

**For discussion on
26 April 2021**

**LEGISLATIVE COUNCIL
PANEL ON ENVIRONMENTAL AFFAIRS**

**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 further 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. Since Hong Kong's return to the motherland, our air quality has improved continuously. In 2020, the ambient concentrations of major air pollutants including sulphur dioxide (SO₂), nitrogen dioxide (NO₂), respirable suspended particulates (RSP) and fine suspended particulates (FSP) have dropped by 80%, 43%, 55% and 67%, respectively, from their past maximum levels. The concentrations of the same pollutants recorded at roadside decreased by 82%, 43%, 66% and 65% respectively. The visibility recorded by the Hong Kong Observatory has also improved by 78%. 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 SO₂, 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 The 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 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. Since 2008, the Secretary for the Environment (the Secretary) has issued TMs under Section 26G of the APCO to allocate emission allowances for each type of specified pollutant in respect of the specified licences of the power plants. Section 2 of the APCO provides that specified pollutant includes SO₂, NO_x and RSP. 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 2014². 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 SO₂, 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 Panel on the proposed emission allowances for the Eighth TM on 28 October 2019. The Eighth TM was subsequently approved by the Legislative Council (LegCo) on 28 November 2019. The emission

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.

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.

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**.

7. When setting the emission allowances under the Eighth TM in 2019, we indicated that a review of the TM would be conducted 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 units³ 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.

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 Plans⁴ 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 taken account of the following factors –

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.

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.

- (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 estimated import of nuclear power output from DBNPS in the future;
- (d) the quantity of low-emission coal to be acquired by the power companies in 2026 and 2027;
- (e) the projected local electricity consumption in the period from 2026 to 2027; and
- (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 Plan⁶; and partly due to new incentives to promote energy efficiency and conservation (EE&C)⁷ under the post-2018 SCA;
- (b) the construction of the two new gas-fired units, Units L11 and L12⁸, 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

⁶ 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.

⁷ 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.

⁸ 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.

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 SO₂, 10% for NO_x and 3% for RSP in 2026 and beyond, as compared to the levels in the Eighth TM.

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 D2⁹, 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) 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, allowing further reduction in the emission allowances due to the reduction in local electricity generation;

⁹ Emission reduction resulting from the commissioning of Unit D2 has been considered in the Eighth TM.

- (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 uncertainty¹⁰. 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; optimize 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;
- (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 SO₂, 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

¹⁰ 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.

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 sources¹¹, are at **Annexes D** and **E**, respectively.

Emission Allowances for New Electricity Works

18. In the event that there will be new electricity works¹², 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

¹¹ While the present review has not taken into account the possible additional supply of clean energy through the enhanced CETS, 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 and that the power plants have imported additional clean energy through it.

¹² “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.

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 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 maintain the practice to review a TM 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 SO₂, 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 SO₂ (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. Nevertheless, the future 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. It is premature at this stage to make any meaningful assessment on the implication of the proposed emission allowances for the tariff in 2026 and beyond. 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.

27. We consulted the Advisory Council on the Environment on the proposed Eighth TM on 12 April 2021. The Council supported the proposal.

WAY FORWARD

28. Subject to Members' view, we plan to submit the Ninth TM to LegCo for negative vetting under Section 37B(1) of the APCO in May 2021. Our target is to commence this new 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.

ADVICE SOUGHT

29. Members are invited to advise on the proposal to promulgate a new Ninth TM for revising the emission allowances for power plants from 1 January 2026 onwards as set out in paragraph 15 above and the **Annex G**.

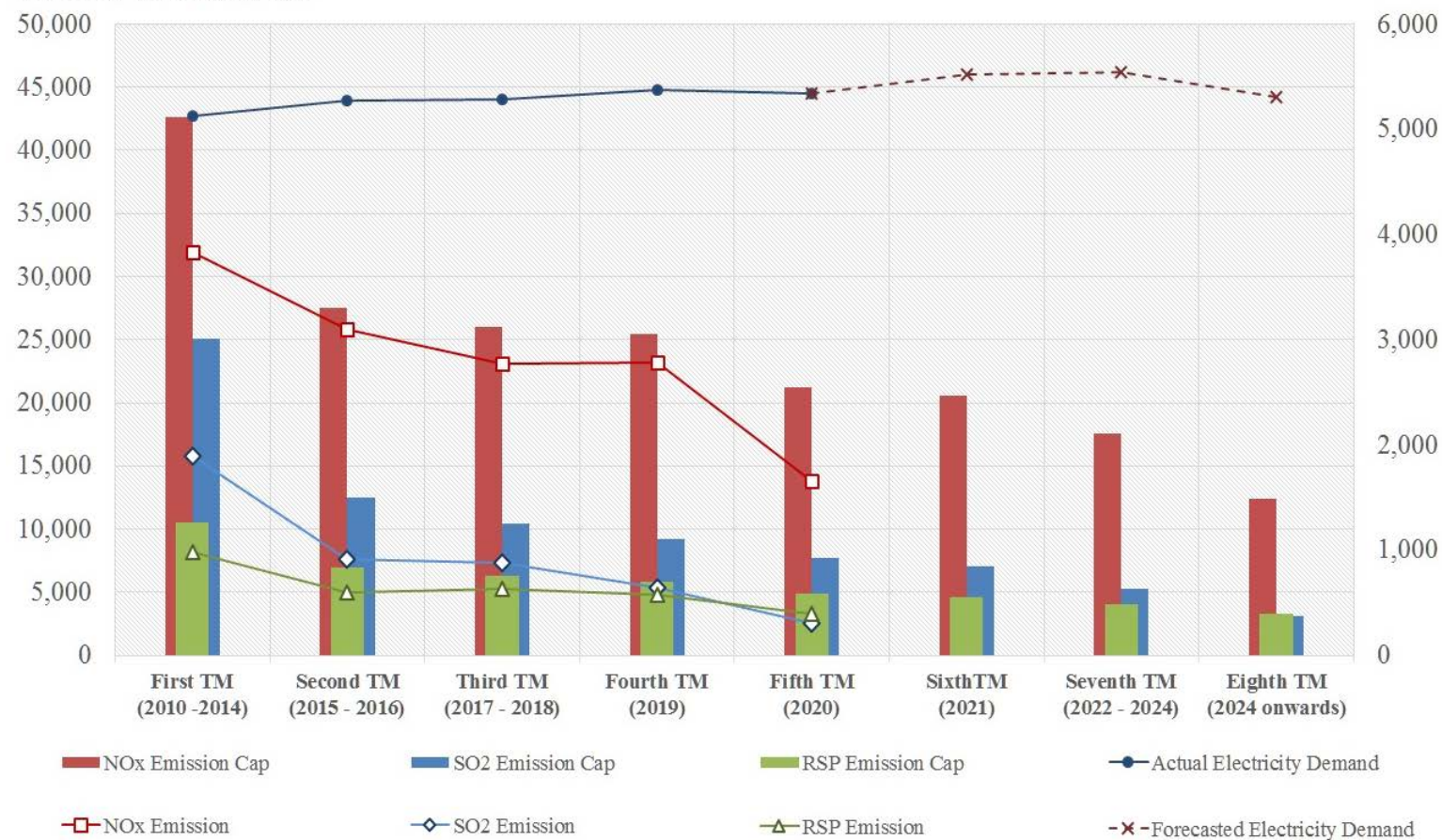
Environmental Protection Department
April 2021

Emission Caps, Actual Emissions and Electricity Demand since 2010

SO₂ and NO_x (Tonnes)

Electricity Demand (GWh)

RSP (Tonnes)



**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	$1\,590 + (7 - A) \times 0.150^*$
NO _x ^[@]	$3\,230 + (7 - A) \times 0.308^*$
RSP	$116 + (7 - A) \times 0.011^*$

(b) Black Point Power Station

	2024 and thereafter
SO ₂	$255 + (467^{\&} - B) \times 0.014^{\wedge}$
NO _x ^[@]	$2\,291 + (467^{\&} - B) \times 0.122^{\wedge}$
RSP	$125 + (467^{\&} - B) \times 0.007^{\wedge}$

(c) Castle Peak Power Station

	2024 and thereafter
SO ₂	$1\,303 + (147^{\&} - C) \times 0.219^{\#}$
NO _x ^[@]	$6\,907 + (147^{\&} - C) \times 1.162^{\#}$
RSP	$149 + (147^{\&} - C) \times 0.025^{\#}$

(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% to 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.

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 8 th 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

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)		Emission allowances to be added/deducted owing to deviation of the actual intake of RE from the anticipated RE sources ¹³ (i.e., about 7 GWh and 794 GWh for HEC and CLP respectively)
	=			
			<i>plus/minus</i>	

¹³ 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	$1\,564 + (7 - A) \times 0.151^*$
NO _x ^[@]	$2\,906 + (7 - A) \times 0.282^*$
RSP	$113 + (7 - A) \times 0.011^*$

(b) Black Point Power Station

	2026 and thereafter
SO ₂	$133 + (603^{\&} - B) \times 0.008^{\wedge}$
NO _x ^[@]	$2\,050 + (603^{\&} - B) \times 0.118^{\wedge}$
RSP	$115 + (603^{\&} - B) \times 0.007^{\wedge}$

(c) Castle Peak Power Station

	2026 and thereafter
SO ₂	$1\,153 + (191^{\&} - C) \times 0.203^{\#}$
NO _x ^[@]	$6\,186 + (191^{\&} - C) \times 1.087^{\#}$
RSP	$138 + (191^{\&} - C) \times 0.024^{\#}$

(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% to 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	$16 \times (D/300) \times (E/12) - F \times 0.008^{\wedge}$
NO _x ^[@]	$55 \times (D/300) \times (E/12) - F \times 0.028^{\wedge}$
RSP	$14 \times (D/300) \times (E/12) - F \times 0.007^{\wedge}$

^[@] 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 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.

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

1. PRELIMINARY

1.1 Citation and Commencement

This Technical Memorandum is the ninth technical memorandum issued pursuant to Section 26G of the Ordinance and may be cited as the "Ninth 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 2026. The allocation of emission allowances set out or determined under the Eighth Technical Memorandum for each and every emission year from 1 January 2026 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.

"Eighth Technical Memorandum" (第八份技術備忘錄) means the "Eighth Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences" published in the Gazette under Section 37B(1) of the Ordinance on 25 October 2019 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 2026 shall be determined by the formulae in the respective tables as follows –

(a) Lamma Power Station and Lamma Power Station Extension

	2026 and thereafter
Sulphur dioxide	$1\,564 + (7 - A) \times 0.151$
Nitrogen oxides ⁽ⁱ⁾	$2\,906 + (7 - A) \times 0.282$
Respirable suspended particulates	$113 + (7 - A) \times 0.011$

(b) Black Point Power Station

	2026 and thereafter
Sulphur dioxide	$133 + (603 - B) \times 0.008$
Nitrogen oxides ⁽ⁱ⁾	$2\,050 + (603 - B) \times 0.118$
Respirable suspended particulates	$115 + (603 - B) \times 0.007$

(c) Castle Peak Power Station

	2026 and thereafter
Sulphur dioxide	$1\,153 + (191 - C) \times 0.203$
Nitrogen oxides ⁽ⁱ⁾	$6\,186 + (191 - C) \times 1.087$
Respirable suspended particulates	$138 + (191 - C) \times 0.024$

(d) Penny's Bay Gas Turbine Power Station

	2026 and thereafter
Sulphur dioxide	2
Nitrogen oxides ⁽ⁱ⁾	2

Respirable suspended particulates	1
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⁽ⁱ⁾ Expressed as nitrogen dioxide

where –

- A is the aggregate of total net sent-out electricity output (in GWh) from the Renewable Energy 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 Renewable Energy 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 Renewable Energy 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.

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 2026 shall be determined by the formulae as follows –

	2026 and thereafter
Sulphur dioxide	$16 \times (D/300) \times (E/12) - F \times 0.008$
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 and other clean energy systems regarded as relevant by the Secretary 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 and other clean energy systems regarded as relevant by the Secretary 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 2026.

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.