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Members of the CDM Executive Board
UNFCCC Secretariat
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31 October 2008

Dear Members of the CDM Executive Board,

Request for review – "Nantong Coalmine Methane" (1929)

Please find below our response to the issues raised in the request for review for this project.

1. The DOE shall further clarify how the quantity of coalmine methane to be generated from the project are estimated and verified

Project Proponent response: Although this question is addressed to the DoE, we would like to provide the following further clarifications:

Future coalmine methane extraction rates are based upon the coalmine's own mining projections and plans, since CMM extraction is a safety requirement as part of the coal extraction operations. The coalmine estimates the future CMM extraction rates based on a complex process that can be simplified in the following three steps:

1. Determining the total coal gas released per year due to mining
2. Cross-checking this value with the estimated total reserves of coal gas below ground
3. Determining the proportion of this gas that is likely to be of sufficient methane concentration to be useable in energy applications

<u>Determining the total coal gas released per year due to mining:</u>

The amount of gas that will be released as a result of mining activities is determined based on the gassiness of the coal (the average methane released per tonne of coal extracted) and the amount of coal that is expected to be extracted per year, as follows:

$$Q_y = q \; X \; m_y$$

Where:

Q_y = Total expected methane released in year y, m3
q = Average methane released per ton of coal extracted, m3/t
m_y = Amount of coal to be extracted in year y, t

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Analysis of the most recent historic data at the time of decision making (2005) by the coalmines shows that the quantity methane released per ton of coal as a result of mining activities is:

	Nantong	Hongyan	Yutianbao	Donglin	Yanshitai
Observed ratio of methane per ton coal extracted (m^3/t)	43.7	44.7	54.8	31.4	40.21

Giving an average (q) of (43.7 + 44.7 + 54.8 + 31.4 + 40.21) / 5 = 42.962 m3/t of coal extracted from the Nantong coalfields.

The coalmining company's planned annual coal production target for 2006 was 2.1 million t/a, providing the m_y parameter. This then gives the annual gas release volume for 2006 as:

Q_y = 42.962 *X* 2,100,000
= 90,220,200 m3

Methane is extracted from the mines in two ways: as relatively high concentration CMM from the underground drainage network, and as low concentration ventilation air methane (VAM) from the ventilation system. It is not possible for all of the methane released from the coal mines to be extracted as CMM via the underground drainage network; a portion will also be drained as ventilation air methane (VAM) by the ventilation system. However the mines aim to ensure that at least 25% of the gas released by the coalmining operations would be drained via the underground drainage network, since reducing the proportion of methane drained via the ventilation system generally reduces the risk of the concentration of methane in the air underground surpassing safe desired levels. Increasing the proportion of gas extracted via the underground drainage network has the effect of improving mining safety. Expected CMM extracted by the underground drainage system, in pure methane terms for 2006 was therefore conservatively estimated as 25% of the total methane released from the mine, as follows:

90,220,200 X 25% = 22,555,050 m3

This number is then adjusted to 22,400,000 m3, taking into account that around 160,000 m3 of gas would come from a mine not part of the project. Similar calculations are used to determine the CMM generation for the mines upon an individual basis and for the years 2007-2010+ where minor adjustments are made either due to increased production targets or increased % of gas drained via the underground network resulting in the projected CMM generation estimation of:

Year	Nantong	Hongyan	Yutianbao	Donglin	Yanshitai	Annual Volumes (m3)

2006	8,100,000	2,600,000	4,500,000	4,200,000	3,000,000	22,400,000
2007	8,200,000	3,000,000	4,800,000	4,500,000	3,100,000	23,600,000
2008	8,300,000	3,800,000	5,300,000	4,800,000	3,200,000	25,400,000
2009	8,500,000	4,500,000	5,500,000	5,500,000	3,500,000	27,500,000
2010 and beyond	9,000,000	5,500,000	5,800,000	6,000,000	4,000,000	30,300,000

Cross-checking this value with the estimated total reserves of coal gas below ground

In order to make sure that the value derived above is realistic, the estimate can be cross-checked against the total volume of methane gas reserves stored in the coalfields that could be released due to coalmining activities. Here the coalmines uses the below method to calculate the reserves:

$$W = W_1 + W_2 + W_3$$

Where:

W = Total reserves that would be released due to mining m^3;
W_1 = Methane held within coal seams being directly mined, m^3
W_2 = Methane held by coal seams that are not mined but would release gas into the mining areas as a result of mining activities, m^3
W_3 = Methane held in the surrounding rock formations， m^3;

The Nantong coalfield has 6 coal seam layers with 3 being mined and 3 not mined but gas from these seams must still be drained for logistic and safety reasons as part of normal mining activities as the seams not mined are directly over the mined seams. Using a combination of historic gas drainage records, gas content analysis and field tests carried out by the coalmines, the total estimated amount of methane that stand to be released is:

		Nantong	Hongyan	Yutianbao	Donglin	Yanshitai
Total methane stored million m^3	Within layers being mined	1280	520	290	490	230
	Within layers not mined and surrounding rocks	840	380	310	350	120
	total	2120	900	600	840	350

Here W would = (1280+520+290+490+230) + (840+380+310+350+120)
= 2810 + 2000
= 4810 (million m^3)

The annual CMM extraction rate of the mines remains a small fraction of the total CMM stored in the strata below ground. Based on the annual methane released estimation for the

year 2006, these levels of CMM extraction could be sustained for at least 53 years before the coal (and CMM) supply was exhausted:

4,810,000,000 / 90,220,200 = 53.31 Years

This shows that the estimations for the CMM generated for the project activity period are feasible even when taking into account of the small increases in the annual gas extraction due to increased coal production in the baseline.

Determining the proportion of this gas that is likely to be of sufficient methane concentration to be useable in energy applications

For CDM purposes the total volume of expected CMM generation, although based upon the above mentioned projections, has been further adjusted with an analysis conducted upon the historic CMM methane concentrations at the mines. Considering that not all the CMM extracted will contain sufficient methane concentrations to be used in energy applications, not all of the methane calculated above can be considered as useable. In order to reliably estimate just how much methane from CMM would be useable the Project Participants used the below method:

Useable CMM = CMM generated in year y X Adjustment factor

The adjustment factor is the percentage of the methane volume where the methane concentration within the CMM is above 30% (and therefore usable in accordance to local regulations) relative to the total volume of methane drained through CMM. Historic records of the hourly and daily CMM methane concentration levels for each mine was examined (up to the most recent 3 years), the annual adjustment factor was calculated as:

Adjustment Factor =

$$\frac{\text{Methane volume where the methane concentration within the CMM is above 30}}{\text{Total volume of methane drained through CMM}}$$

Using this method resulted in:

	Nantong	Hongyan	Yutianbao	Donglin	Yanshitai
Adjustment factor (%)	48	87	96	68	85

The adjustment factors are applied to the expected CMM generation volumes for each mine, For example:

It is estimated that the Donglin mine would generate 4.2 million m3 of methane through CMM, however in 2004 out of the 3,797,399 m^3 of methane extracted only 2,580,628 m^3 was above 30% in concentration at the time of extraction, giving an adjustment factor of 68%. Therefore

future estimations of the generation by the Donglin mine need to be changed to take in to account of actual useable volumes as shown in the below table.

Year	Nantong	Hongyan	Yutianbao	Donglin	Yanshitai	Annual Volumes (useable m^3)
2006	3,888,000	2,262,000	4,320,000	2,856,000	2,550,000	15,876,000
2007	3,936,000	2,610,000	4,608,000	3,060,000	2,635,000	16,849,000
2008	3,984,000	3,306,000	5,088,000	3,264,000	2,720,000	18,362,000
2009	4,080,000	3,915,000	5,280,000	3,740,000	2,975,000	19,990,000
2010 and beyond	4,320,000	4,785,000	5,568,000	4,080,000	3,400,000	22,153,000

However, taking into account that gas flows in the coalmines are not always stable and can fluctuate, as a further conservative measure, the available useable methane was further analysed to double check that future demands by the project can be met when taking into gas flow fluctuations. Here the available number of hours for each of the coalmines where the concentration of methane was more than 30% was calculated, resulting in the following table:

Name of the Coalmine	Percentage of the hours where the extracted gas has a methane concentration of above 30%		
	2004	2005	2006
Nantong	19%	31%	36%
Donglin	68%	98%	93%
Yanshitai	Data Not Available	Data Not Available	85%
Hongyan	87%	96%	100%
Yutianbao	35%	36%	41%

The average value of the above is approximately 63% and when applied to the previous calculated methane extraction rate for 2006 of 15,876,000 m3 would give around 10,000,000 m3. The annual methane demand of the project is 7,819,760 m3 and considering the project has over 55,000 m3 of gas storage capacity to provide a considerable buffer zone to periods of low gas flow, the methane supply to end users is deemed to be generally unaffected by normal gas fluctuations even when very conservative measures are applied the project future drainage can meet demands.

2. The PP/DOE shall further clarify the baseline conditions regarding the gas supply network to the residents, and the boilers to be replaced. Also the work programme for laying of gas network, and thus the timing for the full delivery of methane to the residents shall be reported.

Project Proponent response:

Baseline conditions in regards to the residential network were that there were still small patches of residents who retained access to supplies of CMM gas for cooking; therefore in accordance with ACM0008 a Baseline Thermal Demand study was conducted by a qualified independent third party[1] organisation in accordance to the methodology to determine the number of baseline users and their volume of CMM use. Historic records of monthly CMM use in the form of gas bills sent to end users from the mines were analysed and the highest demand for each month observed in the past 5 years was combined to form a very conservative annual baseline demand, following the detailed process given in the PDD. The report discovered that there was no risk of overlap of demand between the project activities and the baseline, due to the availability of the CMM being far greater than current and project demand put together, hence not only was there no leakage from displacing existing users but also there was no need for additional CMM drainage (i.e. to increase the proportion of gas extracted from the underground drainage network as high concentration CMM, as opposed to VAM) specifically to satisfy project activity needs.

The gas supply network that predates the project was first laid down in 1983 as part of a then state led effort to increase the use of CMM, at a time when the mining company was state owned and not driven by profitability objectives. Due to general lack of funds for maintenance, and in particular as a result of flood damage in June 2002, by the time of the decision to construct the project activity in late 2005 the old network was only able to supply 1,100 households in various isolated patches without compromising safety. A timeline outlining the relevant past, present and expected future events is provided below.

Baseline conditions in regards to the boilers were that all the coalmines' boilers were fired with coal. As part of the project, the boilers will be switched to run on CMM, although even by the time of the validation site visit in 2006 only two of the boilers had finished the fuel switch process, the rest were still using coal.

The following illustrates the timeline of the planning of the project activity:

Table 1: Timeline of the baseline and the project activity regarding the gas supply network to residents and boilers

Stage	Date	Comments
Development of the old CMM gas grid	1983	
Gradual decrease in CMM users due to the lack of funds to cover upkeep and repairs.	Throughout the 1990s	
Devastating floods damages most of the old grid beyond repair	June 2002	
Contract signed to develop the CDM project	October 2005	By then the old grid had only 1,100 users
Local approval given for project	January 2006	
Start of Project activity	June 2006	
First batch of boilers switches to using CMM at Yutianbao mine and first of the homes	August 2006	Approx 731 homes in Nantong and 2 boilers in Yutianbao

[1] Ruby Canyon Engineering,

supplied with CMM due to project activity at the Nantong area		
Boilers switch fuel at the Donglin mine	November 2006	2 Boilers
New residential network completed for the Donglin area	December 2006	Supplying 1,700 homes
New residential network and old grid repairs completed for the Nantong area	February 2007	Supplying 4,000 homes
Boilers switch fuel at the Hongyan mine	October 2007	2 Boilers
Boilers switch fuel at the Nantong mine	October 2007	4 Boilers
Boilers switch fuel at the Yanshitai mine	November 2007	2 Boilers
New residential network and old grid repairs completed for the Yutianbao area	May 2008	Supplying 3,600 homes
New residential network and old grid repairs to be completed for the Yanshitai area	November 2008 (Planned)	Supplying 1,000 homes
Old grid repairs to be completed for the Hongyan area	November 2008 (Planned)	Supplying only 49 homes due to lack of funds and project delays
Formal project completion with the full delivery of methane to residents	December 2008 (planned)	Supplying a total of 10,349 homes and 12 boilers

We hope the justification provided above sufficiently addresses the requests.

Yours sincerely

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