



Environmental Impact Assessment Study for Re-provision of Open Cycle Gas Turbines at Lamma Power Station

Executive Summary

22 November 2021

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1. INTRODUCTION

1.1 Background

The Hongkong Electric Co., Ltd (HK Electric) operates the Lamma Power Station (LPS) with a number of power generating units currently in active operation, including six coal-fired units (i.e. L2, L4 to L8), three gas-fired combined cycle gas turbine units (CCGTs) (i.e. L9, L10 and GT57) and five oil-fired open cycle gas turbine units (OCGTs) (i.e. GT1 to GT4, GT6).

At LPS, there were originally seven OCGTs, GT1 to GT7, which were commissioned in the late 80s prior to the enactment of the Environmental Impact Assessment Ordinance (EIAO). Two of the OCGTs, namely GT5 and GT7, were later converted into a CCGT unit (GT57) in 2002 with a total power generation capacity of 345 MW. GT57 was subsequently converted to a gas-fired unit in 2008. The other five OCGTs, namely GT1 (55 MW) as well as GT2, GT3, GT4 and GT6 (125 MW each), are used for peak-opping and provide back-up power supply in case of emergencies.

GT2, GT3, GT4, GT57 and GT6, which are located within the Gas Turbine Compound (GT Compound) of LPS and have a total power generation capacity of 845 MW, are approaching the end of their service life. Therefore, HK Electric proposes to decommission and demolish these units sequentially from 2022 onwards, and to construct and commission up to four new OCGTs with a capacity of up to 130 MW each (i.e. the proposed GT8, GT9, GT10 and GT11, with a total power generation capacity of 520 MW) within the GT Compound (hereafter referred to as “the Project”) in order to maintain the peak-opping and emergency operational requirements of the LPS. GT1 located outside of the GT Compound is not included in the Project. GT1 will continue to operate within the LPS.

The operation of the aging units is increasingly less efficient and could potentially lead to higher air emissions. New OCGTs are much more efficient and capable of attaining more stringent emission standards and thus producing lower air emissions, in particular nitrogen oxides (NO_x), for generating the same amount of power comparing with the existing OCGTs. Therefore, the Project is beneficial from an environmental perspective and can be considered as part of the ongoing effort of HK Electric to further reduce the overall air emissions from the operation of LPS and contribute to the long-term air quality improvement in Hong Kong.

The submission of and content described in this Environmental Impact Assessment (EIA) Report does not amount to a commitment by or on behalf of HK Electric to proceed with the Project.

1.2 Purpose and Nature of Project

The scope of the Project is to decommission and demolish the existing OCGTs (i.e. GT2, GT3, GT4 and GT6) and CCGT (i.e. GT57) which are approaching the end of their service life, and subsequently construct and operate up to four new OCGTs (i.e. GT8, GT9, GT10 and GT11) as a replacement of the existing units. Upon the progressive retirement of the existing units, the new OCGTs serve to take over the function of these existing units in providing additional power generation during peak-opping and maintaining back-up power supply in case of emergency situations for the continuous operation of the LPS. The four new OCGTs would have a capacity of up to 130 MW each, with a total power generation capacity of up to 520 MW. Key activities associated with Project include the following:

- Decommissioning and demolition of existing GT2, GT3, GT4, GT57 and GT6, and auxiliary equipment including the black start gas turbine (BSGT), the miscellaneous storage shed, and the lube oil storage tank near GT5;
- Construction of the new GT8, GT9, GT10 and GT11, and installation of the new BSGT and Battery Energy Storage System (BESS);
- Construction of new cable trenches and the new staircase and lift, and reconstruction of the GT57 Auxiliary Building (GTAB) to a new 132kV Switching Station; and

- Operation of the new GT8, GT9, GT10 and GT11.

The Project is classified as a Designated Project under the *EIAO (Cap. 499)* as a result of the following elements:

- Decommissioning and demolition of four existing OCGTs and one existing CCGT at LPS (Schedule 2, Part II, Item 4 A public utility --- electricity power plant); and
- Installation of up to four new OCGTs at LPS (Schedule 2, Part I, Item D.1 Public utility electricity power plant).

1.3 Purpose and Objectives of the EIA Study

This EIA Report is prepared by ERM-Hong Kong, Ltd (ERM) for HK Electric in accordance with the EIA Study Brief No. ESB-331/2020 (“the EIA Study Brief”), issued in July 2020, and the *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*.

The purpose of this EIA study is to provide information on the nature and extent of potential environmental impacts arising from the decommissioning/ demolition, construction and operation of the Project in accordance with the requirements described in the EIA Study Brief. This information will contribute to decisions by the Director of Environmental Protection on:

- The overall acceptability of any adverse environmental consequences (if any) that are likely to arise as a result of the Project;
- The conditions and requirements for the detailed design, decommissioning/ demolition, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and
- The acceptability of residual impacts (if any) after the proposed mitigation measures are implemented.

The detailed requirements of the EIA study are set out in Clause 3 of the EIA Study Brief. As specified in the EIA Study Brief, the EIA study has addressed the key environmental issues associated with the decommissioning/ demolition, construction and operation of the Project.

2. OBJECTIVES AND BENEFITS OF THE PROJECT AND CONSIDERATION OF ALTERNATIVES

2.1 Objectives and Need of the Project

The objectives and needs of the Project are considered in detail in the EIA study. Given the existing OCGTs/ CCGT (i.e. GT2, GT3, GT4, GT6 and GT57) are approaching the end of their service life, these units need to be progressively retired and replaced by new OCGTs which serve to take over the function of these existing units in providing additional power generation during peak-opping and maintaining back-up power supply in case of emergency situations for the continuous operation of the LPS. Without the Project, HK Electric will slowly lose the capacity to cope with the additional electricity demand during peak-opping and maintain power supply in case of emergencies, putting HK Electric's stable and reliable supply of electricity at risk.

2.2 Environmental Benefits of the Project

The existing GT2, GT3, GT4, GT6 and GT57 have been in service since 1989 and are increasingly less efficient and potentially producing higher air emissions. New OCGTs which serve to replace these existing units are much more efficient and capable of attaining more stringent emission standards and thus producing lower air emissions during operation, in particular NO_x. Therefore, the Project is beneficial from an environmental perspective, contributing to the continuous reduction of overall air emissions from the operation of LPS and the long-term air quality improvement in Hong Kong.

2.3 Consideration of Alternative Options for Power Generation

A number of options have been explored in **Section 2.4.1** of the EIA Report to cope with the electricity demand during peak-opping and emergency operations upon progressive retirement and decommissioning of the aforementioned existing units. The options considered include:

- Construction of new CCGTs;
- Construction of new OCGTs;
- Extending services of existing OCGTs;
- Importing power supply from Mainland China; and
- Use of renewable energy.

The benefits and dis-benefits of the abovementioned options for power generation during peak-opping and emergency operations are summarised in **Table 2.1**.

Table 2.1 Benefits and Dis-benefits of Power Generation Options during Peak-opping and Emergency Operations

Options	Benefits	Dis-benefits	Conclusion
Construction of new CCGTs	CCGT has high efficiency with relatively lower consumption and associated air emissions during its operation.	CCGT does not have fast start-up capability which is the key to providing swift electricity supply during peak-opping and emergency situations.	Not a preferred option – not fit-for-purpose due to its lack of fast start-up capability.
Construction of new OCGTs	OCGT has fast start-up capability with the ability to generate electricity within a relatively short time. New OCGTs produces lower emissions than the existing ones during operation.	-	A preferred option – fit-for-purpose with its fast start-up capability, and is beneficial from an environmental perspective with its lower emissions compared with existing units.
Extending services of existing OCGTs	-	Substantial replacement of components and refurbishment works for the existing OCGTs are required. The control system of the existing OCGTs is obsolete and the equipment suppliers do not have the necessary spare parts or technical support to enable continuous operation of the existing units.	Not a preferred option – technically not viable, not cost-effective and not the long-term solution in securing power generation during peak-opping and emergency operations.
Importing power supply from mainland China	-	Lack of infrastructure for connecting to the power grid in Mainland China. Reliable electricity supply cannot be guaranteed as HKSAR government does not have direct control and regulation of the electricity imported from Mainland China. Displacement of local pollutants from power generation to Mainland China where the HKSAR government or HK Electric has no control over the emission performance.	Not a preferred option – lack of infrastructure, uncertainty in maintaining electricity supply reliability and lack of control over emission performance.
Use of renewable energy	No emissions would be generated.	Renewable energy cannot supply electricity on demand to serve the purpose of peak-opping and emergency operations due to its intermittent nature.	Not a preferred option – not fit-for-purpose due to its inability to supply electricity on demand.

The construction and operation of new OCGTs is considered the most practicable and preferred option to pursue as this involves essentially like-to-like replacement, is fit for purpose, technically the most practicable, environmentally beneficial and can tie in with the retirement schedule of the existing units. Other options would present impracticality and uncertainties, or may not tie in with the retirement schedule of the existing units.

2.4 Consideration of Siting

The benefits and dis-benefits of potential sites for accommodating the new OCGTs within the LPS and Lamma Extension (LMX) are discussed in **Section 2.4.2** of the EIA Report and summarised in **Table 2.2** below, with due consideration of various factors including site condition, space adequacy, construction feasibility and complexity, and environmental impacts. The preferred location to develop the new OCGTs is at the GT Compound where the existing units to be demolished are located.

Table 2.2 Benefits and Dis-benefits of Potential Sites for the New OCGTs

Potential Sites	Benefits	Dis-benefits	Conclusion
GT Compound	There would be sufficient space for constructing the new OCGTs, cable trenches and associated facilities after the removal of the existing units. Foundation works are not required as the existing foundation piles and reinforced concrete structures could be reused for the construction of the new OCGTs. Existing chimneys can also be reused for the new OCGTs.	-	A preferred option – small project scope with no foundation works and limited civil works involved and low environmental impacts.
L13 Area	L13 Area is currently vacated and have sufficient space for the Project.	L13 Area is planned for the future development of the proposed L13. The construction of the new OCGTs in L13 Area may pose constraints on the design and construction of the proposed L13. Foundations and concrete structures for the new OCGTs need to be constructed. New chimneys for the new OCGTs need to be constructed as well.	Not a preferred option – design complexity and constraints due to interfacing with the proposed L13. Increased project scope, construction time and cost, and environmental impacts due to new foundations and extensive civil works required.
L3 Main Station Building	-	Extensive demolition of existing structures and equipment associated with the L3 Main Station Building is required to create space for the construction of new OCGTs. Foundations and concrete structures for the new OCGTs need to be constructed. New chimneys for the new OCGTs need to be constructed as well.	Not a preferred option – extensive demolition works required to create space. Increased project scope, construction time and cost, and environmental impacts due to extensive demolition, foundation and civil works required.

2.5 Scenarios With and Without the Project

If the Project does not proceed, HK Electric will slowly lose the capacity of additional power generation to cope with the electricity demand during peak-logging and maintaining power supply in

case of emergencies upon the progressive retirement of the existing units from 2022 onwards. Such capacity will be completely lost upon complete retirement and decommissioning of these existing units. This would hamper the normal operation of LPS significantly and put HK Electric's stable and reliable supply of electricity at risk.

With the Project in place, HK Electric would enable the decommissioning of the existing units and construction of the new OCGTs progressively (i.e. decommissioning of at least one existing unit before commissioning of one new OCGT), allowing a smooth transition of the OCGT reprovisioning programme and at the same time maintaining the necessary capacity for coping with the additional power demand during peak-opping and emergency operation. Upon putting into operation, the new OCGTs can be in service for years to come and are integral to the future LPS operation in supplying stable and reliable electricity in Hong Kong.

3. PROJECT OVERVIEW

3.1 Site Location and History

The Project site covers the existing GT Compound within the LPS as illustrated in **Figure 3.1a / Figure 3.1b**. The reclamation for LPS was completed between late 1970s and early 1980s. The Project site has been vacant until the existing GT2 to GT7 were constructed and put into operation in 1989. GT5 and GT7 were later converted into a CCGT (i.e. GT57) in 2002. The operation of GT Compound remains unchanged since 2002.

3.2 Project Components

The Project is comprised of the following key components which are discussed in detail in **Section 2.5** of the EIA Report.

- New OCGTs – each of the four new OCGTs essentially consists of a gas turbine and a generator, and will be operated by firing ultra-low sulphur diesel (ULSD) to produce electricity under peak loads and emergency situations. The generation capacity of each new OCGT is up to 130 MW, with a total generation capacity of up to 520 MW. The exhaust gas from GT8, GT9, GT10 and GT11 will be discharged via the existing chimneys currently serving GT5, GT6, GT7 and GT2, respectively. The existing chimneys for GT3 and GT4 will be retained but not utilised under this Project. The new OCGTs will be air-cooled with no requirement for cooling water intake or discharge during operation.
- BSGT – A new BSGT will replace the existing BSGT installed near the west boundary of the GT Compound. The new BSGT with capacity similar to the existing one (i.e. about 2.2 MW) will serve to provide start up power for the OCGTs in case of rare black out situations.
- BESS – A new BESS with an estimated output of around 3 MW will be installed to the south of the BSGT. Similar to the BSGT, the BESS also serves to provide start up power for the OCGTs in case of rare black out situations. During black out situations, the BESS will be put into operation first, while BSGT acts as the back up to the BESS.
- 132 kV Switching Station – The existing GTAB will be converted to a new 132 kV Switching Station to support the operation of the new OCGTs. The new 132 kV Switching Station will be equipped with a new staircase and lift, as well as new cable trenches for 132 kV cables connecting to the new OCGTs, BSGT and BESS.

The EIA study has identified a number of existing and committed projects in the vicinity of the Project site which may potentially interface with the decommissioning/ demolition, construction and operation of the Project. The cumulative impacts from these projects, if any, have been addressed in the technical assessments of this EIA study where appropriate as required in the EIA Study Brief.

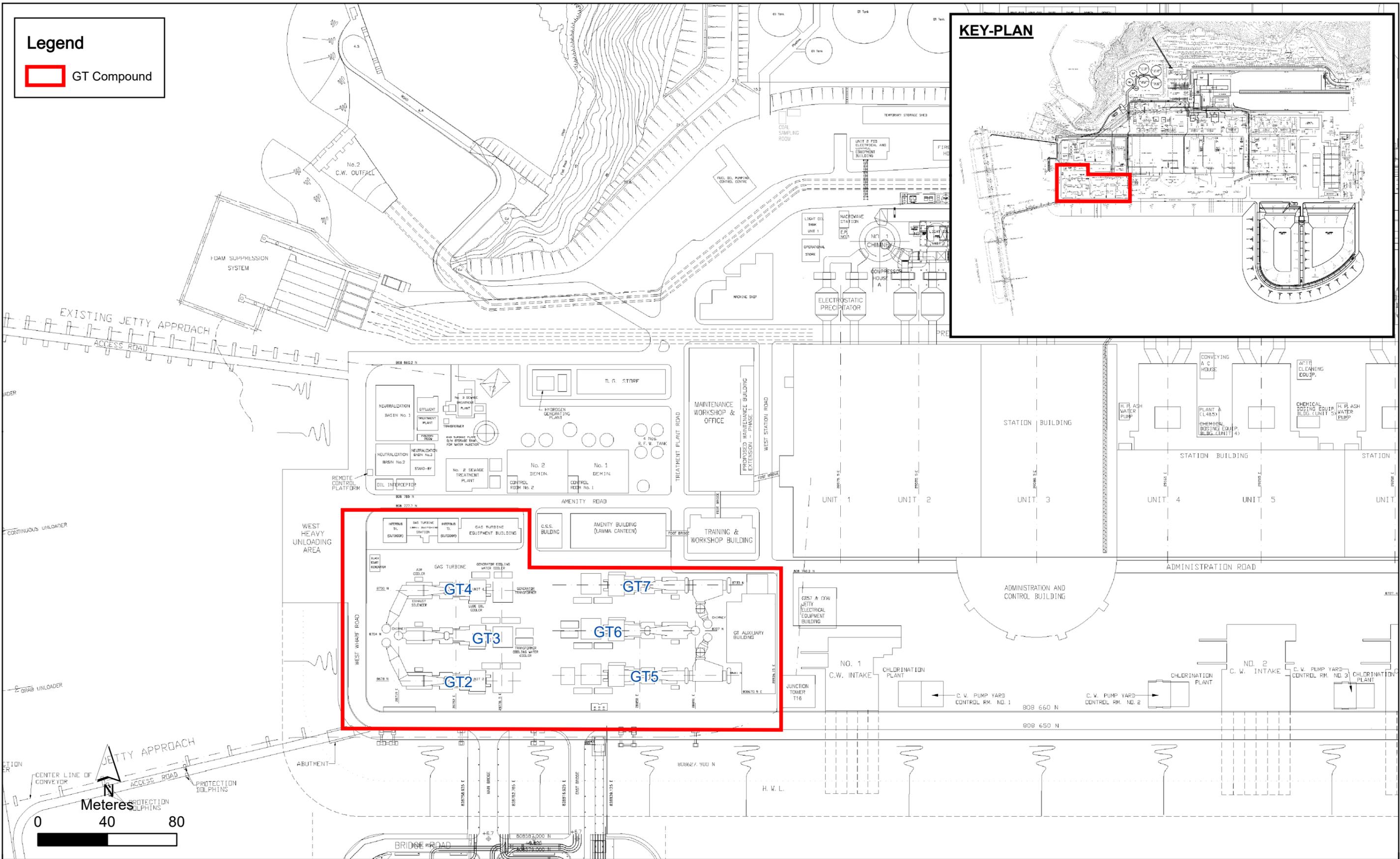


Figure 3.1a

Location of Gas Turbine Compound and its Existing Units at Lamma Power Station

4. LEGISLATIVE REQUIREMENTS, EVALUATION CRITERIA AND SENSITIVE RECEIVERS

4.1 Overview

The Project essentially involves the replacement of existing, aging units (i.e. GT2, GT3, GT4, GT57 and GT6) with new, more efficient units (i.e. GT8, GT9, GT10 and GT11) within the GT Compound in order to maintain the peak-loading and emergency operational requirements for the continuous operation of LPS. The operation of the Project brings environmental benefits from an air quality perspective as the new units are more efficient with lower emissions relative to the existing units.

4.2 Air Quality

This EIA study has examined the decommissioning/ demolition, construction and operation phase impacts to air quality. The impacts have been identified and analysed for compliance with the new set of Air Quality Objectives (AQOs) to be implemented on 1 January 2022 under the *Air Pollution Control Ordinance (APCO)*, and the criteria and guidelines stated in the *EIAO-TM Annexes 4 and 12* respectively.

The Assessment Area is defined as an area within 15 km from the Project site boundary and includes six districts, namely the Islands (Lamma Island, Cheung Chau, Peng Chau, Hei Ling Chau, Northern and Eastern part of Lantau Island), Southern District of Hong Kong Island, Central and Western District of Hong Kong Island, Eastern District of Hong Kong Island, Kowloon, and Tsing Yi. A total of 61 representative air sensitive receivers (ASRs) among these six districts within the Assessment Area have been identified, and the potential impacts arising from the decommissioning/ demolition, construction and operation phases of the Project on these representative ASRs have been evaluated.

4.3 Noise

The potential impacts of noise caused by the decommissioning/ demolition, construction and operation activities of this Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 5 and 13* respectively and the applicable criteria stipulated under the *Noise Control Ordinance (NCO)*.

The Project site is located within the LPS on the Lamma Island which is rural in nature and surrounded by natural terrain with open sea to the south. Background noise at the Project site and the surrounding environment is dominated by the prevailing general background including sea waves and operation of the existing LPS. No existing or planned Noise Sensitive Receiver (NSR) was identified within the Assessment Area which covers a distance of 300m from the Project site boundary. Two representative NSRs beyond the Assessment Area, namely the village houses at Tai Shan Central and at Hung Shing Yeh about 810 m and 1,450 m away from the Project site respectively, have been identified and the potential impacts arising from the decommissioning/ demolition, construction and operation phases of the Project on these representative NSRs have been evaluated where appropriate.

4.4 Water Quality

The EIA study has described the potential impacts associated with the decommissioning/ demolition, construction and operation of the Project on water quality. The impacts have been identified and analysed for compliance with the prevailing Water Quality Objectives (WQOs) stipulated under the *Water Pollution Control Ordinance (WPCO)* and the criteria and guidelines stated in the *EIAO-TM Annexes 6 and 14* respectively.

The Assessment Area for the water quality assessment includes areas within 500 m from the Project site boundary and covers the Southern Water Control Zone (WCZ). Baseline condition within the Assessment Area and the vicinity is heavily influenced by discharges from the Pearl River. A total of five Water Quality Sensitive Receivers (WSRs) have been identified and the potential impacts arising

from the decommissioning/ demolition, construction and operation phases of the Project on these WSRs have been evaluated.

4.5 Waste Management

The potential waste management implications arising from the decommissioning/ demolition, construction and operational activities of the Project have been assessed in this EIA Report. The impacts have been identified and analysed for compliance with the criteria and guidelines stated in the *EIAO-TM Annexes 7 and 15*, respectively.

4.6 Land Contamination

This EIA study has examined the potential of land contamination at the Project site. A land contamination assessment was undertaken in accordance with the guidelines stated in the *EIAO-TM Annex 19* and other relevant guidance notes and practice guides.

Based on the findings of the site appraisal and a review of potential land contamination sources in the Project area, site investigation (SI) and sampling are recommended at five hotspot locations (including 4 boreholes and 1 trial pit) to assess the potential land contamination impacts associated with the Project. SI and sampling will be undertaken in accordance with the Contamination Assessment Plan (CAP) endorsed by the Environmental Protection Department (EPD) when the proposed sampling locations are made available after the demolition of the existing units and structures.

The potential land contamination impacts arising from the decommissioning/ demolition, construction and operation phases of this Project have been evaluated.

5. SUMMARY OF ENVIRONMENTAL IMPACTS

5.1 Project Description

The scope of the Project involves the decommissioning and demolition of the existing units (i.e. GT2, GT3, GT4, GT57 and GT6) and auxiliary equipment within the GT Compound of LPS, and the construction and operation of four new OCGTs (i.e. GT8, GT9, GT10 and GT11) within the GT Compound. The Project site includes the GT Compound as shown in **Figure 3.1a**. The locations of the existing units and the proposed new units within the Project site are shown in **Figure 3.1a** and **Figure 3.1b**, respectively.

5.1.1 Decommissioning/ Demolition, Construction and Operational Activities

No major earthworks, site formation works or dredging works will be required during the decommissioning/ demolition or construction of the Project. Key activities associated with the Project are summarised in **Table 5.1**.

Table 5.1 Summary of Key Project Activities

Item	Detail
Decommissioning/ Demolition Activities	<ul style="list-style-type: none"> ▪ The existing GT2, GT3, GT4, GT57 and GT6 and their auxiliaries will be decommissioned and demolished. ▪ The existing BSGT, the miscellaneous storage shed adjacent to the existing BSGT, and the existing lube oil storage tank near GT5 will be demolished. ▪ The existing Turbo Block structure and equipment inside the GTAB will be removed and demolished which requires minor excavation down to about 2.6m below ground over an area of about 200m². ▪ Typical equipment such as excavators, mobile cranes, electric breakers, grinder, flame cutting and powered mechanical hand tools will be used for the demolition works.
Construction Activities	<p><u>Construction of new units:</u></p> <ul style="list-style-type: none"> ▪ Major equipment of the new OCGTs assembled off-site will be installed on the existing foundation piles and reinforced concrete structure for the demolished units in the GT Compound. ▪ New BSGT and BESS will be installed in the northwest corner of the GT Compound. ▪ Typical equipment such as mobile cranes and powered mechanical hand tools will be used for the construction and installation of the new units. <p>.....</p> <p><u>Conversion of existing GTAB to the new 132kV Switching Station:</u></p> <ul style="list-style-type: none"> ▪ Gas insulated switchgear, electrical and control panels and other associated equipment will be installed inside the new 132kV Switching Station. ▪ Typical equipment such as overhead crane and powered mechanical hand tools will be used for the equipment installation. <p>.....</p> <p><u>Construction of new staircase and lift and cable trenches:</u></p> <ul style="list-style-type: none"> ▪ A new staircase and lift with footprint of about 10m x 5m will be constructed at the immediate east of the GTAB which requires minor excavation down to 5m below ground. ▪ New cable trenches of about 1.5m in width and 1,240m in length will be constructed to house the new 132kV cables connecting the new OCGTs, BSGT and BESS to the new 132kV Switching Station. Minor excavation down to 1.8m below ground will be required. ▪ Typical equipment such as excavators, mobile cranes, welding machines and other power mechanical hand tools will be used during the construction of new staircase and lift and cable trenches and the subsequent cable laying. <p>.....</p>

Item	Detail
Operational Activities	<ul style="list-style-type: none"> The new OCGTs and auxiliary equipment will be operated during peak-logging and emergency situations. The new BESS and BSGT will be operated to supply the required power to start up the new OCGTs in case of rare black-out situation.

5.1.2 Tentative Implementation Programme

HK Electric proposes to decommission and demolish the existing GT2, GT3, GT4, GT57 and GT6, and to construct and commission the new GT8, GT9, GT10 and GT11 within the GT Compound successively between 2022 and 2028. The tentative implementation programme is provided in **Figure 5.1**.

Figure 5.1 Tentative Implementation Programme of the Project

	2022		2023		2024		2025		2026		2027		2028	
	Q3-Q4	Q1-Q2	Q3-Q4											
Decommissioning and Demolition of Existing Units														
GT2														
GT3														
GT4														
GT57														
GT6														
Construction of New Units														
GT8														
GT9														
GT10														
GT11														
Other Construction														
Construction of New Cable Trenches														
Construction of New 132kV Switching Station, Staircase and Lift														
Installation of BESS and BSGT														
Commissioning of New Units														
GT8														
GT9														
GT10														
GT11														

5.2 Air Quality

5.2.1 Decommissioning/ Demolition and Construction Phases

The decommissioning/ demolition and construction works of the Project are not considered potential dust generating activities except for minor excavation works for the construction of new cable trenches, new staircase and lift, and reconstruction works inside the existing GTAB. Limited excavated materials will be generated and the potential fugitive dust emissions are expected to be small. Considering the large separation distance between the worksite and the nearest ASR outside of LPS (at least 800m away), no adverse fugitive dust impact on ASRs outside of LPS arising from the decommissioning/ demolition and construction activities of the Project is anticipated. Considering the potential dust impact would be limited and highly localised, there is also sufficient separation distance between the Administration and Control Building and the Project site (more than 100m apart). Adverse fugitive dust impact on HK Electric staff in the Administration and Control Building due to decommissioning/ demolition and construction works of the Project is also not anticipated with the implementation of good construction site practices and relevant mitigation measures recommended in the *Air Pollution Control (Construction Dust) Regulation*.

As the decommissioning/ demolition and construction works of the Project are relatively small scale and that the units are to be demolished and installed in phases, the number of construction plants deployed on site will be limited and the associated emissions from the operation of these construction plants are expected to be minor. No adverse air quality impact associated with the operation of the construction plants is anticipated provided that the requirements in the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* and *Air Pollution Control (Fuel Restriction) Regulation* are followed.

Demolished equipment will be transported off-site via marine vessels. As the demolition and construction works associated with the Project are small scale, additional marine traffic for equipment transport during the decommissioning/ demolition and construction phases of the Project is expected to be limited (no more than 1 to 2 vessel trips within every 2 days). The requirements in *Air Pollution Control (Marine Light Diesel) Regulation* and *Air Pollution Control (Fuel for Vessels) Regulation* will be followed for the operation of the marine vessels. No adverse air quality impact with respect to marine vessel emissions associated with the Project is anticipated.

5.2.2 Operation Phase

Stack emissions from the proposed new OCGTs would be the major air emission source of operation phase air quality impact. Comparative assessments have been carried out to evaluate the air quality impacts arising from the concerned units before and after the Project. The comparative assessments have considered the “Without Project” scenario and the “With Project” scenario under different phases as presented in **Table 5.2**.

Table 5.2 Modelling Scenarios and Emission Sources Considered

Modelling Scenario	Emission Sources Considered
“Without Project”	<ul style="list-style-type: none"> Existing GT2, GT3, GT4, GT57, GT6
“With Project” – Phase 1	<ul style="list-style-type: none"> Existing GT2, GT3, GT4 New GT10
“With Project” – Phase 2	<ul style="list-style-type: none"> Existing GT3, GT4 New GT8, GT10
“With Project” – Phase 3	<ul style="list-style-type: none"> Existing GT4 New GT8, GT9, GT10
“With Project” – Phase 4	<ul style="list-style-type: none"> New GT8, GT9, GT10, GT11

The air quality impacts at the identified representative ASRs under each of the “With Project” scenario (Phase 1 to Phase 4) have been compared with those under the “Without Project” scenario. Results of the comparative assessments show that contribution from the Project (i.e. NO₂, SO₂, RSP and FSP) under all phases of “With Project” scenario are lower than that under “Without Project” scenario at all relevant assessment heights for all identified ASRs. The reduction of predicted pollutant concentrations under the “With Project” scenario compared with the “Without Project” scenario is summarised in **Table 5.3**. With a reduction of air quality impacts at the identified representative ASRs under all phases of the Project operation, no adverse air quality impact arising from the operation of the Project is anticipated.

Table 5.3 Reduction of Predicted Pollutant Concentrations under “With Project” Scenario Compared with “Without Project” Scenario

Modelling Scenario	Reduction of Predicted Concentration (µg m ⁻³)					
	Max. 1-hour NO ₂	Annual NO ₂	Max. 10-min SO ₂	Max. 24-hour SO ₂	Max. 24-hour RSP/ FSP	Annual RSP/ FSP
“With Project” – Phase 1	-138.55 to -2.58	-1.41 to -0.08	-39.21 to -0.72	-2.17 to -0.05	-2.40 to -0.06	-0.14 to -0.01
“With Project” – Phase 2	-138.09 to -3.37	-1.51 to -0.10	-38.67 to -0.70	-2.11 to -0.05	-2.54 to -0.07	-0.15 to -0.01
“With Project” – Phase 3	-146.61 to -4.21	-1.62 to -0.12	-37.77 to -0.67	-2.06 to -0.05	-2.63 to -0.08	-0.16 to -0.01
“With Project” – Phase 4	-155.65 to -6.84	-1.76 to -0.13	-37.26 to -0.65	-2.03 to -0.04	-2.82 to -0.09	-0.18 to -0.01

5.3 Noise

5.3.1 Decommissioning/ Demolition and Construction Phases

Potential sources of noise impacts during the decommissioning/ demolition and construction phases of the Project will mainly arise from powered mechanical equipment (PME) operating at the construction work sites. No NSR was identified within the 300m Assessment Area, and the nearest NSR is at least 810m from the Project site boundary. Due to large separation distance and screening by terrain and existing building structures, the potential noise impacts arising from the demolition and construction works are expected to be minimal.

All NSRs are located far away from the LPS jetty (at least 1.6 km) and further away from the marine vessel route. With no more than 1 to 2 vessel trips within every 2 days, no adverse noise impact due to marine traffic during decommissioning/ demolition, and construction phases are anticipated.

No mitigation measures or noise monitoring during decommissioning/ demolition and construction phases of the Project are required.

5.3.2 Operation Phase

Fixed plant noise associated with the operation of the new OCGTs, i.e. GT8, GT9, GT10 and GT11, is the major potential noise source during the operation phase of the Project. The new OCGTs would only be operated intermittently during peak-opping and emergency situations. No NSR was identified within the 300m Assessment Area, and two NSRs (i.e. village house at Tai Shan Central and village house at Hung Shing Yeh) were identified at 810m and 1,450m from the Project site boundary, respectively. A quantitative fixed plant noise assessment has been carried out for the operation of the new OCGTs at the village house of Hung Shing Yeh (NSR N2), which is the nearest NSR with possible direct line of sight towards the OCGTs. The predicted noise levels at 1m from the façade of NSR N2 due to operation of the new OCGTs is 37dB(A) and comply with the respective noise criteria during both daytime and night-time periods. Therefore, no adverse noise impacts during the operation of the Project are anticipated. No mitigation measures or noise monitoring during operation of the Project are required.

5.4 Water Quality

5.4.1 Decommissioning/ Demolition and Construction Phases

The decommissioning/ demolition and construction works of the Project will not involve marine or major site formation works. Unacceptable water quality impacts from land-based runoff and sewage discharge from construction workforce during the decommissioning/ demolition and construction phases of the Project are not expected with proper implementation of good site practices and water quality mitigation measures.

5.4.2 Operation Phase

There will be no cooling water discharge associated with the operation of the Project and thus water quality impacts during operation phase are not expected. No mitigation measures or water quality monitoring during operation of the Project are required.

5.5 Waste Management

5.5.1 Decommissioning/ Demolition and Construction Phases

Waste that is expected to be generated during the decommissioning/ demolition and construction phases of the Project include construction and demolition (C&D) materials from demolition and removal of existing units and associated equipment/ parts as well as from minor civil works, excavated materials from the construction of new cables trenches and new staircase and lift as well as

reconstruction works within GTAB, chemical waste from decommissioning of existing units, maintenance of construction plant and commissioning of new units, and general refuse from construction workforce. The estimated waste arisings during decommissioning/ demolition and construction phases are summarised in **Table 5.4**. With the implementation of the mitigation measures recommended, no unacceptable environmental impacts arising from storage, handling, collection, transport and disposal of wastes are expected.

Table 5.4 Summary of Estimated Waste Arisings during Decommissioning/ Demolition and Construction Phases

Types of Waste	Approximate Quantity
C&D materials (demolition works)	<ul style="list-style-type: none"> ▪ Scrap metals: 4,500 tonnes ▪ Other non-inert C&D materials (e.g. plastics, timber, cardboard): 100m³ ▪ Inert C&D materials (e.g. broken concrete): 720m³
C&D materials (civil works)	<ul style="list-style-type: none"> ▪ Inert C&D materials: 84m³ ▪ Non-inert C&D materials: 21m³
Excavated materials	<ul style="list-style-type: none"> ▪ 5,000m³
Chemical waste	<ul style="list-style-type: none"> ▪ Few hundred litres per month
General refuse	<ul style="list-style-type: none"> ▪ 162.5kg per day

5.5.2 Operation Phase

Chemical waste (few hundred litres per month) and general refuse (insignificant quantity) will be generated during the operation phase of the Project. General refuse will be collected, handled, transported and disposed of following the existing waste management practices for LPS operation. Chemical waste will be collected by licenced chemical waste collectors and delivered to the Chemical Waste Treatment Facilities (CWTC) for disposal. Unacceptable environmental impacts related to waste management during the operation of the Project are not expected.

5.6 Land Contamination

5.6.1 Decommissioning/ Demolition and Construction Phases

Based on the findings of the site appraisal and review of potential land contamination sources in the Project site area, potential land contamination risks could not be ruled out at the Lube Oil Tank area, BSGT, Chemical Dosing Pit and Miscellaneous Storage Shed, and a total of five hotspot locations have been identified at these areas. SI and sampling are recommended at these five hotspot locations to assess the potential land contamination impacts associated with the Project. SI and sampling will be undertaken in accordance with the Contamination Assessment Plan (CAP) endorsed by EPD when the proposed sampling locations are made available after the demolition of the existing units and structures. The potential land contamination within the Project site, if any, is considered localised and the chemical of concerns identified are treatable with existing remediation techniques. Provided that the soil and groundwater contamination identified during the SI, if any, is properly treated using the appropriate remediation techniques, no adverse land contamination impacts during the decommissioning/ demolition and construction phases of the Project are anticipated. Good house-keeping practices shall be maintained by the contractor(s) to minimise the risk of land contamination arising from the decommissioning/ demolition and construction works within the Project site.

5.6.2 Operation Phase

No land contamination impacts during the operation phase of the Project are anticipated. No mitigation measures are required.

5.7 Environmental Monitoring and Audit

The EIA study of the Project has evaluated impacts related to air quality, noise, water quality, waste management and land contamination arising from the Project, and has demonstrated to comply with the *EIAO-TM* requirements with the implementation of recommended mitigation measures and good site practices. Actual impacts during the decommissioning/ demolition and construction works will be monitored through a detailed EM&A programme involving regular environmental site inspections and audits to ensure that the recommended mitigation measures and good site practices related to air quality, noise, water quality, waste management and land contamination are properly implemented and are effective. Full details of the programme are presented in the EM&A Manual associated with the EIA Report. This programme will provide management actions and supplemental mitigation measures to be employed should any impacts arise, thereby ensuring the environmental acceptability of the decommissioning/ demolition, construction and operation of the Project.

5.7.1 Decommissioning/ Demolition and Construction Phases

During the decommissioning/ demolition and construction phases, regular site inspections and audits will be conducted to confirm the effective and timely implementation of the recommended mitigation measures.

Regular waste audits will also be conducted to determine if wastes are being managed in accordance with the recommended good site practices and the Waste Management Plan (WMP).

5.7.2 Operation Phase

No regular monitoring or site inspections/ audits during the operation phase of the Project are required.

6. CONCLUSION

The EIA study has critically assessed the overall acceptability of the environmental impacts likely to arise as a result of the decommissioning/ demolition, construction and operation of the Project. It has demonstrated the acceptability of any residual impacts from the Project and the protection of the population and environmentally sensitive resources. The EIA study concluded that, with the implementation of the recommended mitigation measures, the Project would be environmentally acceptable and in compliance with the relevant assessment standards/criteria of the *EIAO-TM*. Where appropriate, EM&A mechanisms have been recommended to verify the accuracy of the EIA predictions to ensure the effectiveness of the recommended mitigation measures.

The implementation of the Project is critical to the continuous operation of LPS in providing additional power generation during peak-opping and maintaining back-up power supply in case of emergency situations, having regard to the progressive retirement of the existing OCGTs/CCGT in the GT Compound from 2022 onwards. The operation of the new OCGTs under the Project will produce lower air emissions compared with that of the existing, aging units when generating the same amount of power. The Project is therefore also beneficial from an environmental perspective and contributes to the reduction of overall air emissions from the operation of LPS and improvement of air quality in Hong Kong in the long run.

NOTES

This EIA Report has been prepared to comply with the requirements of the EIA Study Brief and the EIAO-TM, as a basis for the Director of Environmental Protection to consider granting the Environmental Permit to allow the decommissioning/ demolition, construction and operation of the Project.

The English version of this Executive Summary shall prevail wherever there is a discrepancy between the English version and the Chinese version.

The submission of this Environmental Impact Assessment (EIA) Report and the said Environmental Permit application(s) does not amount to a commitment by or on behalf of HK Electric to proceed with the Project.

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