CLEAN DEVELOPMENT MECHANISM
PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-PoA-DD) Version 01

CONTENTS

NOTE:

This form is for the submission of a CDM PoA whose CPAs apply a large scale approved methodology.

At the time of requesting registration this form must be accompanied by a CDM-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-CPA-DD (using a real case).

SECTION A. General description of programme of activities (PoA)

A.1 Title of the programme of activities:

China Coal Mine Ventilation Air Methane Oxidization Programme

A.2. Description of the programme of activities:

China Coal Mine Ventilation Air Methane Oxidization Programme (hereafter referred to as "The proposed 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.

In general, the term VAM and CMM (Coal Mine Methane) are defined as follows[1]:

- **VAM:** Methane emitted from coal seams that enters the ventilation air and is exhausted from the ventilation shaft at a low concentration, typically in the range of 0.1% to 1.0% by volume.
- **CMM**: Gas captured at a working coal mine by underground methane drainage techniques. Normally the term CMM includes VAM.

Figure-1 shows the outline of the proposed PoA and the definition of terms.

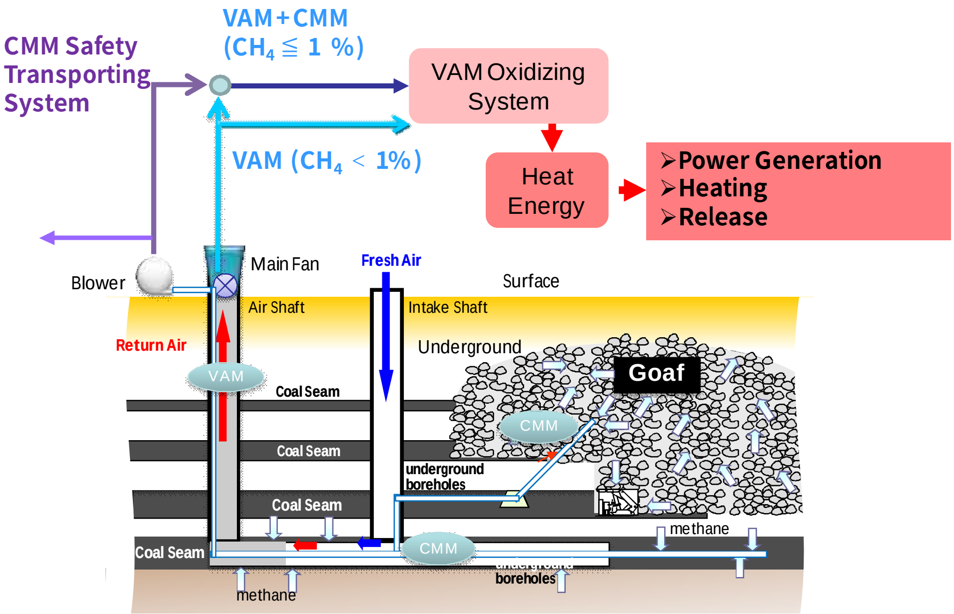

Figure-1 Schematic diagram of the proposed PoA

VAM and/or VAM added CMM will be destroyed by the VAM oxidizing system developed by Shengli Oilfield Shengli Power Machinery Group Co., Ltd. The field trial of the system had been conducted over

[1] ECONOMIC COMMISSION FOR EUROPE, Best Practice Guidance for Effective Methane Drainage and Use in Coal Mines, United Nation, 2010

one year at Dafosi Coal Mine which belongs to Shaanxi Binchang Mining Group Co., Ltd. (Binchang Co.) using full scale plant since August 2009. Figure-2 shows the installation of the system for full scale field trial at the mine. After the full scale trial, the system has been certificated by State Energy Administration as the state crass energy technology[2].

Figure -2 Installation of the VAM Oxidizing System at Dafosi Coal Mine of Binchang Co. for full scale field trial.

Heat energy may be recovered by oxidizing VAM with kinds of VAM oxidizer. However, as methane concentration of VAM is very low, the energy efficiency to recover heat energy by oxidizing VAM is low. Furthermore, it may not able to recover enough heat energy to generate power with steam turbine generator depending on the methane concentration of VAM. Thus the income from selling power as the major financial benefits of VAM oxidizing can seldom expect, if the power generation would be possible. Difficulty to destroy and utilize VAM economically and technologically leads to obstruct the spread of VAM oxidizing in a commercial base in the world.

According to the Chinese government's figures, coal demand in China in 2010 will be over 3 billion tones per year. To meet this demand, China is rapidly developing new coal mines. The country had a production capacity of 2.5 billion tones in 2008; production capacity of an additional 1.1 billion tones was under construction. Taking into account the retirement of old coal mines by 2010, China is expected to have coal production capacity of 3.1 billion tones[3]. As a result of its coal production, China is the world's leading emitter of coal mine methane. China's Coal Mine Methane (CMM) emission is estimated 20 billion m^3 CH_4 (280 million tones of CO_2 equivalent) and 72 % of CMM has been emitted through VAM in 2008[4].

For CMM utilization, Chinese regulation requires that CMM used should have minimum methane concentration of 30 %, except the case in which the technology approved as Safety Production Technology

[2] State Energy Administration, China; [2010] No. 036, May 11, 2010.

[3] IEA; Coal Mine Methane in China:A Budding Asset with the Potential to Bloom, February 2009

[4] http://www.methanetomarkets.org/expo/docs/postexpo/coal_shengchu.pdf, P8,9

Standards[5], new type of engine and CMM safety transport system developed by Shengli Oilfield Shengli Power Machinery Group Co., Ltd., to utilize low methane concentration CMM (below 30 %)[6], would be used. As it is required for coal mines that methane concentration in the exhaust air of the mine to be below 0.75% to avoid the risk of explosion[7], methane concentration of VAM is normally very low (0.1~0.7 %). On the other hand, Chinese government prohibits releasing CMM over 30% methane concentrations into the atmosphere from coal mines[8]. However, there are no legal requirements for releasing CMM below 30% methane concentration including VAM due to the difficulties to utilize such low concentration methane technically and economically. Therefore, all VAM has been released in the atmosphere in the business as usual (BAU) activity, leading to huge amount of GHG gas emission.

A coordinating/managing entity for the proposed PoA is Shaanxi Binchang New Energy Co., Ltd., the associate company of Shaanxi Binchang Mining Group Co., Ltd. (hereafter referred to as "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 under the proposed PoA.

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 the 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 carried 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 expected result for the proposed PoA is a significant reduction of GHG emissions compared to the emissions that would occur in the absence of the proposed PoA. Second expected result is to promote sustainable coal production, generating environmental and social benefit.

a. Local and global environmental benefits

The proposed PoA will contribute GHG emission reduction to local environment and therefore contributing to the mitigation of adverse impacts of climate change, both locally and globally.

The proposed PoA may also displace thermal energy generated by conventional coal-fired boiler owned by coal mines and electricity from the Grid. By employing clean methane in generating thermal energy, the project will reduce SOx and particulate matter emissions from the mine's coal-fired boiler and coal-fired power plants operated by the Grid, therefore contributing to the mitigation of air pollution in the local area. Even if the thermal energy would be released without utilization, as VAM oxidizers discharge exhaust gas without SOx, NOx, and particulate matter, and waste water, it means that the proposed PoA will reduce huge amount of GHG gas without any air and water pollution by introducing VAM oxidizing system.

[5] Safety Production Technology Standards, AQ 1075-2009, AQ 1076-2009 and AQ 1078-2009.

[6] National Coalmine Safety Regulation (3/2010) , item 148 (revised)

[7] National Coalmine Safety Regulation (11/2005) , Section two, item 135

[8] GB 21522-2008, Emission Standard of Coalbed Methane/Coal mine Gas (on trial), July 1, 2008

b. Social-Economic benefits

The proposed PoA will utilize VAM as energy source, which would otherwise be released into the atmosphere under the baseline scenario, thus contributing to the establishment of a recycling-oriented and zero-emission society, and to the amelioration of the imbalance of energy supply/demand in the area where the proposed PoA would be implemented.

The proposed PoA will create new job during the construction and operation of VAM oxidisation plants, which thus will contribute to the regional development in China.

The proposed PoA will introduce a new VAM oxidation technology to China with great possibility of spread and have effects on other industries, such as oil and gas industry, and chemical industry, in which low concentration methane have been emitted into the air, thus contributing to the establishment of low-emission industries. As a result, the industry and the company relevant to VAM oxidization also develop, and then it leads to development of the economy whole of China.

c. Other Benefits

Major income for the proposed CPA is CDM revenue. This means that the proposed CPA without CDM revenue would not be implemented and no additional GHG reduction would occur. Under the PoA protocol, same technology should be used in each CPA included in the proposed PoA. As a coordinating/managing entity can control CDM registration procedure, the unified design and purchase of the system, effort for CDM registration and initial investment cost could be reduced. As a result, more CPAs would be implemented under the proposed PoA compared with a case in which single CDM activity would be registered, leading to reduce more GHG emission reduction.

In summary, the proposed PoA will not only benefit global GHG emission reduction but also contribute much to local environment and sustainable development.

A.3. Coordinating/managing entity and participants of POA:

Name of Party involved (*) **((host) indicates a host Party)**	**Private and/or public entity(ies) project participants (as applicable)**	**Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)**
People's Republic of China (host)	Shaanxi Binchang Mining Group Co., Ltd.	No
Japan	Carbon Capital Management, Inc.(Japan)	No

Further contact information of project participants is provided in Annex 1.

A.4. Technical description of the programme of activities:

A.4.1. Location of the programme of activities:

A.4.1.1.	Host Party(ies):

People's Republic of China

A.4.1.2.	Physical/ Geographical boundary:

The geographical boundary for the proposed PoA includes all Province of China. Figure-3 characterizes the geographical boundary of the proposed PoA.

Figure-3 Geographical boundary of the proposed PoA

A.4.2. Description of a typical CDM programme activity (CPA):

A.4.2.1. Technology or measures to be employed by the CPA:

The proposed PoA activity consists of CPAs which have the same technical concept. 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 included in the proposed PoA has following three options or their combination; that is, (i) to release the thermal energy, (ii) to use the thermal energy for heating, and (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.

Schematic view of the technology to be employed by the proposed PoA is presented in Figure-4:

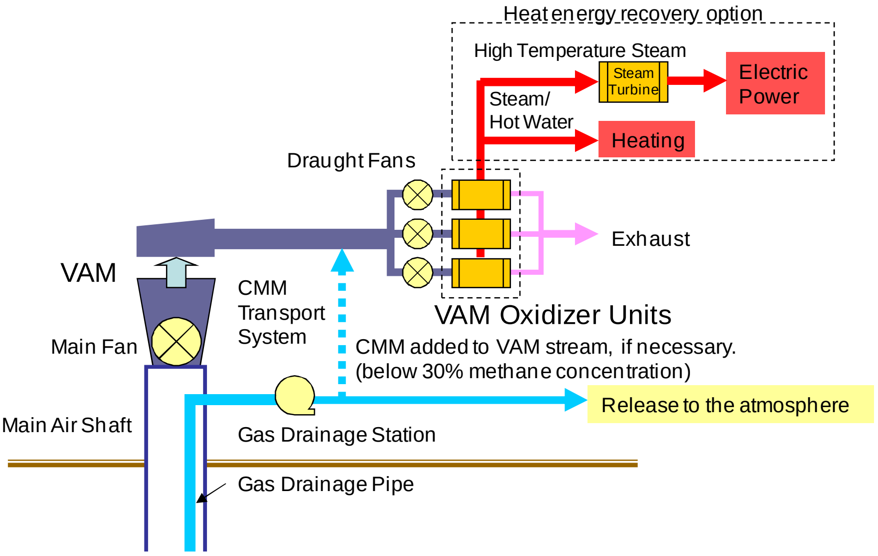

Figure-4 Schematic view of the technology to be employed by the proposed PoA

Technology to be employed by each CPA in the proposed PoA includes following equipments:

■ VAM oxidizer

In February 2005, Shengli Oilfield Shengli Engine Machinery Group Co.,Ltd. put forward the VAM oxidation theory for the first time in China, later they manufactured 200 Nm^3/h oxidation units and confirmed the theory on the base of trial and error. In March 2006, they applied a national patent for invention in China, and then in May 2007, they obtained the letters of patent. In October 2006, they began to research 10,000 Nm^3/h oxidation units. In August 2007, several famous experts from National Development Reform Commission, Coal Industry Association and Environmental Protection Administration appraised the technology of VAM oxidation at a coal mine in China, and concluded that the technology is the most important innovation for coal mines in oxidizing the VAM and has a most important practical significance in promoting energy-saving and GHG emission reduction. In December 2007, the company manufactured 60,000 Nm^3/h VAM oxidizer (VAM60.00) successfully. In the Table-1, technical parameter of the VAM Oxidizer is presented.

Table-1 Technical Parameters of VAM Oxidizer

Item	Unit	Spec
Type of VAM oxidiser	VAM60.00	
Oxidation ability	Nm^3/h	60,000
Temperature of VAM	°C	10 - 50
Maximum work-concentration	% CH_4	1.2
Minimum work-concentration	% CH_4	0.25
Rated power of draught fan	kW	2 x 55
Rated power of heater	kW	400

Start up (heating up) hours	hours	72
Rated output (1% CH_4 input)	MJ/Nm^3	35.8
Oxidation ratio	%	≥ 97
Overhaul cycle	years	3
Renewal period	years	15

The VAM oxidizer consists of oxidation bed and control system. The outside and operating principle of the VAM oxidizer is presented in Figure-5. Oxidation bed is heated up to a workable temperature about 1,000 °C by electricity for start-up procedure of the unit. Then the VAM is forced in the oxidation bed by two draught fans. When the VAM is oxidized, exothermic reaction occurs. In the oxidation bed, the oxidizer accumulates oxidation heat at the far side from the inlet of the bed. At regular intervals, the flow direction of VAM is automatically changed so that the part of the previously heated bed heats the incoming VAM. Although a part of the oxidation energy is consumed to keep the oxidation process, at the same time, the excess energy can be recovered by heat exchange in the form of the heat which would be utilized for power electricity or for heating.

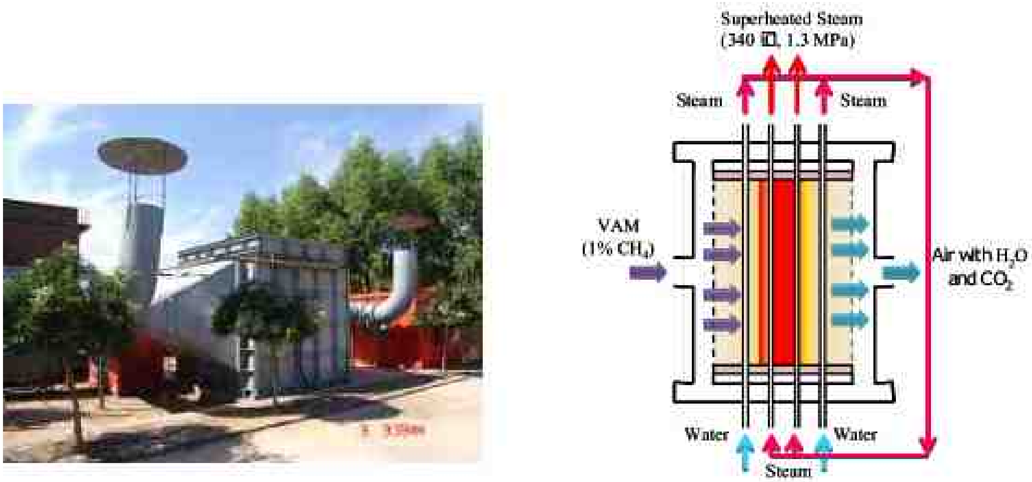

Figure-5 Outside View and Operating Principle of VAM Oxidiser

As methane concentration of VAM is typically 0.3~0.7 %, it is necessary to add low methane concentration CMM to VAM stream in order to generate electricity effectively. At the case of 0.3 % of methane concentration, the energy recovery ratio of the VAM oxidizer is very low. Therefore, heat energy recovered will be used only to produce hot water or released into the atmosphere.

■ Steam turbine power generator (Option for power generation)

The steam produced by VAM oxidizes are sent to steam turbine and power generator for power generation.

■ CMM Safety Transport System (Option for enriching VAM with CMM)

Because the methane concentration of the CMM added to VAM in the proposed PoA falls between the ranges of explosive concentration levels, an anti-explosion CMM safety transport system should be installed between CMM gas extraction station and CMM mixing point to VAM stream. The system is approved as Safety Production Technology Standards (AQ 1076-2009 and AQ 1078-2009) and developed by Shengli Oilfield Shengli Power Machinery Group Co., Ltd., to transport low methane concentration CMM (below 30 %) and the National Coalmine Safety Regulation requires using the system for safety transportation[9]. Figure-6 shows the schematic diagram of the CMM transport system. The features of the system are introduction of mist transmission system in addition to normal explosion proof devices. Ring-shaped atomizers are installed in the CMM gas pipeline to the mixing point and constantly spray mist from the mist generators. By constantly filling the pipes with mist, static-caused fires can be prevented.

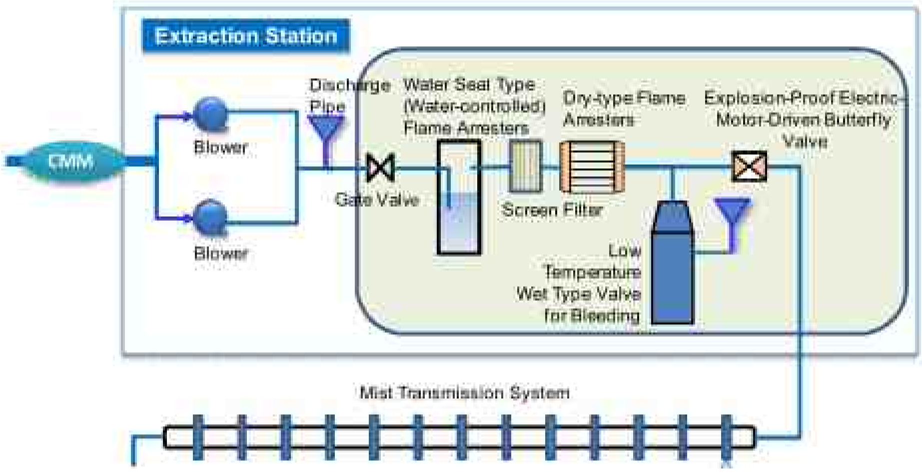

Figure-6 CMM Safety Transport System

■ CMM mixing unit to VAM stream and safety system (Option for enriching VAM with CMM)

Figure-7 shows CMM mixing unit to VAM stream and safety system. CMM mixing system will be used to add CMM to VAM stream that sent to VAM oxidizes. The unit consists of monitoring (methane concentration and pressure) equipments for both CMM and VAM stream, data analysing units and valve control units. Based on monitoring data, flow control of CMM added line is performed so that predetermined methane concentration of the VAM stream will be sent into VAM oxidizer automatically. CMM will be transported by the pipeline with mist transmission system to the VAM mixing point. At the point, following safety facilities are also equipped.

- Mechanical safety equipment: When draught fans for forcing VAM to VAM oxidizer are operated, a mechanical valve of the CMM adding line will be opened by the action of wind pressure. If draught fans will be stop, the valve will be closed by the force of return spring.
- Interlocking draught fans and safety valve: When the electric power for draught fans is intercepted, safety valve will operate immediately and intercept VAM stream, and discharge VAM in the atmosphere
- When the methane concentration of mixed VAM exceeds predetermined value, the safety valve of VAM oxidizer and mixing system will close automatically, and VAM will be discharged in the atmosphere.

[9] National Coalmine Safety Regulation (03/2010) , item 148 (Revised)

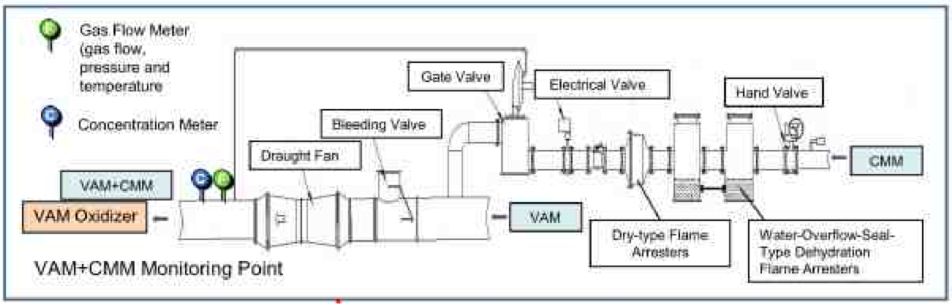

Figure-7 CMM Mixing Units to VAM Stream and Safety System

A.4.2.2. Eligibility criteria for inclusion of a CPA in the PoA:

Following eligibility criteria should be applicable for inclusion of the CPA in the proposed PoA:

1) The geographic boundary of a CPA lies within China;

2) A CPA reduces GHG emission by destroying methane contained in VAM emitted from underground coal mines and also the CMM (<30%) in case added to the VAM, which otherwise have been released in the atmosphere. And a CPA adopts one 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);

3) An existing Approved CDM Methodology ACM0008 (Version 07) is applicable to a CPA;

4) 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.

5) Destroying methane is carried out by flameless VAM oxidizer developed by Shengli Oilfield Shengli Power Machinery Group Co., Ltd. Major specification of the VAM oxidizer are presented in the Table-1 of A.4.2.1;

6) CBM option for methane gas extraction through surface well is not included;

7) 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 electric power;

8) 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 be released into the atmosphere without utilization/destruction, and have no legal requirement to utilize/destruct 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[10];

9) 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 the 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 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;

10) A CPA meets following criteria for assessing additionality:
   (i) The FIRR of the CPA is calculated based on updated input parameters and assumptions and the method provided in section E.5.1;
   (ii) The FIRR benchmark, 15 % (after tax) requirement under NDRC's investment approval criteria for coal mine sectors should be applied to estimate the financial additionality at activity of the CPA under the proposed PoA;
   (iii) The financial additionality is demonstrated by showing that the calculated FIRR (excluding CDM) is below the applied investment benchmark after carrying out sensitivity analysis.

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

The information presented here shall constitute the demonstration of additionality of the PoA as a whole.

(i) The proposed PoA is a voluntary coordinated action;

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[10] Even if the low methane concentration CMM added to VAM would otherwise be used for CDM project of CMM power generation, CER calculated for adding VAM is more conservative, because the efficiency to generate electricity of oxidizer and steam turbine generator is lower than that of gas engine and generator for low concentration CMM. That is, although project emissions from destroying methane is same, baseline emissions from power generation replaced by CMM power generation is more than that by VAM oxidization.

Currently in the business as usual activity, all VAM emitted from underground coal mines in China have been released in the atmosphere, because it is difficult to utilize or destroy methane in the VAM technically and economically due to its low methane concentration, below 0.75 % normally.

The proposed PoA improves current practice by introducing newly developed technology, that is low concentration methane destruction with flameless oxidizes. If all VAM from the coal mine would be sent to the VAM oxidizers, the 97 % of methane gas contained in the VAM which is 21 times more potent greenhouse gas than CO_2 will be destroyed. It is estimated that hundreds of thousands tons of CO_2 emissions will be abated at a typical gassy coal mine which has a several hundreds tons of annual production capacity.

There are no national, province or local requirements providing for VAM treating at coal mines. Although the National regulation prohibits releasing CMM which methane concentration is over 30 %[11], there are no requirement for CMM and VAM which concentration is below 30 %. This way, coal mines itself are not require to destroy or utilize VAM. Therefore the proposed PoA is a voluntary action to reduce GHG emissions and implemented by the coordinating/managing entity.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

Major financial benefits generated by the proposed PoA to the PoA coordinator are CER revenue. Without CER revenue, the PoA coordinator has no obligation to, and cannot manage the PoA and conduct coordination between all participants because it is a private entity. Thus, the voluntary coordinated action would not be implemented in the absence of the PoA.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

Not applicable.

(iv) If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Not applicable.

A.4.4. Operational, management and monitoring plan for the programme of activities:

A.4.4.1. Operational and management plan:

Management and operational scheme of the proposed PoA is shown in Figure-8 below.

[11] GB 21522-2008, Emission Standard of Coalbed Methane/Coal mine Gas (on trial), July 1, 2008

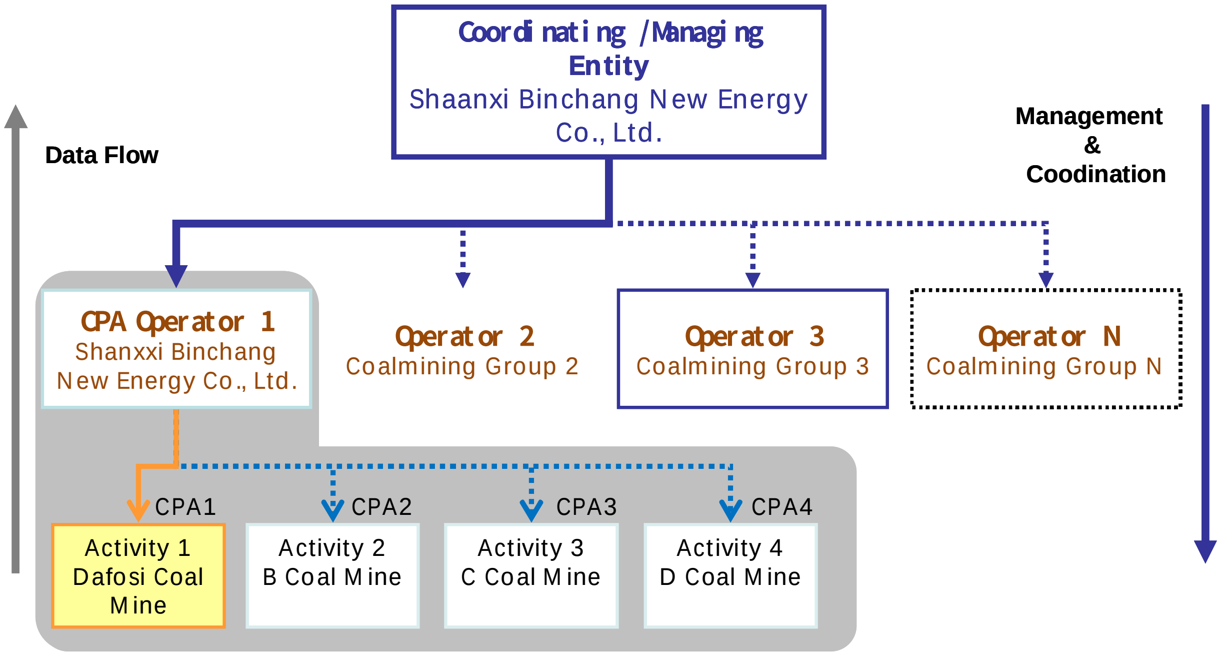

Figure-8 Management and operational scheme of the proposed PoA

The managing/coordinating entity, Shaanxi Binchang New Energy Co., Ltd. is in charge of coordinating all project participants of the proposed PoA, collecting necessary data and information from each CPA for the purpose of monitoring, and also communicating with DOE and CDM Executive Board.

(i) A record keeping system for each CPA under the PoA.

Each CPA is operated by a CPA operator under the control of the coordinating entity. The CPA operator reports monitored data to the managing/coordinating entity.

The record keeping system consists of the method of data monitoring, the duty and roles of each participants and the database including but not limited to schedule and serial number for each CPA, name of coal mine, size of each CPA, and all necessary information/data of the coal mines in each CPA. The database is completed by CPA operators through *ex ante* and *ex post* survey of entire activity. The database is submitted to the coordinating entity periodically. The entity verifies the reported data with field check if necessary.

Related responsibilities and tasks of participants under the record keeping system are described in the Table-2 below.

Table-2 Responsibilities and tasks of the participants to the PoA

Activities	Entity in Charge	Task Description
Writing Stakeholder guideline	Coordinating Entity will provide the guideline and be responsible for the implementation.	Writing PoA guideline with instruction for all involved stakeholders to clarify responsibility and tasks.

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VAM oxidizing system construction	Coordinating Entity will organize and supervise the technical team to construct the system, supported by the manufacture.	Construct VAM oxidizing system and install the related equipments.
Monitoring	Monitoring data will be collected and archived by operators according to approved methodology.	Collection of monitoring data.
Data archiving and analysis	Monitoring data are sent to coordinate entity, and then archived and analyzed by coordinating entity.	Receiving monitoring data, structuring and maintaining data base and provide the data in a suitable format for calculating emission reduction.
CDM application	Coordinating entity will take the full responsibility for the CDM application.	Develop and register the PoA as along the CDM regulations.
CER trading and revenue allocation	Coordinating entity will in charge of trading the CERs and allocating the revenue based on the agreement with the related participants.	Trading the CERs and allocate revenue.
Communication and reporting	Coordinating entity is responsible for coordinating between project participants and communicating with DOE and CDM EB. CPA operators report the monitoring data, operation record and maintenance record to the coordinating entity.	Communication between participants and with DOE and CDM EB, and reporting monitoring data, et al.

(ii) A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as CDM project activity or as a CPA of another PoA.

The operator of a CPA shall, in accordance with the eligibility criteria in section 4.2.2, confirm with a written statement at the time of CPA inclusion that any VAM oxidizing system under the CPA does not belong to another CPA under this PoA, another registered CDM project activity or another CDM PoA.

(iii) The provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA;

As per the eligibility criteria for CPAs in section 4.2.2, the operator shall also confirm with a written statement that they are aware that the CPA will be subscribed to the PoA.

A.4.4.2. Monitoring plan:

(i) Description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emissions by sources or removals by sinks of greenhouse gases achieved by CPAs under the PoA.

No statistically sound sampling method/procedure to be used by DOEs. All data required for verification of amount of reduction of anthropogenic emission by sources by CPAs under the PoA is provided the coordinating/managing entity through operators.

(ii) In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA;

According to the Procedures for Registration of a Programme of Activities as a Single CDM Project Activity and Issuance of Certified Emission Reductions for a Programme of Activities (version 04.1), all the CPAs under the proposed PoA will be monitored as per the related methodologies, procedures and guidelines.

All relevant parameters included in the monitoring plan shall be monitored and recorded for each included CPAs independently. Monitoring reports will be prepared separately for each of the CPAs for the purpose of verification and request for issuance of CERs. To guarantee the uncomplicated access to the CPA data, the coordinating entity will maintain a database for all included CPAs.

In each included CPA, operator destroys and uses VAM or VAM enriched with CMM rather than CMM which imposed to be destroyed or used by regulatory requirements and have a capability to be used for other purpose. This is confirmed by the monitoring carried out in each monitoring according to related approved methodology.

A.4.5. Public funding of the programme of activities:

No public funding from Parties included in Annex I countries is involved.

SECTION B. Duration of the programme of activities

B.1. Starting date of the programme of activities:

Starting date of the proposed PoA is the same as the starting date of the first CPA included in the proposed CPA. The earliest start date of the first CPA is expected to be Feb 2011, when the construction work will be commenced.

B.2. Length of the programme of activities:

The length of the proposed PoA is 28 years.

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐
2. **Environmental Analysis is done at CPA level** ☑

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

Not applicable. Environmental Analysis is done at CPA level.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

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.

SECTION D. Stakeholders' comments

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ☐
2. **Local stakeholder consultation is done at CPA level** ☑

D.2. Brief description how comments by local stakeholders have been invited and compiled:

Not applicable. Local stakeholder consultation is done at CPA level.

D.3. Summary of the comments received:

Not applicable. Local stakeholder consultation is done at CPA level.

D.4. Report on how due account was taken of any comments received:

Not applicable. Local stakeholder consultation is done at CPA level.

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SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate the application of the baseline and monitoring methodology to a typical CPA. The information defines the PoA specific elements that shall be included in preparing the PoA specific form used to define and include a CPA in this PoA (PoA specific CDM-CPA-DD).

E.1. Title and reference of the approved baseline and monitoring methodology applied to each CPA included in the PoA:

(a) Approved consolidated methodology ACM0008 (Version 07); "Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction through flaring or flameless oxidation";
(b) The tool for the demonstration and assessment of additionality (Version 05.2);
The tool to calculate the emission factor for an electricity system (Version 02).

E.2. Justification of the choice of the methodology and why it is applicable to each CPA:

ACM0008 defines the applicability of this methodology. The following Table-3 and Table-4 explain the reason why the methodology applies to each CPA:

Table-3 Comparison of extraction components of each CPA with applicability of ACM0008

ACM0008 Applicability	Extraction Components of a CPA
Surface drainage boreholes to capture CBM associated with mining activities	The project activity does not involve the extraction of CBM.
Underground boreholes in the mine to capture pre mining CMM	Included
Surface goaf wells, underground boreholes, gas drainage galleries or other goaf gas capture techniques, including gas from sealed areas, to capture post mining CMM	Underground boreholes, gas drainage galleries and some other goaf gas capture techniques are adopted to capture the post mining CMM.
Ventilation air methane that would normally vented	Included

Table-4 Comparison of the utilization components of each CPA with applicability of ACM0008

ACM0008 Applicability	Utilization Components of a CPA
The methane is captured and destroyed through flaring	No flaring is involved in the project
The methane is captured and destroyed through flameless oxidation with or without utilization of the thermal energy	Most of VAM is destroyed by flameless oxidizers with or without utilization of the thermal energy.
The methane is captured and destroyed through utilization to produce electricity, motive power and/or thermal energy; emission reductions may or may not be claimed for displacing or avoiding energy from other sources	The methane may be captured and destroyed through utilization to produce electricity and/or thermal energy; emission reduction only for displacing electricity from the Grid is claimed.

The remaining share of the methane, to be diluted for safety reason, may still be vented	Part of CMM/VAM is still vented in the project.
All the CBM or CMM captured by the project should either be used or destroyed, and cannot be vented	All of the VAM captured by the project should either be used or destroyed, and cannot be vented.

ACM0008 also define the types of activities that could not be applied to this methodology. Each CPA does not apply to any of those activities (Table-5):

Table-5 Comparison of each CPA with incompatibility of ACM0008

ACM0008 Inapplicability	**CPA**
Capture methane from abandoned/decommissioned coal mines	The project is implemented in a working underground coal mine
Capture/use of virgin coal-bed methane, e.g. methane of high quality extracted from coal seams independently of any mining activities	All of methane captured/used in the project is dependent with mining activity
Use CO_2 or any other fluid/gas to enhance CBM drainage before mining takes place	No CBM extraction is involved in the project

It can be concluded from the above analysis that the proposed project complies with both the baseline and the monitoring methodologies of ACM0008.

E.3. Description of the sources and gases included in the CPA boundary

Based on approved methodology ACM0008, the project boundary for a CPA is determined as follows:

For the purpose of determining project activity emissions, project participants shall include:
(Followings are demonstrated according to the 8th criterion of eligibility criteria in A.4.2.2.)

◆ *CO_2 emissions from the combustion of methane in a flare, engine, power plant or heat generation* plant;
· A CPA does not include the combustion of methane in a flare, engine, power plant or heat generation plant;

◆ *CO_2 emissions from the oxidation of methane in a flameless oxidation unit;*
· CO_2 is emitted from the oxidation of methane in the VAM oxidizers.

◆ *CO_2 emissions from the combustion of non methane hydrocarbons (NMHCs), if they represent more* than 1% by volume of the extracted coal mine gas;
· NMHCs present less than 0.01% by volume of extracted VAM, the CO_2 emissions from the combustion will not be included; if it presents more than 0.01%, the CO_2 emissions from the combustion will be included.

◆ *CO_2 emissions from on-site fuel consumption due to a CPA, including transport of the fuel;*

- VAM oxidizers to be used in the project activity are for VAM use only, and use no additional fuels. However, additional electricity is used for sending VAM to the oxidizers (Draught fans), pre-heating the oxidizers and operating steam turbine generator (if power generation would be included).

◆ *Fugitive emissions from unburned methane*
- The oxidation rate for the VAM oxidizer is 0.97 according to the specifications of the unit. However, actual oxidization rate is monitored in each CPA.

For the purpose of determining baseline emissions, project participants shall include the following emission sources:
(Followings are demonstrated according to the 9th criterion of eligibility criteria in A.4.2.2.)

◆ *CH_4 emissions as a result of venting gas that would be captured in the project scenario;*
- In the baseline scenario, the VAM and low concentration (below 30%) CMM added to VAM are released into the atmosphere.

◆ *CO_2 emissions from the destruction of methane in the baseline scenario;*
- In the baseline scenario, the all of VAM and low concentration CMM (below 30%) are released into the atmosphere, and thus, no methane is combusted or destructed.

◆ *CO_2 emissions from the production of power (motive and electrical) that is replaced by the project* activity.
- The power generation using VAM would be included in a CPA, the power replaces the electricity from the grid.

The spatial extent of the project boundary comprises:
(Followings are demonstrated according to the 10th criterion of eligibility criteria in A.4.2.2.)

◆ *All equipment installed and used as part of the project activity for the extraction, compression, and storage of CMM and CBM at the project site, and transport to an off-site user;*
- 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.
- Draught fans installed between the ventilation fan and VAM oxidizers will be included in a CPA boundary.
- CMM safety transport system will be included in a CPA boundary, if CMM would be added to VAM.

◆ *Flaring, flameless oxidation, captive power and heat generation facilities installed and used as part of the project activity;*
- A CPA does not introduce flaring, captive power and heat generation facilities destroying and/or utilizing CMM. VAM oxidizer is used as the major part of the project activity.

◆ *Power plants connected to the electricity grid, where the project activity exports power to the grid, as per the definition of project electricity system and connected electricity system given in "Tool for calculation of the emission factor for an electricity system".*
- The grid is the relevant electricity grid of the Project.

Based on the conditions required in the methodology, the project boundary for this project activity is presented in Figure-9, and the overview on emissions sources including in or excluded from the project boundary is presented in Table-6.

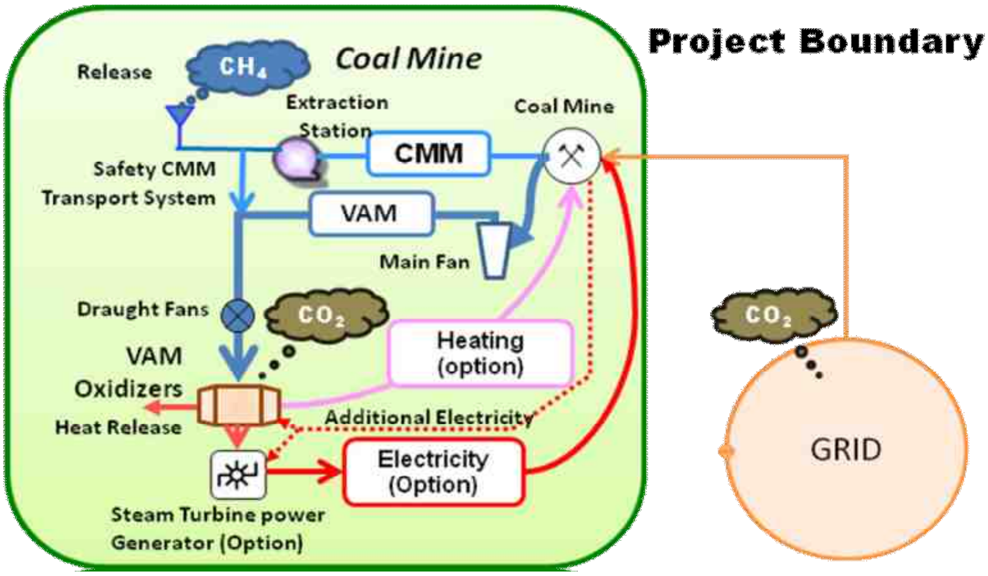

Figure-9 Typical CPA boundary under the proposed PoA

Table-6 Overview on emissions sources included in or excluded from the typical CPA boundary

	Source	Gas	Included?	Justification / Explanation
Baseline Emissions	Emissions of methane as a result of venting	CH_4	Included	All of captured methane in the CPAs is vented in the base line scenario. This is the major emission source.
	Emissions from destruction of methane in the baseline	CO_2	Excluded	None of methane captured in the CPAs is destroyed in the baseline.
		CH_4	Excluded	None of methane captured in the CPAs is destroyed in the baseline.
		N_2O	Excluded	None of methane captured in the CPAs is destroyed in the baseline.
	Grid electricity generation (electricity provided to the grid)	CO_2	Included	Only emissions from the Grid equivalent to electricity generated by the project activity.
		CH_4	Excluded	Not significant. Excluded for simplification.
		N_2O	Excluded	Not significant. Excluded for simplification.

	Captive power and/or heat, and vehicle fuel use	CO_2	Excluded	Base line scenario does not involve captive power and/or heat, vehicle fuel use that would be displaced by power and/or steam produced by VAM oxidizers. Even if heat generation would be introduced in the CPA, the CERs from displacement by steam or hot water recovered from VAM oxidizer will not be claimed.
		CH_4	Excluded	Not significant. Excluded for simplification.
		N_2O	Excluded	Not significant. Excluded for simplification.
Project Emissions	Emissions of methane as a result of continued venting	CH_4	Excluded	Only the change in VAM emissions release will be taken into account by monitoring the methane destroyed by the project activity.
	On-site fuel consumption due to the project activity, including transport of the gas.	CO_2	Included	Only emissions due to the additional consumption of electricity from the Grid for draught fan, heating up the VAM oxidizer and operation of steam turbine generator (if introduced).
		CH_4	Excluded	Not significant. Excluded for simplification.
		N_2O	Excluded	Not significant. Excluded for simplification.
	Emission from methane destruction	CO_2	Included	Methane oxidized by VAM oxidizers. This is the major emission source.
	Emissions from NMHC destruction	CO_2	Included	In a CPA, only in case NMHC accounts for more than 0.1% by volume of VAM, the emission will be included.
	Fugitive Emissions of unburned methane	CH_4	Included	Small amounts of methane will remain in the exhaust of VAM oxidizers.
	Fugitive methane emissions from on-site equipments	CH_4	Excluded	Not significant. Excluded for simplification.
	Fugitive methane emissions from gas supply pipeline or in relation to use in vehicles	CH_4	Excluded	Not significant. Excluded for simplification.
	Accidental methane release	CH_4	Excluded	Not significant. Excluded for simplification.

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

The baseline scenario of CPAs is identified according to approved methodology ACM 0008 (version 07).

CPAs in the proposed PoA only includes destruction/utilization of VAM and low methane concentration CMM (lower than 30%) added to VAM. The CMM would otherwise be vented to the atmosphere. Therefore those baseline scenario alternatives concerning only extraction and treatment of VAM and low methane concentration CMM are included in the following discussions.

Step 1. Identify technically feasible options for capturing and/or using CBM or CMM or VAM

Step 1a. Options for CBM and CMM or VAM extraction

As CBM extraction is not considered at all for the option of methane extraction for a CPA because CBM extraction does not included into eligibility criteria for inclusion of a CPA in the proposed PoA. Thus, CBM shall not be considered.

Following options could be included:

A. Ventilation air methane;
B. Pre-mining CMM extraction;
C. Post-mining CMM extraction;
D. Possible combination of A, B and C.

Option D is the proposed project activity not implemented as a CDM project.

Typical gassy coal mine carries out a combination of VAM, and pre-mining and post-mining CMM by underground boreholes. However, pre-mining and post-mining CMM are normally both brought to the gas drainage station on the surface through the same drainage lines, and it is therefore impossible to specify the share of CMM captured by each method.

Step 1b. Options for extracted CBM and CMM or VAM treatment

A CPA does not recover CBM, thus CBM are not considered as a candidate for treatment. The possible options to use VAM (including VAM enriched by CMM) are as follows:

i. Venting;
ii. Using/destroying ventilation air methane rather than venting it;
iii. Flaring of CMM;
iv. Use for additional grid power generation;
v. Use for additional captive power generation;
vi. Use for additional heat generation;
vii. Feed into gas pipeline (to be used as fuel for vehicles or heat/power generation);
viii. Possible combinations of options i, ii, iv or v, and vi with the relative shares of gas treated under each option specified.

Option viii is the proposed project activity not implemented as a CDM project.

It is difficult to utilize VAM enriched by low methane concentration CMM (below 30%), if necessary, for power generation and/or producing heat energy with traditional technology, due to the very low concentration of methane (below 0.75%). Flameless VAM oxidization could make it possible to recover the energy as steam and/or hot water from VAM. Although several types of VAM oxidizer has been developed in the world and tried to introduce in coal mines in UK, Australia and USA, all the cases have not gone beyond the test operation. This project will use the VAM oxidizer developed by Shengli Oilfield Shengli Engine Machinery Group Co., Ltd, China. The oxidizer makes it possible to destroy VAM, having extremely low methane concentration but huge volume, and to be as heat energy resource. This could make the option ii, iv, v, vi and viii in *step 1b* technically feasible baseline options.

It is also difficult to treat VAM and CMM by Flaring, because the concentration of VAM (lower than 0.75%) and CMM (lower than 30%) adding to VAM, if necessary, is less than 30%, such a low concentration of methane could not be flared. With regard to option vii, due to the same reason of low methane concentration of VAM and CMM, it is not technically feasible to purify the VAM to be fed into gas pipeline for vehicles or heat/power generation which usually requires the methane concentration of higher than 30%. Thus option iii (Flaring) and vi (feed into gas pipeline to be used as fuel for vehicles or heat/power generation) is excluded.

To summarize the above analysis, the six options left for VAM treatment, those are:

i. Venting;
ii. Using/destroying ventilation air methane rather than venting it;
iv. Use for additional grid power generation;
v. Use for additional captive power generation;
vi. Use for additional heat generation;
viii. Possible combinations of options i, ii, iv or v, and vi with the relative shares of gas treated under each option specified.

Option viii is the proposed project activity not implemented as a CDM project.

Step 1c. Options for energy production

Options for energy production in a CPA involve heat generation for producing hot water and/or high temperature steam to generate electricity with steam turbine generators. The baseline scenario alternatives envisaged for thermal energy production include the following options:

1. Electricity from a Grid;
2. Power generation from captive coal fired power plants;
3. Power generation using captured methane;
4. Heat generation using captured methane;
5. Heat generation from coal boilers;
6. Fuel vehicles
7. Combination of option 1, 3, 4 and 5 with the relative shares of energy production under each option specified.

Option 7 is the proposed project activity not implemented as a CDM project.

With regard to option 6, due to the concentration of VAM (lower than 0.75%) and CMM (lower than 30%) adding to VAM, if necessary, it is not technically feasible to purify the VAM to produce fuel for vehicles which usually requires the methane concentration of higher than 30%. Thus option 6 (Fuel vehicles) is excluded.

Step 2. Eliminate baseline options that do not comply with legal or regulatory requirements

It is required for coal mines that methane concentration in the ventilation air of the mine to be below 0.75% to avoid the risk of explosion (National Coalmine Safety Regulation 2005 version, Section Two item 135). If solely adopting ventilation in a coal mine could not satisfy the 0.75% requirement, item 145 of the National Coalmine Safety Regulation requires methane to be extracted at gas drainage station built above ground, especially for the coal mine which gas flow rate is equivalent of or exceeds $40m^3$/min. Therefore, in the CPAs, gas must be extracted employing underground boreholes. It is also difficult to specify the share of gas of pre-mining CMM and post-mining CMM in the normal case, because they are brought to the surface through the same extraction system.

Based on the above considerations, options A, B and C in *step 1a* do not comply with regulatory requirements solely. Thus, option A, B and C in *step 1a* could be eliminated.

Methane concentration of VAM is limited below 0.75% to avoid the risk of explosion[12]. There is no law or regulation requiring destruction or utilization of VAM, or giving any instruction on how to destruct or utilize VAM.

For CMM utilization, Chinese regulation requires that CMM used should have minimum methane concentration of 30 %, except the case in which the approved[13] technology, new type of engine and CMM safety transport system developed by Shengli Oilfield Shengli Power Machinery Group Co., Ltd., to utilize low methane concentration CMM (below 30 %)[14]. However, there are no legal requirements for releasing CMM below 30% methane concentration.

Hence the above listed all option i, ii, iv, v, vi and viii in *step 1b* are in compliance with legal and regulatory requirements.

According to the Chinese power regulation (Notice on Strictly Prohibiting the Installation of Fuel-fired Generators with Capacity of 135 MW or below issued by the General Office of the State Council, decree no. 2002-6), the construction of coal-fired power plant with a capacity of 135MW or below is prohibited in the national grid coverage area. As a CPA has the possibility to install generators with a capacity of 10MW or below (see eligibility criteria in the section A.4.2.2), the construction of coal-fired power plant with such amount of capacity is prohibited.

Thus, option 2 in *step 1c* does not comply with regulatory requirements.

Step 3. Formulate baseline scenario alternatives:

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[12] National Coalmine Safety Regulation 2001 version and 2005 version, Section Two item 100-1501

[13] Safety Production Technology Standards, AQ 1075-2009, AQ 1076-2009 and AQ 1078-2009.

[14] National Coalmine Safety Regulation (03/2010) , item 148 (revised)

Based on the consideration of the baseline options that are technically feasible and comply with regulatory requirements, the following baseline options are identified.

Options in *step 1a*:

D. Possible combination of A, B and C.

Options in *step 1b*;

- i. Venting;
- ii. Using/destroying ventilation air methane rather than venting it;
- iv. Use for additional grid power generation;
- v. Use for additional captive power generation;
- vi. Use for additional heat generation;
- viii. Possible combinations of options i, ii, iv or v, and vi with the relative shares of gas treated under each option specified

Option viii is the proposed project activity not implemented as a CDM project..

Options in *step 1c*:

1. Electricity from a Grid;
3. Power generation using captured methane;
4. Heat generation using captured methane;
5. Heat generation from coal boilers;
7. Combination of option 1, 3, 4 and 5 with the relative shares of energy production under each option specified.

Option 7 is the proposed project activity not implemented as a CDM project.

Combining the above baseline options, the projected baseline scenario is as follows:

Scenario I (combination of D, i and 1 and 5, 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 (combination of D, viii, and 7, 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. Gas extraction is a combination of CMM and VAM. VAM oxidizers destroy methane contained in VAM (methane concentration is below 0.75%). Produced heat energy through VAM oxidization may use for power generation with steam turbine generator and/or for heating, and/or be released in the atmosphere with the relative shares of gas treated and the relative shares of energy production under each option specified. VAM may be enriched by adding low methane concentration CMM (below 30%), if necessary, which would otherwise have been vented into the atmosphere. Remaining VAM and CMM is released into the atmosphere. Coal mine's electricity demand is mainly met through the grid and generated power in the VAM oxidization plant is supplied to the grid or mine. A part of coal mine's heat demand may be supplied by hot water produced at the VAM oxidization plant and the other part depends on its own coal boilers.

Scenario III (combination of D, i, iv and v, and 1, 3 and 5, CMM power generation for the grid/captive power): Gas extraction is a combination of CMM and VAM. Only CMM of over 8 % methane concentration will be utilized by CMM power generation units installed in the CMM power station for additional grid/captive power generation. VAM and CMM of less than 8 % methane concentration are vented into the atmosphere without destroying/utilization. Coal mine's electricity demand is mainly met through the grid and generated power in the CMM power station is supplied to the grid or mine. All coal mines heat demand depends on its own coal boilers.

Step 4. Eliminate baseline scenario alternatives that face prohibitive barriers

Scenario I (combination of D, i and 1, business as usual scenario): This is the BAU scenario and faces no barriers.

Scenario II (combination of D, viii, and 7, 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. The utilization of VAM for generating electric power or heating have been carried out in a tentative way in UK, USA and Australia using VAM oxidizer such as *Vocsidizer* developed by MEGTEC System AD, Sweden[15]. Recently in China, some CDM project[16,17] has introduced *Vocsidizer* to destroy VAM and to utilize hot water, not to power generation. Shengli Oilfield Shengli Engine Machinery Group Co., Ltd has developed flameless VAM oxidizer, there have been never introduced in commercial operating at coal mines in China[18]. The installation and operation of the VAM oxidizers developed by the Chinese manufacture at the commercial base would be the first case in China under the proposed PoA. As a result, the technical risks to install and operate the VAM oxidizing system for the first time are considered to be significant, thus this scenario faces barriers due to prevailing practice. Moreover, according to the eligibility criteria described in A.4.2.2, calculated FIRR of a proposed project activity without CDM revenue should be below the applied investment benchmark (15 % (after tax) requirement under NDRC's investment approval criteria for coal mine sectors). It seems that debt funding is not available for this type of innovative and not financially attractive project activity, thus this scenario faces investment barriers. These considerations exclude this scenario from being as a baseline scenario.

Scenario III (combination of D, i, iv and v, and 1, 3 and 5, CMM power generation for the grid/captive power): The most important technological risk to utilize low concentration CMM for power generation is that the CMM may have explosive character between the methane concentrations of 4.8% to 14.5%[19]. The

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[15] World Bank Formal Report 326/07; A Strategy for CBM and CMM Development and Utilization in China, 19P, 2007.

[16] CDM Project Reference No.1603: http://cdm.unfccc.int/Projects/DB/DNV-CUK1201793890.37/view

[17] CDM Project Reference No. 1613: http://cdm.unfccc.int/Projects/DB/DNV-CUK1202819290.66/view

[18] http://www.slpmg.com/html/2009/0620/98.html

[19] www.engineeringtoolbox.com/explosive-concentration-limits-d_423.html

new type of engine and CMM transport system developed by Shengli Oilfield Shengli Power Machinery Group Co., Ltd. made it possible to utilize CMM ranging from 8 % to 30 % methane concentrations in power generation safely. Because the system is very recent one (introduction started in 2006)[20], possible technological risk is significantly higher than with conventional CMM generating system, including training persons who are engaged in the power plant. Thus this scenario faces technological barriers. In addition, the fluctuation of volume and methane concentration of CMM will influence the performance of low concentration CMM power plant. It has a significant influence on financial benefits of the project. Furthermore, FIRR of this kind of project activity without CER's revenues is as low as only 5.37 % (according to the PDD of registered CDM project "Dafosi Coal Mine Low Concentration Coal Mine Methane Power Generation Project[21]), compared with the applied investment benchmark (15 % (after tax) requirement under NDRC's investment approval criteria for coal mine sectors, indicating that the scenario is not financially attractive. Thus this scenario faces investment barriers. These considerations also exclude this scenario from being as a baseline scenario.

As a result of above consideration, **Scenario I** (business as usual scenario) is the only scenario that does not face prohibitive barriers.

As Step 5 (identify the most economically attractive baseline scenario) is only required if there are several potential baseline scenario candidates that do not face any barriers, ***Step 5*** could be skipped.

Therefore, **Scenario I** (business as usual scenario) is considered to be the baseline scenario of the proposed PoA.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the CPA being included as registered PoA (assessment and demonstration of additionality of CPA): >>

E.5.1. Assessment and demonstration of additionality for a typical CPA:

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 a typical CPA.

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

Because a typical CPA may have the financial profit by selling electricity to the coal mine or the Grid other

[20] The system was approved by the scientific and technology committee the Chinese Mining Safety Bureau in December 2005, http://www.chinasafety.gov.cn/newpage/Contents/Channel_5745/2005/1226/10771/content_10771.htm

[21] CDM Project Reference No. 2428: http://cdm.unfccc.int/Projects/DB/TUEV-SUED1236267273.45/view

than CER revenue, a simple cost analysis (Option I) is not applicable. An investment comparison (Option II) is also not suitable, because the baseline is not a new construction project activity. As a result, the benchmark analysis (Option III) is adopted.

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

The FIRR (Financial Internal Rate of Return) shall be employed as the appropriate financial indicator for the benchmark analysis. The 15% benchmark is applied based on NDRC's investment approval criteria[22]. 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.

The operator of a typical CPA is a coalmining group which mainly operates coal mines. The core investment focus of the implementer is coal mining industry, and has little experience of constructing and operating VAM oxidization plant. So entering the different industry will be a big challenge for the implementer. According to page 197 of NDRC's investment approval criteria, when an implementer invests in a project based on another sector rather than its own core business base, and has little experience in characteristics and the risk of project, the sectoral benchmark FIRR of its own core business can be applied. Then the FIRR benchmark for coal mining sectors, 15%, in the NDRC's investment approval criteria should be applied to the CPA under the proposed PoA.

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

The FIRR should be calculated based on all critical techno-economic parameters and assumptions. The key parameters and assumptions upon which the calculation is based are provided in Table-7.

Table-7 Key parameter and assumptions of investment analysis for a typical CPA

Item	Unit	Source
Volume of Oxidized VAM	Nm3/min	FS Report, et al.
Methane Concentration of VAM	%	FS Report, et al.
Annual VAM Consumption (Pure Methane)	Million Nm3/year	Calculated
Number of VAM Oxidizes	unit	Calculated
Fixed Assets Cost	Million RMB	FS Report, et al.
O& M Costs (average)	Million RMB/year	FS Report, et al.
Power Generation Amount	GWh/year	Calculated
Additional Power Consumption	GWh/year	FS Report, et al.

[22] Economic Evaluation Methodology and Parameter of Construction Projects, the 3rd edition, Published by NDRC & Ministry of Construction of the People's Republic of China, China Planning Press, 204p, 2006 Beijing.

Power Unit Price (without VAT)	RMB/kWh	FS Report, et al.
Power Cost for additional Use (without VAT from the Grid)	RMB/kWh	FS Report, et al.
Project Lifetime	years	FS Report, et al.
Annual Operating Hour	Hours/year	FS Report, et al.
Income Tax Rate	%	Enterprise Income Tax Law
VAT	%	FS Report
City Maintenance and construction tax rate	%	FS Report
Education additive charge rate	%	FS Report

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

Therefore, if the FIRR 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 FIRR (without CER revenues) when they fluctuate in the range of -10% to +10%.

The methodological tool states that: *The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be financially/economically attractive.*

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, 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:

As Chinese Coal Mine Methane (CMM) emission is estimated 280 million tones of CO_2 equivalent and 72 % of CMM has been emitted through VAM in 2008[23], it seems that Chinese market potential for oxidizing VAM was quite large. However, the technical and economical hurdle which should be conquered may be high. 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[24]) and Zhengzhou Coal Industry (Group) Co., Ltd. in Henan province (CDM project reference No.1603[25]). 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 Oilfield Shengli Engine Machinery Group Co.,Ltd, China. It is the first case in China to introduce the VAM oxidiser in a full-scale commercial plant[26].

Therefore, it is concluded that similar activity cannot 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.

E.5.2. Key criteria and data for assessing additionality of a CPA:

The criteria included here shall be checked upon inclusion of a CPA to the proposed PoA in order to demonstrate that the additionality arguments presented in section E.5.1 fully apply to the CPA. The criteria are additional to those assessed when determining the general eligibility of the CPA under the PoA as per section A.4.2.2.

Key criteria and data for assessing additionality of a CPA are as follows:

[23] http://www.methanetomarkets.org/expo/docs/postexpo/coal_shengchu.pdf

[24] CDM Project Reference No. 1613: http://cdm.unfccc.int/Projects/DB/DNV-CUK1202819290.66/view

[25] CDM Project Reference No.1603: http://cdm.unfccc.int/Projects/DB/DNV-CUK1201793890.37/view

[26] http://www.slpmg.com/html/2009/0620/98.html

Criteria related to the investment analysis

To demonstrate that a CPA under the proposed PoA is financially not attractive, the following three steps should be checked upon inclusion the CPA to the proposed PoA:

(i) The FIRR of the CPA is calculated based on updated input parameters, assumptions and the method provided in section E.5.1;
(ii) The FIRR benchmark, 15 % (after tax) requirement under NDRC's investment approval criteria for coal mine sectors should be applied to the CPA under the proposed PoA in the CPA-DD;
(iii) The financial additionality is demonstrated by showing that the calculated FIRR (excluding CDM) is below the applied investment benchmark after carrying out sensitivity analysis.

Criteria related to the common practice analysis

There is only one criteria related the common practice analysis. That is, a CPA under the proposed PoA introduces VAM oxidizer developed by Shengli Oilfield Shengli Power Machinery Group Co., Ltd., which is included in the eligibility for inclusion of a CPA in the proposed PoA.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical CPA:

The equations determined by the approved methodology ACM0008 (Version 07) are applied for calculating emission reduction of a CPA.

The formulae from "Tool to calculate the emission factor for an electricity system (Version 02)" are applied for calculating carbon emissions factor of electricity used by coal mine and replaced by a CPA.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a CPA:

1) Project Emissions

Project emissions are defined by the following equation:

$$PE_y = PE_{ME} + PE_{MD} + PE_{UM} \quad \textbf{(E-1)}$$

where:

PE_y Project emissions in year y (tCO_2e)
PE_{ME} Project emissions from energy use to capture and use methane (tCO_2e)
PE_{MD} Project emissions from methane destroyed (tCO_2e)
PE_{UM} Project emissions from un-combusted methane (tCO_2e)

Combustion emissions from additional energy required for CBM/CMM capture and use

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.

$$PE_{ME} = CONS_{ELEC,PJ} \times CEF_{ELEC} \quad \textbf{(E-2)}$$

Where:

PE_{ME}	Project emissions from energy use to capture and use or destroy methane (tCO_2e)
$CONS_{ELEC,PJ}$	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 (tCO_2/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.

Combustion emissions from use of captured methane

In a CPA, the VAM is oxidized by VAM oxidizers, and then the units may produce steam and/or hot water. The steam will be utilized to generate electric power with steam turbine power generators.

In addition, if NMHC accounts for more than 0.1% by volume of the VAM supplied to VAM oxidizers, combustion emission from these gases should also be included in PE_{MD}. If the NMHC concentration to be under 0.1%, PE_{MD} as defined in this PDD does not include emissions from the combustion of NMHC. Under each CPA, the NMHC concentration of VAM supplied to VAM oxidizers will be monitored annually.

$$PE_{MD} = MD_{OX} \times (CEF_{CH4} + r \times CEF_{NMHC}) \quad \textbf{(E-3)}$$

with:

$$r = PC_{NMHC} / PC_{CH4} \quad \textbf{(E-3a)}$$

where:

PE_{MD}	Project emissions from CMM destroyed (tCO_2e)
MD_{OX}	Methane destroyed through flameless oxidation (tCH_4)
CEF_{CH4}	Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4)
CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane) (tCO_2eq/tNMHC)
r	Relative proportion of NMHC compared to methane
PC_{CH4}	Concentration (in mass) of methane in extracted gas (%), measured on wet basis
PC_{NMHC}	NMHC concentration (in mass) in extracted gas (%)

$$MD_{OX} = MM_{OX} - PE_{OX} \quad \textbf{(E-4)}$$

Where:

MD_{OX} Methane destroyed through flameless oxidation (tCH_4)
MM_{OX} Methane measured sent to flameless oxidizer (tCH_4)
PE_{OX} Project emissions of non oxidized $CH_4$from flameless oxidation of the VAM stream (tCH_4)

And where:

$$MM_{OX} = VAM_{flow.rate,y} \times time_y \times PC_{CH4.VAM} \times D_{CH4,corr\ inflow} \quad \textbf{(E-4a)}$$

Where:
$VAM_{flow.rate,y}$ Average flow rate of VAM entering the flameless oxidation unit during period y (Nm3/s)
$time_y$ Time during which VAM unit is operational during period y (s)
$PC_{CH4.VAM}$ Concentration of methane in the VAM entering the flameless oxidation unit (m3/m3)
$D_{CH4,corr\ inflow}$ Density of methane entering the flameless oxidation unit corrected for pressure and temperature ($P_{VAMinflow}$ and $T_{VAMinflow}$ respectively) (kg/Nm3)

and

$$PE_{OX} = VAM_{flow.rate,y} \times time_y \times PC_{CH4.exhaust} \times D_{CH4,corr\ exh} \quad \textbf{(E-4b)}$$

Where:
$PC_{CH4exhaust}$ Concentration of methane in the VAM exhaust (m^3/m^3)
$D_{CH4,corr\ exh}$ Density of methane corrected for pressure and temperature in the exhaust gases ($P_{VAMexhaust}$ and $T_{VAMexhaust}$ respectively) (kg/Nm^3)

Under standard conditions, 1 mol of CH_4 (=16 g) is 22.4L. Hence the mass of $1Nm^3$ of CH_4 is 0.714286kg under 1 atm 0 degrees centigrade. Under the condition of 1 atm and 20 degrees centigrade (IPCC Guideline), the mass of 1 m^3 of CH_4 is 0.67kg.

Un-combusted methane from end uses

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

$$PE_{UM} = PE_{OX} \times GWP_{CH4} \quad \textbf{(E-5)}$$

where:
PE_{UM} Project emissions from un-combusted methane (tCO_2e)
GWP_{CH4} Global warming potential of methane ($21tCO_2e/tCH_4$)
PE_{OX} Project emissions of non oxidized CH_4 from flameless oxidation of the VAM stream (tCH_4)

2) Baseline Emissions

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

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{Use,y} \quad \textbf{(E-6)}$$

where:

BE_y	Baseline emissions in year y (tCO_2e)
$BE_{MD,y}$	Baseline emissions from destruction of methane in the baseline scenario in year *y* (tCO_2e)
$BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year *y* that is avoided by the project activity (tCO_2e)
$BE_{Use,y}$	Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity in year *y* (tCO_2e)

Methane destruction in the baseline

In the project activity, VAM is extracted during the mining process using ventilation air. This activity is also conducted under BAU, meaning the baseline scenario. Thus, the volume of captured methane in the project activity is equal to that of the baseline scenario. The captured VAM is released into the atmosphere unused under the baseline scenario. As same as VAM, CMM of less than 30% methane concentration, which would be added in the project when the methane concentration in the VAM is considered to be too low to ensure a reliable performance of VAM oxidizers, is also released into the atmosphere unused under the baseline. These conditions are the eligible requirement for a CPA to be included in the proposed PoA.

Hence,
$BE_{MDy} = 0$

Calculation of the mean annual demand (Thy) for each year of the crediting period

In the project activity, the methane concentration of the captured VAM is less than 1.0%; thus, it is not employed as city gas or as fuel for heat supply centers. Therefore, analysis of thermal demand is unnecessary.

Methane released into the atmosphere

Baseline emissions from release of methane into the atmosphere are given by the following equation:

$$BE_{MRy} = GWP_{CH4} \times [(CMM_{PJ,i,y} – CMM_{BL,i,y}) + (PMM_{PJ,i,y} – PMM_{BL,i,y}) + (VAM_{PJ,i,y} - VAM_{BL,i,y})] \quad \textbf{(E-7)}$$

where:

$BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year *y* that is avoided by the project activity (tCO_2e)
$CMM_{PJ,i,y}$	Pre-mining CMM captured, sent to and destroyed by use *i* in the project activity in year *y* (expressed in tCH_4)
$CMM_{BL,i,y}$	Pre-mining CMM that would have been captured, sent to and destroyed by use *i* in the baseline scenario in year *y* (expressed in tCH_4)
$PMM_{PJ,i,y}$	Post-mining CMM captured, sent to and destroyed by use *i* in the project activity in year *y* (expressed in tCH_4)
$PMM_{BL,i,y}$	Post-mining CMM that would have been captured, sent to and destroyed by use *i* in the baseline scenario in year *y* (expressed in tCH_4)
$VAM_{PJ,i,y}$	VAM sent to and destroyed by use *i* (power generation) in the project activity in year *y* (expressed in tCH_4)
$VAM_{BL,i,y}$	VAM that would have been captured, sent to and destroyed by use *i* in the baseline

scenario in year *y* (expressed in tCH_4)
GWP_{CH4} Global warming potential of methane ($21tCO_2e/tCH_4$)

In the base line scenario, the VAM and CMM added to VAM are not used and destroyed. Therefore, $CMM_{BLi,y}$, $PMM_{BLi,y}$ and $VAM_{BL,i,y} = 0$

Hence,

$$BE_{MRy} = GWP_{CH4} \times (CMM_{PJ,i,y} + PMM_{PJ,i,y} + VAM_{PJ,i,y}) \quad \textbf{(E-8)}$$

The volume of methane released into the atmosphere under the baseline scenario is as much as the volume of VAM used under the project activity. The total amount of $CMM_{PJi,y}$, $PMM_{PJi,y}$ and $VAM_{PJi,y}$ represents the amount destroyed by VAM oxidizers in the project activity.

Note that the total amount of $CMM_{PJi,y}$, $PMM_{PJi,y}$ and $VAM_{PJi,y}$ is the same as MM_{OX} which is described in equation E-4.

Emissions from heat/ power generation replaced by project

This project activity involves only VAM and CMM (below 30% methane concentration) added to VAM. Therefore, the values for $ED_{CBMw,y}$ and $ED_{CBMz,y}$ are 0. Emissions from the production of power or heat replaced by the project activity are given by the following equation:

$$BE_{Use,y} = ED_{CPMM,y} \quad \textbf{(E-9)}$$

where:

$BE_{Use,y}$ Total baseline emissions from the production of power or heat replaced by the project activity in year *y* (tCO_2)
$ED_{CPMM,y}$ Emissions from displacement of end uses by use of VAM/CMM (tCO_2e)

The total methane captured during year y can be descried as follows;

$$CBM_{tot,y} = CMM_{PJ,i,y} + PMM_{PJ,i,y} + VAM_{PJ,i,y} \quad \textbf{(E-10)}$$

Where;

$CBM_{tot,y}$ Total VAM/CMM captured and utilized by the project activity (tCH_4)
$CMM_{PJ,i,y}$ Pre-mining CMM captured by use *i* in the project activity in year *y* (tCH_4)
$PMM_{PJ,i,y}$ Post-mining CMM captured by use *i* in the project activity in year *y* (tCH_4)
$VAM_{PJ,i,y}$ VAM captured by use *i* in the project activity in year *y* (tCH_4)

The potential emission reductions from displacement of power and heat generation are given by the following equation:

$$PBE_{Use,y} = GEN_y \times EF_{ELEC} + HEATy \times EF_{HEAT} \quad \textbf{(E-11)}$$

However, to be conservative, CERs will not be claimed for heat replaced by the CPA. Thus, the total potential emissions reduction from displacement of power generation is given by following equation:

$PBE_{Use,y} = GEN_y \times EF_{ELEC}$ **(E-11a)**

where:

$PBE_{Use,y}$	Potential total baseline emissions from the production of power replaced by the project activity in year y (tCO_2e)
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)

$$ED_{CPMM,y} = (CMM_{PJi,y} + PMM_{PJi,y} + VAM_{PJi,y}) / CBM_{tot,y} \times PBE_{Use,y}$$
$$= PBE_{Use,y}$$
$$= GEN_y \times EF_{ELEC} \quad \textbf{(E-12)}$$

From the equation E-9 and E-12, emissions from the production of power replaced by the project activity are given by the following equation:

$BE_{Use,y} = GEN_y \times EF_{ELEC}$ **(E-13)**

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.

3) Leakage

The formula for leakage is given as follows

$LE_y = LE_{d,y} + LE_{o,y}$ **(E-14)**

where:

LE_y	Leakage emissions in year y (tCO_2e)
$LE_{d,y}$	Leakage emissions due to displacement of other baseline thermal energy uses of methane in year *y* (tCO_2e)
$LE_{o,y}$	Leakage emissions due to other uncertainties in year *y* (tCO_2e)

The leakage of CDM project activities could result from the following:

a) Displacement of baseline thermal energy uses；

b) CBM extraction from outside the de-stressed zone；

c) Impact of CDM project activity on coal production；

d) Impact of CDM project activity on coal prices and market dynamics.

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.

Therefore, leakage emissions can be excluded from the project.

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:

$$ER_y = BE_y - PE_y - LE_y \qquad \textbf{(E-15)}$$

Where:

ER_y	Emissions reductions of the project activity during the year y (tCO_2e)
BE_y	Baseline emissions during the year y (tCO_2e)
PE_y	Project emissions during the year y (tCO_2e)
LE_y	Leakage emissions in year y (tCO_2e)

E.6.3. Data and parameters that are to be reported in CDM-CPA-DD form:

Data / Parameter:	$D_{CH4, corr, inflow}$
Data unit:	kg/Nm^3
Description:	Density of methane entering the flameless oxidation unit corrected for pressure and temperature.
Source of data used:	Calculated
Value applied:	0.714
Justification of the choice of data or description of measurement methods and procedures actually applied :	Under standard conditions, 1 mol of CH_4 (=16 g) is 22.4L. Hence the mass of 1Nm3 of CH_4 is 0.714286kg under 0 degrees centigrade.
Any comment:	-

Data / Parameter:	$D_{CH4, corr, exh}$
Data unit:	kg/Nm^3
Description:	Density of methane in the exhaust gases corrected for pressure and temperature.
Source of data used:	Calculated
Value applied:	0.714
Justification of the choice of data or description of measurement methods and procedures actually applied :	Under standard conditions, 1 mol of CH_4 (=16 g) is 22.4L. Hence the mass of 1Nm3 of CH_4 is 0.714286kg under 0 degrees centigrade.
Any comment:	-

Data / Parameter:	CEF_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Carbon emission factor for combusted methane
Source of data used:	ACM0008 default value
Value applied:	2.75
Justification of the choice of data or description of measurement methods and procedures actually	ACM0008 / Version 07

applied :	
Any comment:	-

Data / Parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of methane
Source of data used:	ACM0008 default value
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	ACM0008 / Version 07
Any comment:	-

Data / Parameter:	$EF_{OM,y}$
Data unit:	tCO_2e/MWh
Description:	Operating margin emission factor of the Power Grid concerned by each CPA
Source of data used:	"The Clarification of Determining Baseline Emission Factor for China Regional Grid" by NCCC
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National* *Development and Reform Commission*
Any comment:	-

Data / Parameter:	$EF_{BM,y}$
Data unit:	tCO_2e/MWh
Description:	Build margin emission factor of the Power Grid concerned by each CPA
Source of data used:	"The Clarification of Determining Baseline Emission Factor for China Regional Grid" by NCCC
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National* *Development and Reform Commission*
Any comment:	-

Data / Parameter:	$EF_{grid,CM,y}$
Data unit:	tCO_2/MWh
Description:	Combined margin CO_2 emission factor for grid power concerned by each CPA
Source of data used:	The calculation is conducted based on data calculated by the Office of National Coordination Committee on Climate Change.

Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National Development and Reform Commission*
Any comment:	The calculation was conducted based on data calculated by the Office of National Coordination Committee on Climate Change.

Data / Parameter:	CEF_{ELEC}
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor of the electricity used by coal mine
Source of data used:	The calculation is conducted based on data calculated by the Office of National Coordination Committee on Climate Change.
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National Development and Reform Commission*
Any comment:	

Data / Parameter:	EF_{ELEC}
Data unit:	tCO_2/MWh
Description:	CO_2 baseline emission factor for the electricity displaced due to the project activity during the year *y*
Source of data used:	The calculation is conducted based on data calculated by the Office of National Coordination Committee on Climate Change.
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National Development and Reform Commission*
Any comment:	

Data / Parameter:	EG_y
Data unit:	MWh
Description:	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost / must-run power plants / units, in year *y*
Source of data used:	China Electric Power Yearbook
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National Development and Reform Commission*
Any comment:	-

Data / Parameter:	$EF_{CO2i,y}$ / $COEF_{i, j, y}$
Data unit:	kgC/GJ / tCO_2/mass
Description:	CO_2 emission factor of fossil fuel type *i* in year *y*
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories" Volume2 Energy, CHAPTER 1, P1.21 ,Table 1-3 and P1.23 ,Table 1-4.
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	IPCC's official data
Any comment:	-

Data / Parameter:	$FC_{i,y}$ / $F_{i, j, y}$
Data unit:	mass or volume unit
Description:	Amount of fossil fuel type *i* consumed in the project electricity system in year *y*
Source of data used:	China Energy Statistical Yearbook
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National Development and Reform Commission*
Any comment:	-

Data / Parameter:	$NCV_{i,y}$
Data unit:	kJ/kg
Description:	Net calorific value (energy content) of fossil fuel type *i* in year *y*
Source of data used:	China Energy Statistical Yearbook
Value applied:	Depends on the grid concerned.
Justification of the choice of data or description of measurement methods and procedures actually applied :	China Official Data of *National Bureau of Statistics of China* and *National Development and Reform Commission*
Any comment:	-

E.7. Application of the monitoring methodology and description of the monitoring plan:

D.7.1. Data and parameters to be monitored by each CPA:

Data / Parameter:	$CONS_{ELEC,PJ}$
Data unit:	MWh
Description:	Additional electricity consumption for capture and use or destruction of methane, if any
Source of data to be used:	Monitoring data of each CPA.

Value of data applied for the purpose of calculating expected emission reductions in section B.5	Depends on each CPA
Description of measurement methods and procedures to be applied:	Continuously monitored by electricity meter. Monitoring points are presented in Figure-12, E.7.2.
QA/QC procedures to be applied:	Electricity meter is periodically checked and maintained. Backup data is continuously monitored and archived.
Any comment:	

Data / Parameter:	$time_y$
Data unit:	s
Description:	Time during which VAM unit is operational during period y
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Continuously monitored at control center for VAM oxidizer operation by PC.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	PC_{CH4} (same as $PC_{CH4,VAM}$ in below)
Data unit:	%
Description:	Concentration (in mass) of methane in extracted gas (VAM & CMM added to VAM) supplied to VAM oxidization, measured on wet basis.
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	CH_4 in VAM: % CH_4 in CMM added to VAM: % CH_4 in VAM supplied to VAM Oxidizers: % ($\leq$1% is designed value)
Description of measurement methods and procedures to be applied:	Methane concentration is monitored by concentration meters and/or gas analyzers continuously at the VAM oxidization plant. Monitoring points are presented in Figure-12, E.7.2. The confidence level of the measuring system, based on the supplier's quote, is over 95 %.
QA/QC procedures to be applied:	Concentration meters are periodically checked and maintained.
Any comment:	To be measured on wet basis.

Data / Parameter:	PC_{NMHC}
Data unit:	%
Description:	NMHC concentration (in mass) in VAM supplied to VAM oxidizer.
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected	Depends on each CPA. Normally below 0.1%

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Sample will be taken annually at inlet of VAM oxidizers and analyzed by gas chromatography.
QA/QC procedures to be applied:	Analysis of gas samples will be executed by using gas chromatography subjected to a regular maintenance regime before analysing gas components to ensure accuracy.
Any comment:	-

Data / Parameter:	$VAM_{flowrate,y}$
Data unit:	Nm^3/s
Description:	Average flow rate of VAM entering the VAM oxidizers during period y.
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1,000Nm^3/min (60,000Nm^3/s) per 1 unit
Description of measurement methods and procedures to be applied:	$VAM_{flowrate,y}$ are monitored by gas flow meter at the VAM oxidizing plant and corrected into the mass at standard temperature and pressure, which is 0 degrees centigrade and 1 atm. The confidential level of the measuring system, based on the supplier's quote, is over 95 %.
QA/QC procedures to be applied:	Gas flow meter, pressure and temperature transducer are periodically checked and maintained
Any comment:	-

Data / Parameter:	$PC_{CH4,VAM}$
Data unit:	%
Description:	Concentration of methane in the VAM (including added CMM) entering the VAM oxidizes
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	CH_4 in VAM: % CH_4 in CMM added to VAM: % CH_4 in VAM supplied to VAM Oxidizers: % ($\leq$1% is designed value)
Description of measurement methods and procedures to be applied:	Methane concentration is monitored by concentration meters and/or gas analyzers continuously at the VAM oxidization plant. Monitoring points are presented in Figure-12, E.7.2. The confidence level of the measuring system, based on the supplier's quote, is over 95 %.
QA/QC procedures to be applied:	Concentration meter are periodically checked and maintained.
Any comment:	To be measured on wet basis.

Data / Parameter:	$PC_{CH4,exhaust}$

Data unit:	%
Description:	Concentration of methane in exhaust gas from the VAM oxidizers
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	$PC_{CH4,VAM}$ x 0.03 (oxidization ratio of the specification is 97%)
Description of measurement methods and procedures to be applied:	Methane concentration is monitored by gas analyzers continuously at the VAM oxidization plant. Monitoring points are presented in Figure-12, E.7.2. The confidence level of the measuring system, based on the supplier's quote, is over 95 %.
QA/QC procedures to be applied:	Gas analyzers are periodically checked and maintained.
Any comment:	To be measured on wet basis.

Data / Parameter:	GEN_y
Data unit:	MWh
Description:	Electricity generated by project activity in year *y* (MWh).
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Depends on each CPA
Description of measurement methods and procedures to be applied:	The power generated by the steam turbine generator which is transferred to the transformer is continuously monitored. Monitoring points are presented inFigure-12, E.7.2.
QA/QC procedures to be applied:	Electricity meter will be periodically checked and maintained. Backup data is continuously monitored at the transformer.
Any comment:	

Data / Parameter:	$CMM_{PJ,y} + PMM_{PJ,y}$
Data unit:	tCH_4
Description:	Pre mining CMM captured sent to and destroyed by the CPA in year y and post mining CMM captured sent to and destroyed by the CPA in year y.
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Depends on each CPA
Description of measurement methods and procedures to be applied:	Total volume of ($CMM_{PJ,y} + PMM_{PJ,y}$) is monitored by gas flow meter at the VAM oxidizing plant and corrected into the mass at standard temperature and pressure, which is 0 degrees centigrade and 1 atm by the monitoring data such as pressure, temperature and methane concentration. The confidential level of the measuring system, based on the supplier's quote, is over 95 %.
QA/QC procedures to be applied:	Gas flow meter, pressure and temperature transducer are periodically

	checked and maintained
Any comment:	$CMM_{PJ,y}$ is monitored together with $PMM_{PJ,y}$, because the common extraction system is located in the underground mine. Under the condition of 1 atm and 0 degrees centigrade, the mass of 1 Nm^3 of CH_4 is 0.714kg.

Data / Parameter:	$VAM_{PJ,y}$
Data unit:	tCH_4
Description:	VAM captured, sent to and destroyed by VAM oxidizers in the project activity in year y.
Source of data to be used :	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Depends on each CPA.
Description of measurement methods and procedures to be applied:	The volume of $VAM_{PJ,y}$ is monitored by gas flow meter at the VAM oxidization plant and corrected into the mass at standard temperature and pressure, which is 0 degrees centigrade and 1 atm by the monitoring data such as pressure, temperature and methane concentration. The confidential level of the measuring system, based on the supplier's quote, is over 95 %.
QA/QC procedures to be applied:	Gas flow meter, pressure and temperature transducer are periodically checked and maintained
Any comment:	Under the condition of 1 atm and 0 degrees centigrade, the mass of 1 Nm^3 of CH_4 is 0.714kg.

Data / Parameter:	MM_{OX}
Data unit:	tCH_4
Description:	Amount of methane supplied to and consumed by VAM oxidization plant.
Source of data to be used:	Monitoring data of each CPA.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Depends on each CPA.
Description of measurement methods and procedures to be applied:	The total volume of MM_{OX} is monitored by gas flow meter at the VAM oxidization plant and corrected into the mass at standard temperature and pressure, which is 0 degrees centigrade and 1 atm by the monitoring data such as pressure, temperature and methane concentration. The confidential level of the measuring system, based on the supplier's quote, is over 95 %.
QA/QC procedures to be applied:	Gas flow meter, pressure and temperature transducer are periodically checked and maintained.

Any comment:	Under the condition of 1 atm and 0 degrees centigrade, the mass of 1 Nm^3 of CH_4 is 0.714kg.

E.7.2. Description of the monitoring plan for a CPA:

Organization and Monitoring Manual

The project involves the development of a monitoring manual, based on which accurate monitoring shall be conducted. The monitoring manual clearly states the monitoring method employed at each monitoring point and makes sure that the monitoring is accurately conducted. The contents of the monitoring manual are presented in Annex 4.

The manual clarifies the management structure for a CPA. Typical monitoring structure is presented in Figure-10. A monitoring team is formed under the CDM Director, who oversees the entire project, for the management of the monitoring of the project. Monitoring is mainly conducted at the VAM Oxidization Plant. Other monitoring is carried out at the transformer under the control of existing structure if steam turbine generation is involved. Other functions such as maintenance and periodical check-up and emergency management are also carried out at each section (See Figure-11).

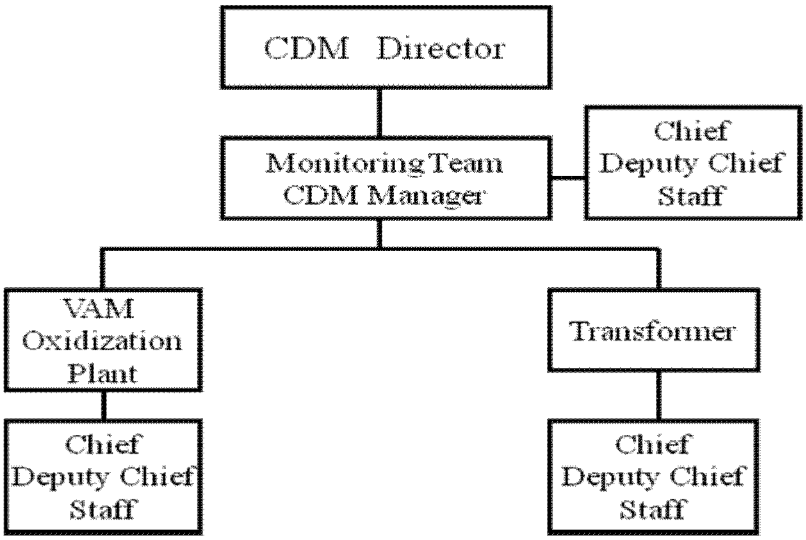

Figure-10 Management Structure of a CPA

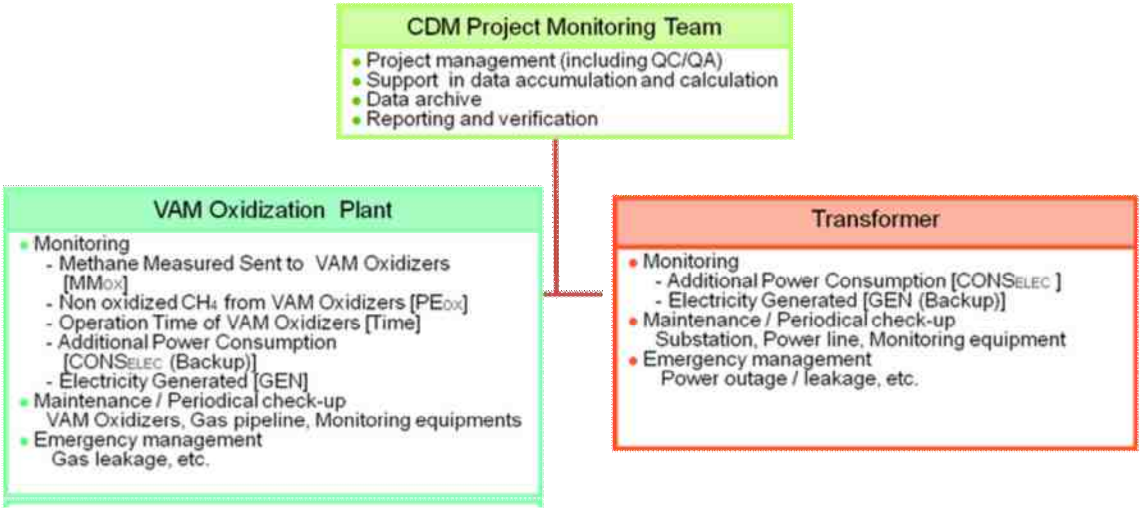

Figure-11 Monitoring & Other Function of Each Section

Monitoring points and data to be monitored

The data that will be monitored are shown in the table of Section D.7.1. Figure-12 indicates the detailed instruments installation for monitoring. All equipments installed are corresponding to Chinese national standards.

The Gas flow measured is corrected by pressure and temperature into the STP. STP is defined as 0^oC 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.

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.

The data are measured continuously and electronically archived as descried already. The chief of each section checks the data in the measurement tables, signs the datasheets, and reports the data of the previous day to the monitoring team everyday. Furthermore, on the first day of every month, the chief sends the measurement table of the previous month to the monitoring team for storage and management.

The monitoring team compile the collected data to calculate emission reductions. The team is also responsible for data storage and for preparing the data for verification.

Quality control and training

The following procedures will be followed to install, maintain and calibrate the equipment used in this project:

1) CDM monitoring team and their staff has training on every day maintenance check during the test operation by the instrument supplier.
2) The measuring instruments such as for flow rate, methane concentration, pressure and temperature will be calibrated in accordance with relevant national/sectoral or manufacturers' requirements;
3) The electricity meters are calibrated by authorized entities.

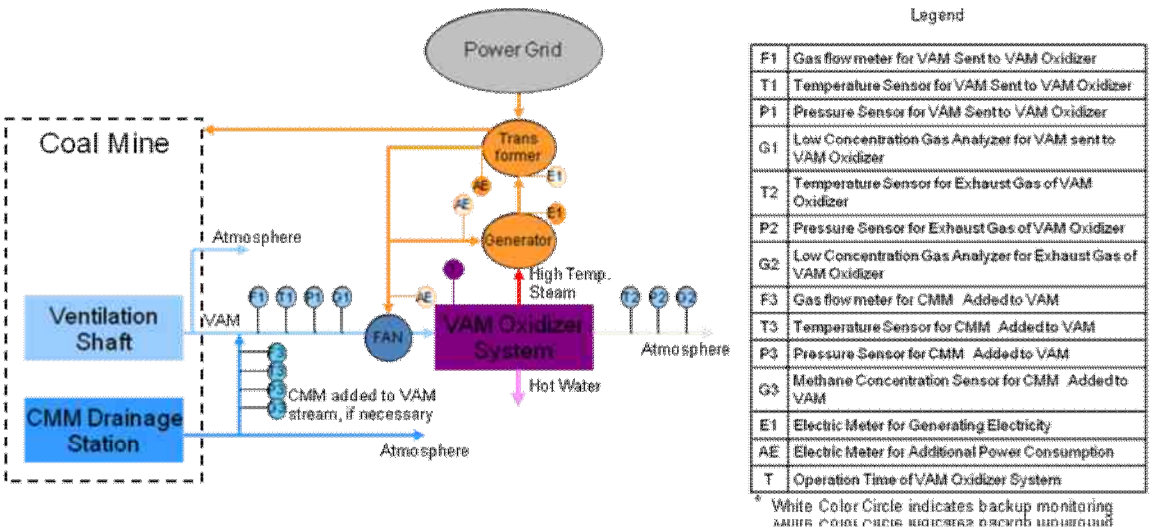

Figure-12 Monitoring Points for a CPA

E.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The completion date of the application of the baseline study and monitoring methodology:

12/01/2011

The name of the responsible person(s)/entity(ies):

Name/origination	Project participant: Yes/No
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Mr. Daniel Cao/ Ms. Connie Kang/Mr. Wei Zhang KOE Environment Consultancy, Inc.(Japan) 〒 100044 Room 15A2, A Tower, Xihuan Plaza, No.6, Gaoliangqiao Street, Xicheng district, Beijing, 100044, China cy@cncdm.cn/ kjl@cncdm.cn / zw@cncdm.cn	No

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

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Middle name:	
First name:	Kaoru
Department:	

Mobile:	
Direct FAX:	
Direct tel:	
Personal e-mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding from Parties included in Annex I countries is involved.

Annex 3

BASELINE INFORMATION

Baseline information will be listed in CDM-CPA-DD.

Annex 4

MONITORING INFORMATION

Contents of Monitoring Manual

The monitoring manual named “The Operations Monitoring Plan for Ventilation Air Methane Oxidation Project” includes the following contents:

1. Introduction
   - 1.1 Purpose of the Operations Monitoring Plan
   - 1.2 Use of the Operations Monitoring Plan

2. Project Information
   - 2.1 The Monitoring Methodology
   - 2.2 Description of the project activity
   - 2.3 Estimated amount of emission reductions over the chosen crediting period
   - 2.4 Duration of the project activity
   - 2.5 The baseline scenario
   - 2.6 Description of the sources and gases included in the project boundary

3. Management
   - 3.1 Allocation of Responsibilities
   - 3.2 Monitoring Organization
   - 3.3 Operational Obligations
   - 3.4 Job Responsibility
   - 3.5 Performance Reports

4. Calculation of emission reductions
   - 4.1 Project Emissions
   - 4.2 Baseline Emissions
   - 4.3 Leakage
   - 4.4 Estimation of emission reductions:

5. Monitoring System
   - 5.1 Data and parameters monitored:
   - 5.2 Recording and Archiving of Monitoring Data
   - 5.3 Monitoring Point
   - 5.4 Monitoring
   - 5.5 The Project Workbook - How to use the Workbook
   - 5.6 Quality Assurance
   - 5.7 Training

6. Auditing and Verification
   - 6.1 Project Commissioning
   - 6.2 Verification Procedures

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