

香港電燈有限公司  
The Hongkong Electric Co., Ltd.



**Lamma Power Station  
Conversion of Two Existing Gas Turbines  
(GT5 & GT7) into a Combined Cycle Unit  
Operation Phase  
Monthly EM&A Report**

**January 2018**



香港電燈有限公司  
The Hongkong Electric Co., Ltd.



**ENVIRONMENTAL IMPACT ASSESSMENT (EIA) ORDINANCE, CAP. 499**

**ENVIRONMENTAL PERMIT NO. EP-083/2000**

**LAMMA POWER STATION  
CONVERSION OF TWO EXISTING GAS TURBINES (GT5 & GT7) INTO A  
COMBINED CYCLE UNIT  
ENVIRONMENTAL MONITORING & AUDIT PROGRAMME  
AT OPERATIONAL PHASE**

|              |  |
|--------------|--|
| Report Title | <u>Monthly EM&amp;A Report (January 2018)</u>  |
| Date         | <u>12 February 2018</u>  |
| Certified by | <br><u>(Mr. Kenneth Fung, Environmental Team Leader)</u>                                      |
| Verified by  | <br><u>Mr. Y T Tang</u><br>(AECOM Asia Company Limited,<br>Independent Environmental Checker) |

## TABLE OF CONTENT

### EXECUTIVE SUMMARY

|           |  |           |
|-----------|--|-----------|
| <b>1.</b> | <b>INTRODUCTION .....</b>  | <b>1</b>  |
| 1.1       | Background   | 1         |
| 1.2       | Project Organisation   | 1         |
| 1.3       | Plant Availability   | 1         |
| 1.4       | Malfunction / Outage Record of Pollution Control Equipment           | 2         |
| 1.5       | Summary of EM&A Requirements   | 2         |
| <b>2.</b> | <b>AIR QUALITY .....</b>   | <b>5</b>  |
| 2.1       | Monitoring Requirements  | 5         |
| 2.2       | Summary of Results And Observations                                  | 5         |
| <b>3.</b> | <b>WATER QUALITY MONITORING .....</b>                                | <b>6</b>  |
| 3.1       | Monitoring Requirements  | 6         |
| 3.2       | Summary of Results And Observations                                  | 6         |
| <b>4.</b> | <b>ENVIRONMENTAL AUDIT .....</b>                                     | <b>7</b>  |
| 4.1       | Review of Environmental Monitoring Procedures                        | 7         |
| 4.2       | Assessment of Environmental Monitoring Results                       | 7         |
| 4.3       | Status of Environmental Licensing and Permitting                     | 8         |
| 4.4       | Implementation Status of Environmental Mitigation Measures           | 8         |
| 4.5       | Implementation Status of Event/Action Plans                          | 9         |
| 4.6       | Implementation Status of Environmental Complaint Handling Procedures | 9         |
| <b>5.</b> | <b>FUTURE KEY ISSUES .....</b>                                       | <b>10</b> |
| 5.1       | Outage Plan for the coming 3 months                                  | 10        |
| 5.2       | Key issues for the coming month                                      | 10        |
| <b>6.</b> | <b>CONCLUSION .....</b>  | <b>11</b> |

### LIST OF TABLES

|           |  |
|-----------|--|
| Table 2.1 | Air Quality Monitoring Parameters and Frequency              |
| Table 3.1 | Water Quality Monitoring Parameters and Frequencies for GT57 |
| Table 4.1 | Summary of AL Level Exceedances on Monitoring Parameters     |
| Table 4.2 | Summary of Environmental Licensing and Permit Status         |
| Table 4.3 | Implementation Schedule                                      |
| Table 4.4 | Environmental Complaints Received in January 2018            |
| Table 4.5 | Outstanding Environmental Complaints Carried Over            |

### LIST OF FIGURES

|            |   |
|------------|---|
| Figure 1.1 | Location of GT57 Combined Cycle Unit    |
| Figure 1.2 | Organization Chart at Operational Phase |

## **APPENDIX**

Appendix A Event/Action Plans

Appendix B Action and Limit Levels for Air Quality and Water Quality Monitoring

Appendix C Summary Results and Observations on Air Quality Monitoring

Appendix D Summary Results and Observations on Water Quality Monitoring

## EXECUTIVE SUMMARY

This is the 179<sup>th</sup> monthly Environmental Monitoring and Audit (EM&A) report for the Project “Operation of GT57 Combined Cycle Unit” prepared by the Environmental Team (ET). This report presents the results of impact monitoring on air quality and marine water quality for the said project in January 2018.

Air and water quality monitoring were conducted according to the requirement stated in the EM&A manual. The implementation status of the environmental mitigation measures, Event/Action Plan and environmental complaint handling procedures were also checked.

### Plant Availability

Unit GT57 was fully available in the reporting month.

### Malfunction / Outage Record of Pollution Control Equipment

No malfunction / Outage record in the reporting month.

### Environmental Monitoring Works

Environmental monitoring works, as mentioned in the EM&A manual (Operational phase), were performed during the operation of GT57 in the reporting period.

#### *Air Quality*

No Action / Limit level exceedance on stack NO<sub>x</sub> was recorded in the reporting month.

No exceedance on hourly average water injection rate was recorded in the month.

#### *Water Quality*

No exceedance of Action and Limit levels for water quality was recorded in the month.

### Environmental Licensing and Permitting

| Description                                 | Permit/Licence No. | Valid Period |            | Issued To   | Date of Issuance |
|---|--------------------|--------------|------------|-------------|------------------|
|   |                    | From         | To         |             |                  |
| Environmental Permit                        | EP-083/2000        | 04/12/2000   | -          | HK Electric | 04/12/2000       |
| Specified Process Licence issued under APCO | L-7-002(11)        | 01/01/2017   | 31/12/2018 | HK Electric | 22/12/2016       |
| WPCO discharge licence for L1-L9 and GT57   | WT00029676-2017    | 16/01/2018   | 30/11/2019 | HK Electric | 19/01/2019       |

### Implementation Status of Environmental Mitigation Measures

Environmental mitigation measures were implemented in the reporting month.

### **Environmental Complaints**

No complaint against the Project was received in the reporting month.

### **Future key issues**

Key issues to be considered in the coming month include:

#### *Air Impact*

- To monitor the water injection rate continuously.
- To monitor the NO<sub>x</sub> emission continuously through the GT57 CEM System.
- To monitor the fuel sulphur content of the LGO if the combined cycle unit is run on LGO.

#### *Water Impact*

- To continuously carry out the water quality monitoring for GT57 as required by the EM&A manual (Operational phase).

### **Concluding Remarks**

The environmental performance of the project was generally satisfactory.

## **1. INTRODUCTION**

### **1.1 Background**

The Environmental Team (hereinafter called the “ET”) was formed within the Hongkong Electric Co. Ltd (HEC) to undertake Environmental Monitoring and Audit for “Operation of GT57 Combined Cycle Unit” (hereinafter called the “Project”). Under the requirements of Section 5 of Environmental Permit EP-083/2000, an EM&A programme for impact environmental monitoring, as set out in the EM&A Manual (Operational Phase), is required to be implemented. In accordance with the EM&A Manual, environmental monitoring of air quality and water quality are required for the Project.

Figure 1.1 shows the location of the GT57 combined cycle unit. Making use of the open area between the existing gas turbines at the south western corner of Lamma Power Station, a steam-cycle bottoming system was installed to recover the waste heat from the exhaust gas of GT5 and GT7 so as to produce an extra output of 115MW and form a combined cycle unit of a gross output of 345MW. The exhaust gas after passing through the heat recovery steam generator (HRSG) is discharged to the atmosphere through the existing stacks of 80m height. Cooling water required for the steam-cycle bottoming system is supplied from additional C.W. pumps and returned to the existing No.1 C.W. outfall for discharge to the sea. As a result of the additional power output generated by the steam cycle, there is a substantial gain in the overall thermal efficiency from about 30% (in a simple cycle GT) to 46% (in a combined cycle GT).

The additional equipment installed for the project include:

- 2 numbers of heat recovery steam generators;
- 1 steam turbine building to house the steam turbine and auxiliaries;
- Generator and unit transformer; and
- 2 numbers of additional C.W. pumps.

This report summarizes the environmental monitoring and audit work for the Project for the month of January 2018.

### **1.2 Project Organisation**

The management structure to oversee the Project, includes the following:

- Environmental Protection Department (The Authority);
- General Manager (Corporate Development) (The official contact person between HEC and EPD);
- Environmental Team Leader (ET);
- Independent Environmental Checker (IEC);
- Environmental Team (ET).

The organization chart for the Operation EM&A programme is shown in Figure 1.2.

### **1.3 Plant Availability**

Unit GT57 was fully available in the reporting month.

#### **1.4 Malfunction / Outage Record of Pollution Control Equipment**

No malfunction / Outage record in the reporting month.

#### **1.5 Summary of EM&A Requirements**

The EM&A program requires environmental monitoring for air and water quality. The EM&A monitoring work for air quality and water quality are described in Sections 2 and 3 respectively.

The following environmental audits are summarized in Section 4 of the report:

- Environmental monitoring results;
- The status of environmental licensing and permits for the Project;
- The implementation status of environmental protection and pollution control / mitigation measures.

The future key issues for the Project will be reported in Section 5 of this report.



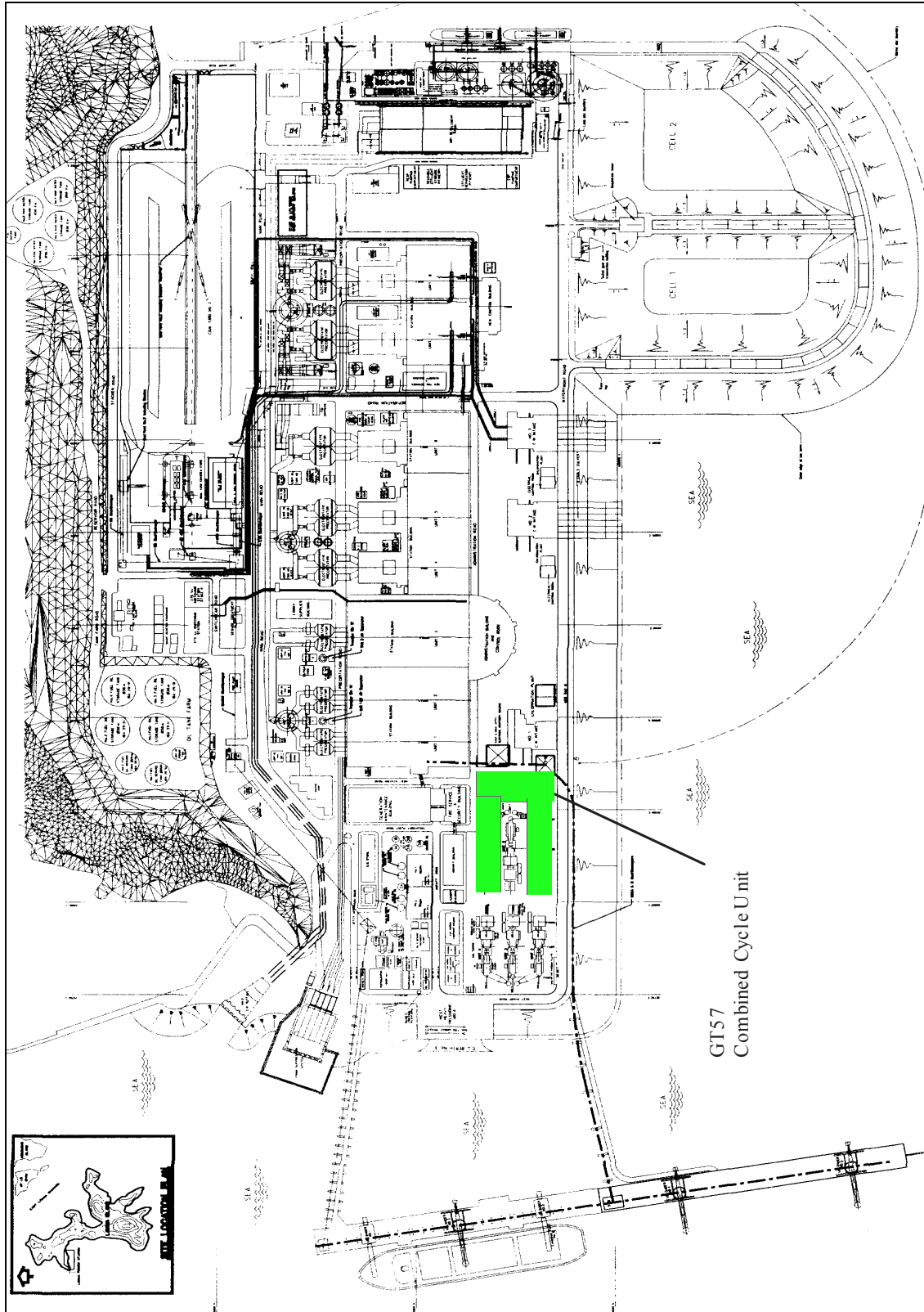


Figure 1.1 Location of GT57 Combined Cycle Unit

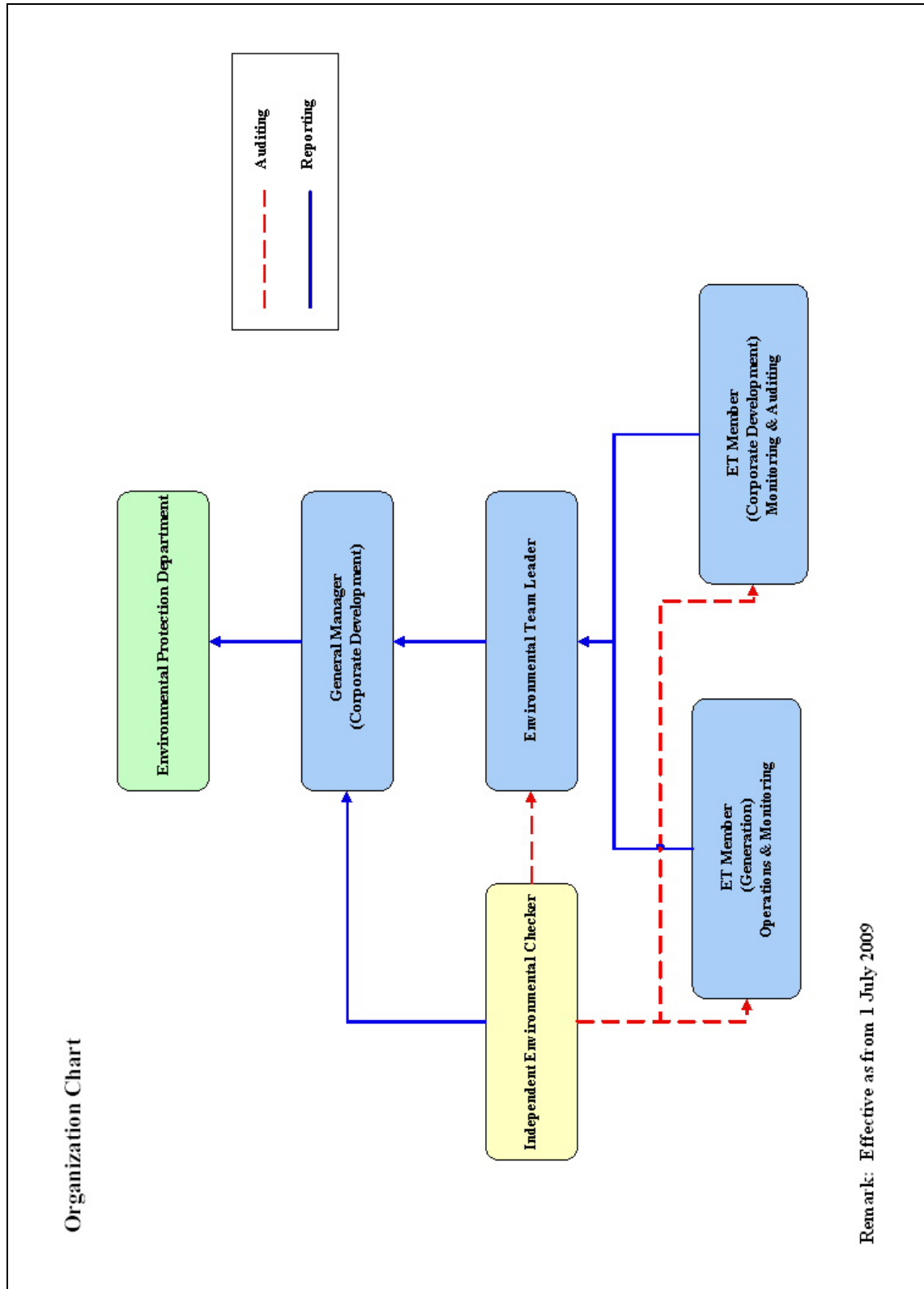


Figure 1.2 Organization Structure at Operational Phase of GT57 combined cycle unit

## 2. AIR QUALITY

### 2.1 Monitoring Requirements

In accordance with the EM&A manual (Operational Phase) for GT57 and the requirements stipulated in the Specified Process Licence issued under Air Pollution Control Ordinance, water injection rates, sulphur content of fuel burnt (when GT57 is run on light gas oil) are monitored. Various operation parameters (viz. generation output and fuel consumption) are reported. Water injection rates were checked against the Action/Limit Levels shown in Appendix B.

The monitoring frequency of various parameters is shown in table 2.1 below:

Table 2.1 Air Quality Monitoring Parameters and Frequency

| Parameter                           | Frequency                          |
|-------------------------------------|------------------------------------|
| Hourly Average Stack NOx            | Continuous, when GT57 is operating |
| Hourly Average Water Injection Rate | Continuous, when GT57 is operating |
| Sulphur content of fuel             | Monthly                            |

### 2.2 Summary of Results And Observations

A monthly summary of the data is shown in Appendix C.

#### *Summary of Action/Limit Level Alarm in January 2018*

No Action / Limit level exceedance on stack NOx was recorded in the reporting month.

No exceedance of Action and Limit levels for hourly average water injection rate was recorded in the month.

### 3. WATER QUALITY MONITORING

#### 3.1 Monitoring Requirements

In accordance with the EM&A manual (Operational Phase) for GT57, the monitoring requirements for the EM&A work should strictly follow the discharge licence for L1-L9 & GT57 issued under the Water Pollution Control Ordinance (WPCO). The parameters as stated in table 3.1 were monitored and checked against the Action/Limit Levels as given in Appendix B.

Table 3.1 Water Quality Monitoring Parameters and Frequencies for GT57

| Item | Parameters                                     | Frequency*              |
|------|--|-------------------------|
| 1    | Cooling Water Temperature                      | Daily                   |
| 2    | Cooling Water Temperature Rise                 | Daily                   |
| 3    | Total Residual Chlorine                        | Bi-weekly               |
| 4    | Grease & Oil from Oil Free Drain               | Monthly                 |
| 5    | Temperature of Blowdown Effluent (HRSG)        | At least twice per year |
| 6    | Suspended Solids from Blowdown Effluent (HRSG) | At least twice per year |
| 7    | Grease & Oil from Blowdown Effluent (HRSG)     | At least twice per year |
| 8    | Scum of foam in ambient water                  | Daily                   |

Remark: \* monitoring will only be carried out when there is operation of the GT57.

#### 3.2 Summary of Results And Observations

Monitoring of various parameters as listed in table 3.1 above were carried out during the operation of GT57 in the reporting month. A monthly summary of the data is shown in [Appendix D](#).

The data recorded for the monitoring parameters were all below their corresponding Action/Limit Levels. No AL level exceedance was recorded in the reporting month. There was no foam present within 500 meters of Hung Sing Ye Beach in the reporting month. Details of the foam observation report are also given in Appendix D. The effluent quality was generally satisfactory.

#### 4. ENVIRONMENTAL AUDIT

##### 4.1 Review of Environmental Monitoring Procedures

The environmental monitoring procedures were regularly reviewed by the Environmental Team. No modification to the existing monitoring procedures was recommended.

##### 4.2 Assessment of Environmental Monitoring Results

###### *Monitoring results for Air Quality and Water Quality*

The environmental monitoring results for Air Quality and Water Quality in January 2018 presented in sections 2 and 3 respectively are summarized in Table 4.1.

Table 4.1 Summary of AL Level Exceedances on Monitoring Parameters

| Item  | Parameter Monitored                 | Monitoring Period | No. of Exceedances In |             | Event/Action Plan Implementation Status and Results |
|-------|-------------------------------------|-------------------|-----------------------|-------------|---|
|       |                                     |                   | Action Level          | Limit Level |   |
| Air   |                                     |                   |                       |             |   |
| 1     | Hourly Average Water Injection Rate | 01/01/18-31/01/18 | 0                     | 0           |   |
| 2     | Stack NOx                           | 01/01/18-31/01/18 | 0                     | 0           |   |
| Water |                                     |                   |                       |             |   |
| 1     | Cooling Water Temperature           | 01/01/18-31/01/18 | N.A.                  | 0           |   |
| 2     | Cooling Water Temperature Rise      | 01/01/18-31/01/18 | 0                     | 0           |   |
| 3     | Total Residual Chlorine             | 01/01/18-31/01/18 | 0                     | 0           |   |
| 4     | Grease & Oil from Oil Free Drain    | 01/01/18-31/01/18 | 0                     | 0           |   |
| 5     | Temperature of Blowdown Effluent    | 01/01/18-31/01/18 | N.A.                  | N.A.*       |   |
| 6     | Suspended Solids from Blowdown      | 01/01/18-31/01/18 | N.A.                  | N.A.*       |   |

| Item | Parameter Monitored                      | Monitoring Period | No. of Exceedances In |             | Event/Action Plan Implementation Status and Results |
|------|--|-------------------|-----------------------|-------------|---|
|      |  |                   | Action Level          | Limit Level |   |
|      | Effluent                                 |                   |                       |             |   |
| 7    | Grease & Oil from Blowdown Effluent      | 01/01/18-31/01/18 | N.A.                  | N.A.*       |   |
| 8    | Inspection of Scum/Foam in ambient water | 01/01/18-31/01/18 | 0                     | 0           |   |

Note:\* Monitoring was not scheduled in the reporting month.

#### 4.3 Status of Environmental Licensing and Permitting

All permits/licenses obtained as of January 2018 are summarised in Table 4.2.

Table 4.2 Summary of Environmental Licensing and Permit Status

| Description                                 | Permit / Licence No. | Valid Period |            | Status |
|---|----------------------|--------------|------------|--------|
|   |                      | From         | To         |        |
| Environmental Permit                        | EP-083/2000          | 04/12/2000   | -          | Valid  |
| Specified Process Licence issued under APCO | L-7-002(11)          | 01/01/2017   | 31/12/2018 | Valid  |
| WPCO Discharge Licence for L1-L9 and GT57   | WT00029676-2017      | 16/01/2018   | 30/11/2019 | Valid  |

#### 4.4 Implementation Status of Environmental Mitigation Measures

Mitigation measures detailed in the permits and the EM&A Manual (Operational Phase) are required to be implemented. An updated summary of the Environmental Mitigation Implementation Schedule (EMIS) is presented below:

Table 4.3 Implementation Schedule

| Project Profile Ref. | Mitigation Measures                               | Implementation Status   |
|----------------------|---|-------------------------|
| 19                   | Use of 0.2% sulphur content for oil-firing of the | Complied <sup>(1)</sup> |

|    |   |          |
|----|---|----------|
|    | conversion unit.                                      |          |
| 19 | Use of acoustic enclosures around major noise sources | Complied |

(1) - Only Ultra Low Sulphur Diesel is consumed at Lamma Power Station.

#### 4.5 Implementation Status of Event/Action Plans

The Event/Action Plans for air quality and water quality extracted from the EM&A Manual (Operational Phase) are presented in Appendix A.

As no action/limit level exceedance was recorded, no action has been devised.

#### 4.6 Implementation Status of Environmental Complaint Handling Procedures

In January 2018, no complaint against the Project was received.

Table 4.4 Environmental Complaints Received in January 2018

| Case Reference /<br>Date, Time Received /<br>Date, Time Concerned | Descriptions /<br>Actions Taken | Conclusion /<br>Status |
|---|---------------------------------|------------------------|
| Nil   | N/A                             | N/A                    |

Table 4.5 Outstanding Environmental Complaints Carried Over

| Case Reference /<br>Date, Time Received /<br>Date, Time Concerned | Descriptions /<br>Actions Taken | Conclusion /<br>Status |
|---|---------------------------------|------------------------|
| Nil   | N/A                             | N/A                    |

## 5. FUTURE KEY ISSUES

### 5.1 Outage Plan for the coming 3 months

| Unit | Time                     | Remark        |
|------|--------------------------|---------------|
| GT5  | 28/02/2018 to 20/03/2018 | Unit Overhaul |
| GT7  | 05/02/2018 to 04/04/2018 | Unit Overhaul |

### 5.2 Key issues for the coming month

Key issues to be considered in the coming month include:

#### *Air Impact*

- To monitor the water injection rate continuously.
- To monitor the NOx emission continuously through the GT57 CEM System.
- To monitor the fuel sulphur content of the LGO if the combined cycle unit is run on LGO.

#### *Water Impact*

- To continuously carry out the water quality monitoring for GT57 as required by the EM&A manual (Operational phase).



## **6. CONCLUSION**

Environmental monitoring was performed as required in the reporting month. All monitoring results were checked and reviewed.

No Action/Limit level exceedance on hourly average water injection rate was recorded in the reporting month.

No Action/Limit level exceedance on stack NO<sub>x</sub> was recorded in the reporting month.

No Action/Limit level exceedance on water quality parameters were recorded in the reporting month.

Environmental mitigation measures recommended in the Project Profile were implemented in the reporting month.

No complaint against the Project was received in the reporting month.

No prosecution was received for this Project in the reporting period.

The environmental performance of the Project was generally satisfactory.

## Appendix A Event / Action Plans

Table A.1 Event and Action Plans for Air Quality

| Exceedance                                    | ET Leader   | IEC  | Operations Engineer   |
|---|---|--|---|
| <b>Action Level</b>                           |   |  |   |
| Exceedance of one sample                      | Identify source;<br>Inform IEC verbally;<br>Repeat measurement to confirm finding.  | Check monitoring data submitted by ET and advise ET for any finding.   | Rectify any unacceptable practice;<br>Amend any working methods if appropriate.   |
| Exceedance of two or more consecutive samples | Identify source;<br>Inform IEC verbally;<br>Repeat measurement to confirm finding;<br>Increase monitoring frequency;<br>Discuss with Operations Engineers on remedial actions required;<br>If exceedance stops, discontinue additional monitoring.  | Check monitoring data submitted by ET and advises ET for any finding;<br>Verify the implementation of the remedial measures;   | Discuss with ET on remedial actions required;<br>Implement the agreed remedial actions.   |
| <b>Limit level</b>                            |   |  |   |
| Exceedance of one sample                      | Repeat measurement to confirm finding;<br>Identify the source(s) of the impact. Verbally advise IEC, and inform the EPD of the exceedance, as soon as practicable;<br>Discuss with Operations Engineers on remedial actions required;<br>Increase monitoring frequency;<br>Assess the effectiveness of the remedial actions and keep IEC and EPD informed of the results.   | Check monitoring data submitted by ET and advises ET of any finding;<br>Verify the implementation of the remedial measures.  | Take immediate action to avoid further exceedances;<br>Discuss with ET on remedial actions required<br>Implement the agreed remedial actions.   |
| Exceedance of two or more consecutive samples | Identify source;<br>Identify the source(s) of the impact. Verbally advise IEC, and inform EPD of the exceedance as soon as practicable;<br>Repeat measurement to confirm finding;<br>Increase monitoring frequency;<br>Carry out analysis on existing control procedures to determine possible mitigation to be implemented;<br>Discuss with Operations Engineers on the remedial actions to be taken;<br>If exceedance stops, discontinue additional monitoring. | Provide feedback and advise ET/Operations Engineers on the effectiveness of the remedial actions proposed by them;<br>Verify the implementation of the remedial measures | Take immediate action to avoid further exceedance<br>Discuss with ET on remedial actions required;<br>Implement the agreed remedial actions;<br>Stop the unit and check the suspected defective parts if the problem still does not come under control. |

Table A.2 Event/Action Plan for Water Quality

| <b>Exceedance</b>                                     | <b>ET Leader</b>   | <b>IEC</b>  | <b>Operations Engineer</b>   |
|---|--|---|--|
| <b>Action Level</b>                                   |  |   |  |
| Exceedance on one sampling day                        | Verbally inform IEC;<br>Repeat in-situ measurement to confirm findings;<br>Identify source(s) of impact.   | Check monitoring data submitted by ET and advises ET for any findings.  | Rectify unacceptable practice;<br>Amend any working methods if appropriate.  |
| Exceedances on more than one consecutive sampling day | Identify source(s) of impact;<br>Verbally inform IEC;<br>Repeat in-situ measurements to confirm findings;<br>Increase monitoring frequency;<br>Discuss with Operations Engineers on remedial actions required;<br>If exceedance stops, discontinue additional monitoring   | Check monitoring data submitted by ET and advises ET for any finding;<br>Verify the implementation of the remedial measures.  | Discuss with ET on remedial actions required;<br>Implement the agreed remedial actions.  |
| <b>Limit Level</b>                                    |  |   |  |
| Exceedance on one sampling day                        | Repeat measurement to confirm finding;<br>Identify the source(s) of impact.<br>Verbally advise IEC and inform the EPD of the exceedance, as soon as practicable;<br>Discuss with Operations Engineers on remedial actions require;<br>Increase monitoring frequency;<br>Assess the effectiveness of the remedial actions and keep IEC and EPD informed of the results.   | Check monitoring data submitted by ET and advises ET for any finding;<br>Verify the implementation of the remedial measures.  | Take immediate action to avoid further exceedance;<br>Discuss with ET on remedial actions required;<br>Implement the agreed remedial actions.  |
| Exceedances on more than one consecutive sampling day | Identify the source(s) of impact.<br>Verbally advise IEC, and inform EPD of the exceedance as soon as practicable;<br>Repeat measurement to confirm finding;<br>Increase monitoring frequency;<br>Carry out analysis on existing control procedures to determine possible mitigation to be implemented;<br>Discuss with Operations Engineers on the remedial actions to be taken;<br>If exceedance stops, discontinue additional monitoring. | Provide feedback and advise ET/Operations Engineers on the effectiveness of the remedial actions proposed by them;<br>Verify the implementation of the remedial measures. | Take immediate action to avoid further exceedance;<br>Discuss with ET on remedial actions required;<br>Implement the agreed remedial actions;<br>Stop the unit and check the suspected defective parts if the problem still does not come under control. |

## Appendix B Action and Limit Levels for Air Quality, Water Quality Monitoring

### B.1 Air

| Parameter                           | Action   | Limit  |
|-------------------------------------|--|--|
| Stack NOx (gas firing)              | 80 mg/Nm <sup>3</sup>  | 90 mg/Nm <sup>3</sup>  |
| Stack NOx (oil firing)              | 150 mg/Nm <sup>3</sup>   | 150 mg/Nm <sup>3</sup>   |
| Hourly Average Water Injection Rate | Measured Hourly Average Water Injection Rate lower than corresponding Specified Hourly Average water Injection Rate. | Measured Hourly Average Water Injection Rate lower than corresponding Specified Hourly Average water Injection Rate. |

Note: Expressed as at 0°C, 101.325kPa, dry and corrected to 15% O<sub>2</sub> condition.

The Action / Limit level for stack NOx would be revised with more emission data available if deemed necessary.

## B.2 Water

| Monitoring Area / Location              | Parameters to be Monitored    | Frequency  | Concentration Not to Be Exceeded  | Action   | Limit                                       | Proposed Action  |
|---|-------------------------------|--|---|--|---|--|
| Trade Effluent Cooling Water            | Temperature                   | Daily, when the combined cycle unit is operating                   | Temperature at outfall should not exceed that at intake by > 10°C and temperature at outfall should not exceed 40°C | 9.5°C  | +10°C above intake                          | Please refer to the event & action plans in Table A.2. |
|   | Total Residual Chlorine       | Bi-weekly, when the combined cycle unit is operating               | 0.5mg/L   | 0.47 mg/L  | 0.5 mg/L                                    |  |
| Trade Effluent oil free drain discharge | Grease and Oil                | Monthly, when the combined cycle unit is operating                 | 20 mg/L   | 15 mg/L  | 20 mg/L                                     | Please refer to the event & action plans in Table A.2. |
| Trade Effluent Boiler Blowdown (HRSG)   | Temperature                   | At least twice per year, when the combined cycle unit is operating | 40°C  | -  | 40°C  | Please refer to the event & action plans in Table A.2. |
|   | Suspended Solids              | At least twice per year, when the combined cycle unit is operating | 30 mg/L   | -  | 30 mg/L                                     |  |
|   | Grease & Oil                  | At least twice per year, when the combined cycle unit is operating | 20 mg/L   | -  | 20 mg/L                                     |  |
| Marine waters cooling water outfall     | Scum of foam in ambient water | Daily, when the combined cycle unit is operating                   | No scum within 500 m of Hung Shing Ye Beach   | When scum passes the station south-west corner and north-west corner | No scum within 500 m of Hung Shing Ye Beach | Please refer to the event & action plans in Table A.2. |

## Appendix C Summary Results on Air Quality Monitoring

**Site:** Lamma Power Station – Unit GT57

**Month:** January 2018

### Monthly Summary of Stack NOx

| Date      | Daily Maximum Stack NOx concentration (mg/Nm <sup>3</sup> ) <sup>#</sup> |     |
|-----------|--|-----|
|           | GT5  | GT7 |
| 1/1/2018  | 66   | *   |
| 2/1/2018  | 67   | *   |
| 3/1/2018  | 67   | *   |
| 4/1/2018  | 69   | *   |
| 5/1/2018  | 67   | *   |
| 6/1/2018  | *  | *   |
| 7/1/2018  | 66   | 65  |
| 8/1/2018  | 67   | 69  |
| 9/1/2018  | 70   | 73  |
| 10/1/2018 | 71   | 72  |
| 11/1/2018 | 71   | 70  |
| 12/1/2018 | 72   | 70  |
| 13/1/2018 | 71   | 66  |
| 14/1/2018 | 69   | *   |
| 15/1/2018 | 70   | 65  |
| 16/1/2018 | 70   | 66  |
| 17/1/2018 | 70   | 68  |
| 18/1/2018 | 70   | 67  |
| 19/1/2018 | 69   | 71  |
| 20/1/2018 | 70   | 67  |
| 21/1/2018 | 5  | *   |
| 22/1/2018 | 69   | 64  |
| 23/1/2018 | 70   | 67  |

| Date      | Daily Maximum Stack NOx concentration (mg/Nm <sup>3</sup> ) <sup>#</sup> |     |
|-----------|--|-----|
|           | GT5  | GT7 |
| 24/1/2018 | 70   | 66  |
| 25/1/2018 | 70   | 66  |
| 26/1/2018 | 70   | 64  |
| 27/1/2018 | 70   | 65  |
| 28/1/2018 | 70   | *   |
| 29/1/2018 | 70   | *   |
| 30/1/2018 | 70   | 79  |
| 31/1/2018 | 70   | 88  |

Note: # - Hourly average value. Expressed as at 0°C, 101.325kPa, dry and corrected to 15% O<sub>2</sub> condition.

\* - Unit GT5 / GT7 was not on load.

#### Monthly Fuel Data and Generation Output

|                                 | GT5      | GT7      | Steam Turbine | Total     |
|---------------------------------|----------|----------|---------------|-----------|
| Generation Output (MWH)         | 64,427.0 | 36,841.7 | 44,645.0      | 145,913.7 |
| Natural Gas Consumption (MT)    | 16,591.7 | 9,701.3  | -             | 26,293.0  |
| Fuel Oil Consumption (MT)       | 0.0      | 0.0      | -             | 0.0       |
| Sulphur content of Fuel Oil (%) | NA       | NA       | -             | -         |

\* The figures may not sum to total due to rounding.

|                             | GT6   |
|-----------------------------|-------|
| Sulphur content of Fuel (%) | 0.001 |

## Appendix D Summary Results and Observations on Water Quality Monitoring

### Maximum Outlet Temperature and Temperature Rise (Deg. Celsius) of Cooling Water at C.W. Outfall No.1 Serving Units L1-L6 & GT57 Condensers Weighted by Flowrates of Individual Streams (January 2018)

| Date      | Maximum Outlet Temperature (Deg. Celsius) | Maximum Outlet Temperature Rise (Deg. Celsius) |
|-----------|---|--|
| 1/1/2018  | 22.1                                      | 3.8  |
| 2/1/2018  | 22.9                                      | 4.3  |
| 3/1/2018  | 23.2                                      | 4.5  |
| 4/1/2018  | 22.9                                      | 4.5  |
| 5/1/2018  | 23.3                                      | 4.7  |
| 6/1/2018  | *   | *  |
| 7/1/2018  | 23.7                                      | 5.9  |
| 8/1/2018  | 23.7                                      | 5.6  |
| 9/1/2018  | 23.0                                      | 5.6  |
| 10/1/2018 | 22.6                                      | 5.6  |
| 11/1/2018 | 22.5                                      | 5.9  |
| 12/1/2018 | 22.5                                      | 6.0  |
| 13/1/2018 | 22.4                                      | 5.6  |
| 14/1/2018 | 21.5                                      | 4.7  |
| 15/1/2018 | 22.5                                      | 5.5  |
| 16/1/2018 | 23.1                                      | 6.0  |
| 17/1/2018 | 23.0                                      | 5.6  |
| 18/1/2018 | 23.0                                      | 5.8  |
| 19/1/2018 | 23.2                                      | 6.0  |
| 20/1/2018 | 23.6                                      | 5.9  |
| 21/1/2018 | 23.4                                      | 5.5  |
| 22/1/2018 | 23.7                                      | 5.6  |
| 23/1/2018 | 23.6                                      | 5.5  |
| 24/1/2018 | 23.6                                      | 5.5  |
| 25/1/2018 | 23.5                                      | 5.5  |
| 26/1/2018 | 23.2                                      | 5.4  |
| 27/1/2018 | 23.2                                      | 5.7  |
| 28/1/2018 | 22.6                                      | 5.2  |
| 29/1/2018 | 22.9                                      | 5.9  |
| 30/1/2018 | 22.6                                      | 6.0  |
| 31/1/2018 | 22.3                                      | 5.8  |

Note: \* GT57 Condensers were not in operation.



**Total Residual Chlorine Level at C.W. Outfall No.1 (January 2018)**

|                               |       |       |
|-------------------------------|-------|-------|
| Date of sampling              | 05/01 | 19/01 |
| Total Residual Chlorine, mg/L | 0.25  | 0.30  |

**Grease & Oil at Oil Free Drain From Oil Interceptor for GT57 (January 2018)**

|                    |       |
|--------------------|-------|
| Date of sampling   | 26/01 |
| Grease & Oil, mg/L | <10   |

**Boiler Blowdown from GT5 & GT7 HRSG to C.W. Outfall No.1 (January 2018)**

|                           |     |     |
|---------------------------|-----|-----|
| Source of discharge       | GT5 | GT7 |
| Date of sampling          | #   | #   |
| Suspended Solid, mg/L     | #   | #   |
| Grease & Oil, mg/L        | #   | #   |
| Temperature, Deg. Celsius | #   | #   |

Note: # Monitoring was not scheduled in the reporting month. The last monitoring was carried out in July 2017.

**Observation of Scum Formation in Marine Water Mixing Zone  
 At Lamma Power Station (January 2018)**

| Date     | Observation   |
|----------|---|
| 1/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall   |
| 2/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall   |
| 3/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall   |
| 4/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station; Some foam outside CW Outfall and defoamer added to Outfalls No.1 & No.2 |
| 5/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station; Some foam outside CW Outfall and defoamer added to Outfalls No.1 & No.2 |
| 6/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall   |
| 7/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall   |
| 8/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall   |

| Date      | Observation   |
|-----------|---|
| 9/1/2018  | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 10/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 11/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 12/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 13/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 14/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 15/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 16/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 17/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 18/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 19/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 20/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 21/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 22/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 23/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 24/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 25/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 26/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 27/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 28/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 29/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 30/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |
| 31/1/2018 | No scum within 500m of HSY Beach & NW/SW corner of the Station & CW Outfall |

Note: The water spraying system at C.W. Outfall No.1 was in service from 4 to 5/1/2018.