs is expected to

be well below the statutory limits.

c) Water Quality

As the proposed site is located on formed land, minimal site runoff is expected and no adverse construction water quality is anticipated.

d) Ecology

As the proposed retrofit work is located within the existing power station compound, no terrestrial ecological impact is envisaged.

e) Land Contamination

To avoid or minimize any risks or hazards associated with the potential land contamination arising from demolition of the two existing Nos. 4 & 5 Light Oil tanks, a site contamination assessment will be carried out and proper remedial measures will be implemented if necessary in accordance with the relevant guidance notes issued by the EPD.

#### 4.2.2 Operational Phase

a) Air Quality

The proposed FGD plant retrofit project will effectively reduce the SO<sub>2</sub> emissions in the boiler flue gas of existing coal-fired Generation Units L4 & L5, which would otherwise be discharged to the atmosphere. Hence, emissions from the existing boilers of Units L4 & L5 are the only sources of pollutants before and after the retrofit work.

When the FGD Plant is in operation, the SO<sub>2</sub> emission is expected to reduce by over 90%. The wet scrubbing process of the FGD plant will also remove particulates in the boiler flue gas. There will be significant reduction of atmospheric emission and hence environmental improvement from the proposed retrofit project.

b) Noise Impact

Potential noise sources during operation of the outdoor equipment such as booster fans, slurry pumps, etc. Because of their much smaller quantities and sizes compared with the existing power station equipment, the proposed FGD plants would have insignificant contribution to the Lamma Power Station cumulative noise. Moreover, majority of the NSRs are located to the north of the Lamma Power Station and are completely screened from the FGD plants by natural topography. Operational noise is therefore expected to comply with the statutory limits.

c) Water Quality

In line with the existing practice adopted for Units L6, L7 & L8 FGD plants,

operational plant effluent from the proposed FGD plant retrofit project for Units L4 & L5 will be reused as far as possible for preparation of limestone slurry, conditioning of PFA for offsite transportation, etc. to minimize discharge to the existing wastewater treatment plant (WWTP). As the existing WWTP has spare capacity to cater for the additional wastewater produced from the proposed retrofit project, it is expected that effluent from the WWTP to the Ash Lagoon will meet the requirements in WPCO licence for the Ash Lagoon Decantrate Tower.

d) Solid Waste

Similar to Units L6, L7 & L8, gypsum produced from the proposed FGD plant retrofit project will be transported offsite for cement manufacture and wallboard production. Thus no adverse environmental impact is envisaged.

e) Marine & Terrestrial Ecologies

As the proposed FGD plant retrofit project is located within the existing power station compound, no terrestrial ecology impact is envisaged. The insignificant amount of wastewater discharged to the sea via the ash lagoon is not expected to have any impact to the marine ecology.

f) Visual and Landscape

As all equipment of the proposed FGD plant retrofit project are situated in the existing power station, there will be no direct impact on the existing land form and coastal morphology of Lamma Island. Furthermore, Units L4 & L5 FGD plants will be well surrounded by the existing station facilities with a low landscape quality. The new absorbers and booster fans, etc. are small masses of blocks and have relatively low visual characters especially compared with the adjacent Boilers and Chimney. Views from many of the more populated areas on Lamma Island will be obstructed by the Po Lo Tsui headland. By adopting appropriate colour scheme to the new structures, any visual impact as a result of the retrofit project would be well absorbed by the established character of the power station. The proposed retrofit plants will be well absorbed by the existing installations at Lamma Power Station, hence are not expected to pose any adverse visual and landscape impact to the existing environment.

## **5. DESCRIPTION OF MITIGATION MEASURES**

Based on the above assessment, the construction and operation of the proposed retrofit project will not result in any adverse environmental impacts with the implementation of the following mitigation measures:

- a) Implement good site management practices for construction waste management, effluent discharge and general noise mitigation such as:



- All debris and materials will be covered or stored in a sheltered debris collection area. Dust control measures such as water spraying on roads and dusty areas, covering of lorries by impervious sheets and controlling of the falling height of fill materials, etc. will be implemented in accordance with APCO.
- General noise mitigation measures (ref NCO) will be employed at work site throughout the construction phase such as selection of quiet Powered Mechanical Equipment (PMEs). Mitigation against general construction noise will be provided during Sundays and public holidays, either at source with portable noise barriers, or by rescheduling of some PMEs to less sensitive time periods.
- Construction waste will be properly stored at site and windblown litter and dust will be minimized during transportation by either covering trucks or transporting wastes in enclosed containers. Waste will be disposed of at licensed sites and disposal permit will be obtained from appropriate authorities, if required, in accordance with the Waste Disposal Ordinance. Should chemical waste be produced, it will be handled in accordance with the relevant regulation.
- Effluent discharge from construction activities will conform to relevant statutory requirements and comply with the Water Pollution Control Ordinance (WPCO).

b) Use of acoustic enclosures around major noise sources.

## 6. USE OF PREVIOUSLY APPROVED EIA REPORT

This Project Profile has made reference to the following EIA Reports:

### Reference 1

Title:	The Hongkong Electric Company Limited Environmental Impact Assessment of Units L7 and L8 Lamma Power Station – Final Initial Assessment Report	
Reference Number:	EIA-012/BC	
Time of Approval:	May 1992	
Approved by:	Director of Environmental Protection	
Environmental Aspects Addressed:	Air quality Water quality Noise Waste Management	Marine Ecology Terrestrial Ecology Social-Economic Impacts Maritime Transport

Landscape and visual

EM&A

Reference 2

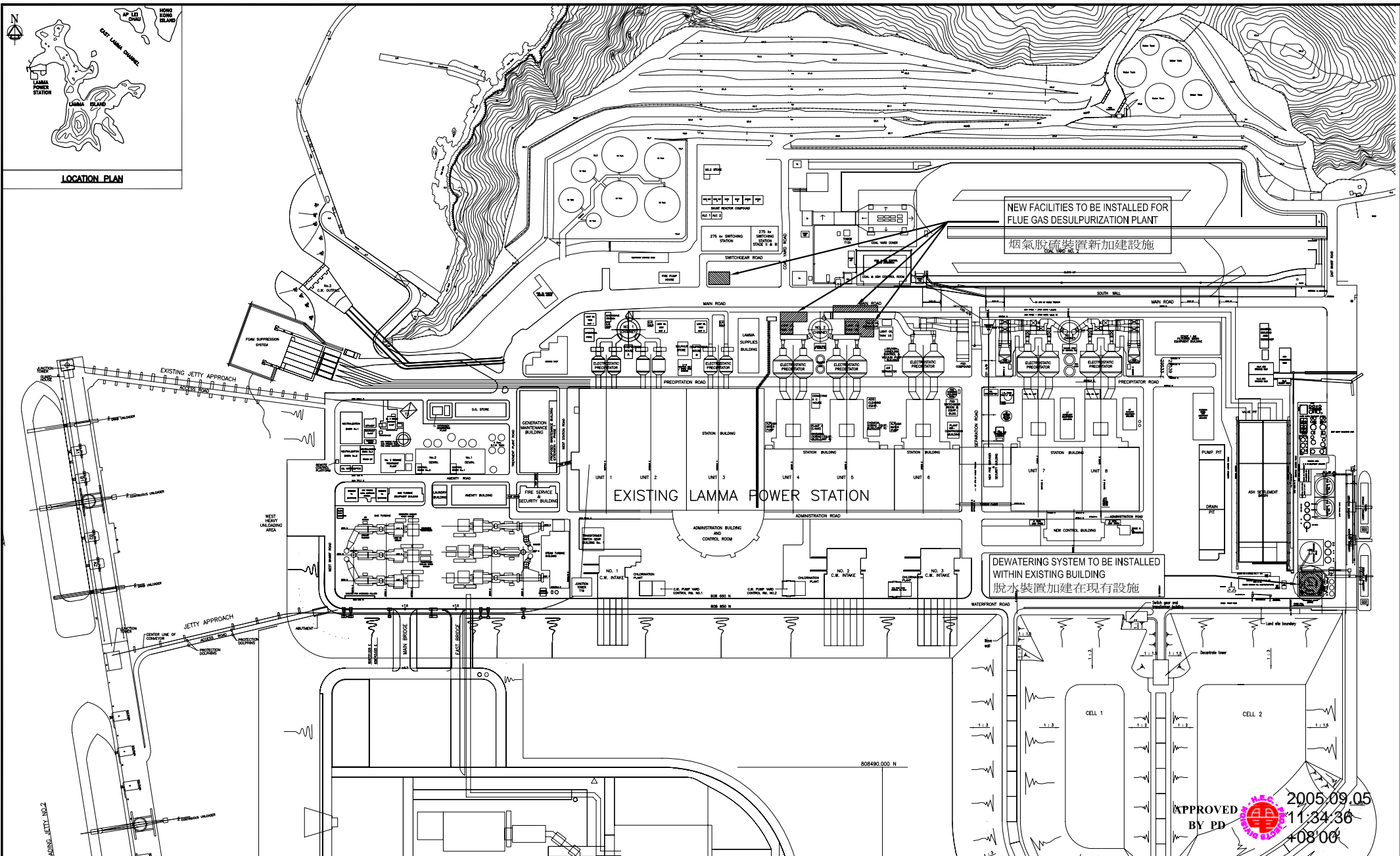
Title: The Hongkong Electric Company Limited  
Environmental Impact Assessment of a 1,800MW  
Gas-Fired Power Station at Lamma Extension

Reference Number: AEIAR-010/1999

Time of Approval: May 1999

Approved by: Director of Environmental Protection

Environmental Aspects Addressed:	Air quality	Ecology
	Water quality	Fisheries
	Noise	Land Contamination
	Waste Management	Hazard to Life
	Landscape and visual	



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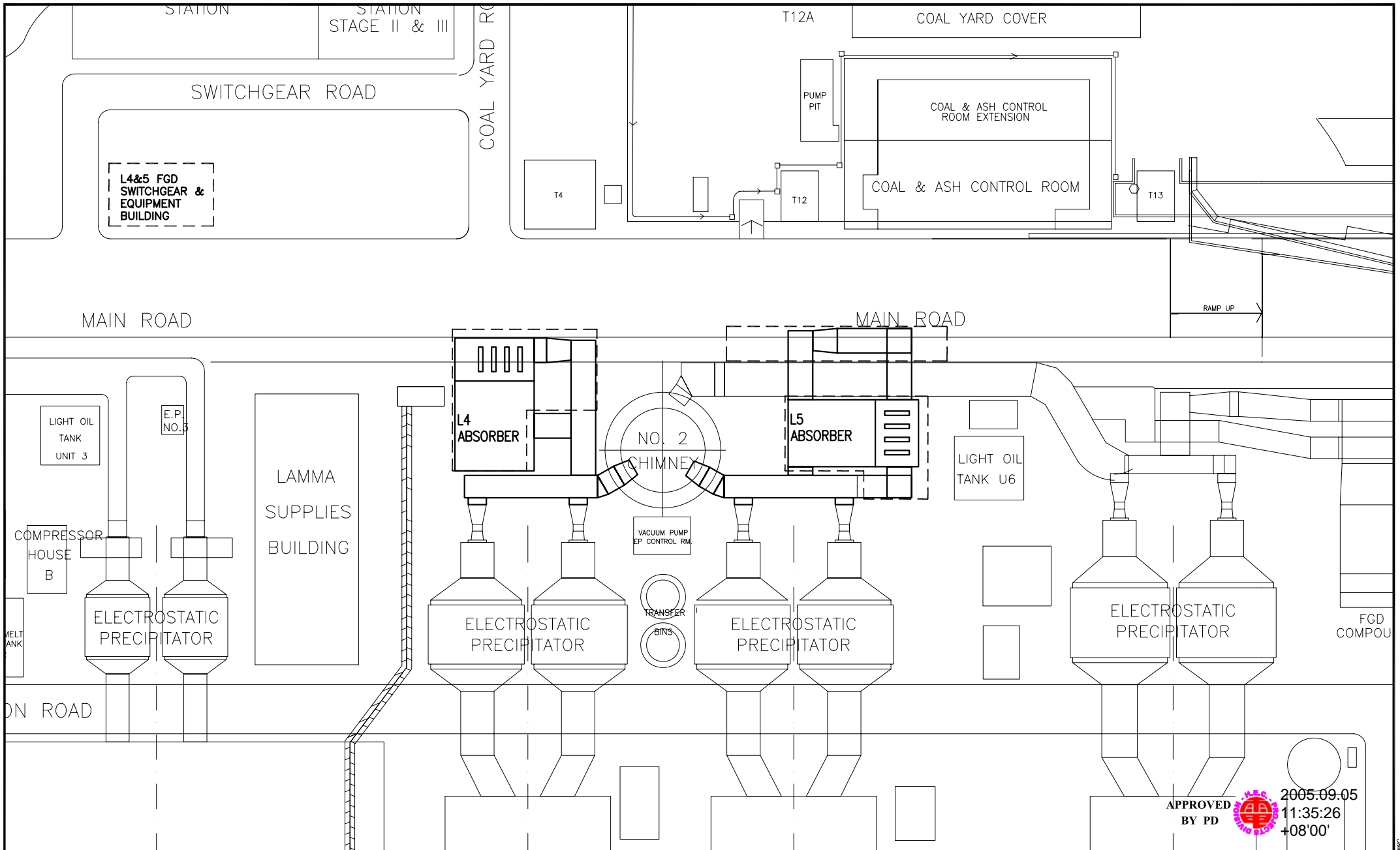
The Hongkong Electric Co Ltd  
香港電燈有限公司  
Projects Division  
The Hongkong Electric Group



Project LAMMA POWER STATION  
UNITS L4 & L5 FLUE GAS DESULPHURIZATION PLANT RETROFIT PROJECT  
Drawing Title Fig 2.4a LOCATION OF PROPOSED NEW FACILITIES FOR L4 & L5 FGD PLANT  
圖2.4a第四及五號機組煙氣脫硫裝置新加建設施位置圖

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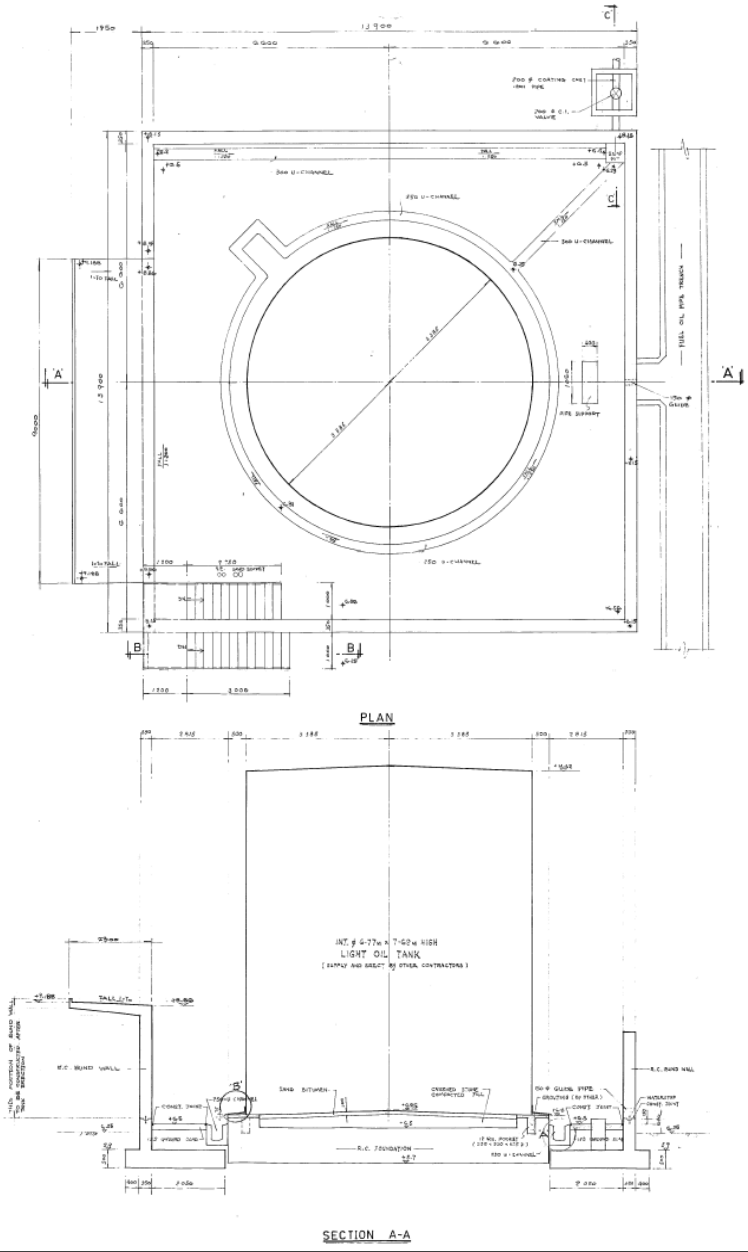
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 The Hongkong Electric Group



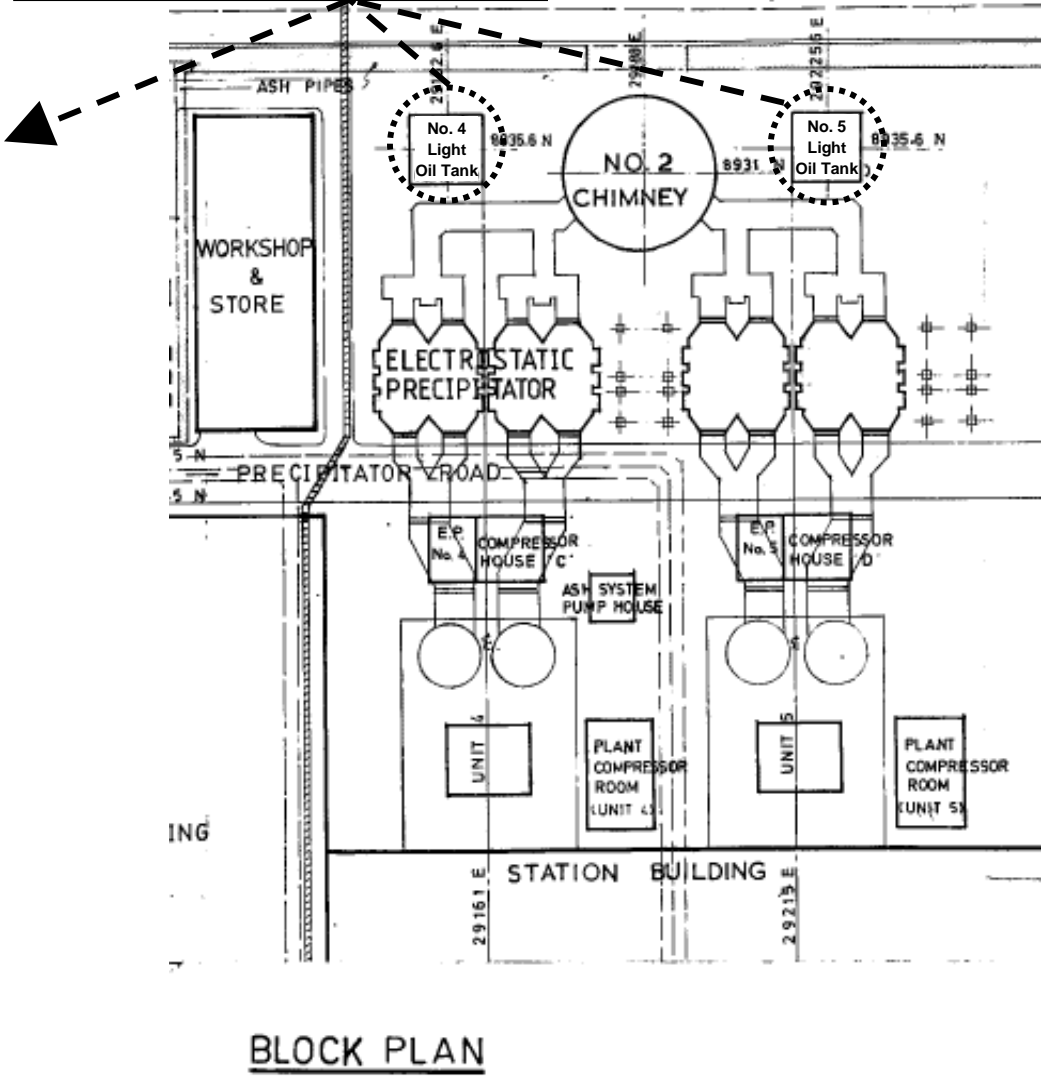
Project LAMMA POWER STATION  
 UNITS L4 & L5 FLUE GAS DESULPHURIZATION PLANT RETROFIT PROJECT  
 Drawing Title Fig.2.6a GENERAL ARRANGEMENT OF THE ADDITIONAL EQUIPMENT FOR L4 & L5 FGD PLANT  
 圖2.6a 第四及五號機組煙氣脫硫裝置新加建設施佈置圖

Drawn Leo	Checked MWK Chu	Approved YL Kwan
Scale NTS	Date Sept 2005	
Drawing No. 504/06/030/4002		Rev.

CAD ref.: LAM2451.DWG



Light Oil Tanks (250m<sup>3</sup>) to be demolished  
 將被拆卸的輕油缸(250立方米)



**BLOCK PLAN**

Figure 2.6b Arrangement of Existing Nos. 4 & 5 Light Oil Tanks (250m<sup>3</sup>) to be demolished  
 圖2.6b 將被拆卸現有的第四及五號輕油缸(250立方米)佈置圖



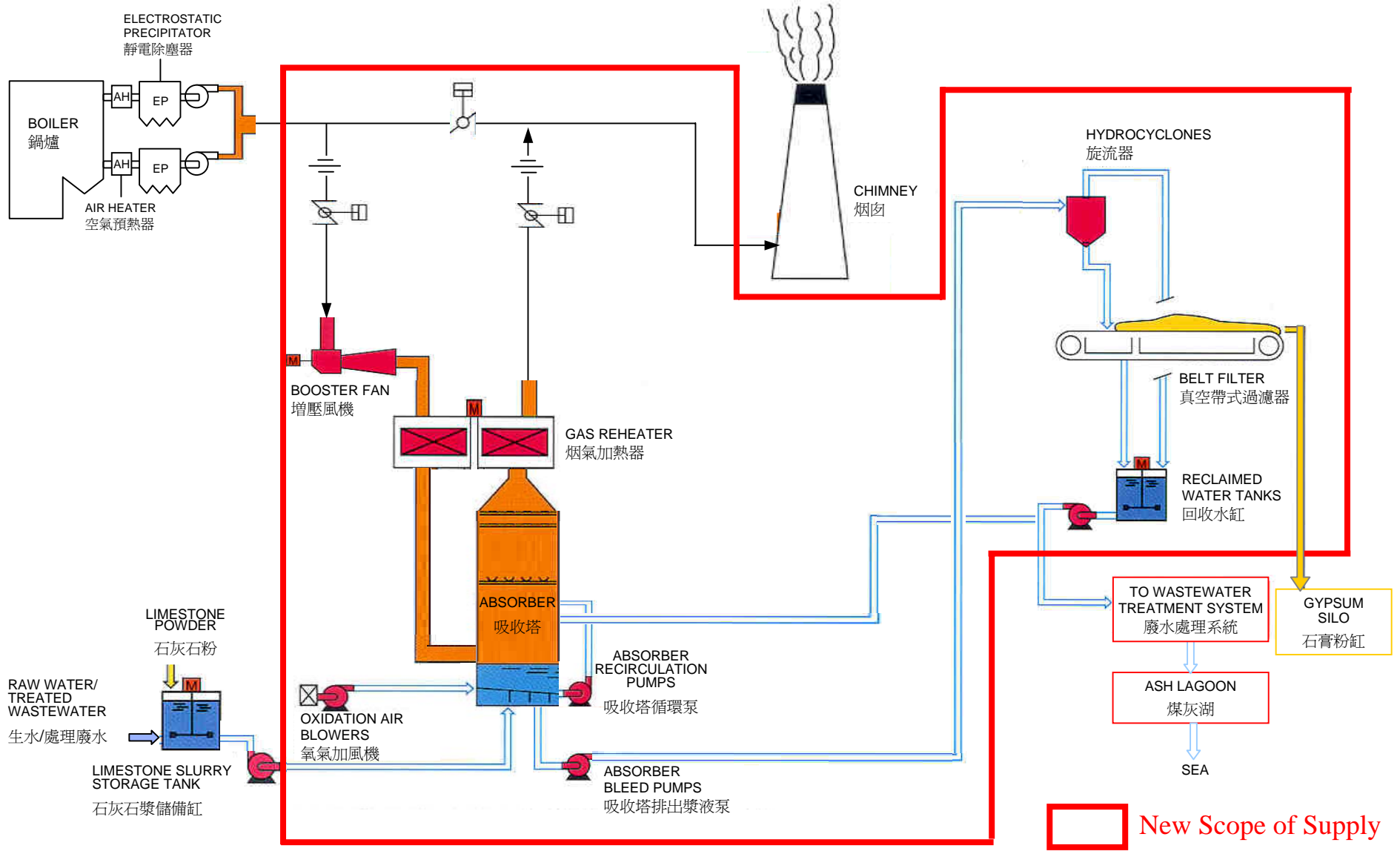


Figure 4.1a Schematic Diagram of Proposed FGD Plant  
 圖4.1a 建議中煙氣脫硫裝置示意圖

