40/F, Revenue Tower, 5 Gloucester Road, Wan Chai, Hong Kong
香港灣仔告士打道 5 號稅務大樓 40 樓

ACE Paper 9/2012
For discussion on 15 October 2012

Review of the Second Technical Memorandum for Allocation of Emission Allowances for Power Plants

PURPOSE

This paper seeks Members' views on the proposal to reduce the emission allowances for power plants for the emission years starting from 1 January 2017 by way of issuing a new Technical Memorandum (TM) under section 26G of the Air Pollution Control Ordinance (Cap. 311) (APCO).

BACKGROUND

2. APCO empowers the Administration to set emission caps for power plants for improving air quality in Hong Kong. Section 26G of the APCO provides for the Secretary for the Environment (the Secretary) to allocate emission allowances for three specified pollutants, i.e., sulphur dioxide (SO2), nitrogen oxides (NOx) and respirable suspended particulates (RSP), for electricity power plants by way of a TM.

3. Two TMs were issued in 2008 and 2010 respectively. The First TM sets the emission allowances for the emission years between 2010 and 2014 while the Second TM tightens the emission allowances starting from 1 January 2015. The emission allowances in the Second TM were determined with due regard to maximising the use of existing gas-fired generation units and prioritizing the use of coal-fired generation units equipped with advanced emission control devices. The specific emission allowances under the Second TM are as follows:

Table 1: Emission Allowances for Existing Electricity Works from 2015 onwards
(Tonnes Per Year)

	Sulphur dioxide	**Nitrogen oxides** [@]	**Respirable suspended particulates**
The Hongkong Electric Company Limited (HEC)			
Lamma Power Station and Lamma Power Station Extension (mixed fuel)	6 780	10 020	300
The CLP Power Hong Kong Limited (CLP)			
Black Point Power Station (gas-fired)	1 440	4 140	110
Castle Peak Power Station (coal-fired)	4 260	13 390	420
Penny's Bay Gas Turbine Power Station (oil -fired) [#]	2	2	1
Total of CLP Power Stations	5 702	17 532	531

[@] Expressed as nitrogen dioxide

[#] As the Penny's Bay Gas Turbine Power Station is for emergency and peak-lopping purposes, the projected SO2, NOx and RSP emissions for the purposes are one to two tonnes.

The TM also allows the allocation of not more than 1% of the total emission allowances for the power sector in respect of each of the specified pollutants for new electricity works.

4. Section 2.5 of the Second TM requires the Secretary to review the emission allowances not less than once every two years after its commencement. If the new emission allowances for the emission years starting from 1 January 2017 are promulgated by a new TM within 2012, the new emission allowances will take effect from 2017 at the earliest pursuant to section 26G(4) of the APCO.

THE REVIEW

5. Under Section 26G(2) of the APCO, the Secretary, in making the emission allocations, shall:

(a) have regard to the best practicable means (BPM) for preventing the emission of that type of pollutant;

(b) have as his purpose the attainment and maintenance of any relevant air quality objective (AQO); and
(c) have regard to whether the emission of that type of pollutant would be, or be likely to be, prejudicial to health.

6. When determining the emission allowances under the new TM, we have made reference to a number of considerations, including-

(a) the Administration announced in January 2012 the proposed adoption of the new AQOs, which are benchmarked against the World Health Organisation's Air Quality Guidelines and Interim Targets, for better protection of public health. Among the 22 control measures proposed for achieving the new AQOs, raising the use of natural gas in the fuel mix of local electricity generation to 50% and prioritizing the use of coal-fired generation units equipped with advanced emission control equipment are key measures for the power sector;
(b) the BPM for power plants to reduce emissions by upkeeping the performance of the existing emission control equipment and/or retrofitting additional control equipment;
(c) the feasibility for power plants to increase the use of cleaner fuels such as natural gas and low emission coals;
(d) the projected electricity demand; and
(e) the generation of renewable energy (RE) and waste-to-energy (WTE).

7. Our assessment is that if both power companies could continue their efforts to use low emission coals as far as possible and upkeep the performance of their emission control devices, it should be possible to tighten the emission caps stipulated in the Second TM further.

8. For RE and WTE, other than the Lamma Winds and thin film photovoltaic solar system for the HEC and the landfill gas utilization plant of the South East New Territories Landfill to the grid of the CLP, there will be WTE facilities (e.g. the sludge treatment facility at Tuen Mun) for operation in late 2013. Since the power sector could reduce its electricity generation by tapping into these sources, we consider it appropriate for the new TM to cater for it. The electricity to be tapped from RE and WTE will be taken as for displacing the electricity generation from the coal-fired generation units in view of our established policy to encourage maximising the use of natural gas for electricity generation and that the natural gas-fired generation units need to be fully operated under the "take-or-pay" natural

gas supply contracts. As such, the emissions to be avoided for each unit of electricity tapped from RE and WTE would be equal to the unit emissions from all coal-fired generation units of respective power companies. We would deduct such emissions to be avoided by the anticipated annual electricity intake of RE and WTE (i.e., 2 GWh and 21 GWh for HEC and CLP respectively) from the emission allowance allocations according to these unit emission factors for coal-fired generation units and the reduced electricity generation figures.

9. The generation of RE and WTE could be affected by exogenous factors, e.g. changes in weather patterns and the heat contents of the refuse or sludge respectively. We hence consider it necessary to establish a mechanism in the TM for ascertaining the emission allowances according to the actual annual intake of the electricity generated from WTE and RE based on the unit emission factors mentioned in paragraph 8 above.

10. Taking all the above factors into consideration, we expect that the emissions of the existing power plants from 2017 and onwards could further be reduced as in Table 2 below. To put these figures into perspective, we have also presented the reduction from the Second TM for reference.

Table 2: Projected Emissions for Existing Electricity Works in 2017 (tonnes per year) with Additional Emission Reduction Measures

		Sulphur dioxide	**Nitrogen oxides** [@]	**Respirable suspended particulates**
HEC	Lamma Power Station and Lamma Power Station Extension (mixed fuel)	5 200 (-23%)	9 450 (-6%)	250 (-17%)
CLP	Black Point Power Station (gas-fired)	1 440	4 140	110
	Castle Peak Power Station (coal-fired)	3 757 (-12%)	12 358 (-8%)	389 (-7%)
	Penny's Bay Gas Turbine Power Station (oil -fired)	2	2	1
	Total of CLP's Power Stations	5 199 (-9%)	16 500 (-6%)	500 (-6%)

[@] Expressed as nitrogen dioxide

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

PROPOSED EMISSION CAPS FOR NEW TM

Emission Allowances for Existing Electricity Works

11. Based on the latest review, we propose to promulgate a new TM to allocate the emission allowances from 2017 onwards to each of the existing power plants by the following method:

Emission allowances to be allocated and ascertained	
=	Emission allowances that are required with the use of BPM (i.e., those presented in Table 2 above)
plus/minus	Emission allowances to be added / deducted due to deviation of the actual intake of RE and WTE from the anticipated intake (i.e., 2 GWh and 21 GWh for HEC and CLP, respectively) in accordance with the unit emission factors of coal-fired generation units

12. The specific formulae for allocating the emission allowances to the four existing electricity works are presented below.

Table 3(a): Lamma Power Station and Lamma Power Station Extension

	Quantity of Emission Allowance for 2017 and thereafter
SO2	5 200 + (2 – A) × 0.614
NOx [@]	9 450 + (2 – A) × 0.941
RSP	250 + (2 – A) × 0.027

Table 3(b): Black Point Power Station

	Quantity of Emission Allowance for 2017 and thereafter
SO2	1 440
NOx [@]	4 140
RSP	110

Table 3(c): Castle Peak Power Station

	Quantity of Emission Allowance for 2017 and thereafter
SO2	3 757 + (21 – B) × 0.367
NOx [@]	12 358 + (21 – B) × 1.208
RSP	389 + (21 – B) × 0.038

Table 3(d): Penny Bay's Gas Turbine Power Station

	Quantity of Emission Allowance for 2017 and thereafter
SO2	2
NOx [@]	2
RSP	1

[@] Expressed as nitrogen dioxide

where -

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

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

Emission Allowances for New Electricity Works

13. Similar to the First and Second TM, we would provide an allocation of not more than 1% of the total emission allowances of the power sector in respect of each of the specified pollutants for any possible new electricity works[1] so as to ensure that they will not be debarred from starting their business even with the use of the most advanced emission reduction technology. We also propose to introduce the same mechanism outlined in paragraphs 8 and 9 above to cater for the possible intake of RE and WTE by new electricity works. Accordingly, the formulae for allocating and ascertaining the emission allowances in respect of each of the specified pollutants for possible new electricity works, with respect to the same reference installed capacity adopted in both First and Second TM, i.e., 300 MW, for emission years starting from 1 January 2017 would be as follow:

[1] "New electricity works" refers to new entrant comes into the electricity generation industry after the commencement of the proposed TM.

Table 4: New Electricity Works

	Quantity of Emission Allowance for 2017 and thereafter
SO2	90 × (C/300) × (D/12) – E × 0.047
NOx [@]	230 × (C/300) × (D/12) – E × 0.120
RSP	7 × (C/300) × (D/12) – E × 0.004

[@] Expressed as nitrogen dioxide

where –

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

D is the total number of months in the emission year after the commencement of operation of the New Electricity Works and part of a month is taken as a full month in the determination; and

E is the aggregate of total net sent-out electricity output (in GWh) from individual RE and WTE to the electricity grid of the New Electricity Works in the emission year.

Frequency of Review

14. We also propose to maintain the current practice to review the TM at a frequency of no less than once every two years to enable timely revision of the emission allowances.

Commencement Date of New Emission Caps

15. A copy of the draft Third TM is at **Annex**. If the proposed new Third TM commences before the end of 2012, the new emission allowances would take effect starting from 1 January 2017, having regard to the statutory requirement in section 26G(4) of the APCO that an allocation of emission allowances made by the TM in relation to an emission year (other than an allocation made under the First TM) could only take effect at least four years after the commencement of the TM making the allocation.

ENVIRONMENTAL BENEFITS

16. As compared with the current emission allowances for 2015 under the Second TM, the proposed Third TM will see a tightening of 17% for SO2, 6% for NOx and 10% for RSP. The reduction will help improve local air quality given

that emissions from the power sector account for 50%, 25% and 16% respectively of the territory-wide emissions of these pollutants in 2010.

TARIFF IMPLICATIONS

17. Achieving the proposed 2017 emission caps does not involve new capital investment by power companies. As for fuel cost, while the Third TM will not have any major impact on the fuel mix of power companies, actual fuel cost would be subject to international market price. The power companies will present their tariff assessment to the Administration in accordance with the prevailing regulatory mechanism under the Scheme of Control Agreement (SCA).

CONSULTATION

18. The two power companies have been consulted on the proposal. Both of them consider that the proposed new emission allowances are extremely challenging and the compliance with these tightened requirements could be adversely affected should there be significant deviations from the assumptions made in determining the new emission allowances. CLP is committed to working closely with the Administration to support the new emissions allowances while maintaining the reliable supply of electricity to customers. HEC considers that meeting the proposed reduced emission allowances from 2017 onwards is very challenging. It stresses the need for a long-term policy on increase of the use of natural gas for electricity generation as gas suppliers have no flexibility for any ad hoc natural gas supply. Both companies also indicated that the achievement of the new emission targets is based on the stable supply of low emission coals with consistent properties which could not be assured in the very volatile fuel market, sufficient supply of natural gas, the consistently high performance of their emission reduction devices during the relevant period and no exceptional increase in electricity demand.

19. We consider that compliance with the proposed emission caps is feasible as natural gas supplies are being sourced from the Mainland for the maximum utilization of existing gas-fired generation units. Both power companies should prioritize the loading schedule to maximize the use of their coal-fired generation units with better environmental performance, carry out proper maintenance of their plants and ensure the appropriate sourcing of low emission coals. In determining the emission caps for both companies, we have made reference to the best available

electricity demand forecast and per GWh emission figures of the generation plants of both companies with due consideration of the actual emission performances. In addition, a lead time of at least four years will be provided to the power companies in accordance with section 26G(4) of the APCO to gear themselves up before the proposed emission caps take effect. We are therefore of the view that both power companies can comply with the proposed requirements.

20. The Panel on the Environmental Affairs of the Legislative Council was consulted on 4 July 2012. The Panel supported the proposal but some Members were concerned about the tariff impact of the increased use of natural gas for power generation. We had explained that the emission caps of the new TM was built on the fuel mix of the Second TM and did not require an increase in the use of natural gas for electricity generation. In any case, the actual fuel cost would be subject to international market prices and the power companies would present their tariff assessment to the Administration in accordance with the prevailing regulatory mechanism under the Scheme of Control Agreement.

WAY FORWARD

21. We plan to submit the Third TM to the Legislative Council under section 37B(1) of the APCO for negative vetting in late October 2012. Our target is that the new Third TM shall commence before the end of 2012, thus providing at least four years' lead time for the revised emission allowances in respect of the specified pollutants in relation to the emission years from 1 January 2017 to take effect.

Environmental Protection Department
October 2012