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**Report of the Subcommittee on Seventh Technical Memorandum for
Allocation of Emission Allowances in Respect of Specified Licences**

Purpose

This paper reports on the deliberations of the Subcommittee on Seventh Technical Memorandum for Allocation of Emission Allowances in Respect of Specified Licences ("the Subcommittee").

Background

Emission caps for the power sector

2. The Air Pollution Control Ordinance (Cap. 311) ("APCO") empowers the Government to set emission caps for power plants for improving air quality in Hong Kong. Section 26G of APCO provides for the Secretary for the Environment ("SEN") to allocate emission allowances for three specified pollutants, i.e. sulphur dioxide ("SO₂"), nitrogen oxides ("NO_x") and respirable suspended particulates ("RSP"), for power plants by way of a technical memorandum ("TM").¹ Section 26G(2) stipulates that in making emission allocations, SEN shall have regard to the following:

- (a) the best practicable means ("BPM") for preventing the emission of a specified type of pollutant;
- (b) whether the emission of that type of pollutant would be, or is likely to be, prejudicial to health; and

¹ Under section 37B of APCO, a TM is subject to a scrutiny mechanism which is akin to the procedure commonly known as the negative vetting procedure for subsidiary legislation. Pursuant to section 30B(1) of APCO, non-compliance with the emission caps is an offence liable on a first conviction to a fine of \$30,000 in respect of each tonne in excess of the relevant allowed emission; and on a second or subsequent conviction to a fine of \$60,000 in respect of each tonne in excess of the relevant allowed emission plus imprisonment for six months.

- (c) the attainment and maintenance of any relevant air quality objective.

Previous Technical Memoranda for Allocation of Emission Allowances in Respect of Specified Licences

3. Section 26G(4) of APCO stipulates that an allocation of emission allowances made by a TM in relation to an emission year can only take effect at least four years after the commencement of the TM. Six TMs were issued from 2008 to 2016 as follows:

- (a) the first TM, issued in 2008, set the emission allowances for the emission years between 2010 and 2014; and
- (b) the Second to Sixth TMs were issued in 2010, 2012, 2014, 2015 and 2016 to tighten the emission allowances. The emission allowances for the Second and Third TMs took effect from 1 January 2015 and 1 January 2017 respectively while the Fourth, Fifth and Sixth TMs will take effect from 1 January 2019, 1 January 2020 and 1 January 2021 respectively.²

Increasing electricity generation through the use of natural gas

4. The Administration announced during the public consultation on "Future Development of the Electricity Market" in 2015 that it had planned to increase the percentage of local gas generation to around 50% of the total fuel mix for electricity generation in 2020 ("fuel mix target"). It was envisaged that the two power companies would need to build a small number of additional gas-fired generating units ("gas-fired units") in order to increase the use of natural gas and achieve the fuel mix target.

5. In connection with the above, the Hongkong Electric Company, Limited ("HEC") has started the construction of two new gas-fired units (known as "L10" and "L11") at the Lamma Power Station Extension, which are expected to be commissioned in 2020 and 2022 respectively. It is estimated that HEC will be able to achieve a gas generation ratio of 50% in 2020 and 55% in 2022.³

² Compared to the emission caps set out in the first TM for 2010, the emission allowances of SO₂, NO_x and RSP will be reduced by 72%, 52% and 56% respectively in 2021 under the Sixth TM.

³ In 2016, on a total electricity sent-out basis, the fuel mix for HEC is 66% coal and 34% gas.

6. In December 2016, the Executive Council approved the construction of a new gas-fired unit (known as "D1") at the Black Point Power Station by CLP Power Hong Kong Limited and Castle Peak Power Company Limited (collectively referred to as "CLP"). It is expected that D1 will commence operation in 2020 and CLP will be able to achieve a gas generating ratio of about 49% in 2020.⁴

7. According to the Administration, when determining the emission allowances for the two power companies under the Seventh TM, it has taken into account the following factors:

- (a) the progress of increasing local gas generation to meet the fuel mix target for 2020, including the construction of new gas-fired units and replacement of some old power generating units;
- (b) the new technology to upgrade existing gas-fired units for improving their NO_x emission performance as well as thermal efficiency;
- (c) the practicability to maintain the current import of 80% of nuclear output from Daya Bay Nuclear Power Station to CLP after 2018; and
- (d) projected local electricity consumption in the period from 2022 to 2023.

8. As mentioned in the Legislative Council ("LegCo") brief on the Seventh TM, in ascertaining the emission allowances for HEC and CLP, the Administration will also follow the established mechanism in the Sixth TM by taking into account the actual intake of the electricity generated from renewable energy ("RE") facilities and the unit emission factors of coal-fired units.⁵ For RE, facilities covered in the Seventh TM include the Lamma Winds of HEC and its photovoltaic system at Lamma Power Station. The Sludge Treatment Facility (T · PARK) in Tuen Mun, Phase 1 of the new Organic Resources Recovery Centre in Siu Ho Wan, North Lantau, and the landfill gas electricity generation at West New Territories Landfill are taken into account in CLP's emission caps under the Seventh TM.

⁴ In 2016, on a total electricity sent-out basis, the fuel mix for CLP is 41% coal, 26% gas and 32% nuclear. (Note: Percentages may not add up to 100% owing to rounding.)

⁵ Unit emission factors of coal-fired units are the averaged emission of specified pollutants (i.e. SO₂, NO_x and RSP) owing to the generation of 1 GWh electricity from coal-fired units in the power plant, expressed in tonne/GWh.

The Seventh Technical Memorandum for Allocation of Emission Allowances in respect of Specified Licences

9. The Seventh TM was published in the Gazette on 13 October 2017 and tabled before LegCo on 18 October 2017 for negative vetting. The Seventh TM allocates for each emission year from 1 January 2022 the quantities of emission allowances for the three specified pollutants for each of the four existing power plants and possible new electricity works in Hong Kong.⁶ It also requires SEN to review the quantity of the emission allowances for each type of specified pollutant for each specified licence set out or determined in accordance with the Seventh TM not less than once every two years after its commencement.

10. According to the LegCo brief, the projected emission allowances for the four power plants under the Seventh TM in 2022 and their reductions relative to the respective Sixth TM levels are set out in the table below:

Projected emissions in 2022 and beyond (tonnes per year)

		SO₂	NO_x	RSP
HEC	Lamma Power Station and Lamma Power Station Extension (mixed fuel)	2 210 [-23%] ⁷	4 910 [-21%]	120 [-8%]
CLP	Black Point Power Station (gas-fired)	319 [15%]	3 381 [-17%]	123 [14%]
	Castle Peak Power Station (coal-fired)	2 759 [-30%]	9 237 [-10%]	246 [-21%]
	Penny's Bay Gas Turbine Power Station (oil-fired)	2 [0%]	2 [0%]	1 [0%]
	Total of CLP's stations	3 080 [-27%]	12 620 [-12%]	370 [-12%]
Electricity sector		5 290 [-25%]	17 530 [-15%]	490 [-11%]

⁶ The four existing power plants are the Lamma Power Station and Lamma Power Station Extension, Black Point Power Station, Castle Peak Power Station, and Penny's Bay Gas Turbine Power Station. "New electricity works" refers to electricity works that come into existence after the commencement of the Seventh TM.

⁷ According to the LegCo brief, the figures in square brackets are the percentage of reduction compared to the emission allowances stipulated in the Sixth TM.

11. According to the LegCo brief, compared with the emission allowances for 2021 set under the Sixth TM, the Seventh TM will see a further tightening of 25% for SO₂, 15% for NO_x, and 11% for RSP for the electricity sector.

The Subcommittee

12. At the House Committee meeting on 20 October 2017, Members agreed that a subcommittee should be formed to examine the Seventh TM. Under the chairmanship of Ir Dr Hon LO Wai-kwok, the Subcommittee has held a meeting on 31 October 2017 to discuss with the Administration, and also invited views from the public. The membership list of the Subcommittee and a list of organizations and individuals who have made written submissions to the Subcommittee are in **Appendices I and II** respectively.

Deliberations of the Subcommittee

13. Members of the Subcommittee in general welcome the measure to further tighten the emission caps on the specified pollutants from electricity generation, which is vital to achieving the Air Quality Objectives ("AQOs").⁸ In examining the Seventh TM, the Subcommittee has focused on issues including the fuel mix and emission reduction targets, scope of specified pollutants, regional collaboration, development of new energy and tariff implications.

Fuel mix and emission reduction targets

14. According to the Administration, the emission caps for the power stations set in the Seventh TM have taken into account the progress of new gas-fired units to increase the local gas generation to around 50% of the total fuel mix for electricity generation by 2020, which is one of the key measures to meet the 2020 emission reduction targets.

15. Noting that both power companies consider the proposed new emission allowances extremely challenging, some members have asked about the difficulties faced by them in complying with the tightened requirements. The Administration has advised that the two companies have indicated that the achievement of the new emission allowances under the Seventh TM would hinge on a number of factors, including the availability of fuels of the right

⁸ The Air Quality Objectives are benchmarked against a combination of interim and ultimate targets under the World Health Organization's Air Quality Guidelines and have taken effect from 1 January 2014.

quality, performance of the generating units or emission control equipment, the supply of low-emission coal with sufficiently high heating value, etc. Notwithstanding the difficulties, the power companies are prepared to support the Administration's objective to continuously reduce emissions.

16. The Subcommittee notes that AQOs, which are drawn up in accordance with the recommendations of the World Health Organization as well as the standards of other advanced places, have been implemented since 1 January 2014 to improve air quality and will be reviewed at least once every five years to see whether further tightening of AQOs in future is practicable. Noting that the proposed emission allowances will take effect from 1 January 2022 if the Seventh TM commences before the end of 2017, Hon Kenneth LEUNG has enquired how the Seventh TM will tie in with the goal to achieve AQOs for the relevant pollutants by 2020.

17. The Administration has advised that in setting the proposed emission allowances under the Seventh TM, it has already taken into account the progress of gas-fired units in contributing towards the attainment of the AQOs by 2020. Apart from the Seventh TM, the Administration has also been implementing a wide spectrum of air quality improvement measures to help alleviate air pollution problems.

Scope of specified pollutants in TMs

Setting emission caps for PM2.5⁹

18. The Subcommittee notes that the Environmental Protection Department ("EPD") currently includes fine suspended particulates (i.e. PM2.5) in the measurement of air pollutants for compilation of the Air Quality Health Index and the regular monitoring of certain pollutants by the general and roadside air quality stations. Ir Dr Hon LO Wai-kwok and Hon CHAN Hak-kan have enquired about the feasibility of setting emission caps for PM2.5 emitted from power plants, having regard to the potential adverse impact on public health arising from high concentrations of PM2.5 in the air.

19. The Administration has advised that unlike the measurement of ambient PM2.5 concentrations, there is no established method for measuring the PM2.5 concentrations in a stack where water droplets are present. As the stacks of local power plants equipped with wet scrubbers to control emissions are saturated with water vapour, water droplets entrained in the flue-gas could

⁹ Respirable suspended particulates ("RSP") (i.e. PM10) includes PM2.5. PM10 is particulate matter ("PM") having a nominal aerodynamic diameter not more than 10 micrometers while PM2.5 not more than 2.5 micrometers.

dissolve some of the PM_{2.5} particles, rendering these particles not collected by the PM_{2.5} particle-sizing device for measurement. Without a reliable measurement method, it is not practicable to set limits on PM_{2.5} emissions from local power plants. The Administration has further pointed out that even in other environmentally advanced jurisdictions such as the United States and member states of the European Union, there is still no established method to measure PM_{2.5} emissions from power plants with wet stacks nor emission standard set on their PM_{2.5} emissions. Nevertheless, the Administration has assured members that EPD will continue to closely monitor the development of PM_{2.5} measurement technology, and that control measures to reduce RSP (i.e. PM₁₀) emissions could also reduce PM_{2.5} emissions.

Performance monitoring

20. The Subcommittee has sought details on the mechanism to ensure effective monitoring of the particulates emissions arising from the power plants operation. The Administration has advised that at present, power plants are required to continuously monitor the particulates emission by means of opacity from the stack in accordance with the internationally recognized methods specified by EPD and the relevant data are transmitted to EPD for on-line monitoring to ensure compliance with the requirements.

21. Hon CHAN Hak-kan has suggested that real-time emission data of specified pollutants including SO₂, NO_x and RSP be disseminated to the public to enhance monitoring. The Administration has advised that from time to time it would review the dissemination of relevant data (e.g. air quality health indexes compiled by EPD) to the public, and agreed to consider the suggestion in future review exercises.

Allocation of emission allowances

22. Regarding the formulae for allocating the emission allowances to the power plants, Hon CHAN Hak-kan and Dr Hon Junius HO have sought information on the emission efficiency of each power plant in terms of the specified pollutants including SO₂, NO_x and RSP. The Administration has explained that the emission allowances to be allocated to power plants comprise two parts. The first part is the projected emissions under the adoption of BPM requirements while the second part is the emissions that could be offset by RE sources. According to the Administration, the emission factors of coal-fired-units have been embedded in the formulae of allocation of emission allowances for the power plants, which are the coefficients of the variables for adjusting the emissions from coal plants due to actual RE intake. As the amount of energy obtained from RE sources could vary depending on various uncontrollable factors such as meteorological conditions and the amount of

landfill gas generated, the formulae include variables for adjusting upwards or downwards the emission allowances from coal-fired units to account for the deviation of the actual RE intake in that year from the anticipated level.

23. The Subcommittee notes that the formula caters for possible new electricity works by allocating emission allowances based on the emission performance of a new gas-fired unit adopting BPM for emission reduction, with respect to the same reference installed capacity adopted in the Sixth TM, i.e. 300 MW. The Administration advises that this reference is drawn from the installed capacity of a typical gas-fired unit, for which the emission factors are substantially lower than those of coal-fired unit.

Penalties

24. On the Subcommittee's concern that power companies might invoke the special event provision under section 26K of APCO to absolve their responsibilities of not meeting the emission caps, the Administration has advised that it is a statutory requirement for power companies to meet the emission caps as set out in APCO. The Administration has assured members that EPD will not lightly adjust the emission caps under the special event mechanism unless the incidents are clearly proven to be beyond the control of power companies and that they have made their best endeavour to avoid such happenings. While the power companies have not ever invoked the special event provision under the previous TMs, they are obliged to exercise all due diligence to minimize their emissions even after invoking the special event provision.

Regional collaboration in emission reduction

25. Hon WU Chi-wai has asked about the local and regional pollution sources for Hong Kong's air quality and how reducing the emissions of the specified pollutants from the power plants would contribute to the Administration's environmental targets for 2020 to achieve emission reductions.

26. The Administration has advised that in 2012, the Hong Kong Special Administrative Region ("HKSAR") Government and Guangdong Provincial Government adopted a set of emission reduction targets/ranges for four major air pollutants in Hong Kong and Pearl River Delta ("PRD") Economic Zone for 2015 and 2020 as shown in the table below and agreed to conduct a mid-term review in 2015 to finalize the emission reduction targets for 2020. The mid-term review study is about to complete and the Administration expects to announce the results by end of 2017.

Pollutant	Area	2015 Emission reduction targets*	2020 Emission reduction ranges*
SO ₂	HKSAR	-25%	-35% ~ -75%
	PRD Economic Zone	-16%	-20% ~ -35%
NO _x	HKSAR	-10%	-20% ~ -30%
	PRD Economic Zone	-18%	-20% ~ -40%
RSP	HKSAR	-10%	-15% ~ -40%
	PRD Economic Zone	-10%	-15% ~ -25%
Volatile organic compounds ("VOC")	HKSAR	-5%	-15%
	PRD Economic Zone	-10%	-15% ~ -25%

* As compared with 2010 emission levels

27. According to the Administration, to achieve the emission reduction targets set for 2015 and 2020, the two governments are implementing emission reduction measures focusing on major emission sources with a view to bringing continuous improvement to regional air quality. The key emission reduction measures being implemented in Hong Kong include tightening of vehicle emission standards, phasing out highly polluting commercial diesel vehicles, strengthening inspection and maintenance of petrol and liquefied petroleum gas vehicles, requiring ocean-going vessels to switch to using low sulphur fuel while at berth, tightening the sulphur content of locally supplied marine diesel, controlling emissions from non-road mobile machinery, controlling VOC contents of products used in the printing and construction industries, and further tightening of emission caps on power plants and increasing use of clean energy for electricity generation.

Development of renewable energy

28. Some members have asked about the incentives for encouraging power companies to use cleaner fuel, such as RE, in view of the substantial capital investment involved. The Administration explains that TMs are meant to control the emission of specified pollutants from power plants whereas power companies are encouraged to develop RE in other contexts, including the Scheme of Control Agreements ("SCAs") signed between the Government and the power companies. Promotion of RE is one of the foci of the post-2018 SCAs signed between the Government and the power companies in April 2017 under which the power companies would be provided with financial incentives to encourage them to develop RE and facilitate the development of distributed RE.

29. As to some members' suggestions of implementing more proactive measures for the development of RE including wind power or photovoltaic systems, the Administration has advised that, in an effort to drive RE development, Feed-in Tariff and RE Certificates would be introduced under the post-2018 SCAs to encourage the private sector and the community to invest in distributed RE. The Administration has been requested to report to the Panel on Environmental Affairs on this matter in due course.

30. With the operation of new facilities such as the Sludge Treatment Facility (T · PARK) in Tuen Mun and Phase 1 of the new Organic Resources Recovery Centre in Siu Ho Wan, North Lantau which are RE facilities built by the Government, Hon WU Chi-wai pointed out that the power companies could save substantial capital investments on building these infrastructures to produce RE. In response to Hon WU Chi-wai's question, the Administration has advised that for electricity generated from the waste-to-energy facilities owned by the Government, the existing arrangement was that the surplus electricity was sold to power companies at the marginal cost saving in coal fuel by the power companies.

Tariff implications

31. Hon WU Chi-wai has asked for an assessment of the potential impact on electricity tariff arising from the capital investment of \$5.5 billion and \$4.1 billion for building new gas-fired units by CLP and HEC respectively. The Administration has advised that Unit D1 of CLP and Unit L11 of HEC will be commissioned in 2020 and 2022 respectively. The tariff impact of these gas-fired units will be subject to a number of critical factors, such as operating costs, sales volume, fuel prices and balances of the Tariff Stabilization Fund and the Fuel Clause Recovery Account. According to the Administration's rough estimates, the impact of Unit L11 on the HEC's tariff will be about 0.3 per cent for 2018, while the impact of Unit D1 on CLP's tariff will be about 0.4 per cent for 2018.

Recommendation

32. The Subcommittee has no objection to the issue of the Seventh TM and will not propose any amendment. The Subcommittee notes that the Administration will not move any amendment to the Seventh TM.

Advice sought

33. Members are invited to note the deliberations of the Subcommittee.

Council Business Division 1
Legislative Council Secretariat
22 November 2017

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

Membership list

Chairman Ir Dr Hon LO Wai-kwok, SBS, MH, JP

Members Hon Jeffrey LAM Kin-fung, GBS, JP
Hon CHAN Hak-kan, BBS, JP
Hon Steven HO Chun-yin, BBS
Hon Frankie YICK Chi-ming, SBS, JP
Hon WU Chi-wai, MH
Hon Kenneth LEUNG
Hon KWOK Wai-keung, JP
Hon Martin LIAO Cheung-kong, SBS, JP
Hon CHU Hoi-dick
Dr Hon Junius HO Kwan-yiu, JP
Hon Tanya CHAN
Hon HUI Chi-fung

(Total : 13 members)

Clerk Miss Cindy HO

Legal Adviser Mr Cliff IP

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

**List of deputations/individuals who have provided written submissions
to the Subcommittee**

1. Dr WONG Chung-leung
2. Federation of Hong Kong Industries
3. Hong Kong General Chamber of Commerce
4. Hong Kong Green Strategy Alliance
5. Hong Kong Organic Waste Recycling Centre
6. iGen6 Digi-Marcom Limited
7. Junefair Group, Hong Kong Electrical Contractors' Association
and Yau Tsim Mong Federation of Association
8. Ma Wan Rural Committee
9. Mr LAM Kin-lai
10. The Chinese General Chamber of Commerce, Hong Kong
11. The Hong Kong General Chamber of Small and Medium Business
12. Tuen Mun District (S&E) Commercial Association
13. Yuen Long Ping Shan District Residents Association