

For Information on
29 September 2005

**LEGISLATIVE COUNCIL
PANEL ON ENVIRONMENTAL AFFAIRS**

REDUCING EMISSIONS TO IMPROVE REGIONAL AIR QUALITY

Purpose

This paper informs Members the progress of measures for meeting the 2010 emissions reduction targets as agreed with the Guangdong Provincial Government in April 2002, as well as the emission reduction measures proposed by CLP Power Hong Kong Limited and Castle Peak Power Company Limited (hereinafter referred to collectively as CLP) and Hongkong Electric Company Limited (HEC) in their Financial Plans up to September 2008 and December 2008 respectively under the Scheme of Control Agreement (SCA).

Background

2. To improve regional air quality, the Hong Kong SAR Government and Guangdong Provincial Government have reached a consensus to reduce, on a best endeavour basis, the emission of four major air pollutants, namely sulphur dioxide (SO₂), nitrogen oxides (NO_x), respirable suspended particulates (RSP) and volatile organic compounds (VOC) by 40%, 20%, 55% and 55% respectively in the region by 2010, using 1997 as the base year. Achieving these targets will not only enable Hong Kong to meet its air quality objectives (AQOs) but also significantly improve the air quality of the Pearl River Delta (PRD) and relieve the regional smog problem.

3. In December 2003, the two governments jointly drew up the Pearl River Delta Regional Air Quality Management Plan (the "Management Plan") with a view to meeting the above emission reduction targets. The Pearl River Delta Air Quality Management and Monitoring Special Panel was set up under the Hong Kong/Guangdong Joint Working Group on Sustainable Development and Environmental Protection to follow up on the tasks under the Management Plan. A regional air quality monitoring network is now under testing and will be in full operation within this year to provide comprehensive and accurate air quality data.

Emission Reduction Measures in Hong Kong

4. As a result of various emission reduction measures implemented in recent years, Hong Kong has achieved good progress in reducing the total emissions of NO_x, RSP and VOC. For SO₂, however, much of the effort has been vitiated by the increase in emissions from the power plants. Details are presented in Table 1 below–

Table 1: Progress in Achieving the 2010 Emissions Reduction Target

	Emission Level in 1997 (tonnes)	Emission Level in 2003 (tonnes)	Changes in Emission Level during 1997-2003	Reduction Target for 2010
SO ₂	64,500	90,900	+41%	-40%
NO _x	110,000	96,600	-12%	-20%
RSP	11,200	7,380	-34%	-55%
VOC	54,400	41,800	-23%	-55%

Table 2: Contribution of emission sources to total emissions in 2003

Sources	Share of total emissions in 2003 (%)			
	SO ₂	NO _x	RSP	VOC
Power Generation	92.2	57.2	45.9	0.9
Road Transport	0.1	20.8	28.4	16.8
Navigation	4.0	15.7	6.2	0.7
Civil Aviation	0.2	3.3	0.6	0.8
Other Fuel Combustion	3.5	3.0	3.2	0.3
Non-combustion	-	-	15.7	80.5
Total	100	100	100	100
Total Emission (Tonnes)	90,900	96,600	7,380	41,800

5. As indicated in Table 2 above, in 2003, power plants accounted for about 92%, 57% and 46% respectively of the total emissions of SO₂, NO_x, and RSP in Hong Kong. The emission trends of the power companies during 1997 and 2003 are set out below –

Table 3: Trend of Emissions from Power Plants

CLP (tonnes)	1997	1998	1999	2000	2001	2002	2003	Changes in Emission Level during 1997-2003
SO ₂	30,734	37,728	24,405	29,725	30,455	26,851	51,059	+66%
NO _x	39,414	40,796	26,510	28,022	22,347	23,476	38,202	-3%
RSP	2,572	2,679	1,643	1,910	1,011	1,223	1,697	-34%

HEC (tonnes)	1997	1998	1999	2000	2001	2002	2003	Changes in Emission Level during 1997-2003
SO ₂	23,700	23,233	23,346	27,035	28,767	33,274	32,765	+38%
NO _x	16,670	14,434	15,234	15,571	15,973	16,523	17,018	+2%
RSP	1,175	1,167	1,147	1,714	1,394	1,445	1,686	+43%

6. Road Transport is the second major source of emissions, accounting for about 21%, 28%, 17% of total NO_x, RSP, and VOC respectively in 2003. It accounted for an insignificant (0.1%) amount of total SO₂ emission. Compared with 1997, vehicular emissions of SO₂, NO_x, RSP and VOC in Hong Kong have reduced by 93%, 35%, 60% and 46% respectively by the end of 2003.

7. Between 1999 and 2004, the RSP and NO_x levels at roadside reduced by 9% and 24% respectively. The number of smoky vehicles also dropped by nearly 80%. However, the concentrations of RSP recorded at the general air monitoring stations increased by 15% from 1999 to 2004, whereas those of ozone increased by 26% during the same period. It is evident that the air quality of Hong Kong is increasingly affected by regional air pollution.

8. To fully achieve the 2010 emission reduction targets, the following additional emissions reduction measures are being pursued/implemented by the Government –

- (a) tightening the motor petrol standard to Euro IV with effect from 1 January 2005;
- (b) requiring the installation of vapour recovery systems for vehicle refuelling at petrol filling stations from 31 March 2005;
- (c) preparing for the introduction of Euro IV emission standards to newly registered vehicles by 2006;
- (d) requiring power companies to take measures to reduce emissions and increase the use of natural gas in electricity generation; and
- (e) working on a scheme to control VOC emissions from selected products.

Emission Reduction Measures in Guangdong

9. The Guangdong Provincial Government has committed to pursue the following emissions reduction measures –

- (a) Four large natural gas power plants are being constructed and are expected to be commissioned in phases from 2006 and natural gas trunk pipelines are being constructed to supply a number of cities in PRD;
- (b) Flue gas desulphurization (FGD) systems are being retrofitted to all generation units of capacity above 125MW in existing power plants. When these projects are completed by 2007, a total of 225,000 tonnes of SO₂ emissions will be reduced each year. FGD retrofitting works have been completed for Shenzhen Xibu Power Plant (Units 4, 5 and 6), Dongguan Shaojiao Power Plant A (Unit 5), Guangzhou Hengyun Power Plant, Guangzhou Ruiming Power Plant, Jiangmen Taishan Power Plant while works on the 11 remaining power plants have commenced;
- (c) Low-NO_x burner (LNB) will be installed to power generation units being modified and expanded. By 2010, all existing thermal power plants will be retrofitted with LNBs;
- (d) Energy consuming and highly polluting coal-fired boilers and industrial furnaces will be phased out or will be required to use clean fuel, clean combustion technology, to install FGD and to adopt NO_x control measures to reduce emissions;
- (e) various industrial processes and facilities with high SO₂ and dust emissions will be phased out; and
- (f) motor diesel with sulphur content less than 500 ppm has been introduced in PRD since 2004. Tailpipe emissions from motor vehicles are being controlled. Newly registered motor vehicles have to comply with China II (equivalent to Euro II) standards from July 2005. Guangdong is preparing to require newly registered motor vehicles to comply with China III (equivalent to Euro III) standards in 2006 and will study the feasibility to adopt China IV (equivalent to Euro IV) and China V (equivalent to Euro V) standards for light-duty and heavy-duty vehicles respectively by 2010.

10. The Legislative Council passed a motion on 15 December 2004, urging the Government to discuss with Guangdong Provincial Government on measures to improve regional air pollution including the introduction of an emissions trading pilot scheme. We are working with the Guangdong Environmental Protection Bureau (GDEPB) on an emissions trading pilot scheme covering power plants in Hong Kong and PRD. The setting up of such pilot scheme is supported by the State Environmental Protection Administration. EPD is

working with GDEPB with a view to submitting a study report to the two governments by mid-2006 and presenting in the third quarter of 2006 the details of the pilot scheme to the power plants in Hong Kong and PRD, so that the prospective participants can identify their trading partners and draw up the emissions trading agreements on a commercial basis.

Emission Reduction Proposals of the Power Companies

11. Recognizing Government's efforts to improve local and regional air quality, CLP and HEC have submitted their emission reduction proposals in their respective Financial Plans.

CLP's Proposal

12. In its 2005 Financial Plan for the period up to September 2008, CLP proposes to retrofit coal-fired generating units at Castle Peak Power B Station with FGD plant and Selective Catalytic Reduction (SCR) plant for reducing atmospheric emissions. The new FGD and SCR systems would reduce emissions of SO₂ by about 90% and NO_x by about 80% from the retrofitted units. CLP noted, in putting forward the proposal, that the project requires major capital investment and long lead time. Hence, while CLP would proceed with the necessary preparatory planning and upfront engineering work, it will review the way forward in light of the Government's long-term environmental policy and the succeeding regulatory regime, prior to making major investment commitment for this project.

13. The proposed project against the 2010 emission reduction targets has been assessed with the assistance of an independent expert consultant, Nexant Inc. (Nexant). Nexant has advised that –

- (a) CLP cannot meet its emission targets to be stipulated by EPD for SO₂, NO_x and RSP by 2010; but
 - (i) will be able to meet the target for NO_x in around 2012 when the FGD and SCR retrofit projects are fully implemented; and
 - (ii) will meet the target for SO₂ from 2012 onwards if new natural gas supply is also secured by 2011;
- (b) CLP's proposal is the most viable and cost-effective option for reducing SO₂ and NO_x emissions, among other alternatives, such as repowering of existing coal-fired units with Combined Cycle Gas Turbine (CCGT) and switching to natural gas for the existing coal-fired units;

- (c) CLP's proposed budget is reasonable and justified; and
- (d) CLP has not put forward any proposal to reduce RSP emissions though the FGD retrofit will lower the RSP emissions to some extent. However, there are no cost-effective technologies available to further reduce RSP on coal-fired units already equipped with electrostatic precipitators. Repowering of existing coal-fired units with CCGT and switching to cleaner fuel (which will entail higher cost and be dependent on additional gas supply) or RSP emissions trading are the only alternatives.

HEC's Proposal

14. HEC proposes in its 2004-2008 Financial Plan to retrofit the two coal-fired Units L4 and L5 with LNB and FGD plant for reducing atmospheric emissions.

15. Having assessed the proposed projects against the 2010 emission reduction targets, Nexant has advised that –

- (a) HEC cannot meet the emission targets to be stipulated by EPD for SO₂, NO_x and RSP by 2010, but
 - (i) will be able to meet the target for NO_x from 2011 onwards when the FGD and LNB retrofit projects are fully implemented; and
 - (ii) will meet the target for SO₂ from 2011 if the gas-fired combined cycle L10 unit is also in service in 2010;
- (b) HEC's proposal is the most viable and cost-effective option for reducing SO₂ and NO_x emissions, among other alternatives, such as repowering of existing coal-fired units with Combined Cycle Gas Turbine (CCGT) and switching to natural gas for the existing coal-fired units;
- (c) HEC's proposed budget is within the industry norm and is justified; and
- (d) HEC has not put forward any proposal to reduce RSP emissions although the FGD retrofit will lower the RSP emissions to some extent. There are no cost-effective technologies available to further reduce RSP on coal-fired units already equipped with electrostatic precipitators. Repowering of existing coal-fired units with CCGT and switching to cleaner fuel (which will entail higher cost and be dependent on additional gas supply), or RSP emissions trading are the

only alternatives.

16. As the proposals of CLP and HEC are not sufficient for achieving the emission reductions needed for improving the air quality in Hong Kong and in PRD by 2010, they have been informed that the consideration or approval of the Financial Plans shall not be or be taken as a representation or promise that Government considers or has accepted as adequate the emission reduction projects in meeting the intended emission caps as conditions which may be specified upon renewal of Specified Process Licences issued pursuant to the Air Pollution Control Ordinance (APCO). To meet the intended caps for 2010, the power companies will need to take additional measures such as speeding up the current work programme, replacing some coal-fired units with gas-fired combined cycle gas turbines, and participating in emissions trading.

17. Moreover, EPD is taking the opportunity, in the renewals of the Specified Process Licence under the APCO, to impose emission caps on power plants with a view to reducing the emissions to the practical minimum. With effect from 1 August 2005, emission caps have already been imposed on the Castle Peak Power Station of CLP.

18. EPD will continue to impose emission caps on power plants upon the licence renewal of power stations to ensure that their emissions will be reduced to the practical minimum.

19. Since the approval of the Financial Plans in June 2005, we have been discussing with the two power companies with a view to finding a package of effective measures for meeting the emissions reduction targets by 2010. As a result, HEC has agreed to review the possibility of accelerating the emissions reduction projects proposed in the 2004-2008 Financial Plan and to join EPD to set up a Task Force to work out a scheme of emissions trading. CLP has responded that they are increasing the use of ultra low sulphur coal, progressing with the upfront engineering work for their emissions reduction projects, exploring the possibility of optimizing the schedule, pursuing the Liquefied Natural Gas (LNG) project to increase the availability of natural gas, and discussing emissions trading with EPD. We will continue to pursue with CLP the acceleration of emissions reduction projects proposed in their 2005 Financial Plan.

Environmental Protection Department
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