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For discussion on 12 April 2021

Review of the Eighth 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 2026 by way of issuing a new Technical Memorandum (TM) (i.e. the Ninth TM) under Section 26G of the Air Pollution Control Ordinance (Cap. 311) (APCO).

BACKGROUND

2. During the last 10 years (from 2011 to 2020), 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 62%, 38%, 44% and 55% respectively. In the same period, the concentrations of SO_2, NO_2, RSP and FSP recorded at roadside decreased by 58%, 43%, 48% and 50% 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 2018, emissions of SO_2, nitrogen oxides (NO_x) and RSP from power plants account for 47%, 28% 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

[1] In the APCO, BPM, where used with respect to the emission from a premises of an air pollutant, has made 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.

reasonably practicable measures in the design and operational management, to minimise 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 the power generation units.

4. We amended the APCO in 2008 to empower the Government to set 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. So far, eight TMs were issued. The First TM set the emission allowances for the emission years between 2010 and 2014[2]. The emission allowances for the Second to Sixth TMs took effect from 1 January 2015, 1 January 2017, 1 January 2019, 1 January 2020 and 1 January 2021 respectively while those for the Seventh and Eight TMs will take effect from 1 January 2022 and 1 January 2024 respectively. Despite a 6% increase in the projected electricity demand from 2010 to 2024, the emission allowances of SO_2, NO_x and RSP set in the Eighth TM were about 69% to 87% less, as compared with the First TM. The emission allowances of power plants in the past eight TMs, actual emissions from power plants and electricity demand are at **Annex A**.

6. We consulted this Council and the Panel on Environmental Affairs of the Legislative Council (LegCo) on the proposed emission allowances for the Eighth TM on 10 June 2019 and 28 October 2019 respectively. The Eighth TM was subsequently approved by the LegCo on 28 November 2019. The emission allowances under the Eighth TM were determined with due regard to the electricity demand forecasts for 2024 and 2025 by CLP and HEC, the progress of increasing local gas generation to around 57% of the total fuel mix for electricity generation by 2024, the new technology to upgrade CLP's existing old gas-fired units to improve their NO_x emission performance and thermal efficiency, the projected electricity intake from renewable energy (RE) sources and CLP's continued efforts to import 80% of nuclear power output from the Daya Bay Nuclear Power Station (DBNPS) beyond 2023. The emission allowances under the Eighth TM are at the **Annex B**.

[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.

7. When setting the emission allowances under the Eighth TM in 2019, we undertook to conduct a review of the TM in two years (i.e. 2021) to take account of all factors that could affect the emissions of the generation fleets of the two power companies in future years. If we are able to issue a new TM for commencement within 2021, the new emission allowances can take effect from 1 January 2026.

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 be 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 currently operates nine gas-fired units in the Black Point Power Station including the new Unit D1 which was put into operation in mid-2020. A new gas-fired unit D2 will be put into operation in 2023. CLP completed between 2016 and 2020 the efficiency upgrading work for five of their existing old gas-fired units with enhancement in generation capacity and improvement in emission performance. Similar efficiency upgrading work of the remaining three existing old gas-fired units will be completed by CLP before 2024 for enhancing the performance including emissions reduction. For HEC, there are currently one new (i.e. Unit L10) and two old gas-fired units[3] in the Lamma Power Station and its Extension, and two new gas-fired units (i.e. Units L11 & L12) will be put into operation between 2022 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 RE to help reduce emissions from coal-fired units and make the city's buildings and infrastructure more energy efficient.

[3] Unlike the old combustion systems in CLP's Black Point Power Station, which have no spare parts supply and technical support from the manufacturer and so need for efficiency upgrading, there is no such problem for HEC's two old gas-fired units. Hence, upgrading of combustion systems is not necessary for HEC.

11. The Government entered into the post-2018 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 the two new gas-fired units (i.e. Units D2 of CLP and L12 of HEC) with better fuel efficiency and emission performance to replace the existing coal-fired units which are scheduled for retirement, and the enhancement of the Clean Energy Transmission System (CETS)[5] by CLP. The Government approved the five-year Development Plans in July 2018. The proportion of gas generation will be further increased from around 50% of the total fuel mix for electricity generation in 2020 ("Fuel Mix Target") to about 57% in 2024. The Government has given approval to 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 electricity supply in Hong Kong.

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

(a) the progress of the construction of new gas-fired units for 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 old gas-fired units for improving their NO_x emission performance as well as thermal efficiency;

(c) the practicability of maintaining the current import of 80% of nuclear power output from DBNPS to CLP after 2023 and the resumption of nuclear power output to the normal level after the completion of a periodic safety review[6];

(d) the power companies' efforts to acquire adequate quantity of low-emission coal for electricity generation in 2026 and 2027;

(e) the projected local electricity consumption in the period from 2026 to 2027; and

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[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.

[5] The CETS connects CLP's electricity grid to the power network of the China Southern Power Grid and the DBNPS, and has been used to import nuclear power from the DBNPS since 1994. The CETS enhancement project, which is expected to be completed by 2025, will strengthen the overall reliability and transmission capacity of the system and hence can provide Hong Kong with greater flexibility to use more clean energy.

[6] The DBNPS is required by the National Nuclear Safety Administration of China to conduct periodic safety review on its electricity generation system. The next comprehensive safety inspection is scheduled to commence in 2023 and complete by 2024. As DBNPS's electricity generation units will need to be shut down during the safety review period, its overall generation output in 2023 and 2024 is expected to be lower than normal.

(f) the projected electricity intake from RE sources.

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

(a) the electricity demand for the Hong Kong Island is forecasted to drop by around 1.4% during 2026 and 2027 as compared to that of 2024 when setting the Eighth TM. The anticipated reduction in electricity demand is partly due to the energy efficiency measures outlined in the Energy Saving Plan[7]; and partly due to new incentives to promote energy efficiency and conservation (EE&C)[8] under the post-2018 SCA;

(b) the construction of the two new gas-fired units, Units L11 and L12[9], each with an installed capacity of 380 megawatt (MW), at the Lamma Power Station Extension is progressing as planned and is expected to complete by 2022 and 2023, respectively. With the inclusion of these two new gas-fired units in HEC's generation fleet, the gas generation ratio (on sent-out basis) will increase from around 50% in 2020 to about 70% in 2026;

(c) the decrease in electricity generation from the coal-fired units in 2026 and 2027 will enable their operations at the optimum loading range with a better performance in NO_x emission;

(d) the scheduled retirement of an old coal-fired unit (i.e. Unit L6) in the first half of 2027 is subject to the decision and government's approval for the construction of a new gas-fired unit (i.e. Unit L13);

(e) HEC will continue its effort to acquire adequate quantity of low-emission coal for electricity generation in 2026 and 2027 as far as possible and maintain the performance of the emission control devices of its coal-fired units;

(f) the anticipated increase in electricity intake from RE in 2026 and 2027 will be similar to that in the Eighth TM (See **Annex C**); and

(g) based on the above considerations, it is estimated that HEC's emission allowances could be reduced by 2% for SO_2, 10% for NO_x and 3% for RSP in 2026 and beyond, as compared to the levels in the Eighth TM.

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[7] 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.

[8] 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 installations and encouraging households to save energy.

[9] Emission reductions resulting from the commissioning of Units L11 and L12 have been considered in the Seventh TM in 2017 and Eighth TM in 2019, respectively.

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

(a) the electricity demand for CLP is forecasted to slightly increase by around 0.7% during 2026 and 2027 as compared to that of 2024 when setting the Eighth TM;

(b) the construction of the new gas-fired unit, Unit D2[10], with an installed capacity of around 600 MW at the Black Point Power Station is expected to complete by 2023. After the commencement of operation of Unit D2, CLP's gas generation ratio (on sent-out basis) will increase from around 48% in 2020 to about 50% in 2026;

(c) the DBNPS would continue to supply 80% of its annual nuclear power output to CLP beyond 2023[11]. In addition, due to the completion of the scheduled periodic safety review in 2024, the projected annual nuclear power imports from the DBNPS to CLP will gradually resume normal and will be around 16% higher than that when setting the Eighth TM, thus allowing further reduction in the emission allowances due to the reduction in local electricity generation;

(d) the decrease in electricity generation from the coal-fired units in 2026 and 2027 will enable their operations at the optimum loading range with a better performance in NO_x emission;

(e) the scheduled retirement of the two remaining coal-fired units at the Castle Peak A (CPA) Station (i.e. Units A3 and A4) in 2024 and 2025 respectively is subject to uncertainty[12]. Nevertheless, the utilisation of these two units will be kept to the absolute minimum as they are mainly for meeting peak electricity demand in the summer period and serving as backup units during the outage of the coal-fired units at the Castle Peak B (CPB) Station;

(f) CLP will continue its effort to acquire adequate quantity of low-emission coal for electricity generation in 2026 and 2027 as far as possible; optimise the number of start-up and shut-down operations of their coal-fired units during summer period; and maintain the performance of the emission control devices to reduce emissions from their coal-fired units;

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[10] Emission reduction resulting from the commissioning of Unit D2 has been considered in the Eighth TM.

[11] In 2014, CLP reached an agreement with DBNPS 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. Upon consultation with CLP, it is assumed that such arrangement will continue beyond 2023.

[12] According to CLP, the retirement plan of the remaining two coal-fired units at CPA station is subject to various factors including the commissioning schedule of, and availability of additional power import through, the enhanced CETS. As the enhancement of the CETS is still at an early stage, the present review does not take into account the implication of the CETS to local electricity generation from CLP power plants in 2026 and beyond.

(g) five of the eight existing old gas-fired units at the Black Point Power Station have been upgraded, thereby increasing their generation capacity by 8%, i.e. 125 MW or 25 MW each, and reducing its NO_x emissions by around 30%. CLP will upgrade the remaining three existing old gas-fired units before 2024, which will further reduce its NO_x emissions;

(h) there will be projected increase in electricity intake from RE sources mainly owing to the higher participation under the Feed-in Tariff (FiT) Scheme (See **Annex C**); and

(i) in view of the above-mentioned development, it is estimated that CLP's emission allowances could be reduced by 17% for SO_2, 10% for NO_x and 8% for RSP in 2026 and beyond, as compared to the levels in the Eighth TM.

15. The projected emission allowances for power plants of the two power companies in 2026 and beyond are presented in Table 1 below, together with the reductions relative to the respective Eighth TM levels –

Table 1: Projected Emission Allowances in 2026 and beyond (tonnes per year)

		Sulphur dioxide	**Nitrogen oxides** [@]	**Respirable suspended particulates**
HEC	Lamma Power Station and Lamma Power Station Extension (mixed fuel)	1 564 [-2%]	2 906 [-10%]	113 [-3%]
CLP	Black Point Power Station (gas-fired)	133 [-48%]	2 050 [-11%]	115 [-8%]
	Castle Peak Power Station (coal-fired)	1 153 [-12%]	6 186 [-10%]	138 [-7%]
	Penny's Bay Gas Turbine Power Station (oil-fired)	2 [0%]	2 [0%]	1 [0%]
	Total of CLP's Stations	1 288 [-17%]	8 238 [-10%]	254 [-8%]
Electricity sector		2 852 [-9%]	11 144 [-10%]	367 [-6%]

[@] Expressed as nitrogen dioxide

Note: The figures in square brackets are the reduction in percentage when compared with the emission allowances stipulated in the Eighth 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 Ninth TM, taking into account the projected electricity intake from RE sources[13], are at **Annexes D** and **E**, respectively.

Emission Allowances for New Electricity Works

18. In the event that there will be new electricity works[14], 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 Eighth 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, i.e. 300 MW, for emission years upon the commencement of the proposed Ninth TM.

Commencement Date of New Emission Caps

19. If the proposed Ninth TM commences before the end of 2021, the new emission allowances will take effect starting from 1 January 2026, 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

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[13] While the present review has not taken into account the possible additional supply of clean energy through the enhanced CETS, we consider that the established mechanism for accounting the deviation of the actual intake of RE from various RE sources, as set out in the formulae in Annex E, can also be used to ascertain the emission allowances in the case that the enhanced CETS could be materialised in 2025 or beyond.

[14] "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.

power supply or the commissioning schedule of the new gas-fired units which are the prime considerations in setting the emission allowances in the Ninth 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 IMPLICATIONS

22. As compared with the emission allowances for 2024 and 2025 set under the Eighth TM, the proposed Ninth TM will see a further tightening of about 9% for SO_2, 10% for NO_x as well as 6% for RSP for the entire electricity sector. The reduction will help improve air quality, given that emissions from the electricity sector account for 47%, 28% and 16% respectively of the territory-wide emissions of these pollutants in 2018.

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, which was completed in end of 2018. The Government introduced the Air Pollution Control (Amendment) Bill 2021 into the LegCo in March 2021 for tightening the AQOs of SO_2 (24-hour) and fine suspended particulate ($PM_{2.5}$) (both annual and 24-hour) as prescribed in Schedule 5 to the APCO. The on-going tightening of the emission caps of power plants will also be considered in the next review of the AQO which is underway and scheduled for completion in 2023.

TARIFF IMPLICATIONS

24. Achieving the proposed emission caps under the Ninth TM does not involve additional new capital investment by power companies nor major changes in the fuel mix for local electricity generation. As for their tariff implication, it is premature at this stage to make any meaningful assessment for 2026 and beyond. This is because the level of electricity tariff would depend on a host of factors, including the future fuel costs, operating costs, sales volume, as well as future movements in the Tariff Stabilisation Fund and the Fuel Clause Recovery Account. The power companies will present their tariff assessment to the Administration annually in accordance with the relevant regulatory mechanism under the SCA.

CONSULTATION

25. We have consulted the two power companies about the proposal to further tighten the emission caps. Both power companies have agreed with the proposed emission caps as set out in the Ninth TM, which have been tightened further despite there is no major change to the fuel mix for local generation. They are supportive of (a) the EE&C initiatives proposed by the Government in the "Energy Saving Plan for Hong Kong's Built Environment 2015~2025+" and the post-2018 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 2023.

26. 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 adequate low-emission coal with low sulphur and ash contents while the global demand for low-emission coal is escalating. Nevertheless, the power companies will endeavor to source and use low-emission coal in their coal-fired units. 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 2026 and beyond, unexpected delay in the upgrading works on the three existing gas-fired units at BPPS and/or commissioning of the new gas-fired units (i.e. Units L11 and L12 for HEC and Unit D2 for CLP), interruption in the supply of natural gas due to inclement weather 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.

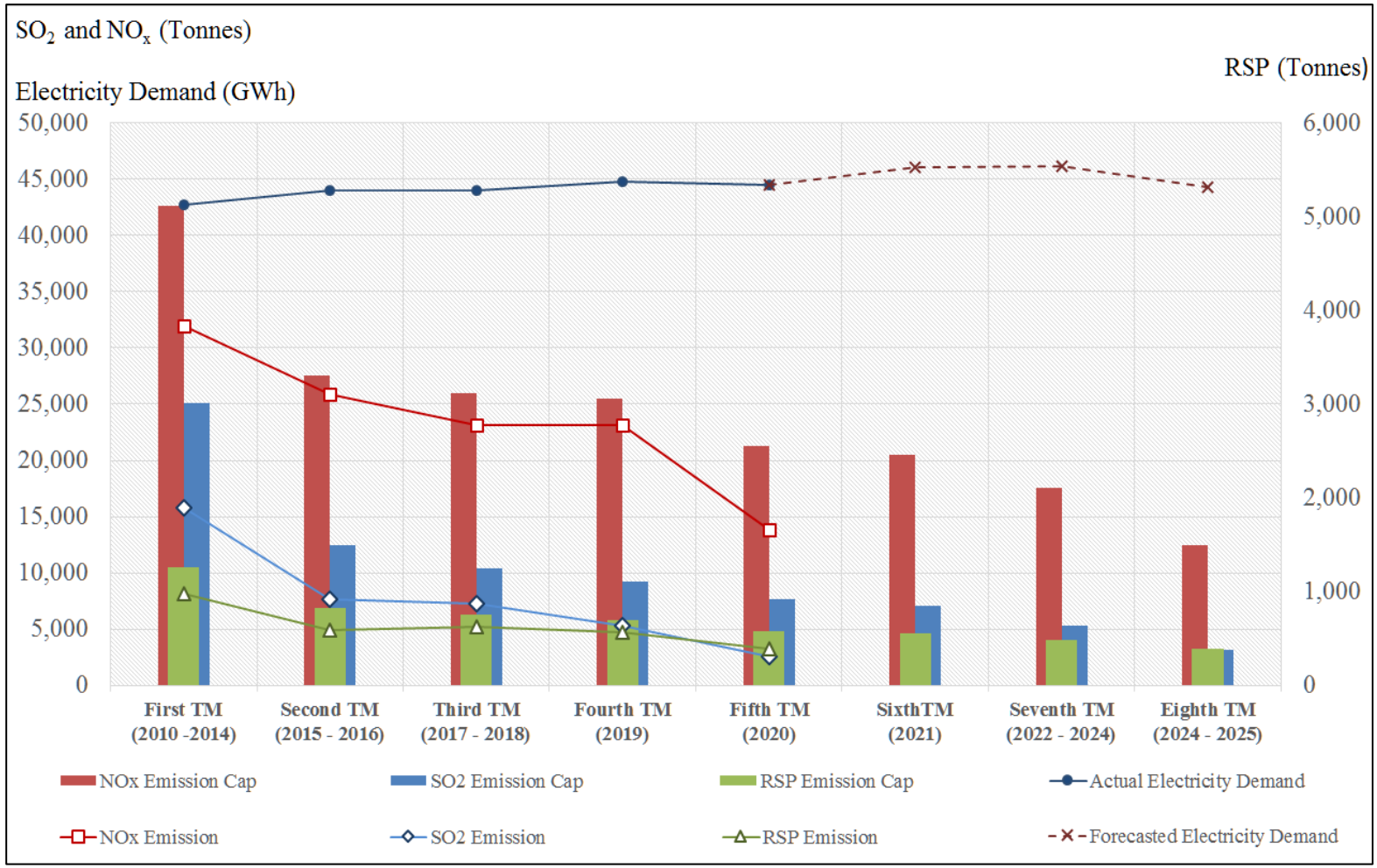
WAY FORWARD

27. Subject to Members' view, we will consult the Panel on Environmental Affairs of the LegCo in April 2021. Our target is to seek LegCo's approval of the Ninth TM before the end of 2021, 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 2026.

Environmental Protection Department
April 2021

Annex A

Emission Caps, Actual Emissions and Electricity Demand since 2010



Annex B

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 2024/2025

\# 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 from CLP's gas-fired and coal-fired units are around 76% and 24% respectively. 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 gigawatt hour (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 C

The Government's Measures and Efforts in Promoting RE

Local electricity generation is one of the major emission sources of carbon and air pollutants. To improve air quality and reduce carbon emissions, the Government has seen to it that the two power companies use cleaner fuel for electricity generation. Coal only accounts for about one quarter of the fuel mix for electricity generation in 2020, substantially lower than its share in 2015 which was about 50%. The two power companies will continue to replace coal-fired generating units with gas-fired ones. Nevertheless, if we are to strive to achieve carbon neutrality before 2050, we must substantially increase the proportion of zero-carbon energy, including RE in the overall fuel mix for electricity generation.

2. The Government is committed to promoting the local development of RE and taking the lead in enhancing RE at government premises. Since 2017-18, the Government has earmarked a total of $2 billion to install small-scale RE systems at government premises. More than $1.5 billion has been approved so far for more than 130 projects. The 2021-22 Budget has proposed to earmark an additional $1 billion for this purpose. The Government is also actively developing larger-scale solar energy generation systems at suitable reservoirs and landfills. Besides, the Government is making great efforts to developing waste-to-energy (WTE) plants and has pushed forward a number of WTE projects, such as T·PARK, Integrated Waste Management Facility, Organic Resources Recovery Centres and West New Territories (WENT) Landfill Gas Generation Project.

3. 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 installation of solar energy generation systems on the rooftops of New Territories Exempted Houses (i.e. "village houses"), launching Solar Harvest to install solar energy generation systems for eligible schools and welfare non-governmental organisations for free, introducing legislative amendments so that individuals who have installed RE systems on their residential premises need not apply for business registration or file profits tax returns for the FiT payments they receive, etc. As at end 2020, the two power companies have received over 13 000 FiT applications,

of which about 11 000 have been approved. It is estimated that the approved systems can generate RE to meet the electricity demand of some 50 000 households.

4. For HEC, a total of about 7 GWh electricity intake from RE per year is estimated to be obtained in 2026 and 2027. For CLP, a total of about 793 GWh and 794 GWh electricity intake from RE per year are estimated to be obtained in 2026 and 2027 respectively. The projected total electricity intake from RE sources in 2026 and 2027 will be around 1.8% of the electricity demand. Breakdown of electricity intake from RE sources in 2026 and 2027 are presented in the table below.

Breakdown of electricity intake from RE in 2026 and 2027 (GWh)

RE Facilities		**Electricity intake from RE considered in the 8th TM**	**2026**	**2027**
HEC	Lamma Winds and photovoltaic systems	2	3	3
	Distributed RE systems	5	4	4
	Total of HEC's RE	**7**	**7**	**7**
CLP	T·PARK	3	7	8
	Organic Resources Recovery Centre in Siu Ho Wan, (O·PARK1)	14	14	14
	Organic Resources Recovery Centre in Sha Ling, (O·PARK2)	24	24	24
	WENT Landfill Gas Generation	68	68	68
	Integrated Waste Management Facility	480	480	480
	Distributed RE systems	25	200	200
	Total of CLP's RE	**614**	**793**	**794**
Electricity sector		**621**	**800**	**801**

Annex D

Allocation Method for Emission Allowances for Existing Electricity Works

The Government proposes to promulgate the Ninth TM to allocate the emission allowances from 2026 onwards to each of the existing power plants by the following allocation method, as adopted in the Eighth 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 RE sources[15] (i.e., about 7 GWh and 794 GWh for HEC and CLP respectively)

[15] Anticipated RE sources include the wind and photovoltaic systems (including the distributed RE systems), waste to energy facilities and the enhancement of the CETS for the supply of clean energy to Hong Kong.

Annex E

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

(a) Lamma Power Station and Lamma Power Station Extension

	2026 and thereafter
SO_2	1 564 + (7 – A) × 0.151*
NO_x [@]	2 906 + (7 – A) × 0.282*
RSP	113 + (7 – A) × 0.011*

(b) Black Point Power Station

	2026 and thereafter
SO_2	133 + (603[&] – B) × 0.008^
NO_x [@]	2 050 + (603[&] – B) × 0.118^
RSP	115 + (603[&] – B) × 0.007^

(c) Castle Peak Power Station

	2026 and thereafter
SO_2	1 153 + (191[&] – C) × 0.203[#]
NO_x [@]	6 186 + (191[&] – C) × 1.087[#]
RSP	138 + (191[&] – C) × 0.024[#]

(d) Penny's Bay Gas Turbine Power Station

	2026 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 2026/2027

^ Unit emission factors of gas-fired units in Black Point Power Station in 2026/2027

\# Unit emission factors of coal-fired units in Castle Peak Power Station in 2026/2027

& Electricity intake by CLP from the RE systems and other clean energy systems regarded as relevant by the Secretary will displace both gas and coal generation broadly according to the fuel mix ratio of CLP. It is projected that in the period 2026 to 2027, (i) the electricity generation from CLP's gas-fired and coal-fired units are around 76% and 24% respectively, and (ii) gas generation at Black Point Power Station and coal generation at Castle Peak Power Station to be offset by the RE electricity intake are 603 GWh (i.e. 76% of the total anticipated RE electricity intake of 794 GWh) and 191 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 and other clean energy systems regarded as relevant by the Secretary 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 and other clean energy systems regarded as relevant by the Secretary 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 and other clean energy systems regarded as relevant by the Secretary to the electricity grid connected to Castle Peak Power Station in the emission year.

Annex F

Proposed Emission Allowances for New Electricity Works under the Ninth TM (tonnes per year)

	2026 and thereafter
SO_2	16 × (D/300) × (E/12) – F × 0.008^
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 RE Systems and other clean energy systems regarded as relevant by the Secretary to the electricity grid connected to the New Electricity Works in the emission year.