

LEGISLATIVE COUNCIL BRIEF
Air Pollution Control Ordinance (Cap. 311)

**Seventh Technical Memorandum for
Allocation of Emission Allowances in Respect of Specified Licences**

INTRODUCTION

Pursuant to Section 26G of the Air Pollution Control Ordinance (Cap. 311) (the Ordinance), the Secretary for the Environment (the Secretary) has made the "Seventh Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences" (the Seventh TM) at **Annex** to tighten the emission allowances for the two power companies with a view to improving air quality. The emission allowances will apply to three types of air pollutants, i.e., sulphur dioxide (SO₂), nitrogen oxides (NO_x) and respirable suspended particulates (RSP), to be allocated in respect of each specified licence to conduct electricity works for each emission year from 1 January 2022.

JUSTIFICATIONS

2. Section 26G(2) of the Ordinance provides for the Secretary to allocate the emission allowances for each type of specified pollutant allocated in respect of each specified licence to conduct electricity works by a technical memorandum (TM). The Secretary, in making the emission allocations, shall:

- (a) have regard to the best practicable means (BPM) for preventing the emission of that type of pollutant;
- (b) have as his purpose the attainment and maintenance of any relevant air quality objective; and
- (c) have regard to whether the emission of that type of pollutant would be, or be likely to be, prejudicial to health.

3. In 2016, the Secretary issued the "Sixth Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences" (the Sixth TM) to allocate emission allowances in relation to each emission year

commencing on 1 January 2021 for each of the power plants of the two power companies. The emission allowances under the Sixth TM were determined with due regard to the reduction in electricity demand forecasts in 2021 for both CLP Power Hong Kong Limited (CLP) and the Hongkong Electric Company, Limited (HEC) as compared to those in 2020¹, and taking also into account that CLP would endeavour to continue importing 80% of nuclear output from the Daya Bay Nuclear Power Station (DBNPS) beyond 2018. Both power companies shall continue to maximise the use of existing gas-fired units, prioritise the use of coal-fired units equipped with advanced emission control devices, use low-emission coal and uphold the performance of the emission control devices to meet the emission allowances.

4. When setting the emission allowances under the Sixth TM last year, we committed to a review of the TM in 2017 to take account of the latest development on the building of new gas-fired units, which will affect the fuel mix for electricity generation and hence emissions in future years. When reviewing the Sixth TM, we have taken account of the following –

- (a) the progress of increasing local gas generation to around 50% of the total fuel mix for electricity generation by 2020 (“Fuel Mix Target”) so as to meet the Government’s pledged environmental targets for 2020², including the construction of new gas-fired units and replacement of some old power generating units, which are scheduled for retirement after reaching the end of their service life in coming years;
- (b) new technology to upgrade existing gas-fired units for improving their NO_x emission performance as well as thermal efficiency;
- (c) the practicability to maintain the current import of 80% of nuclear output from DBNPS to CLP after 2018; and
- (d) the projected local electricity consumption in the period 2022 to 2023.

¹ The projected load reduction was in part attributable to the Energy Saving Plan for Hong Kong's Built Environment 2015~2025+ released by the Government in May 2015, which set a target of reducing energy intensity in Hong Kong by 40% by 2025 when compared to 2005.

² The pledged environmental targets for 2020 are to reduce the carbon intensity by 50-60% by 2020 when compared to 2005; and to reduce the emissions of sulphur dioxide (SO₂) by 35-75%, nitrogen oxides (NO_x) by 20-30% and respirable suspended particulates (RSP) by 15-40% by 2020 when compared to 2010.

5. Based on the above considerations, our assessment for HEC is as follows –

- (a) HEC is building a new gas-fired unit (Unit L11) with an installed capacity of 380 MW at its Lamma Power Station Extension for operation in 2022. As an interim measure to achieve the 2020 Fuel Mix Target (i.e., 50% gas generation) thus contributing to the meeting of the pledged environmental targets, including the carbon intensity reduction target, HEC will keep an existing gas-fired unit in service, which was originally scheduled for retirement in 2020, until Unit L11 is commissioned in 2022. When Unit L11 starts operation in 2022, the gas generation ratio will increase from 50% in 2020 to 55%, thus allowing further reduction of the emission allowances;
- (b) the electricity demand for the Hong Kong Island is forecasted to drop by around 2% in the period 2022 to 2023 as compared to that of 2021 when the Sixth TM will take effect. The forecasted reduced electricity demand is partly due to the energy efficiency measures outlined in the Energy Saving Plan for Hong Kong's Built Environment 2015~2025+ (the Energy Saving Plan); and
- (c) the reduced electricity demand in 2022 and 2023 and the availability of more gas-fired electricity generating capacity could reduce the reliance on coal-fired units for power generation. It is estimated that HEC's emission allowances in the new TM could be reduced by 23% for SO₂, 21% for NO_x and 8% for RSP as compared to the levels in the Sixth TM.

6. As for CLP, our assessment is as follows –

- (a) CLP is building a new gas-fired unit of 550 MW (Unit D1) at its Black Point Power Station. Unit D1, after commencement of operation in 2020, will increase CLP's gas generation ratio from around 25% in 2015 to about 49% in 2020, contributing to the achievement of the 2020 Fuel Mix Target for meeting the pledged environmental targets, including the carbon intensity reduction target, and allowing for further reduction of its emission allowances;

- (b) at its Black Point Power Station, one of the eight gas-fired units has been upgraded, thereby increasing its generation capacity by 8%, i.e., 25 MW, and reducing its NO_x emissions by around 30%. CLP will upgrade two more gas-fired units by 2018, which will further reduce its NO_x emissions;
- (c) DBNPS would continue to supply 80% of its annual nuclear power output to CLP beyond 2018;
- (d) the electricity demand for CLP is forecasted to increase by around 1% in the period 2022 to 2023 as compared to that of 2021 when setting the Sixth TM; and
- (e) the limited increase in electricity demand forecast in 2022 to 2023 and the availability of more gas-fired electricity generation capacity could reduce the reliance on coal-fired units for power generation. It is estimated that its emission allowances could be reduced by 27% for SO₂, 12% for NO_x and 12% for RSP in the period 2022 to 2023 as compared to the levels in the Sixth TM.

7. The projected emissions for the power plants of the two power companies in 2022 and beyond are presented in Table 1 below, together with the reductions relative to the respective Sixth TM levels –

Table 1: Projected Emissions in 2022 and beyond (tonnes per year)

		Sulphur dioxide	Nitrogen oxides ^[@]	Respirable suspended particulates
HEC	Lamma Power Station and Lamma Power Station Extension (mixed fuel)	2 210 [-23%]	4 910 [-21%]	120 [-8%]
CLP	Black Point Power Station (gas-fired)	319 [15%]	3 381 [-17%]	123 [14%]
	Castle Peak Power Station (coal-fired)	2 759 [-30%]	9 237 [-10%]	246 [-21%]
	Penny's Bay Gas Turbine Power Station (oil-fired)	2 [0%]	2 [0%]	1 [0%]

		Sulphur dioxide	Nitrogen oxides ^[@]	Respirable suspended particulates
	Total of CLP's Stations	3 080 [-27%]	12 620 [-12%]	370 [-12%]
	Electricity sector	5 290 [-25%]	17 530 [-15%]	490 [-11%]

^[@] Expressed as nitrogen dioxide

Note: The figures in square brackets are the percent reduction comparing with the emission allowances stipulated in the Sixth TM.

8. Based on the above projected emissions, in ascertaining the emission allowances for HEC and CLP, we will also follow the established mechanism in the Sixth TM by taking into account the actual intake of the electricity generated from RE and the unit emission factors of coal-fired units³. For RE facilities, the Lamma Winds of HEC and its photovoltaic system at Lamma Power Station will continue to supply RE of about 2 GWh per year in total to HEC's power grid. The Sludge Treatment Facility (T·PARK) in Tuen Mun, which started operation in 2015, and Phase 1 of the new Organic Resources Recovery Centre in Siu Ho Wan, North Lantau, which will start operation by the end of 2017, are expected to supply about 32 GWh of surplus electricity per year to CLP's power grid when fully commissioned. CLP will develop landfill gas electricity generation at West New Territories (WENT) Landfill with generation capacity of around 68 GWh for operation beginning in the third quarter of 2018. Besides, the Integrated Waste Management Facility in Shek Kwu Chau is also a potential RE facility and is expected to start providing RE by 2024. Further assessment will be conducted in our next review of TM when more details are available.

THE SEVENTH TECHNICAL MEMORANDUM

9. Based on the above review, we propose to promulgate a new TM to allocate the emission allowances from 2022 onwards to each of the existing power plants by the following method, as adopted in the Sixth TM:

³ Unit emission factors of coal-fired units are the averaged emission of specified pollutants (i.e., SO₂, NO_x and RSP) owing to the generation of 1 GWh electricity from coal-fired units in the power plant, expressed in tonne/GWh.

	Emission allowances to be allocated and ascertained
=	Emission allowances that are required with the use of BPM (i.e., those presented in Table 1 above)
<i>plus/minus</i>	Emission allowances to be added/deducted owing to deviation of the actual intake of RE from the anticipated intake (i.e., 2 GWh and 100 GWh for HEC and CLP respectively) in accordance with the unit emission factors of coal-fired units

10. The formulae for allocating the emission allowances to the four power plants are presented in the tables below –

Table 2(a): Lamma Power Station and Lamma Power Station Extension

	Quantity of Emission Allowance for 2022 and thereafter
SO ₂	$2\,210 + (2 - A) \times 0.459^*$
NO _x ^[@]	$4\,910 + (2 - A) \times 0.922^*$
RSP	$120 + (2 - A) \times 0.018^*$

Table 2(b): Black Point Power Station

	Quantity of Emission Allowance for 2022 and thereafter
SO ₂	319
NO _x ^[@]	3 381
RSP	123

Table 2(c): Castle Peak Power Station

	Quantity of Emission Allowance for 2022 and thereafter
SO ₂	$2\,759 + (100 - B) \times 0.343^\#$
NO _x ^[@]	$9\,237 + (100 - B) \times 1.148^\#$
RSP	$246 + (100 - B) \times 0.030^\#$

Table 2(d): Penny’s Bay Gas Turbine Power Station

	Quantity of Emission Allowance for 2022 and thereafter
SO ₂	2
NO _x ^[@]	2
RSP	1

^[@] Expressed as nitrogen dioxide

* Unit emission factors of coal-fired units in Lamma Power Station in 2022

Unit emission factors of coal-fired units in Castle Peak Power Station in 2022

where –

A is the aggregate of total net sent-out electricity output (in GWh) from the RE Systems to the electricity grid of Lamma Power Station and Lamma Power Station Extension in the emission year; and

B is the aggregate of total net sent-out electricity output (in GWh) from the RE Systems to the electricity grid of Castle Peak Power Station in the emission year.

11. In the event that there will be new electricity works⁴, we will, as in the past, allocate emission allowances based on the emission performance of a new gas-fired unit having adopted BPM for emission reduction. We also propose to retain the mechanism in the Sixth TM to cater for the possible intake of RE by new electricity works. Accordingly, the formulae for allocating and ascertaining the emission allowances in respect of each of the specified pollutants for possible new electricity works, with respect to the same reference installed capacity adopted in the previous TM, i.e., 300 MW, for emission years starting from 1 January 2022 would be as presented in the table below –

Table 3: New Electricity Works

	Quantity of Emission Allowance for 2022 and thereafter
SO ₂	$36 \times (C/300) \times (D/12) - E \times 0.018^{\wedge}$

⁴ "New electricity works" refers to electricity works that come into existence after the commencement of the proposed TM. The use of coal in new electricity generation plants was banned since 1997. New generating units shall be gas-fired units.

	Quantity of Emission Allowance for 2022 and thereafter
NO _x ^[@]	$55 \times (C/300) \times (D/12) - E \times 0.028^{\wedge}$
RSP	$14 \times (C/300) \times (D/12) - E \times 0.007^{\wedge}$

[@] Expressed as nitrogen dioxide

[^] Unit emission factors of gas-fired units equipped with latest emission control device

where –

- C is the total installed capacity (in MW) of the New Electricity Works; or 300 (i.e., reference installed capacity), whichever is smaller;
- D is the total number of months in the emission year after the commencement of operation of the New Electricity Works and part of a month is taken as a full month in the determination; and
- E is the aggregate of total net sent-out electricity output (in GWh) from the RE Systems to the electricity grid of the New Electricity Works in the emission year.

LEGISLATIVE TIMETABLE

12. The Seventh TM will be published in the Gazette on 13 October 2017 and tabled at the Legislative Council for negative vetting on 18 October 2017. Subject to the negative vetting by the Legislative Council, the new set of emission allowances will take effect on 1 January 2022, in accordance with Section 26G(4) of the Ordinance⁵.

NEXT REVIEW

13. This review has taken account of all the new gas-fired generating units which have been approved by the Government. We will thus maintain the normal practice to review a TM at a frequency of no less than once every two years to enable timely revision of the emission allowances.

⁵ Section 26G(4) of the Ordinance provides that an allocation does not have effect in respect of an emission year unless the relevant TM issued has commenced to have effect at least 4 years before the commencement of the emission year. An emission year commences on 1 January.

BASIC LAW AND HUMAN RIGHTS IMPLICATIONS

14. The Seventh TM is in conformity with the Basic Law, including the provisions concerning human rights.

ENVIRONMENTAL AND SUSTAINABILITY IMPLICATIONS

15. As compared with the emission allowances for 2021 set under the Sixth TM, the proposed Seventh TM will see a further tightening of 25% for SO₂, 15% for NO_x as well as 11% for RSP for the electricity sector. The reduction will help improve air quality, given that emissions from the electricity sector accounted for 37%, 28% and 11% respectively of the territory-wide emissions of these pollutants in 2015.

16. Achieving better air quality for Hong Kong through statutory control on power plants' emissions is in line with the sustainability principles of seeking opportunities to enhance the quality of our living environment that promotes and protects the physical health of the people of Hong Kong.

TARIFF IMPLICATIONS

17. The construction of one new gas-fired unit each by the two power companies would allow them to achieve the proposed emission allowances for 2022 and onwards. HEC estimates that total capital expenditure involved for building Unit L11 is about \$4.1 billion, while CLP estimates that for Unit D1 is about \$5.5 billion. As for their tariff implication, it is premature at this stage to make any meaningful assessment for 2022 and beyond. This is because how the increase in capital investment will be reflected in electricity tariff would depend on a host of factors, including the future fuel costs, the pace of capital investments, operating costs, sales volume, as well as future movements in the Tariff Stabilisation Fund and the Fuel Clause Recovery Account.

18. The power companies will present their tariff assessment to the Administration annually in accordance with the relevant regulatory mechanism under the Scheme of Control Agreements.

FINANCIAL AND CIVIL SERVICE IMPLICATIONS

19. The Seventh TM will not incur additional financial implications for the Government. Enforcement of the emission caps for power companies will be carried out by existing staff of EPD.

CONSULTATION

20. We have consulted the two power companies about the proposal to further tighten the emission caps. While they agree that the commissioning of their new gas-fired units would help further reduce emissions from their power plants, they consider the proposed new emission allowances, which have been tightened further taking into account the increase in gas generation, extremely challenging. Nevertheless, they are supportive of the new energy efficiency and conservation initiatives proposed by the Government in the Energy Saving Plan; and the fuel mix for 2020 with a view to cutting emissions from electricity generation. They are committed to working closely with the Government to ensure compliance while maintaining a reliable supply of electricity to the customers. They also agree to another review of the TM to be conducted not later than 2019.

21. Both power companies also see the compliance of the emission allowances contingent upon availability of fuels of the right quality. They have also put forward that any forced outages or a drop in the performance of the generating units or emission control equipment due to ageing problem or natural deterioration will jeopardize their compliance with the new emission allowances. HEC has also raised its concern that with progressive retirement of its two oldest coal-fired units and one gas-fired unit, the drop in its available generating capacity would pose a challenge to the sourcing of the right kind of low-emission coal with sufficiently high heating value to compensate for the smaller available generating capacity. Should the operation of the power plants encounter events that are beyond their control and with significant emission implications (e.g., cessation or insufficient supply of low-emission coal, unexpected increase in power demand, increase in sulphur content of the natural gas supplied, less than expected nuclear energy made available to CLP for 2022,

and/or other related issues falling outside their control), they may have to resort to the special event provision under Section 26K of the APCO to adjust their emission allowances accordingly. When necessary, we will handle these special events in accordance with the APCO.

22. We consulted the Advisory Council on the Environment and the Legislative Council Panel on Environmental Affairs on the proposed Seventh TM on 5 June 2017 and 17 July 2017 respectively. Both of them supported the proposal.

PUBLICITY

23. A press release will be issued on the date of gazette of the Seventh TM. A spokesman will be made available for media enquiries.

ENQUIRY

24. For any enquiry relating to this brief, please contact Mr. Dave HO Tak-yin, Acting Assistant Director of Environmental Protection (Air Policy), at 2594 6309.

Environmental Protection Department
October 2017

**SEVENTH TECHNICAL MEMORANDUM
FOR ALLOCATION OF EMISSION ALLOWANCES
IN RESPECT OF SPECIFIED LICENCES**

WONG Kam-sing
SECRETARY FOR THE ENVIRONMENT

This Technical Memorandum is published under Section 37B(1) of the Air Pollution Control Ordinance (Cap. 311) and shall commence to have effect in accordance with Section 37C of that Ordinance.

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SEVENTH TECHNICAL MEMORANDUM FOR ALLOCATION OF EMISSION ALLOWANCES IN RESPECT OF SPECIFIED LICENCES

1. PRELIMINARY

1.1 Citation and Commencement

This Technical Memorandum is the seventh technical memorandum issued pursuant to Section 26G of the Ordinance and may be cited as the "Seventh Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences". This Technical Memorandum shall come into operation in accordance with Section 37C of the Ordinance.

1.2 Application and Scope

This Technical Memorandum sets out the quantity of emission allowances for each type of specified pollutant allocated in respect of each specified licence and the allocation principles and determination method of the quantity of emission allowances to be allocated for each and every emission year from 1 January 2022. The allocation of emission allowances set out or determined under the Sixth Technical Memorandum for each and every emission year from 1 January 2022 is superseded by this Technical Memorandum.

1.3 Interpretation

In this Technical Memorandum, unless the context otherwise requires, the following definitions apply –

"Authority" (監督) has the same meaning as in the Ordinance.

"Electricity generation for local consumption" (供本港使用電力) means the gross electricity generation of the Electricity Works concerned minus the electricity sales for export outside the Hong Kong Special Administrative Region irrespective of whether the export sales are directly conducted by the subject specified licence holder or indirectly dealt with by other dealers.

"Electricity Works" (電力工程) means the process of Electricity Works specified in item 7 of Schedule 1 to the Ordinance.

"emission allowance" (排放限額) has the same meaning as in the Ordinance.

"emission year" (排放年度) has the same meaning as in the Ordinance.

"Existing Electricity Works" (現有電力工程) means the Electricity Works conducted in any of the following power stations in respect of which a valid specified licence is in force on the commencement date of this Technical Memorandum –

- (a) Lamma Power Station and Lamma Power Station Extension at Lot 1934 and Lot 2200, DD 3, Po Lo Tsui, Lamma Island;
- (b) Black Point Power Station at Yung Long Road, Lung Kwu Tan, Tuen Mun, New Territories;
- (c) Castle Peak Power Station at Lung Yiu Street, Tuen Mun, New Territories; and
- (d) Penny's Bay Gas Turbine Power Station at Lot 23, DD 256, Penny's Bay, Lantau Island, New Territories.

"Sixth Technical Memorandum" (第六份技術備忘錄) means the "Sixth Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences" published in the Gazette under Section 37B(1) of the Ordinance on 21 October 2016 which came into operation in accordance with Section 37C of the Ordinance.

"New Electricity Works" (新電力工程) means any Electricity Works, other than the Existing Electricity Works, which comes into existence after the commencement of this Technical Memorandum.

"Ordinance" (條例) means the Air Pollution Control Ordinance (Cap. 311).

"Renewable Energy System" (可再生能源系統) means an electricity generation system employing solar, wind, biomass, hydro, tidal, wave, geothermal or energy from waste (including landfill gas or sewage gas) that provides electricity to the grid.

"Secretary" (局長) has the same meaning as in the Ordinance.

"specified licence" (指明牌照) has the same meaning as in the Ordinance.

"specified licence holder" (指明牌照持有人) has the same meaning as in the Ordinance.

"specified pollutant" (指明污染物) has the same meaning as in the Ordinance.

2. ALLOCATION OF EMISSION ALLOWANCES

2.1 The quantity of emission allowances for each type of specified pollutant allocated to each specified licence of Existing Electricity Works for each and every emission year from 1 January 2022 shall be determined by the formulae in the respective tables as follows –

(a) Lamma Power Station and Lamma Power Station Extension

	2022 and thereafter
Sulphur dioxide	$2\,210 + (2 - A) \times 0.459$
Nitrogen oxides ⁽ⁱ⁾	$4\,910 + (2 - A) \times 0.922$
Respirable suspended particulates	$120 + (2 - A) \times 0.018$

(b) Black Point Power Station

	2022 and thereafter
Sulphur dioxide	319
Nitrogen oxides ⁽ⁱ⁾	3 381
Respirable suspended particulates	123

(c) Castle Peak Power Station

	2022 and thereafter
Sulphur dioxide	$2\,759 + (100 - B) \times 0.343$
Nitrogen oxides ⁽ⁱ⁾	$9\,237 + (100 - B) \times 1.148$

	2022 and thereafter
Respirable suspended particulates	$246 + (100 - B) \times 0.030$

(d) Penny's Bay Gas Turbine Power Station

	2022 and thereafter
Sulphur dioxide	2
Nitrogen oxides ⁽ⁱ⁾	2
Respirable suspended particulates	1

⁽ⁱ⁾ Expressed as nitrogen dioxide

where –

- A is the aggregate of total net sent-out electricity output (in GWh) from the Renewable Energy Systems to the electricity grid of Lamma Power Station and Lamma Power Station Extension in the emission year; and
- B is the aggregate of total net sent-out electricity output (in GWh) from the Renewable Energy Systems to the electricity grid of Castle Peak Power Station in the emission year.

2.2 The quantity of emission allowances for each type of specified pollutant allocated to each specified licence of New Electricity Works for each and every emission year from 1 January 2022 shall be determined by the formulae as follows –

	2022 and thereafter
Sulphur dioxide	$36 \times (C/300) \times (D/12) - E \times 0.018$
Nitrogen oxides ⁽ⁱⁱ⁾	$55 \times (C/300) \times (D/12) - E \times 0.028$
Respirable suspended particulates	$14 \times (C/300) \times (D/12) - E \times 0.007$

⁽ⁱⁱ⁾ Expressed as nitrogen dioxide

where –

- C is the total installed capacity (in MW) of the New Electricity Works; or 300, whichever is smaller;
- D is the total number of months in the emission year after the commencement of operation of the New Electricity Works and part of a month is taken as a full month in the determination; and
- E is the aggregate of total net sent-out electricity output (in GWh)

from the Renewable Energy Systems to the electricity grid of the New Electricity Works in the emission year.

2.3 The Authority shall make the allocation of emission allowances for each type of specified pollutant in relation to each specified licence in respect of electricity generation for local consumption.

2.4 For the purposes of determination of the quantity of emission allowances referred in Sections 2.1 and 2.2, the aggregate of the total net sent-out electricity output from the Renewable Energy Systems in the emission year is to be rounded up to the next whole number.

2.5 The quantity of emission allowances determined in this Technical Memorandum for allocation to a specified licence shall be rounded up to the next whole number.

2.6 Unless otherwise provided or required in the Ordinance or its subsidiary legislation, the Authority shall allocate to each specified licence the respective quantity of emission allowances set out or determined in accordance with this Technical Memorandum for each and every emission year from 1 January 2022.

2.7 The Secretary shall review the quantity of emission allowances for each type of specified pollutant for each specified licence set out or determined in accordance with this Technical Memorandum not less than once every two years after the commencement of this Technical Memorandum.