Annex C1

EIA Reports related to HZMB

Supplementary Information on Further Elaboration of the Key Assumptions for Regional Air Quality Emission Inventory

1. Introduction

1.1 As stated in the EIA Reports for HKLR and HKBCF, the background air pollution concentrations for the assessment year at 2031 have been predicted using the PATH model, a well-proven regional air quality model.

1.2 This PATH model covers the pollution sources in both the Pearl River Delta Economic Zone (PRDEZ) and HKSAR. A number of emission sources have been incorporated into the pollution inventory, including power stations, aviation, transportation, industries, biogenics etc.

1.3 In deriving the regional pollutant emission inventory for 2031, reference has been made to the relevant information available, including but not limited to the Mid-Term Review Report, 珠江三角洲環境保護規劃綱要 (2004 – 2020)[1] etc. which have been mentioned in the EIA Reports.

1.4 This supplementary information serves to provide further elaborations on the key assumptions considered in deriving the regional emission inventory for 2031.

2. 珠江三角洲環境保護規劃綱要

2.1 珠江三角洲環境保護規劃綱要[1, 2] was jointly prepared by the Guangdong Province Government and the State Environmental Bureau in early 2004. It comprehensively reviewed the environmental setting in the PRD area and aims to implement timely and appropriate mitigation measures to improve the environmental aspects including but not limited to ecology, air, water quality, waste etc.

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[1] http://www.gdepb.gov.cn/hjgl/ghjh/zlxz/200510/P020051017795765658003.doc 珠江三角洲環境保護規劃綱要 (2004-2020)

[2] http://www.gdepb.gov.cn:82/gate/big5/www.gdepb.gov.cn/ztzl/hbxc/mtbd/ycwb/t20060829_44320.html 廣東環境保護公眾網於 2006 年發放有關「環保規劃」的資訊

2.2 For air quality pollution, the 珠江三角洲環境保護規劃綱要 proposed emission targets for a number of air pollutants for 2010 and 2020. **Appendix I** shows the emission targets for 2010 and 2020 in the 珠江三角洲環境保護規劃綱要 and the following table summarizes the key information.

Table 1 : Emission Target in 珠江三角洲環境保護規劃綱要

Pollutant	Emission Target 2020, Tonne pa	% Reduction (cf 2010)
SO_2	358,000	10%
NO_x	395,000	5.5%
RSP	270,000	5%

Note : Relevant air pollutants extracted from item 4 , 5 & 6 of 環境保護目標指標 in Annex 1.

2.3 In order to achieve that, the 珠江三角洲環境保護規劃綱要 has considered a series of reduction measures including the following -

- Use of more renewable energy;
- Utilise more the electricity from the western part of China;
- Promote the use of natural gas for power generation;
- Utilise more nuclear energy;
- Implement more NO_x removal technology;
- Switch more industrial diesel furnaces to use natural gas;
- Encourage more environmental friendly vehicles (eg. electric and LNG vehicles); and
- Promote domestic utensils to use natural gas etc

3. <u>The Mid-Term Review</u>

3.1 The Mid-Term Review[3] was jointly conducted by EPD of HKSAR and the Environmental Protection Bureau of Guangdong Province (GDEPB) and was completed in early 2008. It sought to assess the effectiveness of the existing emission reduction measures contained in the PRD Regional Air Quality Management Plan 2003; examine the emission trends of the four major air pollutants, namely, sulphur dioxide (SO_2), nitrogen oxides (NO_x), respirable suspended particulates (RSP) and volatile organic compounds (VOC); project the levels of emission and the extent to which the reduction targets could be achieved

[3] http://www.info.gov.hk/gia/general/200801/08/P200801080185.htm HKSAR Government Information Press Release in Jan 2008 on "Pearl River Delta Regional Air Quality Management Plan Mid-term Findings"

by 2010 based on the latest economic and social developments; and recommend necessary additional emission control measures.

3.2 The main conclusions of the Mid-Term Review are summarized as follows -

- The emission reduction and control measures adopted by both sides under the management plan could bring about a positive impact on abating air pollutant emissions in the region, and are therefore conducive to achieving the agreed 2010 emission reduction targets by both sides;
- Upon implementation of the current and committed emission reduction measures under the management plan, the HKSAR should be able to fully meet the mutually agreed emission reduction targets by 2010; and
- In respect of the PRDEZ, with its significant socio-economic developments which well exceeded the original estimates, the emission reduction targets could be achieved by 2010 upon implementation of additional enhanced control measures as recommended in the Mid-Term Review Report.

3.3 The Mid-Term Review Report was considered by the 10th working meeting of the Hong Kong/Guangdong Co-operation Joint Conference in early 2008. Both sides reiterated their commitments to continuing with the various control measures set out in the management plan. The Guangdong Provincial Government will implement additional emission control measures in the PRDEZ taking account of the recommendations of the Mid-Term Review. Both sides also reaffirmed their determination to achieve in time the mutually agreed emission reduction targets by 2010.

3.4 The Mid-Term Review Report therefore represents a more updated version of the 2010 emission inventory, for both the PRDEZ and HKSAR.

4. <u>Implementing the PRDEZ Air Pollution Inventory</u>

4.1 In order to implement the PRDEZ emission for 2020 and supplement on other pollutants that were not reported in the珠江三角洲環境保護規劃綱要 but required for the PATH model, additional information[4, 5, 6, 7, 8, 9] available after the issuance of 珠江三角洲環境保護規劃綱要has therefore been considered and incorporated as necessary. This approach and the measures adopted are consistent

[4] The White Paper on PRC Energy Status and Policy, PRC State Council (2007)
[5] Medium and Long Term Development of Renewable Energy, PRC State Council (2007)
[6] Pan PRD Energy Co-operation 11th 5 Year Plan, Energy Research Institute National development and Reform Commission (2006)
[7] Medium and Long Term Development of Nuclear Energy 2003 – 2020, PRC State council (2007)
[8] World Energy Assessment Overview 2004 Update (2004)
[9] PRD Environmental Protection Planning, PRD Environmental Protection Planning Committee, China Environmental Science Press (2006)

with other regional air quality study being conducted by EPD and have been discussed with the relevant departments from the PRDEZ.

4.2 It has been demonstrated that the regional emission for most of the pollutants including NO_x and RSP from 2010 to 2020 would be decreasing. On this basis, it becomes reasonable to assume that the pollution inventory in the assessment year of 2031 would be even lower.

4.3 For conservatism in the air quality assessment, the EIA Reports for HKLR, HKBCF and TM-CLKL have not assumed the full achievement of PRDEZ emission-reduction 2020 (even though the assessment year is 2031). It is assumed that only half of the emission reduction in PRDEZ from 2010 to 2020 could be materialized in 2031. This is obviously a very conservative assumption. For presentation purpose, this is described as the "2015 inventory" in the EIA Reports for HKBCF, HKLR and TM-CLKL to indicate that the inventory is mid-way between the inventory for 2010 and 2020.

5. Updating the HKSAR Air Pollution Inventory

5.1 Similar exercise has also been conducted for the air pollution inventory for HKSAR. However, given the relative proximity of the emission sources in HK and in order to be more conservative, the pollution inventory for HKSAR has been further updated as described in the EIA Reports. A summary of these is given below for easy reference.

- The emission for HK International Airport has been updated to reflect their operational capacity. Emission source groups that have been considered include aircraft movements, ground support equipment, auxiliary power units, engine run-up facilities, fuel tanks and aircraft maintenance.
- The power stations in HK would only use 50% of natural gas even up to 2031 (about 20 years from now). This is also a conservative assumption since the power companies in HK has stated in their publications that they have plans to increase the utilization of natural gas to 50% by the early 2010's. The percentage of utilizing natural gas should be even higher by 2031.
- All the marine emission within HK has also been projected up to 2031 based on the growth factors assumed in the Port 2020 Study. This is based on the current marine fuel quality. In fact, the government is encouraging the use of more environmental friendly fuel for marine vessels. It is anticipated that the emission from marine vessels should be improving in the long run. This is therefore also a conservative assumption for this air quality assessment.

- The government is encouraging the use of environmental friendly vehicles including but not limited to hybrid cars and even electric cars. The proportion of hybrid cars and electric cars are anticipated to increase in the future when the market is getting more mature and when more infrastructures become available. In the EIA assessment however, it is assumed that the vehicular emission would continue to be increasing up to 2031; but yet neither hybrid nor electric cars were assumed in the air quality model. This is therefore also a conservative assumption for this air quality assessment.

6. Conclusion

6.1 The updated regional pollution inventory for 2031 has been included in Appendix 5D of the EIA Report for HKBCF and HKLR. It is also shown in **Appendix II** for easy reference.

6.2 The following summarizes the key assumptions for updating the regional air quality emission inventory -

- The 2020 emission inventory in the 珠江三角洲環境保護規劃綱要 has been reviewed by taking into account the information available after its issuance.
- In order to be conservative in the air quality assessment, the PRDEZ air quality inventory for 2031 has been assumed to be only mid-way between the 2010 inventory as in the Mid-Term review and the updated 2020 inventory.
- The emission inventory for HKSAR has also been updated to 2031 by assuming a number of conservative assumptions.

附表 1：环境保护目标指标

序号	指　　标	2002 年	2010 年	2020 年
1	生活污水排放量（亿吨）	34.5	58.4	65.0
2	工业废水排放总量（亿吨）	16.8	28.0	38.0
3	工业生活 COD 排放总量（万吨）	99.1	87.4	69.6
4	SO_2 排放总量（万吨）	60.6	39.8	35.8
5	NOx 排放总量（万吨）	52.4	41.8	39.5
6	PM_{10} 排放总量(万吨)	33.8	28.4	27.0
7	集中式饮用水源水质达标率（%）	83.3	95.0	100
8	城市水环境功能区水质达标率（%）	48.3	90.0	100
9	跨界水体水质达标率（%）	<50	80	100
10	近岸海域水环境质量达标率（%）	80	90	100
11	达到二级空气质量以上天数（天/年）	353	355	355
12	酸雨频率（%）	50	40	30
13	烟尘控制区覆盖率（%）	98	100	100
14	森林覆盖率（%）	41.9	42.5	45.0
15	建成区绿化覆盖率（%）	35	40	45
16	城镇人均公共绿地面积（m^2）	10.9	12.0	15.0
17	自然保护区覆盖率（%）	2.4	6.3	6.8
18	环境保护投资占 GDP 比例（%）	2.6	3.5	3.0
19	单位 GDP 用水量（吨/万元）	70.7	43.8	27.4
20	单位 GDP 能耗（吨标煤/万元）	0.9	0.5	0.2
21	单位 GDP COD 排放强度（千克/万元）	10.4	3.5	1.4
22	单位 GDP SO_2 排放强度（千克/万元）	6.3	1.6	0.7
23	工业用水重复率（%）	18.4	50.0	70.0
24	城镇生活污水集中处理率（%）	31.1	70.0	85.0
25	规模化畜禽养殖场粪便综合利用率（%）	/	80	95
26	机动车尾气达标率（%）	83	90	95
27	生活垃圾达标处理率（%）	10	60	90
28	工业固体废物处置利用率（%）	84	95	98
29	危险废物安全处置率（%）	81.9	100	100

Project : HKBCF and HKLR

Title : Summary of 2031 Emission Inventory

Emission Group	Annual Emission (2031), Tonne / Yr			
	SO_2	NO_x	RSP	VOC
Power Plant, Industry, Transportation, VOC Containing Product and others in PRDEZ	394,369	440,991	204,162	173,260
Aircraft Take – Off, Climb Out, Approach, Idling / Taxing	446	8,665	100	1,140
Ground support Equipment	70	189	52	18
Auxillary Power Units	24	156	0	20
Engine Run-up Facilities	1	31	0	2
Fuel Tanks	0	0	0	8
HKSAR - Power Plant	11,698	17,375	737	420
HK Industry (see Note 1)	1,399	7,121	820	4,762
HK Marine	7,169	36,151	1,539	1,536
HK Roads (except those on Lantau)	359	7,337	296	3,665
Petrol car and evaporation of petrol	0	0	0	1,263
Tire wear and brake	0	0	854	0
Non-Road Mobile Source	0.1	26	3	3
VOC Containing Sources	0	0	0	18,939
Commercial & domestic fuel combustion	6	1,982	137	98
Others	0	17	9	334

Note: Emission from the proposed project and other roads on Lantau are separately quantified.

Note 1 : Emission from EcoPark, STF, Green Island Cement have been included in the emission inventory.