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**For discussion on**
**2 July 2019**

# LEGISLATIVE COUNCIL
# PANEL ON ENVIRONMENTAL AFFAIRS

## Review of the Seventh Technical Memorandum for Allocation of Emission Allowances for Power Plants

## PURPOSE

This paper seeks Members' views on the Government's proposal to reduce emission allowances for power plants starting from 1 January 2024 by way of issuing a new Technical Memorandum (TM) (i.e. the Eighth TM) under Section 26G of the Air Pollution Control Ordinance (Cap. 311) (APCO).

## BACKGROUND

2. During the last 10 years (from 2009 to 2018), the concentrations of sulphur dioxide ($SO_2$), nitrogen dioxide ($NO_2$), respirable suspended particulates (RSP) and fine suspended particulates (FSP) recorded at general air quality monitoring stations dropped by 57%, 22%, 30% and 35% respectively. In the same period, the concentrations of $SO_2$, $NO_2$, RSP and FSP recorded at roadside decreased by 50%, 25%, 36% and 29% respectively. Although the overall air quality in Hong Kong has improved substantially, power plants are still one of the major local emission sources of air pollutants. In 2017, emissions of $SO_2$, nitrogen oxides ($NO_x$) and RSP from power plants account for 43%, 27% and 16% respectively of the territory-wide emissions of these pollutants.

3. To reduce emissions from power generation, the Government has banned the construction of new coal-fired generating unit by the two power companies (i.e. CLP Power Hong Kong Limited (CLP) and Hongkong Electric Company, Limited (HEC)) since 1997. Similar to other environmentally advanced areas such as the United States and the European Union, we also, via

licence control, demanded the two power companies to adopt the best practicable means (BPM)[1], including all reasonably practicable measures in the design and operational management, to minimize the emission of air pollutants from their power plants. In this regard, both CLP and HEC have retrofitted coal-fired generating units (coal-fired units) with flue gas desulphurisation and denitrification systems whenever practicable, maximised the use of existing gas-fired generating units (gas-fired units), prioritised the use of coal-fired units equipped with emission control devices, used low-emission coal as far as possible and upheld the performance of emission control devices of gas-fired units.

4. We amended the APCO in 2008 to empower the Government to put a cap on the emissions of power plants. Section 26G of the APCO provides for the Secretary for the Environment (the Secretary) to allocate emission allowances for three specified pollutants, i.e., $SO_2$, $NO_x$ and RSP, for power plants by way of a TM. Section 26G(4) requires a TM to be issued at least four years before the commencement of the emission year (a period of 12 months commencing on 1 January in each year) that it takes effect.

5. Seven TMs were issued in 2008, 2010, 2012 and from 2014 to 2017 respectively. The First TM set the emission allowances for the emission years between 2010 and 2014[2]. The emission allowances for the Second, Third and Fourth ones took effect from 1 January 2015, 1 January 2017 and 1 January 2019 respectively while those for the Fifth, Sixth and Seventh TM will take effect from 1 January 2020, 1 January 2021 and 1 January 2022 respectively. Despite a 10% increase in the projected electricity demand from 2010 to 2022, the emission allowances of $SO_2$, $NO_x$ and RSP set in the Seventh TM reduced by about 59% - 79%, as compared with the First TM. The emission allowances of power plants in the past seven TM, actual emissions from power plants and electricity demand are at **Annex A**.

6. We consulted this Panel on the proposed emission allowances for the

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[1] In the APCO, BPM, where used with respect to the emission from a premises of an air pollutant, has reference not only to the provision and the efficient maintenance of appliances adequate for preventing such emission, but also to the manner in which such appliances are used and to the proper supervision by the owner of the premises of any operation in which such an air pollutant is evolved. In the United States and the European Union, phrases such as "best available techniques" and "best available technology", which has similar meaning as BPM, are often used.

[2] According to Section 26G(5) of the APCO, the four-year advance notice requirement as set out in Section 26G(4) does not apply to the First TM.

Seventh TM on 17 July 2017. The Seventh TM was subsequently approved by the Legislative Council on 15 November 2017. The emission allowances under the Seventh TM were determined with due regard to the electricity demand forecasts for the period 2022 - 2023 by CLP and HEC, the progress of increasing local gas generation to around 50% of the total fuel mix for electricity generation by 2020, the new technology to upgrade existing gas-fired units, and CLP's continued efforts to import 80% of nuclear power output from the Daya Bay Nuclear Power Station (DBNPS) beyond 2018. The emission allowances under the Seventh TM are at the **Annex B**.

7. When setting the emission allowances under the Seventh TM in 2017, we undertook to conduct a review of the TM in two years (i.e. 2019) to take account of the latest development on the building of new gas-fired units and the progress of the retirement of existing coal-fired units, which will affect the fuel mix for electricity generation and hence emissions in future years. If we are able to issue a new TM for commencement within 2019, the new emission allowances can take effect from 1 January 2024.

**THE REVIEW**

8. Under Section 26G(2) of the APCO, the Secretary, in making the emission allocations for a type of specified pollutant, shall:

(a) have regard to the 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 (AQO); and

(c) have regard to whether the emission of that type of pollutant would be, or is likely to be, prejudicial to health.

9. The extensive retrofits that the power companies undertook in the past to reduce emissions from their coal-fired units, as mentioned in the paragraph 3 above, have left limited room for further retrofit. CLP completed in 2016 and 2018 the efficiency upgrading work for three of their existing gas-fired units with enhancement in generation capacity and improvement in emission performance. Similar efficiency upgrading work of the remaining five existing

gas-fired units will be completed by CLP by 2023 for enhancing the performance including emissions reduction. For HEC, there is currently two gas-fired unit[3] in the Lamma Power Station and its extension and three new gas-fired units will be put into operation between 2020 and 2023.

10. In view of limited room for further retrofits of equipment, revamping the fuel mix for electricity generation is the most effective way to further reduce emissions from power plants. Furthermore, as outlined in the Hong Kong's Climate Action Plan 2030+, the Government will continue to phase out the use of coal in local electricity generation, optimise the implementation of renewable energy (RE) to help reduce emissions from coal-fired units and make the city's buildings and infrastructure more energy efficient.

11. The Government last entered into new Scheme of Control Agreements (SCAs) with the two power companies in April 2017. Under the SCAs, the power companies submitted their five-year development plans[4] relating to the provision and future expansion of their electricity supply systems. The development plans covered, among others, the construction of two new gas-fired units with better fuel efficiency and emission performance, and the replacement of existing coal-fired units which are scheduled for retirement. The Government approved the five-year Development Plans in July 2018. The two new gas-fired units, each for HEC and CLP respectively, will be put into operation in 2023. The proportion of gas generation will be further increased from around 50% of the total fuel mix for electricity generation by 2020 ("Fuel Mix Target") to about 57% in 2024. The Government has also approved the two power companies to construct and operate an offshore liquefied natural gas terminal (LNG Terminal) to enhance the security and diversity of natural gas supply, enabling more stable power supply in Hong Kong.

12. When determining the emission allowances for the two power companies under the new Eighth TM, we have also taken account of the following factors –

(a) the progress of increasing local gas generation, including the

[3] The manufacturer of HEC's gas-fired unit, which is different from that of CLP, currently does not provide similar efficiency upgrading solution.

[4] CLP's development plan covers the period from Oct 2018 to Dec 2023 while HEC's development plan covers the period from Jan 2019 to Dec 2023.

construction of new gas-fired units and replacement of some existing coal-fired units, which are scheduled for retirement after reaching the end of their service life in coming years;

(b) the progress of upgrading 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 power output from DBNPS to CLP after 2023;

(d) the projected local electricity consumption in the period from 2024 to 2025; and

(e) the projected electricity intake from RE sources.

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

(a) HEC is building a new gas-fired unit (Unit L12) with an installed capacity of 380MW at its Lamma Power Station Extension for operation in 2023. When Unit L12 starts operation, the gas generation ratio (on sent-out basis) will increase from around 55% in 2022 to about 70% in 2024, thus allowing further reduction of the emission allowances;

(b) the retirement of three existing coal-fired units (i.e. Units L2, L4 and L5) and the reduced generation from the remaining coal-fired units will also contribute to the reduction in emission allowances;

(c) the electricity demand for the Hong Kong Island is forecasted to drop by around 4% during 2024 and 2025 as compared to that of 2022 when setting the Seventh TM. The anticipated reduction in electricity demand is partly due to the energy efficiency measures outlined in the Energy Saving Plan[5]; and partly due to new incentives to promote energy efficiency and conservation (EE&C)[6] under the new SCA; and

[5] The "Energy Saving Plan for Hong Kong's Built Environment 2015~2025+" sets a target of reducing Hong Kong's energy intensity by 40% by 2025 using 2005 as the base year.

[6] Power companies have strengthened their support to customers on adopting energy efficiency and conservation initiatives, such as enhancing the energy efficiency performance of building services

(d) the slight increase in electricity intake from RE, reduced electricity demand in 2024 and 2025 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 28% for $SO_2$, 34% for $NO_x$ and 3% for RSP as compared to the levels in the Seventh TM.

14. As for CLP, the assessment is summarised as follows –

(a) CLP is building a new gas-fired unit of 550 MW (Unit D2) at its Black Point Power Station. After the commencement of operation of the Unit D2 in 2023, CLP's gas generation ratio (on sent-out basis) will increase from around 48% in 2022 to about 53% in 2024, allowing further reduction in the emission allowances;

(b) the retirement of two coal-fired units at Castle Peak Power Station (i.e. Units A1 and A2) by 2023 and the reduced generation from the remaining coal-fired units will also contribute to the reduction in emission allowances;

(c) at its Black Point Power Station, three of the eight gas-fired units have been upgraded, thereby increasing their generation capacity by 8 %, i.e. 75 MW or 25 MW each, and reducing its $NO_x$ emissions by around 30%. CLP will upgrade the remaining five gas-fired units by 2023, which will further reduce its $NO_x$ emissions;

(d) DBNPS would continue to supply 80% of its annual nuclear power output to CLP beyond 2023[7];

(e) the electricity demand for CLP is forecasted to drop by around 4% during 2024 and 2025 as compared to that of 2022 when setting the Seventh TM. The anticipated reduction in electricity demand is due to

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installations and encouraging households to save energy.

[7] In 2014, CLP reached an agreement with Daya Bay Nuclear Power Station to increase the proportion of electricity supply to Hong Kong from 70% to 80% of the plant's output over the next five years. The agreement was extended for another five-year period from 2019 to 2023 in December 2018.

the energy efficiency measures outlined in the Energy Saving Plan and the new incentives to promote EE&C under the new SCA;

(f) the electricity intake from RE sources will increase after the operation of the Integrated Waste Management Facility and other waste to energy facilities; and

(g) in view of the development set out in paragraph 14(a) to (f) above, it is estimated that CLP's emission allowances could be reduced by 49% for $SO_2$, 27% for $NO_x$ and 26% for RSP in the period of 2024 to 2025 as compared to the levels in the Seventh TM.

15. The projected emissions for the power plants of the two power companies in 2024 and beyond are presented in Table 1 below, together with the reductions relative to the respective Seventh TM levels –

Table 1: Projected Emissions in 2024 and beyond (tonnes per year)

| | | **Sulphur dioxide** | **Nitrogen oxides** [@] | **Respirable suspended particulates** |
|---|---|---|---|---|
| HEC | Lamma Power Station and Lamma Power Station Extension (mixed fuel) | 1 590 [-28%] | 3 230 [-34%] | 116 [-3%] |
| CLP | Black Point Power Station (gas-fired) | 255 [-20%] | 2 291 [-32%] | 125 [2%] |
| | Castle Peak Power Station (coal-fired) | 1 303 [-53%] | 6 907 [-25%] | 149 [-39%] |
| | Penny's Bay Gas Turbine Power Station (oil-fired) | 2 [0%] | 2 [0%] | 1 [0%] |
| | Total of CLP's Stations | 1 560 [-49%] | 9 200 [-27%] | 275 [-26%] |
| Electricity sector | | 3 150 [-40%] | 12 430 [-29%] | 391 [-20%] |

[@] Expressed as nitrogen dioxide

Note: The figures in square brackets are the reduction in percentage when compared with the emission allowances stipulated in the Seventh TM.

***Renewable Energy***

16. The Government is committed to promoting the local development of RE as well as spearheading further development of RE. Details of the measures and efforts by the Government are at **Annex C**.

17. Nevertheless, the generation of RE could be affected by exogenous factors such as changes in weather patterns as well as the heat contents of the refuse, sludge, organic waste and landfill gas. In ascertaining the emission allowances for HEC and CLP, we will follow the established mechanism by introducing a correction term to add/deduct any underestimated/overestimated emission allowances according to the actual intake of the electricity generated from RE and the unit emission factors of coal-fired and gas-fired units. The allocation method and the allocated emission allowances for the power plants in the Eighth TM, taking into account the projected electricity intake from RE sources, are at **Annexes D** and **E**, respectively.

***Emission Allowances for New Electricity Works***

18. In the event that there will be new electricity works[8], 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 Seventh TM to cater for the possible intake of RE by new electricity works. Accordingly, we propose to use the formulae at **Annex F** 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.

***Commencement Date of New Emission Caps***

[8] "New electricity works" refers to new entrant (i.e., in addition to HEC and CLP) coming into the electricity generation industry after the commencement of the proposed TM. The use of coal in new electricity generation plants has been banned since 1997. New generating units shall be gas-fired units.

19. A copy of the proposed Eighth TM is at **Annex G**. If it commences before the end of 2019, the new emission allowances will take effect starting from 1 January 2024, pursuant to section 26G(4) of the APCO.

***Special Events***

20. Under Section 26K of the APCO, the Director of Environmental Protection may adjust the emission caps when the power companies invoke the special event provision to account for any uncontrollable factors that affect the additional nuclear power supply or the commissioning schedule of the new gas-fired units which are the prime considerations in setting the emission allowances in the Eighth TM. We have to stress that we will not adjust the emission caps under the special event mechanism automatically unless the incidents are proven to be outside the control of the power companies and they have demonstrated that they have made their best endeavour to avoid such happenings.

## NEXT REVIEW

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

## ENVIRONMENTAL AND HEALTH IMPLICATIONS

22. As compared with the emission allowances for 2022 set under the Seventh TM, the proposed Eighth TM will see a further tightening of about 40% for $SO_2$, 29% for $NO_x$ as well as 20% for RSP for the entire electricity sector. The reduction will help improve air quality, given that emissions from the electricity sector account for 43%, 27% and 16% respectively of the territory-wide emissions of these pollutants in 2017.

23. The progressive tightening of the emission allowances of power plants is one of the major measures considered in the air quality assessment for 2025 under the review of the AQOs. Together with the implementation of other on-going, committed and new air quality improvement measures, there will be

continuous improvement in the air quality in 2025 which provides possible scope to further tighten the AQOs of $SO_2$ and fine suspended particulate ($PM_{2.5}$). If the air quality improvement measures mentioned above could be fully implemented, it is estimated that about 1,850 premature deaths, 1,530 cases of hospital admission and 262,580 cases of clinic visits might be saved as a result of the air quality improvement in 2025, as compared with 2015.

## TARIFF IMPLICATIONS

24. The construction of one new gas-fired unit each by the two power companies will allow them to achieve the proposed emission allowances for 2024 and onwards. The total estimated expenditures of HEC's and CLP's new gas-fired unit are about $5 billion and $6 billion respectively. As for their tariff implication, it is premature at this stage to make any meaningful assessment for 2024 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 future fuel costs, pace of capital investments, operating costs, sales volume, as well as future movements in the Tariff Stabilisation Fund and the Fuel Clause Recovery Account.

25. The power companies will present their tariff assessment to the Administration annually in accordance with the relevant regulatory mechanism under the SCA.

## CONSULTATION

26. We have consulted the two power companies about the proposal to further tighten the emission caps. While they have agreed with the proposed emission caps as set out in the Eighth TM and 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, challenging. Nevertheless, they are supportive of (a) the new EE&C initiatives proposed by the Government in the "Energy Saving Plan for Hong Kong's Built Environment 2015~2025+" and the new SCAs; and (b) the Climate Action Plan 2030+ on increasing the use of natural gas in electricity generation to help achieve the carbon intensity reduction target for 2030. 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 TM to be conducted not later than 2021.

27. Both power companies also see the compliance of the emission allowances contingent upon availability of fuels of right quality. They have 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. Both HEC and CLP have also raised their concern about the difficulty in sourcing low-emission coal with low sulphur and ash contents as the supply sources are limited while the global demand for low-emission coal is escalating. 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 power made available to CLP for 2024, unexpected delay in the upgrading works on the five existing gas-fired units and/or commissioning of the new gas-fired units (i.e. Unit L12 for HEC and Unit D2 for CLP), and/or other related issues outside the control of the two power companies), 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 under the existing mechanism stipulated in Section 26K of the APCO.

28. We consulted the Advisory Council on the Environment on the proposed Eighth TM on 10 June 2019. The Council supported the proposal.

## WAY FORWARD

29. Subject to Members' view, we plan to submit the Eighth TM to the Legislative Council under Section 37B(1) of the APCO for negative vetting in October 2019. Our target is to commence this new TM before the end of 2019, thus fulfilling the statutory requirement to provide the power companies with at least four years' lead time for the tightened emission allowances to take effect from 1 January 2024.

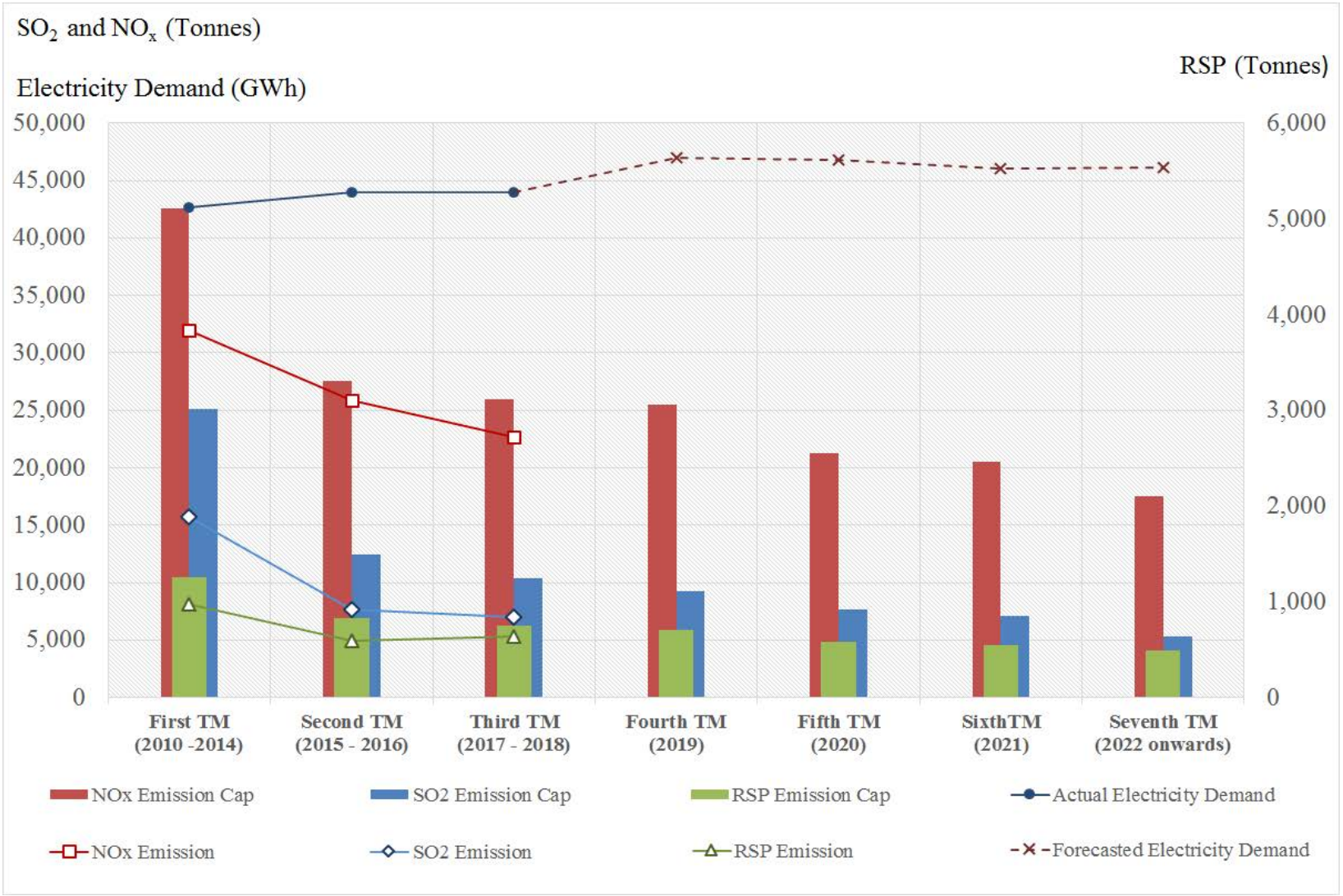
## ADVICE SOUGHT

30. Members are invited to advise on the proposal to promulgate a new Eighth TM for revising the emission allowances for power plants from 1 January 2024 onwards as set out in paragraph 15 above and the **Annex G**.

***Environmental Protection Department***
***July 2019***

**Annex A**

## Emission Caps, Actual Emissions and Electricity Demand since 2010



**Annex B**

## Emission Allowances for Existing Electricity Works under the Seventh TM (tonnes per year)

(a) Lamma Power Station and Lamma Power Station Extension

| | **2022 and thereafter** |
|---|---|
| Sulphur dioxide | 2 210 + (2 – A) × 0.459 |
| Nitrogen oxides [@] | 4 910 + (2 – A) × 0.922 |
| Respirable suspended particulates | 120 + (2 – A) × 0.018 |

(b) Black Point Power Station

| | **2022 and thereafter** |
|---|---|
| Sulphur dioxide | 319 |
| Nitrogen oxides [@] | 3 381 |
| Respirable suspended particulates | 123 |

(c) Castle Peak Power Station

| | **2022 and thereafter** |
|---|---|
| Sulphur dioxide | 2 759 + (100 – B) × 0.343 |
| Nitrogen oxides [@] | 9 237 + (100 – B) × 1.148 |
| Respirable suspended particulates | 246 + (100 – B) × 0.030 |

(d) Penny's Bay Gas Turbine Power Station

| | **2022 and thereafter** |
|---|---|
| Sulphur dioxide | 2 |
| Nitrogen oxides [@] | 2 |
| Respirable suspended particulates | 1 |

[@] 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.

**Annex C**

## The Government's Measures and Efforts in Promoting RE

Local electricity generation is one the major emission sources of carbon and air pollutants. To improve air quality and reduce carbon emission, the Government is making great effort to improve the fuel mix for local electricity generation in the past few years. Currently, coal is still the main fuel type for electricity generation. It accounts for around half of the overall fuel mix, followed by natural gas and non-fossil fuel (including imported nuclear electricity), each accounts for around one-quarter of the overall fuel mix. Having regard to the views and comments received during the public consultation of future fuel mix in 2014, the power companies will mainly be using more natural gas to replace coal in electricity generation in the next 10 years so as to meet the 2030 carbon intensity reduction target. However, burning natural gas for electricity generation will still generate carbon emission. In order to comply with the carbon reduction target for "below 2 degrees Celsius" and to further improve the air quality, we need to further increase the use of zero carbon energy.

2. The Government is committed to promoting the local development of RE and taking lead in enhancing RE by earmarking $2 billion to implement several projects at government premises. The Government is also making great efforts to developing waste-to-energy (WTE) plants and will install solar generation systems of a larger scale at suitable reservoir and landfill locations. On the promotion of WTE, the Government has pushed forward a number of state-of-the-art WTE projects, such as T·PARK, Integrated Waste Management Facility, Organic Resources Recovery Centres and WENT Landfill Gas Generation. Beyond the Government, the power companies and the Government have introduced Feed-in Tariff (FiT) to encourage the private sector and the community to invest in distributed RE as the power generated could be sold to the power companies at a rate higher than the normal electricity tariff rate to help recoup the cost of their investments. We have also implemented different facilitation measures, including suitably relaxing the restrictions on "village house" rooftop installations, launching Solar Harvest to assist eligible schools and welfare non-governmental organisations in installing solar photovoltaic panels, etc. There were only dozens of private RE systems connected to the power grids in the past. But in the past year alone, the two power companies have already received about 3 500 FiT applications. The

above measures will help enable Hong Kong to further improve the fuel mix for local electricity generation.

3. For HEC, a total of about 7 GWh electricity intake from RE per year is estimated to be obtained in 2024 and 2025. For CLP, a total of about 283 GWh and 614 GWh electricity intake from RE per year are estimated to be obtained in 2024 and 2025 respectively. The projected electricity intake from RE sources in 2025 is around 1.3% of the electricity demand. Breakdown of electricity intake from RE sources in 2024 and 2025 are presented in the table below.

Breakdown of electricity intake from RE in 2024 and 2025 (GWh)

| **RE Facilities** | | **2024** | **2025** |
|---|---|---|---|
| **HEC** | Lamma Winds and photovoltaic systems | 2 | 2 |
| | Distributed RE systems | 5 | 5 |
| | **Total of HEC's RE** | **7** | **7** |
| **CLP** | T·PARK | 3 | 3 |
| | Organic Resources Recovery Centre in Siu Ho Wan, (O·PARK1) | 14 | 14 |
| | Organic Resources Recovery Centre in Sha Ling, (O·PARK2) | 24 | 24 |
| | WENT Landfill Gas Generation | 68 | 68 |
| | Integrated Waste Management Facility | 149 | 480 |
| | Distributed RE systems | 25 | 25 |
| | **Total of CLP's RE** | **283** | **614** |
| **Electricity sector** | | **290** | **621** |

**Annex D**

## Allocation Method for Emission Allowances for Existing Electricity Works

The Government proposes to promulgate the Eighth TM to allocate the emission allowances from 2024 onwards to each of the existing power plants by the following allocation method, as adopted in the Seventh TM –

| | |
|---|---|
| Emission allowances to be allocated and ascertained | |
| = | Emission allowances that are required with the use of best practicable means (i.e., those presented in Table 1 in paragraph 15) |
| *plus/minus* | Emission allowances to be added/deducted owing to deviation of the actual intake of RE from the anticipated intake (i.e., about 7 GWh and 614 GWh for HEC and CLP respectively) |

**Annex E**

## Proposed Emission Allowances for Existing Electricity Works under the Eighth TM (tonnes per year)

(a) Lamma Power Station and Lamma Power Station Extension

| | **2024 and thereafter** |
|---|---|
| $SO_2$ | 1 590 + (7 – A) × 0.150* |
| $NO_x$ [@] | 3 230 + (7 – A) × 0.308* |
| RSP | 116 + (7 – A) × 0.011* |

(b) Black Point Power Station

| | **2024 and thereafter** |
|---|---|
| $SO_2$ | 255 + (467[&] – B) × 0.014^ |
| $NO_x$ [@] | 2 291 + (467[&] – B) × 0.122^ |
| RSP | 125 + (467[&] – B) × 0.007^ |

(c) Castle Peak Power Station

| | **2024 and thereafter** |
|---|---|
| $SO_2$ | 1 303 + (147[&] – C) × 0.219[#] |
| $NO_x$ [@] | 6 907 + (147[&] – C) × 1.162[#] |
| RSP | 149 + (147[&] – C) × 0.025[#] |

(d) Penny's Bay Gas Turbine Power Station

| | **2024 and thereafter** |
|---|---|
| $SO_2$ | 2 |
| $NO_x$ [@] | 2 |
| RSP | 1 |

[@] Expressed as nitrogen dioxide

* Composite unit emission factors of coal-fired and gas-fired units in Lamma Power Station based on the projected electricity generation ratio (around 70% gas and 30% coal) in 2024/2025

^ Unit emission factors of gas-fired units in Black Point Power Station in 2024/2015

\# Unit emission factors of coal-fired units in Castle Peak Power Station in 2024/2025

& Electricity intake from the RE systems will offset both gas and coal generation broadly according to the generation ratio. It is projected that in the period 2024 to 2025, the electricity generation ratio of CLP's gas-fired and coal-fired units is around 76% to 24%. It is projected that gas generation at Black Point Power Station and coal generation at Castle Peak Power Station to be offset by the RE electricity intake are 467 GWh (i.e. 76% of the total anticipated RE electricity intake of 614 GWh) and 147 GWh (i.e. 24% of the total anticipated RE electricity intake) respectively.

where –

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

B is the aggregate of total net sent-out electricity output (in GWh) from the RE Systems to the electricity grid connected to Black Point Power Station in the emission year; and

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

**Annex F**

## New Electricity Works

| | Quantity of Emission Allowance for 2024 and thereafter |
|---|---|
| $SO_2$ | 36 × (D/300) × (E/12) – F × 0.018^ |
| $NO_x$ [@] | 55 × (D/300) × (E/12) – F × 0.028^ |
| RSP | 14 × (D/300) × (E/12) – F × 0.007^ |

[@] Expressed as nitrogen dioxide

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

where –

D is the total installed capacity (in MW) of the New Electricity Works; or 300 (i.e., reference installed capacity), whichever is smaller;

E 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

F is the aggregate of total net sent-out electricity output (in GWh) from the Renewable Energy Systems to the electricity grid connected to the New Electricity Works in the emission year.

**Annex G**

# EIGHTH 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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# EIGHTH TECHNICAL MEMORANDUM FOR ALLOCATION OF EMISSION ALLOWANCES IN RESPECT OF SPECIFIED LICENCES

## 1. PRELIMINARY

### 1.1 *Citation and Commencement*

This Technical Memorandum is the eighth technical memorandum issued pursuant to Section 26G of the Ordinance and may be cited as the "Eighth 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 2024. The allocation of emission allowances set out or determined under the Seventh Technical Memorandum for each and every emission year from 1 January 2024 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.

"Seventh Technical Memorandum"（第七份技術備忘錄） means the "Seventh Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences" published in the Gazette under Section 37B(1) of the Ordinance on 13 October 2017 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 2024 shall be determined by the formulae in the respective tables as follows –

(a) Lamma Power Station and Lamma Power Station Extension

| | 2024 and thereafter |
|---|---|
| Sulphur dioxide | 1 590 + (7 – A) × 0.150 |
| Nitrogen oxides [(i)] | 3 230 + (7 – A) × 0.308 |
| Respirable suspended particulates | 116 + (7 – A) × 0.011 |

(b) Black Point Power Station

| | 2024 and thereafter |
|---|---|
| Sulphur dioxide | 255 + (467 – B) × 0.014 |
| Nitrogen oxides [(i)] | 2 291 + (467 – B) × 0.122 |
| Respirable suspended particulates | 125 + (467 – B) × 0.007 |

(c) Castle Peak Power Station

| | 2024 and thereafter |
|---|---|
| Sulphur dioxide | 1 303 + (147 – C) × 0.219 |
| Nitrogen oxides [(i)] | 6 907 + (147 – C) × 1.162 |
| Respirable suspended particulates | 149 + (147 – C) × 0.025 |

(d) Penny's Bay Gas Turbine Power Station

| | 2024 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 connected to Lamma Power Station and Lamma Power Station Extension in the emission year;

B is the aggregate of total net sent-out electricity output (in GWh) from the Renewable Energy Systems to the electricity grid connected to Black Point Power Station in the emission year; and

C is the aggregate of total net sent-out electricity output (in GWh) from the Renewable Energy Systems to the electricity grid connected to 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 2024 shall be determined by the formulae as follows –

| | 2024 and thereafter |
|---|---|
| Sulphur dioxide | $36 \times (D/300) \times (E/12) – F \times 0.018$ |
| Nitrogen oxides(ii) | $55 \times (D/300) \times (E/12) – F \times 0.028$ |
| Respirable suspended particulates | $14 \times (D/300) \times (E/12) – F \times 0.007$ |

(ii) Expressed as nitrogen dioxide

where –

D is the total installed capacity (in MW) of the New Electricity Works; or 300, whichever is smaller;

E 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

F 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 2024.

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.