CB(1) 1442/07-08(01)

Bills Committee on Air Pollution Control (Amendment) Bill 2008

List of Follow-up Actions Arising from the Discussion at the Meeting on 10 April 2008

Administration's Response

I. To provide information on the air policies, including emission control, emissions trading, development of renewable energy etc, adopted by the United Kingdom and Germany over the past 20 years and their effectiveness in improving air quality.

Control of emissions from power plants in the United Kingdom ("UK") and Germany in the past 20 years

1. Since 1987, the European Union Council Directives on the Limitation of Emissions of Certain Pollutants into the Air from Large Combustion Plants, or commonly known as the Large Combustion Plants Directives ("LCPD"), have been serving as the back bones for control of emissions from power plants in both UK and Germany.

2. The overall aim of LCPD is to reduce emissions of acidifying pollutants (i.e. sulphur dioxide ("SO_2") and nitrogen oxides ("NOx")), particulates and ozone precursors. Control of emissions from large combustion plants, i.e. those whose rated thermal input is equal to or greater than 50 MW, plays the most important roles in the European Union's ("EU's") efforts in combating acidification, eutrophication and ground-level ozone as part of the overall strategy to reduce air pollution.

3. The first LCPD (Directive 88/609/EEC) was made on 24 November 1988 and was deemed to have the date of entry into force from 1 July 1987. It applies to combustion plants with thermal input capacity of 50 MW or more and mainly requires:

(a) New plant approved on or after 1 July 1987 to meet the prescribed emission limits, including the following which would have some relevancy to Hong Kong's power plant –

Air pollutant	Emission limit
SO_2	Solid fuels: 500 mg/m3
NOx	Solid fuels: 650 mg/m3
Particulates	Solid fuels: 50 mg/m3

(b) Existing plants to draw up and implement programmes to achieve the respective national emission ceilings and reduction targets. The respective ceilings for UK and Germany are as follows –

Country	Air pollutant	Emission ceiling	
UK	SO_2	Phase 1 (1993)	3,106,000 tonnes
		Phase 2 (1998)	2,330,000 tonnes
		Phase 3 (2003)	1,553,000 tonnes
	NOx	Phase 1 (1993)	864,000 tonnes
		Phase 2 (1998)	711,000 tonnes
Germany	SO_2	Phase 1 (1993)	1,335,000 tonnes
		Phase 2 (1998)	890,000 tonnes
		Phase 3 (2003)	668,000 tonnes
	NOx	Phase 1 (1993)	696,000 tonnes
		Phase 2 (1998)	522,000 tonnes

4. The 1988 LCPD did not set emission limit values for SO_2 for new plants using solid fuel with a rated thermal input of between 50 and 100 MW. It was amended on 15 December 1994 to include also these limit values by the 1994 LCPD (Directive 94/66/EC).

5. LCPD was further amended on 23 October 2001 by the European Parliament and Council. The revised LCPD (2001/80/EC) repealed the old directive on large combustion plants (Directive 88/609/EEC as amended by Directive 94/66/EC) and tightened the requirements for air pollution control from new combustion plants in line with the substantial technical progress that had been made in this sector since the old 1988 LCPD was adopted. The 2001 LCPD also establishes new requirements for those plants approved before 1 July 1987 (the date of entry into force of the old Directive).

6. The 2001 LCPD encourages the combined generation of heat and power and sets specific emission limit values for the use of biomass as fuel. It also includes gas turbines in its scope in order to regulate NOx emissions.

7. In particular, the 2001 LCPD contains the following provisions –

(a) New plants approved after 27 November 2002 have to comply with a set of new emission limit values, including the following:

Air pollutant	**Emission limit**
SO_2	Solid fuels: 200 mg/m3
NOx	Solid fuels: 200 mg/m3
	Natural gas-fired gas turbines: 50 mg/m3
Particulates	Solid fuels: 30 mg/m3

(b) Plants licensed after 1 July 1987 and before 27 November 2002 have to comply with the tightened emission limit values, including the following:

Air pollutant	**Emission limit**
SO_2	Solid fuels: 400 mg/m3
NOx	Solid fuels: 500 mg/m3
Particulates	Solid fuels: 50 mg/m3

(c) Plants approved before 1 July 1987 have to reduce significantly their emissions by 1 January 2008:

(i) by individual compliance with the emission limit values established for new plants referred to in sub-paragraph (b) above, or

(ii) through a national emission reduction plan that aims to achieve an overall reduction calculated using these emission limit values.

8. Before the implementation of item (c) mentioned in paragraph 7 above, the Member States are required to continue to comply with the emission ceilings for SO_2 and NOx mentioned in paragraph 3(b) above.

9. To achieve the requirements of the 2001 LCPD, Germany adopted the

command-and-control approach and has imposed stringent emission limits on the affected plants.

10. UK, in addition to imposition of stringent emission limits, also allows the existing power plants to participate in a "cap-and-trade" emission trading scheme implemented since 1 January 2008 under the National Emission Reduction Plan to satisfy the control requirements. A register of participating large combustion plants has been established for recording the transfers and emission trading transactions.

11. As a result of the control efforts and the closure of large old coal-fired power plants, the emissions from electricity and heat production industries of UK have been significantly reduced. The respective emission figures of 1990 and 2005 are as follows –

Air pollutant	**1990**	**2005**
SO_2	2,729,000 tonnes	385,000 tonnes
NOx (expressed as nitrogen dioxide)	776,000 tonnes	373,000 tonnes
Respirable suspended particulates ("RSP")	70,000 tonnes	9,830 tonnes

12. The corresponding emission reduction figures of German energy industries are as follows:

Air pollutant	**1990**	**2005**
Sulphur dioxide	3,136,250 tonnes	247,570 tonnes
NOx (expressed as nitrogen dioxide)	606,880 tonnes	281,550 tonnes
RSP	N.A.*	11,340 tonnes

** The first year with available RSP figures is 1995. The quantity of emission was 21,510 tonnes.*

Other emissions trading schemes

1. The United States ("US") Acid Rain Programme, the EU Emissions Trading Scheme and the Clean Development Mechanism under the Kyoto Protocol are the more prominent emissions trading schemes. Details of these scheme are at **Enclosure A**.

Renewable energy ("RE") adopted by UK and Germany in the past 20 years

1. In UK, RE has been the key to its strategy to tackle climate change. RE accounted for 4.6% of electricity generated in UK in 2006, up from 1.8% in 1990.

2. Key sources of RE in UK include geothermal, solar, wind, wave, hydro, landfill gas, sewage gas, wood, waste combustion and biofuels. There has been a remarkable increase in the share of RE from landfill gas. It accounted for 33% of total renewables used in 2006, up from 8% in 1990. On the other hand, hydropower has been assuming a declining importance in the field, with its share in total use of renewables dropped from 44% in 1990 to 9% in 2006.

3. In Germany, RE has been a cornerstone to its climate protection policies. RE contributed to 8.5% of total energy consumption in 2007, up from 2% in 1990. Key sources of RE in Germany include wind power, hydropower, biomass, landfill gas, sewage gas, solar and geothermal energy. There has been a remarkable increase in the contribution of wind energy among various RE sources. Wind energy accounted for 45% of electricity generated from RE sources in 2007, up from 0.2% in 1990. Hydropower, another key source of RE, has assumed a declining share from 92% in 1990 to 24% in 2007 in its contribution to electricity generated from RE sources.

III. To advise the feasibility of including CO_2 in item (a) of the long title of the Air Pollution Control (Amendment) Bill 2008 ("the Bill").

1. The long title of the Bill as cast reflects the Administration's policy intention. It is not the Administration's policy intention to regulate emissions of greenhouse gases by way of the Bill.

To also provide a paper elaborating the difficulties and implications, particularly on electricity charges, involved in controlling CO_2 emission (as set out in paragraph 3 of the Administration's response to the submission from Greenpeace) with reference to overseas experience.

1. In Hong Kong, emission from power generation amounts to about 63% of the total CO_2 emission in 2005 and is mainly stemmed from the burning of fossil fuels. Of which, over 50% of the electricity is generated from coal burning.

2. At present, there is no mature and commercially viable technology in the world that could reduce, capture and store CO_2 discharged from the burning of fossil fuels from power sector, although some pilot or trial schemes on the capture and storage of CO_2 control have been conducted.

3. The measures adopted by other advanced countries/economies for reducing CO_2 emission from power generation are:

   (a) changing the fuel mix, i.e. substantial reduction in coal-fired power generation by increase of the use of natural gas;

   (b) use of nuclear power for electricity generation;

   (c) promotion of the use of renewable energy; and

   (d) decrease of electricity demand by energy conservation and demand side management.

4. As a service economy with relatively low per capita emissions, we believe the best way for Hong Kong to reduce CO_2 emissions is through energy conservation and enhancing energy efficiency. Our initiatives in these areas have been set out in our responses to Members' questions raised under items II and V.

5. As for possible technical solutions to reduce CO_2 emissions from the power sector, in the case of Hong Kong item (a) mentioned in paragraph 3 above is probably the most promising technical option for significant reduction of CO_2, as gas-fired units emit only about 50% of the coal-fired units for same quantity of electricity generated. However, changing the fuel mix for power generation involves important and complicated issues such as energy policy, energy security,

stability in power supply etc.

6. Changing the fuel mix will also involve a series of factors that would impact on the tariff level. Firstly, with natural gas price generally far higher than that for coal, the fuel cost for power generation by gas-fired plants will be significantly higher. Secondly, as currently the bulk of power generation capacity comes from coal-fired power plants, any significant increase in the proportion of electricity generated by natural gas will likely call for capital investment in gas-fired power generation and relevant infrastructural facilities. Since such new plants/facilities will form part of the power companies' Fixed Assets, the relevant depreciation and the permitted return allowable thereon under the Scheme of Control Agreements signed by the Government and the power companies, would also have a significant impact on the tariff level. Taking account of the aforesaid factors, the increase of gas in the fuel mix would likely contribute to a significant increase in tariff, the extent of which would depend on the prevailing natural gas price vis-à-vis coal price, the amount of new capital investment involved which in turn will also hinge on the future electricity demand as well as the emission reduction required in the next few years.

7. Thus, more in-depth assessment and discussions among different sectors in the community are necessary before a decision on this matter can be made.

VI. To advise the methodology for working out and allocating the emission allowances to individual power plants and whether the methodology is in line with international practices.

1. The allowed emissions for the electricity sector from 1 January 2010 shall be as follows –

Air pollutant	Allowed emissions
SO_2	25,120 tonnes
NOx (expressed as nitrogen dioxide)	42,600 tonnes
RSP	1,260 tonnes

2. To ensure that all power plants will receive the same quantity of emission allowances per unit of electricity generated, we shall allocate the emission allowances to individual power plants on a pro-rata basis in accordance with

their respective share of the total amount of electricity generated for local consumption as follows –

$$A \times \frac{B}{C}$$

where –

"A" represents the total allowed emissions mentioned in paragraph 1 above.

"B" represents the electricity generated for local consumption from the power plant under consideration from 1999 to 2003 inclusive.

"C" represents the sum of the electricity generated for local consumption from all power plants under consideration from 1999 to 2003 inclusive.

3. As shown in **Enclosure B**, the above allocation methodology is generally in line with those practised in advanced countries/economies.

To also advise the legislative procedure through which the technical memorandum ("TM"), which sets out the methodology, can be amended by the Legislature.

1. The TM may be amended by the Legislative Council through the negative vetting procedures as stipulated in section 37B of the Air Pollution Control Ordinance (Chapter 311) ("APCO"), which follows the same way of how a subsidiary legislation may be amended under section 34 of the Interpretation and General Clauses Ordinance (Chapter 1) ("IGCO").

2. If the Legislative Council proposes an amendment to the TM, it is a requirement under section 37B(2) of APCO that such amendment must be consistent with the power to issue the TM. In other words, an amendment must adhere to the applicable restrictions with regard to the scope and nature of the TM as stipulated in APCO, for example the content of the proposed section 26G which sets out the power of the Secretary for Environment to allocate emission allowances by a TM. The same requirement applies when the Legislative Council proposes to amend a subsidiary legislation under section 34 of IGCO.

VII. To illustrate with a case on the consequences which a power plant may face in the event of failure to meet the emission allowance. Similarly, the situation where the power plant has unspent emission allowance.

1. According to the proposed Schedule 2A of the Bill, a specified licence holder shall ensure that the actual emission of a type of specified pollutant from the licensed premises in an emission year is not greater than the allowed emission of that type of pollutant as applicable to the specified licence in respect of the emission year.

2. Under the proposed section 26I(1)(b) of the Bill, if the specified licence holder contravenes the above term or condition in respect of the preceding year, the quantity by which the relevant actual emission exceeds the relevant allowed emission shall be taken as part of the actual emission of that type of pollutant in the emission year.

3. On the other hand, under the proposed Division 3 of the Bill, the licence holder of a specified process may make adjustments to the quantity of allocated allowances under the following circumstances –

   (a) surplus of allocated allowances in preceding year (the proposed section 26J of the Bill);

   (b) occurrence of special event (the proposed section 26K of the Bill);

   (c) acquisition from or transfer to other local power plants (the proposed section 26L of the Bill); and

   (d) acquisition from or transfer to cross-boundary power plants under a recognised emission trading scheme (the proposed section 26M of the Bill).

4. **Enclosure C** sets out examples to illustrate the adjustment of the quantities of emission allowances under the above circumstances and the consequences of non-compliance and over-compliance with the licensing condition mentioned in paragraph 1 above.

To also advise the basis upon which the proposed "banking" of 2% of the total unspent emission allowances for one year is arrived at and whether such limitation will serve as a disincentive for further reduction of emissions.

1. Under the proposed section 26J of the Bill, power plants with surplus of allocated allowances in the preceding year may increase the quantity of emission allowances by –

   (a) the quantity of the surplus; or

   (b) 2% of the quantity of the allocated allowances of the preceding year,

   whichever is the lesser.

2. This "banking" provision provides greater flexibility to the power plants to deal with the possible slight variance of the emission performance. However, as the quantity of the allocated allowances (i.e. emission caps) will have already been made known to the power plants well in advance, it is expected that they will make adequate advanced planning to ensure full compliance satisfactorily. A small scale of "banking" is considered sufficient.

3. From air quality management point of view, we are also of the view that the scale of "banking" should not be excessive so as not to upset our capability of achieving the 2010 emission reduction targets agreed with the Guangdong Provincial Government for improving the air quality of Hong Kong and Pearl River Delta Region. In general, a more lenient "banking" arrangement is more acceptable if the proposed emission control framework aims at addressing issues with a more long-term impact, such as acid rain and global warming, in which the timing of the emissions is less critical. A tighter "banking" arrangement is considered more appropriate to deal with issues with more immediate health impacts such as the exceedances of hourly or daily air quality standards.

4. In other advanced countries/economies, the practice on "banking" of emission allowances varies from both extremes. For example, US's emission trading programme under the Acid Rain Programme allows unlimited banking and future use of the "banked" emission allowances, while UK's emission trading programme for large combustion plants under the Large Combustion Plants (NERP) Regulation 2007 does not allow any emission allowance to be carried

forward from one calendar year to the next. The Dutch Nitrogen Oxides Emission Trading Programme, on the other hand, permits the "banking" of a maximum of 5% of the allocated emission allowances.

5. Having fully considered the above factors and the international practices, we consider the proposed "banking" arrangement mentioned in paragraph 1 above is the most appropriate to cater for the local situation in Hong Kong.

6. "Banking" arrangement, even with less limitation, should not provide any major or sustainable incentive for power plants to embark on additional emission reduction measures as the "banked" emission allowances will still be used eventually. Furthermore, if the additional emission reduction measures continue to operate satisfactorily, the need to use the banked-in allowance will be low. To encourage further reduction of emissions, the more appropriate measure is to provide bonus or additional incentives to award over-achievements on the part of the power companies. In the post-2008 "Scheme of Control Agreement" signed with the two power companies, the Government has included a provision to allow for an award of 0.05 to 0.1 percentage point in permitted return as an incentive to encourage power companies to "over-achieve" the emission caps imposed under APCO.

Environment Bureau/Environmental Protection Department
May 2008

Enclosure A

Details of Some Overseas Emissions Trading Schemes

Scheme	**United States ("US") Acid Rain Program**	**European Union ("EU") Emission Trading Scheme**	**Clean Development Mechanism ("CDM") under Kyoto Protocol**
Start	1995	2005	2005
Geographical reach	Continental US	EU	Global
Pollutant for trading	Sulphur dioxide	Carbon dioxide	Six greenhouse gases (CO_2, CH_4, N_2O, PFCs, HFCs, SF_6)
Target group	Fossil-fuel burning power plants	Large industrial and energy intensive installations	A wide range of activities
Number of sources	~ 3000 units	~ 10,000 units	Up to Jan 2008, ~900 registered projects
Market volume	In 2006, around 10 million tonnes of SO_2 were transferred among economically unrelated organizations The market price is currently US$500 per tonne	In 2006, 1100 million tonnes of CO_2 were traded for a sum of US$24.4 billion (~ US$22/tonne)	In 2006, 450 million tonnes of CO_2-equivalent were traded for a sum of US$4.8 billion (~ US$11/tonne) China has a dominant market-share of 61% under CDM
Benefit	By 2006, SO_2 emission has been reduced by 46% using 1980 as base year The capital cost of abatement equipment dropped significantly, for example cost of a scrubber, a standard SO_2 removal device, dropped from US$249 per kW in 1995 to US$100 per kW in 2000	Greenhouse gas emissions in EU's 27 member states decreased by 7.9 % between 1990 and 2005, and are projected to remain approximately at 2005 levels by 2010	Successfully promote technology transfer and financial support to assist the developing countries in cutting down greenhouse gas emissions

Environmental Protection Department
May 2008

Comparison of Emission Allowance Allocations of Advanced Countries/Economies

	USA Sulphur dioxide	**USA** Nitrogen oxides	**USA** Sulphur dioxide and nitrogen oxides [(1)]	**USA - Texas** Sulphur dioxide and nitrogen oxides
Statute	Title 40 CFR Part 73 Sulphur Dioxide Trading Program under the Acid Rain Program	Title 40 CFR Part 96 and 97 Nitrogen Oxides Budget Trading Program	Title 40 CFR Parts 96 and 97 Emission Trading Programs under the Clean Air Interstate Rule ("CAIR")	Texas Administrative Law Title 30, Part I, Chapter 101, Sub-chapter H, Division 2
Applicability	> 25 MW (Electricity)	> 25 MW (Electricity)	> 25 MW (Electricity)	-
Allocation methodology	**Sulphur dioxide** Phase II allowance allocation – A various range of allocation rates for allowance and the highest is 1.2 lb/MMBtu x baseline heat input (equivalent to about **5.4 tonnes/GWh**)	**Sulphur dioxide** Not Applicable	**Sulphur dioxide** Phase I (2010 to 2014) – To tighten the Acid Rain Program such that 1 emission allowance allows only 0.5 ton emission (equivalent to about **2.7 tonnes/GWh**) Phase II (2015 onwards) – To tighten the Acid Rain Program such that 1 emission allowance allows only 0.35 ton emission (equivalent to about **1.9 tonnes/GWh**)	**Sulphur dioxide** For grandfathered coal-fired power plants only – 1.38 lb/MMBtu x heat input in 1997 (equivalent to about **6.2 tonnes/GWh**)

	Nitrogen oxides Not Applicable	**Nitrogen oxides** 0.15 lb/MMBtu x baseline heat input (equivalent to about **0.68 tonnes/GWh**） The control period is the ozone season period, i.e. the five calendar months from May to September of a year The actual allocation may adjust upward or downward to ensure the sum of the allowances to be allocated will be the same as the prescribed ceilings This program is implemented in the 22 eastern states including DC The program will be replaced by the CAIR Ozone Season Trading Program from 2009	**Nitrogen oxides** Allocation is on pro-rata basis according to the baseline heat input with discounted factors For units operated before 1.1.2001, the discounted factors are as follows – - Coal: 1.0 - Oil: 0.6 - Other fuels: 0.4 For units operated after 1 January 2001, the baseline heat input is made reference to the following conversion factors – - Coal: 7,900 Btu/kWh - Other fuels: 6,675 Btu/kWh The average annual NOx allocation for coal units for Phase I (2009 to 2014) and Phase II (2015 onwards) are about **0.73 and 0.59 tonnes/GWh** respectively	**Nitrogen oxides** East Texas Region – 0.14 lb/MMBtu x heat input in 1997 (equivalent to about **0.63 tonnes/GWh**） West Texas and El Paso Regions – 0.195 lb/MMBtu x heat input in 1997 (equivalent to about **0.88 tonnes/GWh**）

			Control periods – - CAIR Annual Program: Full calendar year - CAIR Ozone Season Trading Program: May to September of every year	
	Respirable suspended particulates Not applicable	**Respirable suspended particulates** Not applicable	**Respirable suspended particulates** Not applicable	**Respirable suspended particulates** Not applicable

(1) *There are three trading programs under the CAIR. The CAIR SO_2 Trading Program will overlay the Acid Rain SO_2 Trading Program in the 29 eastern states including DC from 2010. The CAIR NOx Ozone Season Trading Program will replace the NOx Budget Trading Program from 2009. The CAIR NOx Annual Trading Program will be implemented from 2009 as a totally new program. Both CAIR NOx programs will be implemented in the 26 eastern states including DC.*

	UK Sulphur dioxide, nitrogen oxides and particulates	**Netherlands** Nitrogen oxides	**Canada - Ontario** Sulphur dioxide and nitrogen oxides	**Hong Kong** Sulphur dioxide, nitrogen oxides and respirable suspended particulates
Statute	Large Combustion Plants (National Emission Reduction Plan) Regulations 2007	Environmental Management Act, Chapter 16	Emissions Trading, Ontario Regulation 397/01	Air Pollution Control (Amendment) Bill 2008
Applicability	> 50 MWth (thermal input) – For large combustion plants existed on 1 July 1987 or before only	> 20 MWth (thermal input on plant basis) and > 1 MWth (thermal input on unit basis)	> 25 MWe (electricity), annual generation > 20,000 MWh electricity and (1) for SO_2, emission factor > 0.05 kg/MWh (2) for NOx, emission factor > 0.015 kg/MWh	> 5 MWe (electricity)
Allocation methodology	**Sulphur dioxide** 400 mg/m3 (equivalent to about **1.2 tonnes/GWh**)	**Sulphur dioxide** Not applicable	**Sulphur dioxide** 153,500 tonnes x A/B (equivalent to about **4.6 tonnes/GWh**)	**Sulphur dioxide** 25,120 tonnes x A/B (equivalent to about **0.60 tonnes/GWh**)
	Nitrogen oxides 500 m3/m3 (equivalent to about **1.5 tonnes/GWh**) From 2016 – 200 mg/m3 (equivalent to	**Nitrogen oxides** 2008 – 52 g/GJ x heat input (equivalent to about **0.53 tonnes/GWh**) 2009 – 46 g/GJ x heat input	**Nitrogen oxides** 41,300 tonnes x A/B (equivalent to about **1.3 tonnes/GWh**)	**Nitrogen oxides** 42,600 tonnes x A/B (equivalent to about **1.02 tonnes/GWh**)

	about **0.60 tonnes/GWh**)	(equivalent to about **0.47 tonnes/GWh**) 2010 – 40 g/GJ x heat input (equivalent to about **0.41 tonnes/GWh**)		
	Respirable suspended particulates 50 mg/m3 (as particulates**)** (equivalent to about 0.15 tonnes/GWh; or expressed as respirable suspended particulates about **0.10 tonnes/GWh**)	**Respirable suspended particulates** Not applicable	**Respirable suspended particulates** Not applicable	**Respirable suspended particulates** 1,260 tonnes x A /B (equivalent to about **0.03 tonnes/GWh**)
			Where – A = electricity generation of the facility B = total electricity generation of all the facilities	Where – A = electricity generation for local consumption of the power plant from 1999 to 2003 B = total electricity generation for local consumption of all power plants from 1999 to 2003

Environmental Protection Department
May 2008

Enclosure C

Determination of Compliance Status and Adjustment of Quantity of Emission Allowances

Scenario A – No emission trading nor special event

Note: All figures are for illustration only. They are NOT real figures.

1. Assuming that the following allowed emissions are imposed on a Power Station W upon renewal of its licence with validity of two years from 1 January 2011 –

Year	SO_2	NOx	RSP
2011	10,000	15,000	500
2012	10,000	15,000	500

The Authority will allocate and notify in writing Power Station W on or before 1 January 2011 the quantity of allocated allowances of 2011 as follows –

Quantity of allocated allowances	SO_2	NOx	RSP
At start of 2011	10,000	15,000	500
At start of 2012	10,000	15,000	500

2. To determine if the actual emissions are in compliance with the allowed emissions, Power Station W needs to monitor the emissions of SO_2 and NOx continuously and determine the RSP emission according to methods specified by the Authority and implement quality assurance and quality control programme according to the European Standard EN 14181 for ensuring data reliability and accuracy. The monthly emissions of SO_2, NOx and RSP are required to be submitted to the Authority within 30 days after the concerned month ends. The quarterly data will also be posted and made accessible to the public at Power Station W's website.

3. On or before 31 January 2012, Power Station W submits a report of the emissions of SO_2, NOx and RSP in 2011 as follows –

	SO_2	NOx	RSP
Actual emissions of 2011	9,900	14,000	490

4. The Authority will ascertain the actual emissions before 29 February 2012.

5. Power Station W have not bought from, or sold to, other power stations any emission allowances. The quantity of emission allowances in hand remains the same. As the actual emissions are all below the respective quantity of emission allowances, Power Station W is in compliance with the mandatory terms and conditions stipulated in the proposed Schedule 2A of the Bill for 2011.

6. According to the proposed section 26J of the Bill, Power Station W is allowed to adjust upward the quantity of emission allowances of the subsequent year, i.e. 2012, as follows:

	SO_2	**NOx**	**RSP**
Allocated allowances of 2011 at start of the year (A)	10,000	15,000	500
Quantity of emission allowances available for 2011 (B)	10,000	15,000	500
Actual emissions in 2011 (C)	9,900	14,000	490
Surplus in 2011 (D) = (B) - (C)	100	1,000	10
2% of allocated allowances of 2011 (E) = 0.02 x (A)	200	300	10
Maximum quantity of emission allowances for upward adjustment in 2012 (F) = Lesser of (D) and (E)	100	300	10

7. The Authority will notify in writing Power Station W that the total quantity of emission allowances of 2012 are adjusted upward to the respective figures presented below –

	SO_2	**NOx**	**RSP**
Total quantity of emission allowances of 2012	10,100	15,300	510

Scenario B – Occurrence of special events

Note: All figures are for illustration only. They are NOT real figures.

1. Assuming that the following allowed emissions are imposed on a Power Station W upon renewal of its licence with validity of two years from 1 January 2011 –

Year	SO_2	NOx	RSP
2011	10,000	15,000	500
2012	10,000	15,000	500

The Authority will allocate and notify in writing Power Station W on or before 1 January 2011 the quantity of allocated allowances of 2011 as follows –

Quantity of allocated allowances	SO_2	NOx	RSP
At start of 2011	10,000	15,000	500
At start of 2012	10,000	15,000	500

2. To determine if the actual emissions are in compliance with the allowed emissions, Power Station W needs to monitor the emissions of SO_2 and NOx continuously and determine the RSP emission according to methods specified by the Authority and implement quality assurance and quality control programme according to the European Standard EN 14181 for ensuring data reliability and accuracy The monthly emissions of SO2, NOx and RSP are required to be submitted to the Authority within 30 days after the concerned month ends. The quarterly data will also be posted and made accessible to the public at Power Station W's website.

3. It has been noted and reported in writing by Power Station W in August 2011 that the natural gas supply was interrupted because of a strike in July 2011. The emissions of July 2011 have thus been increased by the following quantity because of the use of coal-fired units for electricity generation to compensate for the reduction in supply from gas-fired units –

	SO_2	NOx	RSP
Expected emissions without the special event	1,000	2,500	50
Actual emissions with the special event	3,000	6,000	200
Increase of emissions due to the special event	2,000	3,500	150

To keep the emissions to the minimum, Power Station W has ensured that the generation would be made by those coal-fired units with flue gas desulphurization as far as possible.

4. On or before 31 January 2012, Power Station W submits a report of the emissions of SO_2, NOx and RSP in 2011 –

	SO_2	**NOx**	**RSP**
Actual emissions of 2011	12,000	14,950	600

5. The Authority will ascertain the actual emissions before 29 February 2012. Power Station W have not bought or sold any quantity of emission allowances. The quantity of emission allowances in hand remains the same. The actual emissions of Power Station W in 2011 have exceeded the allowed emissions of SO_2 and RSP by 2,000 and 100 tonnes respectively.

6. Because the special event occurred in July 2011, Power Station W may apply between 1 January 2012 and 1 March 2012 for increasing the quantity of allocated allowances under the proposed section 26K of the Bill for covering the unexpected increase in emissions as follows –

	SO_2	**NOx**	**RSP**
Increase of quantity of emission allowances applied	2,000	3,500	150

7. Within ten working days after receiving the application, the Authority will notify Power Station W in writing the decision. As the concerned event is beyond the control of Power Station W and practicable measures have been taken to minimise the emissions, it falls within the circumstances stipulated in the proposed section 26K(2)(a)(i) of the Bill. The following increase in the quantity of emission allowances due to the special event for 2011 will be issued –

Air pollutant	**Increase of quantity of emission allowances issued**	**Rationale**
SO_2	2,000	The applied increase is same as the increase of emission determined in paragraph 3 above
NOx	0	Increase in the quantity of emission allowances is not required as the actual emission of 2011 are less than the allowed emission

RSP	100	Lesser of (a) the increase due to the special event and (b) the amount of exceedance of actual emission over allowed emission, as the purpose of the issuance is for compliance of the emission cap requirements

8. According to the proposed Schedule 2B of the Bill, no fee will be required for the acquisition of these additional quantity of emission allowances.

9. After taking into account the increase in quantity of emission allowances due to the special event, Power Station W is allowed to adjust the quantity of emission allowances of the subsequent year, i.e. 2012, upward as follows –

	SO_2	**NOx**	**RSP**
Allocated allowances of 2011 at start of the year (A)	10,000	15,000	500
Quantity of emission allowances available for 2011 (B)	10,000	15,000	500
Actual Emissions in 2011 (C)	12,000	14,950	600
Increase of quantity of emission allowances due to special events (D)	2,000	0	100
Surplus in 2011 (E) = (B) + (D) - (C)	0	50	0
2% of allocated allowances of 2011 (F) = 0.02 x (A)	200	300	10
Maximum quantity of emission allowances for upward adjustment in 2012 (G) = Lesser of (E) and (F)	0	50	0

10. The Authority will notify in writing Power Station W that the total quantity of emission allowances of 2012 are adjusted upward to the respective figures presented below –

	SO2	**NOx**	**RSP**
Total quantity of emission allowances of 2012	10,000	15,050	500

Scenario C – Transfer of quantity of allocated allowances (local emissions trading)

Note: All figures are for illustration only. They are NOT real figures.

1. Assuming that the following allowed emissions are imposed on a Power Station W upon renewal of its licence with validity of two years from 1 January 2011 –

Year	**SO_2**	**NOx**	**RSP**
2011	10,000	15,000	500
2012	10,000	15,000	500

The Authority will allocate and notify in writing Power Station W on or before 1 January 2011 the quantity of allocated allowances of 2011 as follows –

Quantity of allocated allowances	**SO_2**	**NOx**	**RSP**
At start of 2011	10,000	15,000	500
At start of 2012	10,000	15,000	500

2. To determine if the actual emissions are in compliance with the allowed emissions, Power Station W needs to monitor the emissions of SO_2 and NOx continuously and determine the RSP emission according to methods specified by the Authority and implement quality assurance and quality control programme according to the European Standard EN 14181 for ensuring data reliability and accuracy. The monthly emissions of SO_2, NOx and RSP are required to be submitted to the Authority within 30 days after the concerned month ends. The quarterly data will also be posted and made accessible to the public at Power Station W's website.

3. Under the proposed section 26L(1) of the Bill, Power Station W may acquire from or transfer to other licensed power station any quantity of allocated allowances of 2011 from 1 January 2011 and 31 March 2012. The following are the transactions made during the period –

	SO_2	**NOx**	**RSP**
Acquired from Power Station Y on 1 December 2011	2,500	0	200
Transferred to Power Station Z on 28 February 2012	0	-2,500	0

To make the transaction valid, Power Station W needs to submit joint notification of the transaction with the relevant power stations involved in the transaction within five working days after the acquisition and in any event not later than 31 March in the year immediately following the emission year (i.e. 31 March 2012).

Accordingly, Power Station W has to submit together with Power Station Y and Power Stations Z, respectively, the joint notifications of transaction on or before 8 December 2011 and 6 March 2012 respectively.

4. On or before 31 January 2012, Power Station W submits a report of the emissions of SO_2, NOx and RSP in 2011 as follows –

	SO_2	**NOx**	**RSP**
Actual emissions of 2011	12,000	14,950	700

5. The Authority will ascertain the actual emissions before 29 February 2012.

6. As Power Station W has undertaken emission allowance transfers in the emission year, the quantity of emission allowances in hand for 2011 are as follows –

	SO_2	**NOx**	**RSP**
Quantity of allocated allowances at start of 2011 (A)	10,000	15,000	500
Quantity of allocated allowances acquired from Power Station Y (B)	2,500	0	200
Quantity of allocated allowances transferred to Power Station Z (C)	0	-2,500	0
Net quantity of emission allowances for 2011 (D) = (A) + (B) – (C)	12,500	12,500	700

7. As shown in the following table, although the actual emissions of SO_2 and RSP are equal or below the respective quantity of emission allowances, the actual emission of NOx exceeds the respective quantity of emission allowance. Power Station W is NOT in compliance with the mandatory terms and conditions stipulated in the proposed Schedule 2A of the Bill for 2011. Prosecution under section 30A of APCO will be initiated.

	SO_2	**NOx**	**RSP**
Net quantity of emission allowances for 2011 (D)	12,500	12,500	700
Actual emissions in 2010 (E)	12,000	14,950	700
Surplus / deficit (F) = (D) – (E)	500	-2,450	0
Compliance status	Yes	No	Yes
2% of allocated allowances of 2011 (G) = 0.02 x (A)	200	300	10
Maximum quantity of emission allowances for upward adjustment in 2012 (H) = Lesser of (F) and (G)	200	0	0

8. According to the proposed section 26I(1)(b) of the Bill, the quantity by which the relevant actual emission exceeds the relevant allowed emission shall be taken as part of the actual emission of that type of pollutant in the subsequent emission year. Accordingly, the deficit of 2,450 tonnes of NOx emission will be taken as part of the actual NOx emission of Power Station W in 2012.

9. For SO_2 emission, according to the proposed section 26J of the Bill, Power Station W is allowed to adjust upward the quantity of emission allowances of the subsequent year, i.e. 2012, by 200 tonnes, the lesser of the surplus and 2% of the allocated allowances.

10. The Authority will notify in writing Power Station W that –

    (a) the quantity of emission allowances for SO_2 of 2012 is adjusted upward to 10,200; and

    (b) the deficit of 2,450 tonnes of NOx emission shall be taken as part of the actual NOx emission in 2012.

11. For complying with the allowed emission of NOx in 2012, Power Station W needs to ensure that the emission of NOx from its generating facilities will not exceed 12,550 tonnes or acquire sufficient additional emission allowances from other power stations in that year.

Scenario D – Cross-boundary emissions trading

Note: All figures are for illustration only. They are NOT real figures.

1. Assuming that the following allowed emissions are imposed upon a Power Station W following renewal of its licence with validity of two years from 1 January 2011 –

Year	**SO_2**	**NOx**	**RSP**
2011	10,000	15,000	500
2012	10,000	15,000	500

The Authority will allocate and notify in writing the Power Station W on or before 1 January 2011 the quantity of emission allowances of 2011 and 2012 as follows –

Quantity of allocated allowances	**SO_2**	**NOx**	**RSP**
At start of 2011	10,000	15,000	500
At start of 2012	10,000	15,000	500

2. To determine if the actual emissions are in compliance with the allowed emissions, Power Station W needs to monitor the emissions of SO_2 and NOx continuously and determine the RSP emission according to methods specified by the Authority and implement quality assurance and quality control programme according to the European Standard EN 14181 for ensuring data reliability and accuracy. The monthly emissions of SO_2, NOx and RSP are required to be submitted to the Authority within 30 days after the concerned month ends. The quarterly data will also be posted and made accessible to the public at Power Station W's website.

3. Power Station W has teamed up with a coal-fired Power Station X generating 1,000 million kWh per year in the Pearl River Delta ("PRD") Region to undertake an emission reduction project to achieve the following emission performance from 2011 onward in Power Station X –

   (a) SO_2: 0.7 g/kWh;

   (b) NOx: 2.0 g/kWh; and

   (c) RSP: not applicable.

Assuming Power Station X falls in Phase I of the Table I of the Implementation Framework of the Emission Trading Pilot Scheme for Thermal Power Plants in the Pearl River Delta Region ("the Pilot Scheme"), the emission credits to be generated from this emission reduction project will be –

Air pollutant	**Generation performance standard stipulated under the Pilot Scheme (A), g/kWh**		**Emission performance after the emission reduction project (B), g/kWh**	**Emission credits to be generated = annual electricity generation x [(A) - (B)]**	
	2010 - 2014	2015 - 2019	-	2011 - 2014	2015 - 2019
SO_2	4.5	3.5	0.7	3,800	2,800
NOx	3.9	3.9	2.0	1,900	1,900
RSP	0.75	0.58	Not applicable	Not applicable	Not applicable

4. Power Station W has submitted their emission reduction proposal together with their PRD partner to the Emission Trading Management Panel of the Pilot Scheme ("the Management Panel") to acquire all the emission credits to be generated from 2011 to 2013, inclusive. The approval has been granted by the Management Panel in 2010.

5. To facilitate the use of these SO_2 and NOx emission credits in 2011, Power Station W needs to make an application under the proposed section 26M(4)(a) of the Bill to the Authority on or before 31 December 2011.

6. In approving the use of emission credits, the Authority may impose additional terms and conditions to ensure that the increase of emissions from Power Station W will not give rise to any adverse impact on the local air quality in the vicinity of the power station. Assuming that the Authority can only approve the following use of emission credits –

Year	**SO_2**	**NOx**
2011	2,800	1,900
2012	2,800	1,900
2013	2,800	1,900

7. Under the proposed section 26M(6) of the Bill, the Authority shall notify Power Station W in writing of the decision within 20 working days after receiving the application.

8. On or before 31 January 2012, Power Station W submits a report of the actual emissions of SO_2, NOx and RSP in 2011 –

	SO_2	**NOx**	**RSP**
Actual emissions of 2010	12,500	16,900	500

The Authority will ascertain the actual emissions before 29 February 2012.

9. Power Station W have not bought from, or sold to, other local power stations any emission allowances. The quantity of emission allowances in hand remains the same. The following deficits in emission allowances will be ascertained –

	SO_2	**NOx**	**RSP**
Quantity of emission allowances allocated for 2011 (A)	10,000	15,000	500
Actual emissions of 2011 (B)	12,500	16,900	500
Deficit (C) = (A) – (B)	-2,500	-1,900	0

10. To cover the above deficits of 2011 by the use of emission credits, under the proposed section 26M(4)(b) of the Bill, Power Station W needs to notify the Authority in writing of the acquisition of the emission credits with the supporting documents or information including –

(a) the verification of the emission reduction in 2011 by a professional consultant serving as an independent third party; and

(b) the certificate or approval with the quantity of emission credits certified for 2011 from the Management Panel

on or before 31 March 2012.

11. If the verified and certified quantity of emission credits are as follows –

	SO_2	**NOx**
Verified and certified emission credits of 2011	2,800	1,800

The Authority will update the quantity of emission allowances upon receipt of the notification from Power Station W within five working days (or by 31 March 2012) as follows –

	SO_2	NOx	RSP
Quantities of emission allowances allocated for 2011 (A)	10,000	15,000	500
Verified and certified emission credits of 2011 (B)	2,800	1,800	0
Net quantities of emission allowances available for 2011 (C) = (A) + (B)	12,800	16,800	500

12. As shown in the following table, although the actual emissions of SO_2 and RSP are equal or below the respective quantity of emission allowances, the actual emission of NOx exceeds the respective quantity of emission allowances.

	SO_2	NOx	RSP
Net quantity of emission allowances for 2011	12,800	16,800	500
Actual emissions in 2011	12,500	16,900	500
Increase in quantity of emission allowances due to failure to acquire quantity of emission credits (Please also refer to paragraphs 13 and 14 below)	0	100	0
Surplus/deficit	+ 300	0	0
Compliance status	Yes	Yes	Yes

13. If Power Station W considers that the shortfall of 100 NOx emission credits is solely due to the non-delivery of their partner in the PRD Region, i.e. Power Station X, and due diligence has been taken on their part to ensure the timely delivery of the said emission credits, according to the proposed section 26K(2)(a)(ii) of the Bill, it may apply, together with the supporting evidence and/or documents showing that the failure is beyond its control and that it has exercised all due diligence to prevent its occurrence, to the Authority during the period commencing on 1 January 2012 and ending 1 March 2012 for increase in the quantity of allocated allowances for covering the unexpected increase as follows –

	SO_2	NOx	RSP
Increase of quantity of emission allowances applied	0	100	0

14. Within ten working days after receiving the application, the Authority will notify Power Station W in writing the decisions. If the Authority satisfies that the failure is beyond the control of Power Station W and that it has exercised all due diligence to prevent its occurrence, an increase in the quantity of emission

allowances under application will be granted upon the payment of $20,000 per emission allowance by Power Station W.

15. For SO_2 emission, according to the proposed section 26J of the Bill, Power Station W is allowed to adjust upward the quantity of emission allowances of the subsequent year, i.e. 2012, by 200 tonnes, the lesser of the surplus and 2% of the allocated emission.

16. The Authority will notify in writing Power Station W that the quantity of emission allowances of 2012 is adjusted upward as follows –

	SO_2	**NOx**	**RSP**
Total quantity of emission allowances of 2012	10,200	15,000	500

Environmental Protection Department
May 2008