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January 24, 2009

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Chair, CDM Executive Board

Mr. Lex de Jonge
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Members of the CDM Executive Board,

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Ref: Response to request for review of "Jinling Coal Mine Methane (CMM) Power Generation Project of Dengfeng City, Henan Province" (1931)

Mr. Sethi
Mr. De Jonge
Honorable Members of the CDM Executive Board

In response to the request for review of "Jinling Coal Mine Methane (CMM) Power Generation Project of Dengfeng City, Henan Province" (1931), we bring to your kind attention the following initial clarifications and responses.

1. The DOE is requested to justify the suitability of the benchmark, in particular, appropriateness of a benchmark of year 2006 when assessing the additionality of a project activity with investment decision made in 2005.

PP Answer:
The project owner financially assessed this project by the Project Proposal in August 2005. The financial analysis was conducted based on “Technical Stipulation of the Feasibility of Combined Heat and Power Projects, (Ji Jichu [2001] No. 26)”, which was issued by the National Planning Committee in year 2001. In Section 8, Financial Evaluation, of the Stipulation, it is stated if the project IRR is above the Banking Loan Rate or the target IRR hurdle rate set by the investor, the project should be considered as feasible[1].

Since this proposed project did not involve loan from banks, the banking loan rate was not chosen as

[1] http://www.powerem.com.cn/Article/2006/200611/19340.html

IRR benchmark during the investment decision making process.

The investor of this project was Jinling Coal Mine, therefore the target IRR hurdle rate set by the investor was the IRR benchmark of coal mining industry on the "Economical Assessment and Parameters for Construction Project, Second Edition", which is 15%.

There was another possible target IRR hurdle rates could be considered by the investor. The Confederation of British Industry (CBI) polled of 337 industrial investors in year 2001 and found that the average large industry used 13.5%[2] for its hurdle rate. However, this benchmark was based on survey on foreign investors and, on the other hand, IRR benchmark of coal mining industry was approved by the Chinese government and was also considered by the local government in the appraisal process. Therefore, the project investor chose 15% as the IRR benchmark during the investment decision making process.

As calculated in the spreadsheet attached (Attachment 10), the IRR of this proposed project without being registered as CDM project is 4.36 %(after tax) and 6.25 %(before tax). Considering the incentive of CDM, the IRR can reach 22.86 %(after tax) and 24.18 %(before tax). The comparison of project IRRs and IRR benchmarks is shown below.

Table-1, Benchmark Comparison

	IRR
Project IRR without CDM revenue (after tax)	4.36%
Project IRR without CDM revenue (before tax)	6.25%
IRR benchmark in the CBI survey	13.5%
Coal mining industry benchmark (before tax)	15%
Project IRR with CDM revenue (after tax)	22.86%
Project IRR with CDM revenue (before tax)	24.18%

Therefore, without the CDM revenue, the project IRR is lower than any of possible IRR benchmarks in year 2005 and with the CDM revenue, the project IRR is significantly improved and exceeds the benchmarks. Therefore the project owner decided to invest in this project considering CDM revenue.

The IRR benchmark cited in the PDD was not the investment hurdle rate considered by the project investor in the decision making process in year 2005. After considering different references at different time, the IRR benchmark adopted in the PDD had been changed during the validation process. However, each of these benchmarks is lower than the hurdle rate of 15% and this approach is conservative.

2. The DOE is requested to clarify whether the project participant is independent from the Jinling Coal Mine, and if so, considering that the investment being made is in the power sector by an independent power company, further substantiation that the benchmark reflects the risk profile of this project activity is required.

PP Answer:

[2] Department of Trade and Industry and HM Treasury. 2004. Productivity in the UK 5: Benchmarking UK productivity performance. DTI Economics Papers Series: 27-28.

(1). In May 2005, the Dengcao Group Co. Ltd., the parent company of Jinling coal mine, decided to approve the Jinling Coal Mine to start the CMM utilization project (Attachment 1). In August 2005, the Jinling Coal Mine received the official approval from the local government and then started the construction. In order to develop CMM utilization business, the Jinling Coal Mine invested and registered an independently accounted subsidiary, the Dengfeng Jinling CMM Power Generation Co. Ltd. in March 2006 (Official certificate from the local government can be found in Attachment 2). Therefore, the project participant in not independent from Jinling Coal Mine, rather, is affiliated of the Jinling Coal Mine.

(2). According to the coal mine records, the average gross profit of last three years from selling the coal is 250 million RMB (Attachment 3). The annual electricity generated by this project is 10GWh, considering the electricity price is 0.37RMB/kWh, the revenue for the power generation is only 3.7 million RMB, Therefore coal mining activities accounted for about 98% of Jinling Coal Mine's revenue and is the core business of Jinling Coal Mine.

In addition, according to statistics, the Jinling Coal Mines imported electricity from the Central China power gird for production purposes. The average annual amount of electricity imported from the grid in the last three years was more than 15.7 GWh (Attachment 3), whereas the annual electricity generated by this project and delivered to the coal mine was estimated to be only 9.75GWh. The electricity import from the grid is much more than the electricity generated by this project and delivered to the coal mine. Therefore, the benchmark of the coal mining sector can be applied for a CMM power generation project such as the proposed project. Moreover, as explained above, the Dengfeng Jinling CMM Power Generation Co. Ltd. is administratively affiliated to the Jinling Coal Mine of Dengcao Group and the electricity generated by this project will be completely delivered to the Jinling Coal Mine. Therefore, the benchmark IRR of coal mining industry is appropriate for this project.

Even if the benchmark of the power sector (IRR 8% of total investment after tax) is used, the IRR of the project is still much less than the benchmark. The project IRR without CDM revenue is calculated to be 4.36%, lower than the power sector benchmark rate of 8% (Attachment 10, IRR calculation spreadsheet). The sensitivity analysis with four major financial parameters (Total Investment, Energy Price, Net Energy Generation, and Operating Costs) is tabulated below:

Table-2, Sensitivity Analysis

Parameters	Total Investment	Energy Price	Net Energy Generation	Operating Costs
Threshold to exceeds the benchmark	-31.3%	23.0%	23.0%	-53.9%

As discussed in the PDD, the costs of construction are growing because of the growing price of materials and equipments. Therefore more than 31.3% decrease in total investment is not possible.
, the power tariff is set by the Henan Administration of Commodity Prices. According to the *Guide of Implementing Tariff Reform* published by National Development and Reform Committee[*], the tariff should be kept in relatively stable and any change of the price should be consulted with the State

[*] http://www.ndrc.gov.cn/zcfb/zcfbtz/zcfbtz2005/t20050613_6670.htm

Electricity Regulatory Commission (SERC). In 22nd April, 2008, the head of the SERC said the increase of electricity price will consider the factor of CPI and inflation. Therefore the power tariff alone will not float up to 23%. In order to increase the net energy generation by 23%, threshold be additional 23% of total CMM gas drainage, which is 0.70 million m^3 pure methane, increased for power generation. However the remaining vented gas is only 0.62 million m^3 per year and therefore energy generation is not possible to increase 23%. Considering the cost of material, fuel, wage and repair is growing every year, the operating costs can not be decreased. Therefore more than 53.9% decrease in operating costs is not possible.

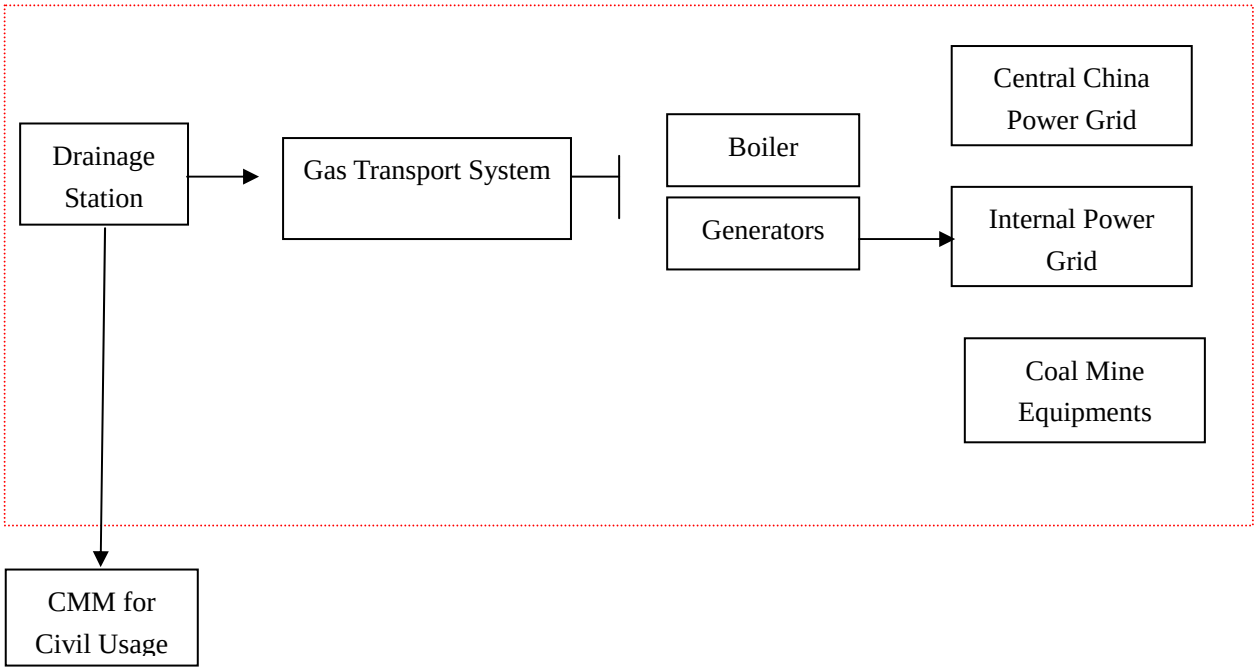
Based on the above sensitivity analysis, there are clear evidences that the implementation of this type of project without CER revenue is not financially attractive in China. Therefore, the project without CDM revenue is not financially viable, and not feasible, even when the possible variations of the main parameters are considered.

3. The project boundary is not described in the PDD section B.3 and the DOE is requested to clarify why a CAR was not raised.

PP Answer:

The project boundary is shown as follows:
As per methodology, the project boundary includes: CMM drainage station of the coal mine, CMM transporting system, all equipments in the power plant, the CMM boiler the internal power grid of Jinling Coal Mine and the mining equipment powered by the grid and Central China Power Grid.

Project Boundary



4. The DOE is requested to substantiate the appropriateness of the baseline selection as: (a) continuation of current practice (alternative 1) has not been assessed financially, and (b) other alternatives such as all project CMM used for power generation and all CMM used for heat generation are not considered.

PP Answer:

In compliance with the ACM0008 (Ver. 03), all possible baseline scenario alternatives for CMM extraction, treatment and energy production will be considered.

As analyzed in the PDD, the baseline alternatives do not face prohibitive barriers are:

Alternative 1: The continuation of current situation.

Alternative 2: Project activity without being registered as CDM project.

Alternative 8: CMM would only be used to fuel a power plant with a capacity of 3000KW.

Alternative 9: CMM would only be used to fuel one boiler.

As proposed by the comments, two more baseline scenario alternatives are also considered,

Alternative 10: All project CMM used for heat generation

Alternative 11: All project CMM used for power generation

As for alternative 10, all project CMM used for heat generation. Jinling Coal Mine used to use a coal-fired boiler as energy source to satisfy heating requirement in the winter. The annual coal consumption of this boiler was 810 tons and the heat value of the coal is 5200kcal (Attachment 9). 1 kcal equals 4.184 KJ, therefore the historic annual heat demand in Jinling colliery Q is can be calculated as follows

$$Q = Mass_{coal} \times HeatValue \times 4.184 = 810 \times 1000 \times 5200 \times 4.184 = 17{,}623{,}008{,}000KJ = 17623GJ$$

If all CMM consumed in the proposed project activity were used for heat generation, the heat energy can be provided by the methane is

$$Q_{CH4} = Volume_{PureMethane} \times NCV_{CH4} = (3.03 + 0.48)milliom \times 35.53MJ / m^3 = 124710.3MJ = 124{,}710GJ$$

The calculation above shows only 14.13% of heat energy produced by the CMM could be consumed and more than 85% of produced energy would have to be wasted. Therefore, this alternative can be eliminated as a realistic baseline scenario.

The financial analysis of baseline alternatives 1, 2, 8, 9, 11 is shown in Table 1 and detailed calculation can be found in the attached spreadsheets (Attachment 4, 5):

Alternative 1: continuation of current practice

Since the project owner is an independently accounted subsidiary, the continuation of financial

situation before the implementation of this project is that all CMM consumed in the proposed project activity would be vented into the atmosphere and there would be no power generation activity existed. Venting CMM neither creates economic benefit nor requires investment for this scenario. Therefore the NPV of this alternative is 0.

Alternative 2: Project activity without being registered as CDM project activity.

Alternative 11: All project CMM used for power generation:

Assuming all project CMM used for power generation, then the amount of annual CMM consumption is 3.51 million m^3 and seven generators would be needed. Annual electricity generation can reach 11.58 GWh. The NPV of this baseline scenario alternative is -473.

Table 3, Results of financial analysis of the baseline scenario alternatives

Baseline alternatives	NPV
Alternative 1: continuation of current practice	0
Alternative 2: Project activity without CDM incentive	-717
Alternative 8: CMM would only be used to fuel a power plant with a capacity of 3000KW	-658.59
Alternative 9: CMM would only be used to fuel one boiler	-66.02
Alternative 11: All project CMM used for power generation	-473

Therefore, from the above analysis, the baseline scenario alternative 1 is the most economically attractive one.

5. The PP/DOE should further clarify the following monitoring information: (i) whether the baseline and project utilization of CMM are independently monitored, (ii) how the mean annual thermal energy demand has been monitored and calculated, (iii) how the amount of electricity generated by the project activity will be monitored, and (iv) consistency in amount of CMM calculation, as sometimes it is expressed in volume and sometimes in mass unit.

PP Answer:

The diagram of CMM pipeline and the monitoring can be found in attachment.(Attachment 6)

(i). In order to monitor the amount of total CMM drainage, the amount of CMM used for power generation, the amount of CMM used to fuel the boiler and the amount of the baseline CMM independently, four sets of monitoring equipments are installed. The data of CMM flow and concentration are continuously monitored and electrically archived.

(ii). In the baseline scenario, there is an independent monitored pipeline to supply CMM to the

catering facilities and CMM was only used by the canteens in Jinling Coal Mine as thermal energy.

The conservative calculation of mean annual thermal energy demand has been done in the following three methods:

1). The stoves used in the baseline scenario and the CMM consumption rate can be found in the following table. (Attachment 7)

Table-4, CMM gas supplied to the stoves

Type	Gas Consumption (m^3/h)	Numbers	Max hours	Total gas Consumption (m^3)
	A	B	C	D=A*B*C
DZR800	9.523	26	1200	297,117.6
DZR1000	14.285	5	1200	85,710
Total				382,827.6

From this table, we can found the amount of maximum CMM consumption in the baseline scenario is 0.38 million m^3 per year.

2). Chongqing Branch of China Coal Research Institute calculated the maximum throughput of the pipeline in Jinling Coal Mine (Attachment 11). The diameter of the pipeline to provide CMM to the catering facilities is 108mm. To avoid static electricity, the engineering estimation of the safe velocity of such pipeline for inflammable gases is below 12m/s. Thus the throughput can be calculated as

$$Q_{safe} = V \times A = 12 \times \pi \times 0.054^2 = 0.1099 m^3 / s$$

$$Q_{peak} = V \times A = 20 \times \pi \times 0.054^2 = 0.1831 m^3 / s$$

The annual operation hours for CMM used for cooking in Jinling colliery is 1200. It is not safe for the pipeline working under the condition with the peak gas speed, therefore the annual maximum throughput of CMM for prospective thermal demand is 0.1099*3600*1200=0.47 million m^3.

3). The Jinling Coal Mine installed monitoring equipments to meter the amount of baseline CMM consumption in September 2007 and the monthly record is shown in table 5.(Attachment 8)

Table 5: Monthly records of baseline CMM consumption

Month	Volume (10k m^3, pure methane)	Month	Volume (10k m^3, pure methane)
10/2007	2.75	6/2008	3.17
11/2007	3.22	7/2008	3.01
12/2007	3.14	8/2008	3.13
1/2008	3.28	9/2008	3.22
2/2008	2.19	10/2008	2.67
3/2008	2.88	11/2008	3.16

4/2008	3.67	12/2008	3.25
5/2008	2.84		

Based on the 15 months record, the annual CMM consumption is 0.32 million m^3 and the average CMM consumption rate is 0.027 million m^3 per month.

In order to project thermal demand, the maximum scalar adjustment is calculated as follows:

Tabke-6, Calculation of d_k and $d_{k,max}$

Year	Month	Volume (m^3)	d_k	
2007	10	27500	0.905002	
	11	32200	1.059675	
	12	31400	1.033348	
2008	1	32800	1.079421	
	2	21900	0.720711	
	3	28800	0.947784	
	4	36700	1.207767	
	5	28400	0.93462	
	6	31700	1.043221	
	7	30100	0.990566	
	8	31300	1.030057	
	9	32200	1.059675	
	10	26700	0.878675	
	11	31600	1.03993	
	12	32500	1.069548	
	Total	455800		$d_{k,max}$ 1.207767

According to the future production plan for the next 10 years, the coal production of Jinling Coal Mine will not be increased. Therefore the number of coal mine workers will not be increased either. In order to estimate the result conservatively, $d_{k,max}$ taken as 2 in the calculation, the estimated thermal energy demand in the baseline for month k is

$$TH_{BL,k} = \frac{TH_{BL,y}}{15} \times d_k^{\max} = \frac{455800}{15} \times 2 = 60773(m^3)$$

Therefore, the estimated annual thermal energy demand is 12*60773=729,280m^3

Based on above actual record and theoretical calculations, the maximum of mean annual thermal energy demand can be met by 0.72 million m^3 CMM. According to the project proposal, the total amount of CMM extraction is 4.5 million m^3 pure methane each year. The amount of CMM sent to power plant and boiler are 3.03 million m^3 and 0.48 million m^3, respectively. Therefore remaining portion of CMM, after fuelling the power plant and CMM boiler, is 0.98 million m^3, more than 0.72 million m^3 (method 3). Therefore mean annual thermal energy demand can be satisfied.

(iii). Each generator set has an independent electricity meter to monitor the electricity generated by the corresponding generator. The summation of the readings from the six meters is the total amount of electricity generated by this project.

In addition, there are two meters to meter the amount of electricity delivered to the coal mine's internal grid and one to meter the amount of electricity consumed by the power plant. The summation of the readings from these three meters can be used to cross check the total electricity generated by this project.

(iv) The data need to be monitored and expressed in mass unit is the amount of heat by the CMM boiler. The energy produced by boiler is expressed as Steam Ton and one Steam Ton equals to 4.1868 GJ

The amount of CMM is calculated as required by the methodology. The data related to the amount of CMM (MM, MD, BE, PE) are all calculated in mass unit.

However, the monitoring equipments can only meter the gas flow volume unit. As per the monitoring methodology, "Flow meters will record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure is 0.67kg/m^3(Revised 1996 IPCC Reference Manual p 1.24 and 1.16)".

Therefore, the records of gas flow will be kept in volume units and the calculation will be conducted by converting volume unit into mass unit, the equation is:

Mass=Volume (under normal condition) * Density of methane

Therefore the data of amount of CMM monitored is

Data / Parameter:	MM_{ELEC}
Data unit:	tCH_4
Description:	*CMM Send to the Generators*
Source of data to be used:	*Measured. Data would be sent to computer control center and recorded by staff manually as well.*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*2040*
Description of measurement methods and procedures to be applied:	*The KJ-93 system will automatically measure the volume and converted into the data under normal condition. It will also be recorded by a staff member on an hourly basis. The Vortex Shedding Flow Meter and WP-L80 Flow Rate Reckoning Meter will be used. The margin of error of the meter is* $\leqslant 3\%$.
QA/QC procedures to be applied	*It will be checked and calibrated by the manufacturer's technical support staff. An annual full maintenance service will be provided by the manufacturer..*
Any comment:	*Flow meters will record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure is*

	0.67kg/m3(Revised 1996 IPCC Reference Manual p 1.24 and 1.16)

Data / Parameter:	MM_{HEAT}
Data unit:	tCH_4
Description:	*CMM Send to the Boiler*
Source of data to be used:	*Measured. Data will both be sent to a computer control center and manually recorded by the staff.*
Value of data applied for the purpose of calculating expected emission reductions in section B.5	*321.6*
Description of measurement methods and procedures to be applied:	*The KJ-93 system will automatically measure the volume and converted into the data under normal condition.. It will also be recorded by a staff member on an hourly basis. The Vortex Shedding Flow Meter and WP-L80 Flow Rate Reckoning Meter are used. The margin of error of the meter is* ≤3%.
QA/QC procedures to be applied:	*It will be checked and calibrated by the manufacturer's technical support staff. An annual full maintenance service will be provided by the manufacturer. The accuracy of the meter is shown in section B7.2.*
Any comment:	*Flow meters will record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure is 0.67kg/m3(Revised 1996 IPCC Reference Manual p 1.24 and 1.16)*

Index of Attachment:

1. The approval from the Dengcao Group, the parent company of Jinling Coal Mine, to Jinling Coal Mine for investing and carrying out the CMM power generation project.
2. The certification from Industrial and Commercial Bureau of Dengfeng City on the issue that Dengfeng Jinling CMM Power Generation Co. Ltd. was invested and registered by Jinling Coal Mine.
3. Explanation from Jinling Coal Mine on the annual revenue from sales of coal and annual electricity consumption of Jinling Coal Mine of last three years.
4. NPV calculation spreadsheet of baseline alternative 2, alternative 8 and alternative 9.
5. NPV calculation spreadsheet of baseline alternative11.
6. Systematic diagram of CMM distribution system and the location of monitoring equipments
7. Explanation from Jinling Coal Mine on number of stoves used as catering facilities in Jinling Coal Mine and the maximum amount of CMM consumed to satisfy the baseline thermal energy.
8. Explanation from Jinling Coal Mine on the amount of CMM used to fuel the stoves in Jinling Coal Mine. The monitoring equipment was installed on September 2007 and therefore only monthly records for last 15 months can be provided.
9. Explanation from Jinling Coal Mine on the amount of coal used to provide heat in the winter each year before being replaced by the CMM-fuelled boiler.
10. The IRR (after tax) calculation spreadsheet of alternative 2

11. The calculation conducted by Chongqing Branch of China Coal Research Institute about the maximum throughput of CMM distribution pipeline in Jinling Coal Mine.