

Title of Feasibility Study:

CDM Feasibility Study on Ventilation Air Methane Power Generation Project at Dafosi Coal Mine in China

Main Implementing Entity:

PEAR Carbon Offset Initiative, Ltd.

1. Implementation Structure

PEAR Carbon Offset Initiative, Ltd.: Undertaking study work, making reports and PDD;
Outsourcing: DNV Climate Change & Environmental Services: DOE for Validation;
Outsourcing: KOE Environment Consultancy, Inc. (Japan): Support for field validation.

2. Description of project activity

2.1 Outline of the project

The proposed CDM project named “Ventilation Air Methane Power Generation Project at Dafosi Coal Mine in China” will be conducted as the first CPA of a PoA (China Coal Mine Ventilation Air Methane Oxidization Programme), of which geographical boundary includes all area of China. The PoA aims to reduce GHG emission by destroying methane contained in Ventilation Air Methane (VAM) emitted from coal mines in China using newly developed flameless oxidization technology. Heat energy recovered by the oxidization may be utilized to generate high temperature steam for electricity generation and/or low temperature steam and hot water for heating.

There are no national, province or local requirements providing for VAM treating at coal mines. Although the national regulation prohibits releasing Coal Mine Methane (CMM) which methane concentration is over 30 %, there are no such requirement for CMM and VAM which methane concentration is below 30 %. This way, coal mines itself are not require to destroy or utilize VAM at present time. Therefore the proposed PoA is a voluntary action to reduce GHG emissions and implemented by the coordinating/managing entity.

A coordinating/managing entity for the proposed PoA is Shaanxi Binchang New Energy Co., Ltd. (Binchang New Energy Co.), the associate company of Shaanxi Binchang Mining Group Co., Ltd. (Binchang Co.). Binchang Co. is one of the largest coalmine groups in China, which have been developing five coalmines in the Binchang Mining Area located in Shaanxi Province. Their target of annual coal production is 50 million tons. Operator of each CPA will correspond to a mining group or associate company of a mining group in China.

Binchang Co. has already carried out registered CDM project, “Dafosi Coal Mine Low Concentration Coal Mine Methane Power Generation Project (Ref. No. 2482)”, at their Dafosi coal mine since 2009. They also plan to conduct the VAM oxidization in cooperation with a Chinese manufacture of VAM oxidizers. These activities are their voluntary actions based on their philosophy to build up “zero-emission coal mines”. The proposed PoA will include entities which agree over the philosophy and carrying out voluntary activity having same targets. That is, CPAs for reducing GHG emission by oxidizing VAM performed at any coalmines in China, which meet the eligibility criteria, will be included in the proposed PoA.

The CPA is operated by Binchang New Energy Co. at Dafosi Coal Mine (Dafosi). The CPA will install VAM oxidizers manufactured by Shengli Oilfield Shengli Engine Machinery Group Co., Ltd. (Shengli Co.) to destroy methane in the VAM and involve following options:

- (i) Total number of oxidizers: 10 units
 - Oxidizers for power generation: 5 units (The 1st step)
 - Oxidizers for heat generation: 5 units (The 2nd step)
- (ii) CMM enriches VAM up to 1% only for power generation.

In the case of utilization to power generation in the CPA, as the methane concentration in the VAM (normally 0.3 %) is considered to be low to ensure a reliable performance of VAM oxidizers, CMM of less than 8 % methane concentration would be added to the VAM stream. This could increase the methane concentration in the VAM up to 1.0 %. As any CMM added would be otherwise vented into the atmosphere, the addition to the VAM would not affect the performance of the existing CDM project.

The CPA will reduce greenhouse gas emission by destroying methane, 21 times more potent a greenhouse gas than CO₂, by oxidation in the VAM oxidizers and replace electric power from the NWPG. 413,220 tCO₂e/y of emission reductions are projected for every fiscal year, thus resulting in 4,044,374 tCO₂e of emission reductions during the ten years from January 2012 through December 2021.

2.2 Methodology to be applied

Approved consolidated methodology ACM0008 (Version 07)

3. Contents of the research

3.1 Research subject

1) Research on the baseline scenario

To setup the baseline scenario based on the situation of the host country such as the future government policy as well as the possible diffusion of VAM oxidizing technology and the situation of CDM EB's review. Fundamental policy to identify the project boundary and additionality will be cleared in order to determine the baseline scenario.

2) Research on the monitoring plan and methods

To identify appropriate monitoring method for the project and to develop the monitoring plan. Monitoring plan will be consistent with baseline methodology applied to the project.

3) Research on duration of project activity and crediting period

To set up appropriate duration of project activity and crediting period based on the baseline scenario.

4) Research on estimation of GHG emission reductions

To quantify GHG emission reductions with and without the project activity based on the field data as well as the host country's data and default value and performance value with international recognition. Leakage will be also reviewed if necessary.

5) Research on environmental impacts

To conduct environmental research works with consideration of the project features. The legal system for environmental impact will be considered thoroughly.

6) Research on other indirect influences

To study indirect social, economical and cultural impact of the project with consideration of the project features.

7) Research on stakeholders' comments

To identify the extent of stakeholders, organize stakeholders meeting and receive their comments. Due account of any comments received will be investigated.

8) Research on financial planning

To estimate required cost and expected revenue for the project and develop the financial planning to realize the project as a CDM project, as well as to estimate the financial attractiveness.

9) Developing project design documents.

To develop CDM-PoA-DD, CDM-CPA-DD and Specific CDM-CPA-DD based on the result of above researches.

10) Implementation of the validation

To be exposed to the validation by DOE on the PoA and the first CPA and to have a meeting with the counterpart on site in order to discuss about submission of Prior Consideration for CDM project. Schedule to submit the Prior Consideration will be fixed during the validation.

11) Research findings on co-benefit

To estimate the effect of mitigation of air pollution by emission of SO_x and particulate matter from coal-fired power plant replaced by the power generated from the project.

3.2 Research contents

1) Coal Mine Methane

Target gas to be reduced by the PoA is methane gas, which has Global Warming Potential of 21, thus 1 ton of methane emissions corresponds 21 tons of CO₂ emissions.

Natural gas originated from coal (major gas component is methane typically), generated during coal formation and stored in coal seams and surrounding seams, is termed "CBM

(Coal Bed Methane)”. Methane gas is emitted with mining activity of coal from coal mines in operation and it is termed as Coal Mine Methane (CMM). CMM has an explosion limit from 4.8 to 14.5 % of methane concentration, in which condition it will be explosive if an ignition source would be exist. CMM is drained through drilling holes from the under ground and /or wells from the surface using suction pump at coal mines where a large amount of CMM is emitted. Although a part of CMM is utilized to generate power and for city gas, the rest of CMM is released to the atmosphere due to the difficulty of utilization such as explosive nature of methane and fluctuation of methane concentration of CMM.

In order to prevent explosion accidents in coal mines, fresh air is introduced by fan(s) to dilute mine air below safety methane concentration and exhaust it to the atmosphere. The exhausted mine air is termed as Ventilation Air Methane (VAM).

It is required for coal mines that methane concentration in the ventilation air to be below 0.75% by National Coalmine Safety Regulation in China. VAM oxidizer could make it possible not only to destroy the methane in the VAM but also to recover heat energy from VAM. However, the technical and economical hurdle which should be conquered may be high. Although several types of VAM oxidizer has been developed in the world and tried to introduce in coal mines in UK, USA and Australia, all the cases have not gone beyond the test operation. Therefore, huge amount of VAM have been emitted to the atmosphere from coal mines in the world. Figure 3-1 shows schematic view of CMM and VAM extraction system at coal mines.

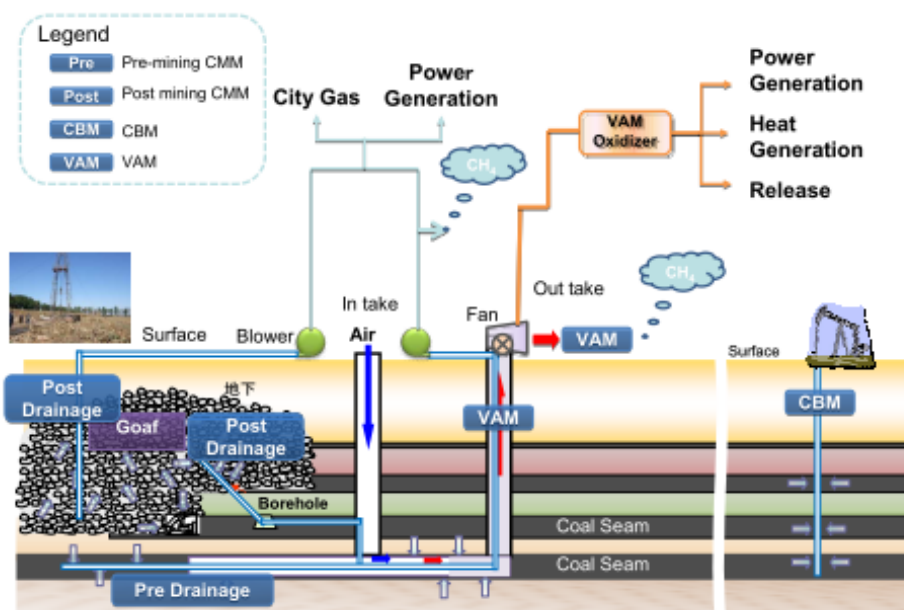


Figure 3-1 Schematic view of CMM and VAM extraction system

2) VAM oxidizing technology

All CPA included in a PoA are required to use same technology or facilities. The eligibility criteria for inclusion of a CPA in the PoA, discussed following section, require that a CPA use VAM oxidizing units that made by Shengli Co., to destroy very low concentration methane in the VAM.

The process is to capture VAM, enforced VAM to VAM oxidizer units in order to destroy methane contained in the VAM stream. Heat energy will be produced by oxidization of VAM. Each CPA under the PoA has any of following three options or their combination;

- (i) to release the thermal energy;
- (ii) to use the thermal energy for heating;
- (iii) to use the thermal energy to produce high temperature steam in order to generate electricity using steam turbine generators.

In the case of enriching VAM with CMM, CMM below 30% methane concentration may be added to VAM stream, which would otherwise have been released in the atmosphere. There is no legal requirement to use or destroy such low methane concentration CMM.

VAM oxidizers which will be introduced the CPA for VAM power generation at Dafosi is the system that they applied a national patent for invention of China in March 2006, and then obtained the letters of patent in May 2007. And a demonstration trial of the system had been carried out in July 2007. The CPA is the first project in the world to utilize the system developed by Shengli Co. for generating electricity on a commercial scale. Field full scale demonstration trial had been conducted at Dafosi since 2008. After the full scale trial, the system has been certificated by State Energy Administration as the state cross energy technology on May 11, 2010.

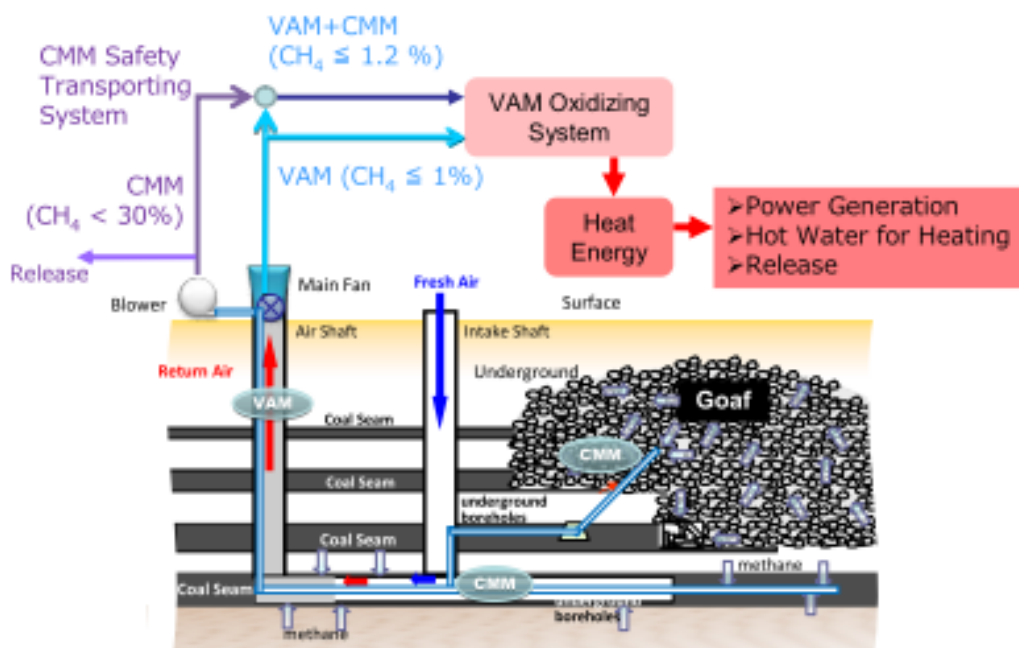


Figure 3-2 Schematic view of oxidization and utilization of VAM and CMM



Figure 3-3 VAM Oxidizing System at Dafosi Coal Mine for full scale field trial.

3) Eligibility criteria for inclusion of a CPA in the PoA

Eligibility criteria for inclusion of a CPA in the PoA were reviewed based on the result of this feasibility study. It was decided to introduce following eligibility criteria in the CDM PoA-DD. Furthermore, it was demonstrated that the first CPA of VAM oxidizing project carried out at Dafosi would meet these criteria during the feasibility study (Justification of the why the CPA is eligible to be included in the proposed PoA is described in the report).

- (a) The geographic boundary of a CPA lies within China;
- (b) A CPA reduces GHG emission by destroying methane contained in VAM emitted from underground coal mines and also CMM (<30%) in case of adding to the VAM, which otherwise have been released in the atmosphere. And a CPA adopts any of following three options or combination of them for use of recovered heat energy:
 - (i) to release the thermal energy;
 - (ii) to use the thermal energy for heating;
 - (iii) to use the thermal energy to produce high temperature steam in order to generate electricity with steam turbine generators (with capacity below 10MW);
- (c) Approved CDM Methodology ACM0008 (Version 07) is applicable to a CPA;
- (d) A CPA implementer/operator confirms in a written statement that:
 - (i) All VAM oxidizing system to be newly installed under a CPA is not and will not be part of another CDM project or PoA;
 - (ii) They are aware and agree with the inclusion of a CPA to the proposed PoA.
- (e) Destroying methane is carried out by flameless VAM oxidizer developed by Shengli Co.;
- (f) CBM option for methane gas extraction through surface well is not included;
- (g) For the purpose of determining project emissions, a CPA should meet following requirements:
 - (i) A CPA does not include the combustion of methane in a flare, engine, power plant or heat generation plant;

- (ii) A CPA does not consume any fuels such as oil and gas to operate VAM oxidizing system except electricity;
- (h) For the purpose of determining baseline emissions, a CPA should meet following requirements:
 - (i) In the baseline scenario, all of VAM are released into the atmosphere without destruction and utilization;
 - (ii) If low methane concentration CMM is added to VAM, methane concentration of the CMM is below 30%, which would otherwise have been released into the atmosphere without utilization/destruction, and have no legal requirement to utilize/destroy and prohibited matter for releasing in the atmosphere;
 - (iii) If low methane concentration CMM power generation have been carried out, the CMM power generation is included in another CDM project activity;
- (i) The spatial extent of the project boundary comprises followings:
 - (i) All equipment used as part of a CPA for the extraction of CMM at Extraction station and VAM at ventilation shaft, such as Blower and Ventilation fan, have been installed before the project would start, and no equipment for compression, storage and transportation to an off-site user would be installed;
 - (ii) Draught fans installed between the ventilation fan and VAM oxidizers are included in a CPA boundary;
 - (iii) In case of adding low methane concentration (below 30%) CMM to VAM, safety CMM transport system approved as Safety Production Technology Standards (AQ 1076-2009 and AQ 1078-2009) is included in a CPA boundary;
 - (iv) A CPA does not introduce flaring, captive power plant and heat generation facilities destroying and/or utilizing CMM. VAM oxidizer is used as the major part of the project activity;
 - (v) The grid is included in a CPA boundary;
- (j) A CPA meets following criteria for assessing additionality:
 - (i) The IRR of the CPA is calculated based on updated input parameters and assumptions and the method provided in CDM-PoA-DD;
 - (ii) The IRR benchmark, 15 % requirement under NDRC's investment approval criteria for coal mine sectors, should be applied to estimate the financial attractiveness of the CPA under the proposed PoA;
 - (iii) If the IRR of the CPA was falling less than the benchmark of 15 % after carrying out sensitivity analysis, the CPA could not be considered as financially attractive.

4. Results of the research for CDM project implementation

4.1 Identification of baseline scenario and project boundary

The baseline scenario of the PoA is identified according to approved methodology ACM 0008 (version 07). Following three alternative baseline scenarios are formulated (Step 3) according to consideration of "Step 1: Identify technically feasible options for capturing and/or using CBM or CMM or VAM" and "Step 2: Eliminate baseline options that do not comply with legal or regulatory requirements".

- **Scenario I:** Business as usual scenario. Gas extraction is a combination of CMM and VAM. All extracted VAM and CMM added to VAM are vented into the atmosphere without

destroying/utilization. All the coal mine's electricity demand is met through a Grid. All the coal mine's heat demand depends on its own coal boilers;

- **Scenario II:** Using/destroying VAM for additional grid/captive power generation and/or heat generation with the relative shares of gas treated and with the relative shares of energy production under each option specified. This is a proposed project activity not implemented as a CDM project;
- **Scenario III:** Low methane concentration CMM power generation for the grid/captive power.

Considering the “Step 4: Eliminate baseline scenario alternatives that face prohibitive barriers”, scenario I (business as usual scenario) is the only scenario that does not face prohibitive barriers. Therefore, Scenario I is considered to be the baseline scenario of the PoA.

The geographical boundary of the proposed PoA includes China. The geographical site of the CPA is located in Shaanxi Province in China, thus the CPA is located within the geographical boundary of the proposed PoA.

The boundary of the CPA includes mainly the coal mine from where VAM are corrected, VAM oxidizing plant where VAM is destroyed and utilized to generate electricity and the grid which electricity will be replaced by the generated power at VAM oxidizing plant. Coal fired boiler is also included in the boundary if the heat energy would be utilized for the mine. Based on the conditions required in the methodology, the project boundary for the CPA is indicated in Figure 4-1.

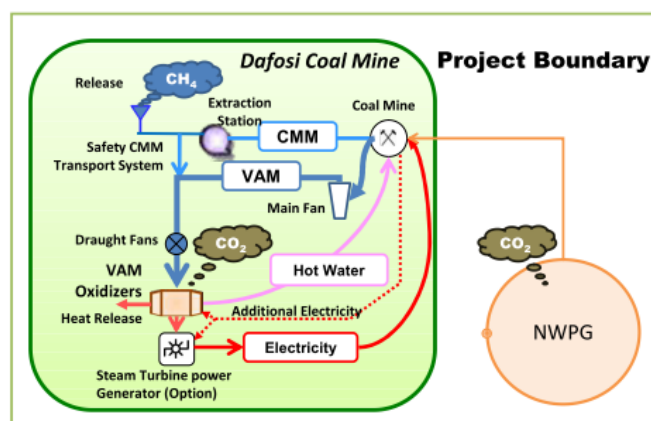


Figure 4-1 Project boundary

4.2 Baseline emissions and project emissions

Baseline emissions, project emissions and leakage are defined by the following equation based on the approved methodology ACM0008 (Version 07):

1) Baseline emissions

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{Use,y}$$

where:

BE_y	Baseline emissions in year y (tCO ₂ e)
$BE_{MD,y}$	Baseline emissions from destruction of methane in the baseline scenario in year y (tCO ₂ e)
$BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO ₂ e)
$BE_{Use,y}$	Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity in year y (tCO ₂ e)

No methane destruction is carried out under the baseline scenario (BAU). Hence,

$$BE_{MD,y} = 0$$

$BE_{MR,y}$ is calculated by the product of the total volume of methane contained in VAM and CMM added which sent to VAM oxidizers and Global warming potential of methane. The volume of methane is equal to MM_{OX} presented in the section of project emission. Hence,

$$BE_{MR,y} = GWP_{CH_4} \times MM_{OX}$$

Where:

GWP_{CH_4}	Global warming potential of methane (21tCO ₂ e/tCH ₄)
MM_{OX}	Methane measured sent to flameless oxidizer (tCH ₄)

A part of heat energy produced by VAM oxidizers will replace hot water generated by existing coal boiler in the base line scenario. However, to be conservative, CERs will not be claimed for heat replaced by the CPA. Furthermore, no gas will be supplied to gas pipeline. Thus, the total potential emission reduction from heat/ power generation replaced by the CPA is only from displacement of power generation, which is given by following equation:

$$BE_{Use,y} = GEN_y \times EF_{ELEC}$$

Where:

GEN_y	Electricity generated by project activity in year y (MWh)
EF_{ELEC}	Emission factor of electricity (grid) replaced by the project (tCO ₂ /MWh)

For electricity emissions factor, EF_{ELEC} , is the same value as CEF_{ELEC} in the calculations of project emissions, which calculated by formulae from “Tool to calculate the emission factor for an electricity system (Version 02)” for calculating the combined margin emissions.

2) Project emissions

$$PE_y = PE_{ME} + PE_{MD} + PE_{UM}$$

where:

PE_y	Project emissions in year y (tCO ₂ e)
PE_{ME}	Project emissions from energy use to capture and use methane (tCO ₂ e)
PE_{MD}	Project emissions from methane destroyed (tCO ₂ e)
PE_{UM}	Project emissions from un-combusted methane (tCO ₂ e)

All equipment to capture VAM and CMM are operated under BAU for the safety operation of the mine. There is no additional installation or fuel consumption to capture methane from the underground. However, draught fans, VAM oxidizers and steam turbine generator (if power generation option would be selected) require electricity, for sending VAM to the oxidizers, heating up the oxidizers and operating the generator. Emissions from these energy uses should be included as project emissions.

$$PE_{ME} = CONS_{ELEC, PJ} \times CEF_{ELEC}$$

Where:

$CONS_{ELEC, PJ}$ Additional electricity consumption for capture and use or destruction of methane (MWh)
 CEF_{ELEC} Carbon emissions factor of electricity used by the VAM oxidizing plan (tCO₂/MWh)

To calculate carbon emission factor of electricity used by the VAM oxidizing plant (CEF_{ELEC}), the formulae presented in “The chapter of base line methodology procedure of Tool to calculate the emission factor for an electricity system (Version 02)” is used.

As NMHC concentration in VAM is below 0.1% normally in the CPA, PE_{MD} does not include emissions from the combustion of NMHC.

$$PE_{MD} = MD_{OX} \times CEF_{CH4}$$

$$= (MM_{OX} - PE_{OX}) \times CEF_{CH4}$$

where:

MD_{OX} Methane destroyed through flameless oxidation (tCH₄)
 MM_{OX} Methane measured sent to flameless oxidizer (tCH₄)
 PE_{OX} Project emissions of non oxidized CH₄ from flameless oxidation of the VAM stream (tCH₄)
 CEF_{CH4} Carbon emission factor for combusted methane (2.75 tCO₂e/tCH₄)

The equation of un-combusted methane from the VAM oxidizer is as follows:

$$PE_{UM} = PE_{OX} \times GWP_{CH4}$$

where:

PE_{OX} Project emissions of non oxidized CH₄ from flameless oxidation of the VAM stream (tCH₄)
 GWP_{CH4} Global warming potential of methane (21tCO₂e/tCH₄)

3) Leakage

$$LE_y = LE_{d,y} + LE_{o,y}$$

where:

LE_y Leakage emissions in year y (tCO₂e)
 $LE_{d,y}$ Leakage emissions due to displacement of other baseline thermal energy uses of methane in year y (tCO₂e)
 $LE_{o,y}$ Leakage emissions due to other uncertainties in year y (tCO₂e)

Methane is not employed for other baseline thermal energy uses, thus $LE_{d,y}$ is 0. CBM is not used in the project activity and the CDM project activity has no influence upon coal production and prices and market dynamics; thus, $LE_{o,y}$ is 0.

4) Estimation of emission reductions

The emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions (BE_y) and project emissions (PE_y), as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y	Emissions reductions of the project activity during the year y (tCO ₂ e)
BE_y	Baseline emissions during the year y (tCO ₂ e)
PE_y	Project emissions during the year y (tCO ₂ e)
LE_y	Leakage emissions in year y (tCO ₂ e)

4.3 Monitoring plan

1) Organization

Monitoring is carried out according to provisions of approved methodology ACM0008. The CPA will set up a management structure, such as indicated Figure 4-2, in order to conduct the accurate monitoring. The monitoring team will be formed under the CDM Director, who oversees the entire project, for the management of the monitoring of the project. Monitoring will be conducted at VAM oxidizing plant and substation according to the monitoring manual which clearly state the monitoring method employed at each monitoring point.

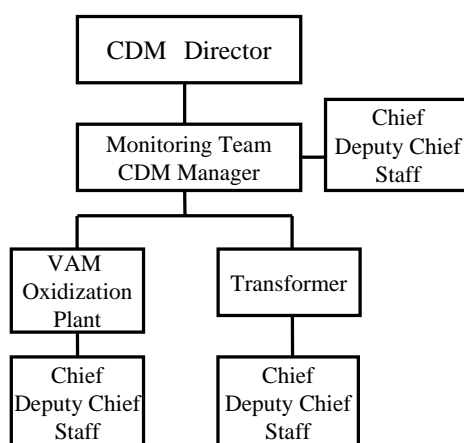


Figure 4-2 Management structure for monitoring of the project

2) Monitoring points and data to be monitored

Figure 4-3 indicates the data and installation points that will be monitored, and type of sensors. The Gas flow measured is corrected by pressure and temperature into the STP. STP is defined as 0°C at one atmospheric pressure.

In the case of power generating is carried out, the power generated by the steam turbine generator which is transferred to the transformer is continuously monitored at the out put of the generator. The backup data will be monitored for receiving electricity at the transformer. The electricity generated is cross-checked with the invoices and /or sales receipts as a control mechanism, (if applicable) in addition to be monitored at a transformer.

3) Monitoring, recording and management of data

All data continuously measured are transmitted to the monitoring computer via transmitters. The records of the time and date are added to each measurement data stored in the computer. The electronic records and paper copies are kept for two years after the end of the crediting period as required by approved methodology ACM0008.

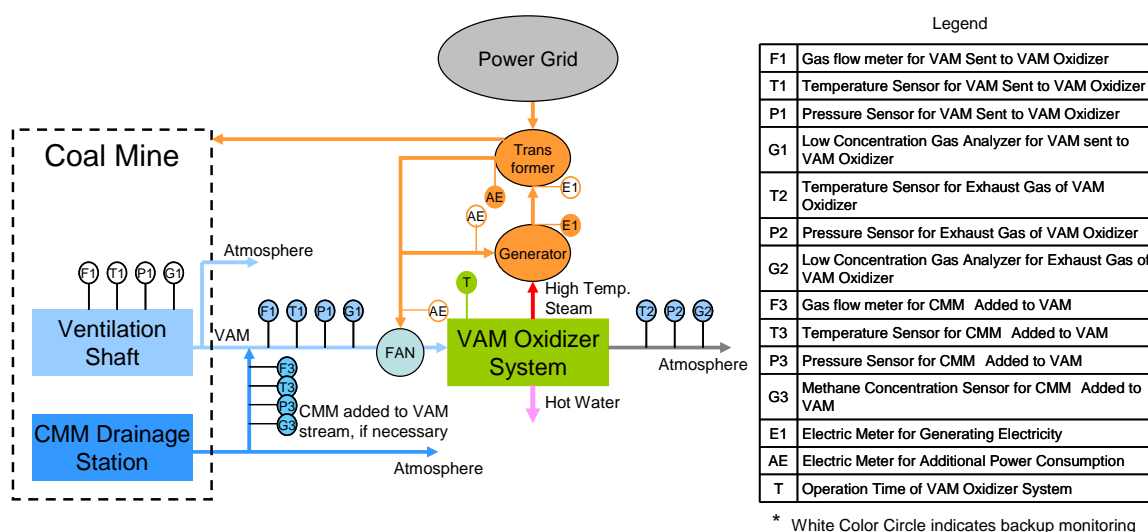


Figure 4-3 Monitoring points and type of sensors

4.4 Estimation of GHG emission reductions

From the equation E-15 in 4.2 4), estimation of GHG emission reduction from the CPA is presented in Table 4-1.

Table 4-1 Summary table of emissions reductions

Year	Estimation of project activity emissions (tonnes of CO ₂ e)	Estimation of baseline emissions (tonnes of CO ₂ e)	Estimation of leakage (tonnes of CO ₂ e)	Estimation of overall emission reductions (tonnes of CO ₂ e)
2012	61,411	386,778	0	325,367
2013	81,515	494,735	0	413,220
2014	81,515	494,735	0	413,220
2015	81,515	494,735	0	413,220
2016	81,515	494,735	0	413,220
2017	81,515	494,735	0	413,220
2018	81,515	494,735	0	413,220
2019	81,515	494,735	0	413,220
2020	81,515	494,735	0	413,220
2021	81,515	494,735	0	413,220
Total	795,046	4,839,393	0	4,044,347

4.5 Duration of project activity and crediting period

Crediting period of each CPA under the proposed PoA is 10 years.

The construction of a VAM oxidizing unit for field trial had commenced on January 7, 2009 and the unit has been owned by Shengli Co. at the present time. Starting date of the CPA will be the day on which changing in ownership of the unit to Binchang Co. would be done and the construction work of the first stage would be commenced. The starting date of the CPA is after the starting date of validation protocol for the PoA and the first CPA (January 2011).

Expected lifetime of the CPA is 19 years since the starting date of the construction work for the first stage. Crediting period of 10 years from January 2012 to December 2021 seems to be reasonable, considering that full commercial operation will start from April 2011 and it is going to take a year for the registration to UNFCCC after starting of validation protocol at the beginning of 2011.

4.6 Environmental impacts and other indirect influences

In line with the national law/regulations, an Environmental Impact Assessment (EIA) should be carried out and approved by the environmental agency in charge of environmental protection of City or County before a CPA would start. The EIA should be carried out for the following environmental impact:

- Expected Environmental impacts during construction, on such as atmosphere, noise, waste water and solid waste;
- Expected Environmental impacts during operation, on such as atmosphere, noise, waste water and solid waste.

The EIA for the CPA have been completed by Academy of General Electronics Research of the Ministry of Information Industry in June 2008, and approved by Environmental Protection Bureau of Xianyang City on December 11, 2008 (Approved letter No. 360 [2008]).

The EIA indicates the following:

- This project complies with the requirements of national industrial policy and the cleaner production policy and the pollutant emission levels satisfy national standards; thus, the project pursues social, economic and environmental public interests;
- This project complies with national environmental regulations and will operate under national standards.

4.7 Stakeholders' comments

The Stakeholders Consultation Meeting on the CPA was held at Dafosi on October 16, 2008. This meeting was held for the purposes of having the CPA's aims and details fully understood by its participants. The Stakeholders Consultation Meeting was announced through visits made to local farmers, telephone communication with local governments and a posting on bulletin board at Binchang Co. The meeting engaged farmers' representatives from two villages, representatives from local authorities, such as Bin County Planning Bureau and Bin County Environmental Protection Bureau, and workers of the coal mine and VAM oxidizing plant.

At the meeting, an overview of the CPA was presented, followed by exchange of views among the participants. All the attendants of this meeting agreed and supported the construction of this project which would contribute local economical development. One

negative comment was taken out from the director of Caiziyuan Village related with the possibility of noise pollution. As described in Environmental impact, this project complies with national environmental regulations and will operate under national standards. The director agreed that all necessary noise protection measures will be taken to maintain noise below legally required level.

4.8 Operational and management plan of the project

The proposed PoA is controlled by Shaanxi Binchang New Energy Co. as a coordinator of the PoA, being affiliated company of Shaanxi Binchang Mining Group Co., as operational and management structure presented in Figure 4-4. Operator of the first CPA is also Binchang New Energy Co.

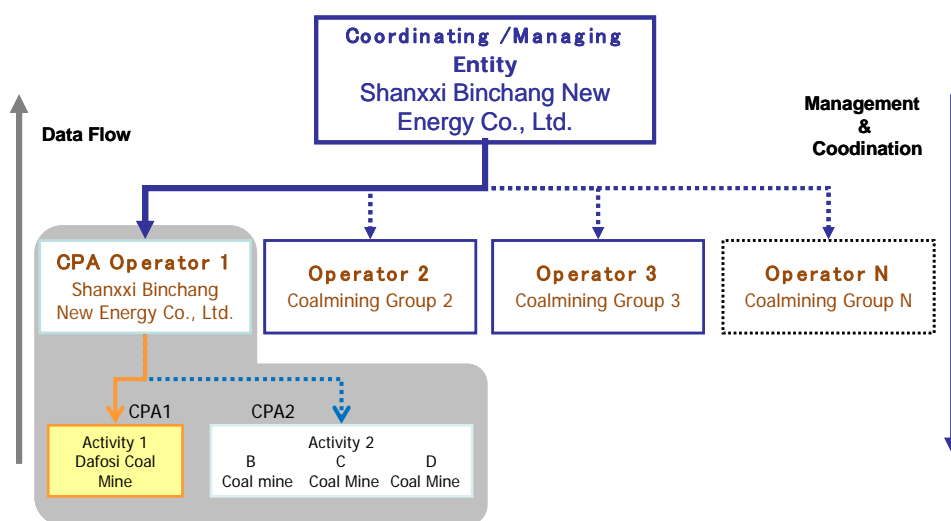


Figure 4-4 Operational and management structure for the PoA

Implementation system for the first CPA is shown in Figure 4-5. Dafosi Coal Mine and Binchang New Energy Co. were built up by investment of Binchang Co. The first CPA, VAM power generation project, will be operated by Binchang New Energy Co. as an operator at Dafosi Coal Mine. VAM and CMM added to VAM will be supplied to the CPA from Dafosi Coal Mine without any charge and electricity and hot water will be supplied to the mine from The CPA. Binchang Co. will raise necessary capital for the CPA.

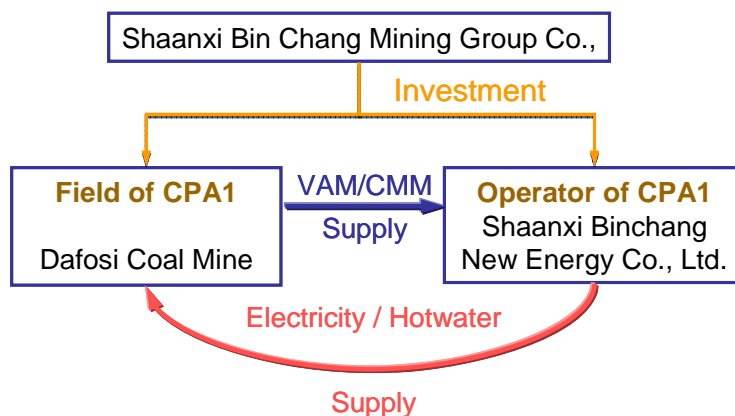


Figure 4-5 Operational and management structure for the CPA

4.9 Financial planning

The CPA will be financed by Binchang Co. Financial planning for fixed asset investment is presented in following Table 4-2. Five units of VAM oxidizers will destroy VAM added CMM and produce high pressure steam to generate electricity for the first stage. Another five VAM oxidizers would produce thermal energy for heating and/or hot water for the second stage. The financing for the first stage have been already finished and the construction will be commenced in this fiscal year. It is not yet fixed the plan of the second stage, because there have been also the possibility to generate power using thermal energy.

Table 4-2 Financial planning for fixed asset investment

Year	unit: mil RMB												Total
	1 2011	2 2012	3 2013	4 2014	5 2015	6 2016	7 2017	8 2018	9 2019	10 2020	11 2021	12 2022	
Capital Expenditure (Fixed Asset Investment)	61.58	29.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	91.38

4.10 Economic analysis

IRR (Internal Rate of Return) calculation with and without CER revenue was employed as the appropriate financial indicator for the benchmark analysis. Table 4-3 indicates the result of IRR calculation respectively. The IRR without CER revenues was -1.54 %, falling much less than the 15 % requirement under NDRC's investment approval criteria for coal mine sectors. Thus the proposed project activity is considered to be not financially attractive at all without CER revenues. On the other hand, the IRR with CER revenues was 27.90 %, satisfying the 15 % hurdle rate. The result of investment analysis with CER revenue is enough for the implementer to decide the investment for the CPA.

Table 4-3 Results of investment analysis

Project IRR without CER revenues	-1.54 %
Project IRR with CER revenues	27.90 %

4.11 Demonstration of additionality

As required by methodology ACM0008, the latest version of the "Tool for the demonstration and assessment of additionality (Version 05.2)" is applied to demonstrate additionality of CPAs. Considering the result of each step of the tool, additionality of the CPA can be demonstrated. Each step of the tool and the results of the consideration are indicated as follows:

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations:

As per the paragraph "Additionality" of the approved methodology ACM0008, this step can be ignored.

Step 2. Investment analysis:

Sub-step 2a. Determine appropriate analysis method

The benchmark analysis (Option III) is adopted.

Sub-step 2b – Option III. Apply investment benchmark analysis

The IRR (Internal Rate of Return) shall be employed as the appropriate financial indicator for the benchmark analysis. The 15% benchmark for coal mining industries is applied based on NDRC's investment approval criteria. The criterion is published by the National Development and Reform Commission and Ministry of Construction in China and is widely used by the relevant authorities in China for assessing the financial viability of potential new projects.

Sub-step 2c – Calculation and comparison of financial indicators

The methodological tool states that: *If the CDM project activity has a less favorable indicator (e.g. lower IRR) than the benchmark, then the CDM project activity cannot be considered as financially attractive.*

Therefore, if the IRR of the CPA was falling less than the benchmark of 15 % (after tax) requirement under NDRC's investment approval criteria for coal mine sectors, the CPA could not be considered as financially attractive.

Sub-step 2d – Sensitivity analysis

A sensitivity analysis should be carried out to estimate whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variation in the critical assumptions. An assessment is conducted of the impact that the parameters, total investment cost, operating cost, power sales price and power sales amount will have the effect on the IRR (without CER revenues) when they fluctuate in the range of -10% to +10%.

If after the sensitivity analysis it is concluded that the CPA under the proposed PoA is unlikely to be the most financially/economically attractive, then proceed to Step 4 (Common practice analysis).

Step 3. Barrier analysis:

According to the tool, this step (barrier analysis) could be skipped for the additionality assessment, if the CPA under the proposed PoA is unlikely to be financially/economically attractive.

Step 4. Common practice analysis:

Identify and discuss the existing common practice through the following Sub-steps:

Sub-step 4a. Analyze other activities similar to the proposed project activity:

VAM oxidizer could make it possible not only to destroy the methane in the VAM but also to recover heat energy from VAM. Although several types of VAM oxidizer has been developed

in the world and tried to introduce in coal mines in UK, USA and Australia, all the cases have not gone beyond the test operation. In China, two project activities are advancing under CDM project in coal mines of Yima Coal Industry (Group) Co., Ltd (CDM project reference No.1613) and Zhengzhou Coal Industry (Group) Co., Ltd. in Henan province (CDM project reference No.1603). The unit used is Vocsidizer developed by MEGTEC and the purpose of VAM utilization is not to generate electric power but to supply hot water. There is no advancing or planned project in China in which VAM oxidizer will be used without consideration of CER revenues.

One of the eligibility criteria for inclusion of a CPA in the proposed PoA is to introduce flameless VAM oxidizer developed by Shengli Co. It is the first case in China to introduce the VAM oxidizer in a full-scale commercial plant. Therefore, it is concluded that similar activity cannot be observed in China without CDM support.

Sub-step 4b. Discuss any similar options that are occurring:

If it is identified that similar activity is widely observed and commonly carried out in the sub-step 4a, essential distinctions between the project activity and similar activities should be reasonably explained in the sub-step 4b. However, based on the analysis of sub-step 4a above, no other project activities which use the same technology, oxidizing VAM to destroy methane and recover heat energy in order to generate power and/or utilize for heating, are occurring in China without CDM support.

Therefore, if steps 2, investment analysis was satisfied, i.e., a CPA under the proposed PoA was financially not attractive, then the CPA under the proposed PoA is additional, according to above discussion in each step.

4.12 Probability of the business plan

The construction of a VAM oxidizing unit for field trial had commenced on January 7, 2009 and the implementer of the CPA had completed all the necessary formalities for carrying out the project as a CDM activity by the day, such as EIA approval by Environmental Protection Bureau of Xianyang City and project approval by Development and Reform Commission of Xianyang City. However, it was decided that the approval required would be reapplied to Xianyang City according to the discussion with DOE, because more 2 years had been passed since getting the approval and some variations had occurred in the project design. These reapplications would be approved on March 10, 2011.

The implementer held a board meeting about FS of the project on June 18, 2008. It was concluded by the board members that carrying out this project as a CDM project is very meaningful and decreases the economic risk.

The VAM oxidizing unit for the trial has been owned by Shengli Co. The change in ownership of the unit will be done by that the implementer will purchase the unit after the starting of validation protocol. Then the construction work of the other 4 sets of VAM oxidizer will be commenced. The implementer, Binchang Co., has decided to make investment for the first stage of the CPA already.

The approval for the CDM project had been acquired from DNA of China on April 9, 2009.

However, it was identified that a reapplication would be required to change the LOA of Dafosi to the LOA for POA and the first CPA. The reapplication will be submitted to the DNA in March 2011. The Prior Consideration of the CPA is not necessary to submit to the DNA according to the statement of “Guidelines on the demonstration and assessment of prior consideration of the CDM, EB49, Report Annex 22”. That is “Such notification is not necessary if a PDD has been published for global stakeholder consultation or a new methodology proposed to the Executive Board for the specific project before the project activity start date.”

5. Validation

5.1 Outline of the Validation

The signing of validation contract with DNV on the PoA has been completed on January 4, 2011. PoA-DD, CPA-DD and Specific CPA-DD have been uploaded on the web-site of UNFCCC for Global Public Stakeholder Process (China Coal Mine Ventilation Air Methane Oxidization Programme: <http://cdm.unfccc.int/ProgrammeOfActivities/Validation/DB/HC7SLUPA2SQI2NOJAUDTFVSCNJF878/view.html>). On site visit as a field validation have been carried out on February 28 and March 1, 2011.

5.2 Process of the communication with DOE

Described in the report.

6. Research findings on “Co-benefit”

NO_x and SO_x have never been monitored in the exhausted gas from VAM oxidizers as a result of trial operation. The project will displace electricity from NWPG. By employing clean methane in power generation, the project will reduce NO_x, SO_x and particulate matter emissions from the coal-fired power plants operated by NWPG, therefore contributing to the mitigation of air pollution;

7. Research findings on the contribution to sustainable development in host country

The CPA will create new employment of 52 people. Shengli Co. would supply 1,600 units of VAM oxidizers to Chinese coal mining industry based on the success of the CPA. As new industry and employment will be created, associated with manufacturing VAM oxidizers as well as construction and operation of VAM oxidizing plant at coal mines, the CPA will contribute to sustainable development with economic and job creating effect in China.