Monitoring report form

(Version 05.1)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

MONITORING REPORT		
Title of the project activity	Jincheng Sihe Coal Mine CMM Generation Project	
UNFCCC reference number of the project activity	1896	
Version number of the monitoring report	01.0	
Completion date of the monitoring report	20/07/2016	
Monitoring period number and duration of this monitoring period	Monitoring period 15# (01/07/2015-31/12/2015[1])	
Project participant(s)	Shanxi Jincheng Anthracite Mining Group Co., Ltd. (project owner); Vitol S.A.	
Host Party	China	
Sectoral scope(s)	Sectoral scopes 8: Mining/mineral production[2]	
Selected methodology(ies)	ACM0008 (Version 03)	
Selected standardized baseline(s)	N/A	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	1,764,702 tCO_2e	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0	2,058,193 tCO_2e (MP15 01/07/2015-31/12/2015)

[1] Both the starting and end dates are included in this monitoring period.

[2] As per CDM accreditation standard 06.0

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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Jincheng Sihe Coal Mine CMM Generation Project (hereafter the project) is utilizing the coal mine methane (CMM), that otherwise would be released to the atmosphere, to generate electricity and displace the electricity generated by North China power grid.

The project comprises of internal combined cycle combustion engines using the CMM as a fuel, as well as waste heat boilers and steam turbines for power generation. The gas extracted is pumped to the gas tank at the power plant and mixed, stirred, and dehydrated. The gas is delivered to the compressing station for compression and then injected to the gas engines for power generation. The waste heat from the gas engines is directed into the waste heat boiler to heat the steam which is driving the steam turbine to generate electricity. There are 4 power houses in the power plant. Each power house consists of 15 gas engines (of 1.8 MW each), 3 waste heat boilers (6 t/h), and 1 steam turbine (3 MW each). Thus, the total installed capacity of the power plant is 120 MW.

The project has been registered by the CDM Executive Board since 22/04/2009. The crediting period started on 22/04/2009 and is a fixed period of 10 years. The project started construction on 25/01/2007. After the completion of construction, the project started commissioning and received the inspection approval on 16/02/2009. The expected operational lifetime of the project activity is 25 years.

The start date of the 15th monitoring period described in this monitoring report is 01/07/2015 and the end date is 31/12/2015. In this monitoring period, the achieved emission reductions of the project are 2,058,193 tCO_2e.

A.2. Location of project activity

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This project is located within Sihe Coal Mine, located in Jiafeng Town, Qinshui County, Jincheng City, Shanxi Province of the People's Republic of China.

GPS coordinates of the project activity are as follows:

Longitude: +112.5194 (112°31'10" E);
Latitude: +35.5875 (35°35'15" N)

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
China (host)	Shanxi Jincheng Anthracite Mining Group Co., Ltd.	No
United Kingdom of Great Britain and Northern Ireland	Vitol S.A.	No

A.4. Reference of applied methodology and standardized baseline

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The approved consolidated methodology ACM0008 (Version 03): "*Consolidated methodology for coal bed methane and coal mine methane capture and use for power (electrical or motive) and heat and/or destruction by flaring"* is applied to the Project.

In accordance with the ACM0008 (Version 03), approved consolidated methodology ACM0002 (Version 06) *"Consolidated methodology for grid-connected electricity generation from renewable sources"* is adopted to calculate the emission factor of the North China Grid.

For more information, please refer to the link below:
https://cdm.unfccc.int/methodologies/DB/YSD3FQ5WR3VPC9Q64CDTLXHLFVKKKU

A.5. Crediting period of project activity

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The crediting period started on 22/04/2009 and a 10-year fixed crediting period is adopted, so the crediting period will end on 21/04/2019.

A.6. Contact information of responsible persons/entities

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Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for completing the CDM-MR-FORM
Organization name	Shanxi Jincheng Anthracite Mining Group Co., Ltd.
Street/P.O. Box	Beishidian
City	Jincheng
State/Region	Shanxi
Postcode	048006
Country	China
Telephone	86-356-3669561
Fax	86-356-3669562
E-mail	jmjtcdm@163.com
Contact person	Zhang Shuhui

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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Combined cycle power generation technology is employed in the project which is composed of internal combustion engines using the CMM as fuel, waste heat boilers and steam turbines. There are four power houses in the power plant. Each power house consists of 15 gas engines (of 1.8 MW each), 3 waste heat boilers (6 t/h), and 1 steam turbine (3 MW). The Specifications of these equipments are shown below.

(1) Specifications of the gas engine:

Item	Specification
type	G3520C
rated power	1.8MW
power factor	0.8
generator voltage	10.5kV
excitation	permanent field coil
Gas	CMM
LHV	14.70MJ/Nm3 and above
Gas pressure	31.5～35kPa
Heat consumption of the engine	8.31MJ/kWh
NO_2 emission	500mg/Nm3
Exhaustion temperature	463℃
Efficiency of the simple cycling	42.3%
Temperature of the cooling water in the inlet	82℃/90℃
Heat radiation to the cooling water	744kW
Gas consumption by the units	917.1Nm3/h（16.31 MJ/Nm3）
Air flow for combustion	7668Nm3/h

(2) Specifications for the waste heat boiler

Item	Specification
Type:	horizontal type with bypass natural cycling waste heat boiler
Model	EGS6.0033-2.5/400NSV
Rated output	6t/h
Rated pressure	2.5MPa(g)
Rated temperature	400℃
steam temperature decrease mode	saturated steam mixing
temperature of inlet water	105℃
exhaustion flow of the gas engine	9371 Nm³/h
exhaustion temperature of the gas engine	458℃
temperature of ejected smoke	≤150℃
resistance of the boiler	≤2.0kPa

(3) Steam turbine

a) Specification of the steam turbine

Item	Specification
Model	quick assembly coagulated
Type	N3-2.35
rated power	3MW
rated revolution	5600r/min

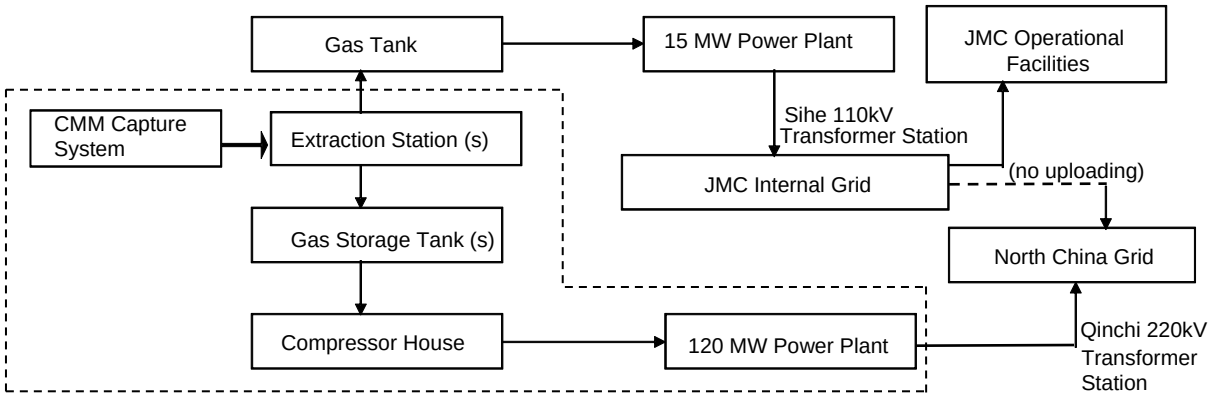
rated gas in take	15.99t/h
steam pressure in the main inlet	$2.35^{+0.2}_{-0.2}$ MPa
steam temperature in the main inlet	390^{+10}_{-20} ℃
rated steam discharge pressure	0.0105MPa
inlet water class	class 1（de-oxydren）
inlet water temperature under rated power output	105℃

b) Generator specifications

Item	Specification
Type	QF-W3-2,10500V
rated power	3000kW
rated voltage	10.5kV
rated flow	206.2A
Frequency	50Hz
Revolution	1500r/min
power factor	0.8
cooling method	air cooling
excitation method	AC excitation without brush
number of sets	4

The flow diagram of the project activity is shown in Figure 1. (JMC is the acronym of Shanxi Jincheng Anthracite Mining Group Co., Ltd.)

Figure 1: Flow diagram of the power generation by the project.

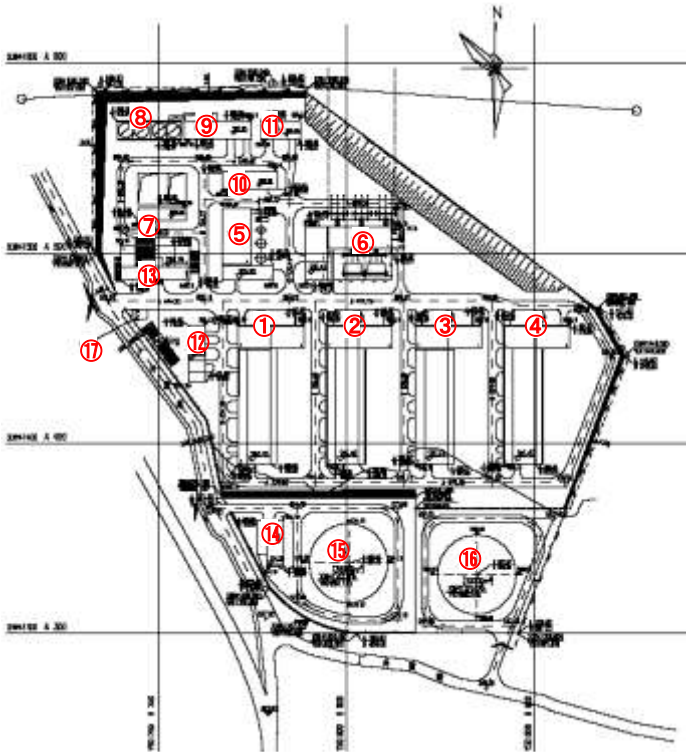


The CMM is captured by the capture system[3]. The captured CMM is then pumped through the extraction stations to the gas storage tanks where it is mixed, stirred, and dehydrated. After that the gas is delivered to the compressing station for compression and then injected to the gas engines for power generation. The waste heat from the gas engines is led into the waste heat boiler to heat the steam which will drive the steam turbine to generate electricity.

The Figure 2 below illustrates the surface layout of the power generation part of this project activity.

[3] Capture system in general refers to the drilling system as well as the gas collection pipeline.

Figure 2. Layout of the power generation facilities.



1	No.1 power house	10	Maintenance room
2	No.2 power house	11	Material storage
3	No.3 power house	12	Heat supply station
4	No.4 power house	13	Administration building
5	Chemical water treating	14	CMM compressing station
6	220KV substation	15	No.1 gas storage tank
7	Comprehensive pump house	16	No.2 gas storage tank
8	Mechanical draft cooling tower	17	Gate office
9	Circulation water pump room		

The project was fully commissioned on February 16, 2009. All the four power houses were put into operation at the same time. The 120MW power plant has been operated normally and consistently with the project design. The power plant was operated by the Qinshui Jinmei Methane Power Generation Co., Ltd., a full investment subsidiary company of JMC. The previous name of the company was Sihe Coal Mine Methane Power Plant and the name changed to Qinshui Jinmei Methane Power Generation Co., Ltd. in January 2010. Despite the change in name, the company remains owned by Shanxi Jincheng Anthracite Mining Group Co., Ltd (JMC).

The Monitoring Plan and the “CDM Project Management and Operations Manual” for this project has been developed based on which the monitoring activities are carried out. The on-site assessment of the initial verification was conducted on August 5-7, 2009 and received positive outcome. The on-site assessment of the first periodic verification was conducted on January 9-10, 2010. The on-site assessment of the second periodic verification was conducted on August 11-13, 2010. The on-site assessment of the third and fourth periodic verification was conducted jointly on October 19-21, 2011. The on-site assessment of the fifth and sixth periodic verification was conducted jointly on April 11-13, 2012. The on-site assessment of the seventh and eighth periodic verification was conducted jointly on November 13-15, 2012. The on-site assessment of the ninth periodic verification was conducted on March 27-29, 2013. The on-site assessment of the tenth periodic verification was conducted on December 30-31, 2013. The on-site assessment of the eleventh periodic verification was conducted on January 19-20, 2015. The on-site assessment of the twelfth and thirteenth periodic verification was conducted jointly on November 4-5, 2015. The

on-site assessment of the fourteenth periodic verification will be conducted jointly with this periodic verification.

During this monitoring period (01/07/2015 to 31/12/2015), the 120MW power plant operated well and all the equipments and monitoring instruments had no malfunctions. The power plant had no scheduled outage.

No special event which may impact the applicability of the methodology occurred during the monitoring period.

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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Not applicable.

B.2.2. Corrections

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The PRC with regard to the correction was approved on 02/06/2016. The PDD version 9.0 was revised to 9.1. The EF_{ELEC} value has been revised in the PDD version 9.1.

B.2.3. Changes to start date of crediting period

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Not applicable.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

>>
Not applicable.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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The monitoring plan has been revised twice. The first revised monitoring plan was approved on 15/03/2011 and the second revised monitoring plan was approved on 07/07/2014. The present monitoring report has been prepared as per the second approved monitoring plan.

Please refer to the web-link below for further details on the approved revision to the monitoring plan.
http://cdm.unfccc.int/Projects/DB/DNV-CUK1214826895.32/view

B.2.6. Changes to project design of registered project activity

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Not applicable.

B.2.7. Types of changes specific to afforestation or reforestation project activity

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Not applicable.

SECTION C. Description of monitoring system

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The Figure 3 below represents the diagram of flows and monitoring points of the new 120MW power plant and the existing 15MW experimental power plant. The Table 1 delineates all the monitoring meters, the corresponding parameters measured and the installed location in accordance with the requirements of the latest approved monitoring plan as of 07/07/2014. The Table 1 separately indicates the meters providing data used for calculation of emission reductions and other meters providing data not used for emission reduction calculation (e.g. used for cross-checking purposes).

Figure 3: Flow diagram and monitoring points at Sihe mining site

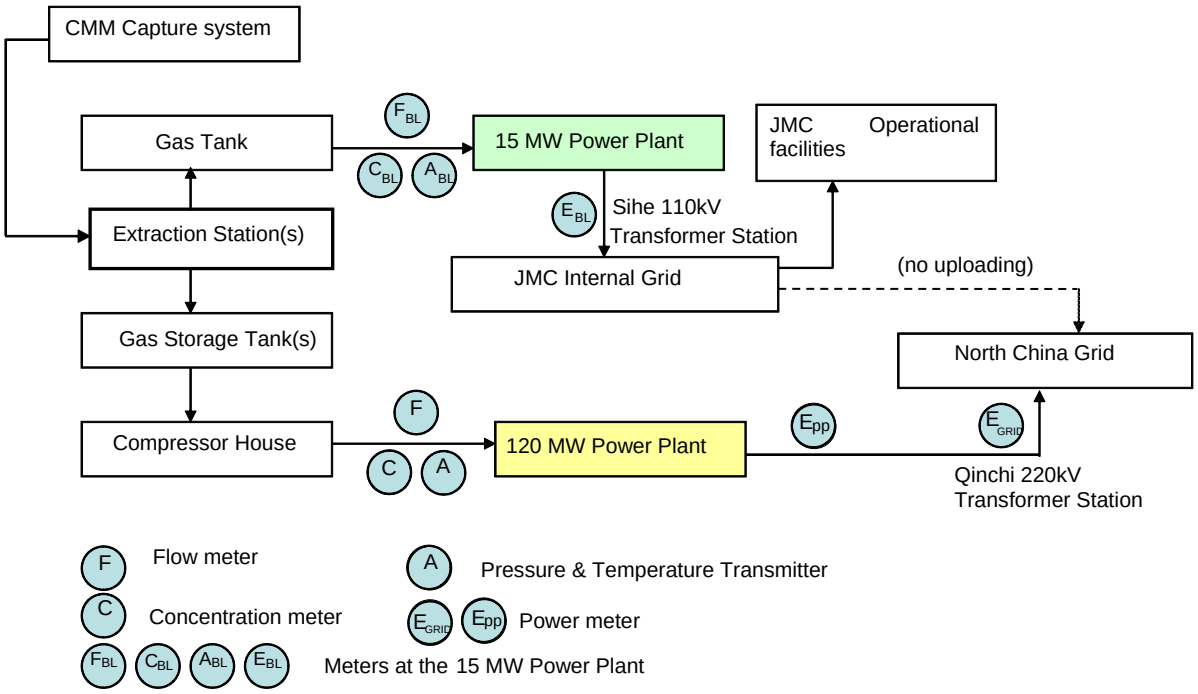


Table 1: Monitoring meters and parameters.

Symbol	Description	Monitored parameter	Installed location
Main meters used for calculation of emission reductions			
F	Gas Flow Meters	MM_{ELEC}	120MW power plant
A	Pressure & Temperature Transmitters	MM_{ELEC}	120MW power plant
C	Concentration Meters	MM_{ELEC} & $PC_{CH4,y}$	120MW power plant
E_{GRID}	Power Meters (main and backup meter)	$GEN_{1,y}$ $GEN_{2,y}$	Grid Company Qinchi 220kv transformer station
Monitoring meters not used for calculation of emission reductions			
E_{PP}	Power Meters (main and backup meter) (used for cross-checking)	$GEN_{1,y}$ $GEN_{2,y}$	120MW power plant

F_{BL}, C_{BL}, A_{BL}	Gas Flow Meters, Concentration Meters, Pressure & Temperature Transmitters	$MM_{BL,y}$	15MW Power Plant
E_{BL}	Power Meters	$GEN_{BL,y}$	15MW Power Plant

Monitoring equipments have been installed on all monitoring sites, including:

- Compressor House of 120MW CMM Power Plant
- Central Controlling Room of 120MW CMM Power Plant
- 15MW CMM Power Plant

All instruments installed are in compliance with relevant national/sectoral standards and are calibrated and maintained in accordance with the manufacturers' instructions and relevant national/sectoral standards by the accredited third party and by the trained monitoring staff at each site, supervised by the site manager. The electricity meters are calibrated by authorized entities and inspected by the local grid company.

The Table 2 indicates the main metering equipments that are used for calculation of emission reductions from the project (e.g., the meters installed at the 120MW power plant only). The number of installed meters is not including backup meters. More detailed information on the metering equipment listed in the Table 1 is provided in the Section D.

Table 2: Meters Installed at the Jincheng Sihe 120MW CMM Power Plant.

Type of metering equipment	Range	Accuracy level	Calibration frequency	No. of installed meters
Gas Flow Meter (differential pressure transmitter)	0 ~ 6.0KPa	0.20%	Annually	4
Pressure Transmitter	0 ~ 100KPa	0.20%	Annually	4
Temperature Transmitter	-200-500℃	±(0.30+0.005|t|)	Annually	4
Concentration Meter (methane concentration analyzer)	0-100%	±2.0%	Annually	4
Power Meter	0-99999.999	0.2S	Annually	2

Data collection

Each monitoring spot is equipped with the monitoring system including all kinds of instruments (as listed in the tables above) and computer system, and also the 120MW power plant is equipped with DCS (distributed control system). The data of the monitoring instruments are generated, collected and archived automatically by DCS. A spreadsheet with the data of each hour is generated automatically and can be printed out daily. The operators on duty record the data manually per hour for cross-checking.

Data archive procedure

Physical document such as paper-based maps, technical process diagrams and environmental assessments are collected in a central place, together with monitoring plan. In order to facilitate auditors' reference of relevant literature relating to the project, the project material and monitoring results are indexed. All paper-based information is stored by the technology department of the

project owner and all the material has a copy for backup. All relevant records have been archived and will be kept for the longer of two years longer than the crediting period or two years after the last issuance of CERs.

Data collection procedures for MM_{ELEC}, $MM_{BL,y}$ and $PC_{CH4,y}$

The data collection procedures for MM_{ELEC} and $MM_{BL,y}$ are almost identical. The monitoring of $PC_{CH4,y}$ is integrated in the monitoring of $MM_{ELEC.}$

Gas mixture flow, methane concentration, gas pressure and gas temperature are continuously measured at each CMM monitoring spot using electronic equipment and archived in computer. Mass of methane is then calculated from those measurements. A spreadsheet is generated automatically to record the amount of methane, methane concentration, gas pressure and temperature values per hour. Also, these values are recorded manually per hour. The daily aggregation of methane can be obtained by the spreadsheet record or the manual record. These records are checked by the shift leader or the site manager and then copied for the CDM Office of JMC periodically. The Monitoring Team of the CDM Office check the records, sum up the amount of methane ($MM_{ELEC,}$ $MM_{BL,y}$) respectively. $PC_{CH4,y}$, the concentration of methane in extracted gas is measured, read and recorded continuously. The concentration data recorded at 11AM of the first day of each month has been presented on section D.2 for illustration purpose only. MM_{ELEC} is used in the emission reductions calculation. $MM_{BL,y}$ are not used in the emission reductions calculation.

Data collection procedures for $GEN_{1,y}$ $GEN_{2,y}$ and $GEN_{BL,y}$

$GEN_{1,y}$ and $GEN_{2,y}$ are continuously measured both in 120MW Power Plant and Grid Company by bidirectional electricity meters. The Power Plant's personnel on duty record the readings hourly and sum up the daily electricity amount. The record is then checked by the shift leader or site manager and copied for the CDM Office periodically. The settlement notices are issued by the Grid Company monthly. The Monitoring Team of the CDM Office check and sum up the electricity amount data from the Power Plant monthly to crosscheck the electricity amount from the settlement notices. The differences between them are mostly small line loss. The electricity amount from the settlement notices is more conservative and therefore used in the emission reductions calculation.

$GEN_{BL,y}$ is continuously measured in 15MW power station by electricity meter. The 15MW Power Station's personnel on duty record the electricity amount hourly and sum up the daily electricity amount. The record is then checked by the shift leader or site manager and copied for the CDM Office periodically. The Monitoring Team of the CDM Office checks and sum up the electricity data monthly. $GEN_{BL,y}$ is not used in the emission reductions calculation.

Data collection procedures for $PC_{NMHC,y}$ and CEF_{NMHC}

Samples of coal mine gas are taken annually, and analysed at a qualified laboratory. The testing result of NMHC is kept both in the 120MW power plant and the CDM Office. **$PC_{NMHC,y}$** will not be used in the Emission reductions calculation if the NMHC concentration is less than 1%. **CEF_{NMHC}** will be monitored only if $PC_{NMHC,y}$ >1% (As per PDD).

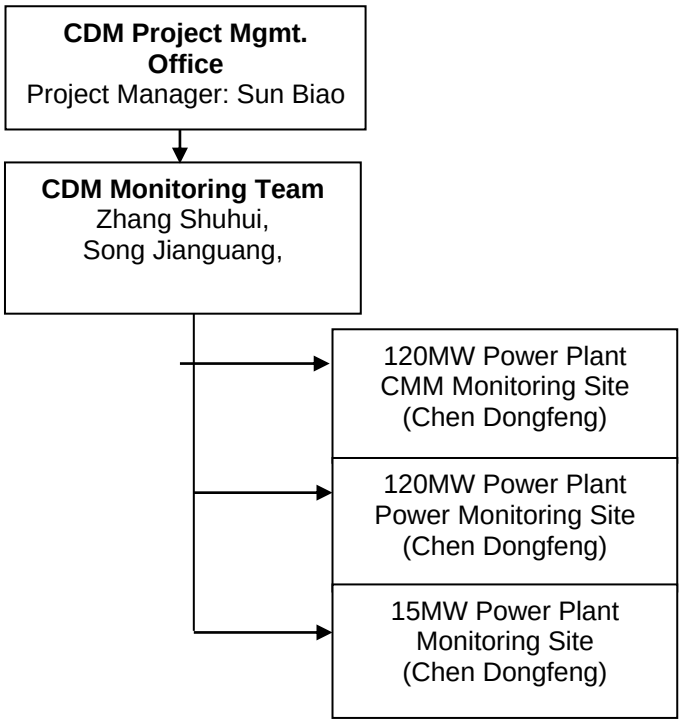
All the data are properly kept by the site managers and the CDM Office and will be kept for at least 2 years after the end of the crediting period.

Organizational structure, roles and responsibilities

The JMC has established a CDM Project Management Office and appointed Ms. Sun Biao as the project manager, who oversees the Office and is responsible for the overall CDM monitoring activities at JMC, supervising the implementation of the Monitoring Plan, checking and reviewing related data, reviewing and issuing the monitoring report. The organization structure of the

monitoring is presented in Figure 4 with indication of the names of the personnel responsible for monitoring activities.

Figure 4: Organizational Structure of Monitoring.



Under the CDM Project Management Office, a Monitoring Team, consisting of Zhang Shuhui and Song Jianguang has been established. The Monitoring team is responsible for coordinating the monitoring issues of each monitoring site, supervising the regular checking and maintenance of the related meters, data recording, data handling and report preparations. The monitoring staffs have all received specific technical training before assuming their responsibilities.

At each monitoring site, a monitoring group has been established, including a site manager and several monitoring staffs (see Figure 4):

- For the 120MW CMM Power Plant and the experimental 15MW CMM Power Plant, the site manager is Chen Dongfeng.

The monitoring group is responsible for operations, maintenance and calibration of the monitoring meters and timely and accurately recording the data in accordance with the "CDM Project Management and Operating Manual" for this project. Each site manager is responsible for regular checks of the data recorded in order to verify if the values are accurate and complete.

The CDM Project Management Office also checks and verifies the data values when reviewing and consolidating the data collected from each site. In case there is a potential data issue, the site manager should inform the CDM Project Manager and attempt to solve the problem. If the issue relates to the equipment, the site manager should immediately contact the supplier and inform the CDM Project Manager. The site manager and monitoring staffs have all received necessary training.

Training

The training and professional education provided to the staffs includes:

1) The monitoring equipment suppliers provide training to the site managers and staff on how to operate the equipment and read meters so that the staff can undertake the tasks of data recording and equipment maintenance required by the monitoring plan;

2) The CDM experts provide specific CDM training to all personnel involved in the monitoring tasks;

3) Internal trainings are conducted periodically on how to comply with the rules and requirements in the “CDM Project Management and Operating Manual” for this project.

Emergency procedures for the monitoring system

In case of the malfunction of on-site digital systems or significant difference between automatic and manual records, site manager should analyze the discrepancy with the assistance of technical staffs based on historic records, technical standard of the equipment and the operational parameters. The site manager should contact the CDM Project Manager and make record of any malfunction or significant discrepancy.

In case of instrument malfunction, and after verification by the CDM Project Manager, the emissions reductions generated during the period of malfunction would not be counted in order to ensure integrity and quality of the emission reductions.

The monitoring team is responsible for the timely replacement of the failed equipment. All the measures taken to address the problem and correct the error should be reported to the CDM Project Manager. The CDM Project Manager needs to validate and sign on the report. The report should be archived according to the “CDM Project Management and Operating Manual”.

In addition, backup meters are prepared, calibrated and ready for use in case of malfunction. Manual records are undertaken for crosschecking and backup.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/parameter:	$F_{i,j,y}$
Unit	Mt, Mm^3
Description	the amount of fuel *i* (in a mass or volume unit) consumed by relevant power sources j in year(s) *y*
Source of data	China Energy Statistical Yearbook (2000~2005)
Value(s) applied)	See Appendix 4 of PDD for details
Choice of data or measurement methods and procedures	Official statistical data
Purpose of data	Official statistical data
Additional comments	

Data/parameter:	NCV_i
Unit	*TJ/ mass or volume unit of a fuel*
Description	the net calorific value (energy content) per mass or volume unit of a fuel *i*
Source of data	China Energy Statistical Yearbook (2005)
Value(s) applied)	See Appendix 4 of PDD for details
Choice of data or measurement methods and procedures	National and official data
Purpose of data	National and official data
Additional comments	

Data/parameter:	$OXID_i$
Unit	%
Description	the oxidation factor of the fuel *i*
Source of data	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
Value(s) applied)	See Appendix 4 of PDD for details
Choice of data or measurement methods and procedures	National data not available, so IPCC default values are used.
Purpose of data	National data not available, so IPCC default values are used.
Additional comments	

Data/parameter:	$EF_{co2,i}$
Unit	tCO_2e/TJ
Description	the CO_2 emission factor per unit of energy of the fuel *i*
Source of data	*Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*
Value(s) applied)	See Appendix 4 of PDD for details
Choice of data or measurement methods and procedures	National data not available, so IPCC default values are used.
Purpose of data	National data not available, so IPCC default values are used.
Additional comments	

Data/parameter:	$G_{j,\ y}$
Unit	MWh
Description	the amount of electricity generation by source *j* in year *y*
Source of data	China Electric Power Yearbook (2000~2005)
Value(s) applied)	See Appendix 4 of PDD for details
Choice of data or measurement methods and procedures	Official statistical data
Purpose of data	Official statistical data
Additional comments	

Data/parameter:	$e_{j,y}$
Unit	%
Description	station service power consumption rate of source *j* in year *y*
Source of data	See Appendix 4 of PDD for details
Value(s) applied)	Official statistical data
Choice of data or measurement methods and procedures	China Energy Statistical Yearbook (2000~2005)
Purpose of data	China Energy Statistical Yearbook (2000~2005)
Additional comments	

Data/parameter:	$EE_{coal,adv}$
Unit	%
Description	Efficiency of most advanced coal-fired power technology that is commercially available
Source of data	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA
Value(s) applied)	36.53
Choice of data or measurement methods and procedures	Official statistics of state power authority
Purpose of data	Official statistics of state power authority
Additional comments	

Data/parameter:	$EE_{oil,adv}$
Unit	%
Description	Efficiency of most advanced oil-fired power technology that is commercially available
Source of data	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA
Value(s) applied)	45.87
Choice of data or measurement methods and procedures	Official statistics of state power authority
Purpose of data	Official statistics of state power authority
Additional comments	

Data/parameter:	$EE_{gas,adv}$
Unit	%

Description	Efficiency of most advanced gas-fired power technology that is commercially available
Source of data	Notice on the determination of emission factors of regional power grids by Chinese CDM DNA
Value(s) applied)	45.87
Choice of data or measurement methods and procedures	Official statistics of state power authority
Purpose of data	Official statistics of state power authority
Additional comments	

Data/parameter:	$CAP_{j,y}$
Unit	MW
Description	Installed capacity of source *j* in year *y* in Northwest Power Grid
Source of data	China Energy Statistical Yearbook (2000~2005)
Value(s) applied)	See Appendix 4 of PDD for details
Choice of data or measurement methods and procedures	Official statistical data
Purpose of data	Official statistical data
Additional comments	

Data/parameter:	EF_{ELEC}
Unit	tCO_2e/MWh
Description	Emissions factor of North China Grid
Source of data	Calculated according to ACM0002 (Version 6). The calculation details are provided in Appendix 4 of the PDD.
Value(s) applied)	0.98255[4]
Choice of data or measurement methods and procedures	The data are used to calculate the baseline emissions from power generation replaced by the project.
Purpose of data	The data are used to calculate the baseline emissions from power generation replaced by the project.
Additional comments	

Data/parameter:	CEF_{ELEC}
Unit	tCO_2e/MWh
Description	Carbon emission factor of electricity used by coal mine (= EF_{ELEC})
Source of data	See EF_{ELEC}
Value(s) applied)	0.98255
Choice of data or measurement methods and procedures	The data are used to calculate the project emissions due to the power consumption by the project.
Purpose of data	The data are used to calculate the project emissions due to the power consumption by the project.
Additional comments	Not applicable since the net electricity delivered to the grid is used for the calculation of emission reductions.

[4] Because the PRC has been done in the 12th periodic verification, therefore the EF_{ELEC} value of the PDD has been revised. Now the value of EF_{ELEC} is in line with the data of latest approved PDD.

Data/parameter:	GWP_{CH4}
Unit	tCO_2e / tCH_4
Description	Global Warming Potential (GWP) of methane, valid for the relevant commitment period.
Source of data	COP/MOP decision: "Standard for application of the global warming potentials to CDM project activities and PoAs for the second commitment period of the Kyoto Protocol" (a value of 25 is to be applied for the second commitment period of the Kyoto Protocol)
Value(s) applied)	25
Choice of data or measurement methods and procedures	The data are used for the calculation of the project emissions from un-combusted methane.
Purpose of data	The data are used for the calculation of the project emissions from un-combusted methane.
Additional comments	Value of 25 is to be applied for the second commitment period of the Kyoto Protocol.

Data/parameter:	Eff_{ELEC}
Unit	%
Description	Efficiency of methane destruction/oxidation in power plant
Source of data	IPCC default value
Value(s) applied)	99.5
Choice of data or measurement methods and procedures	The data are used for calculation of project emissions from methane destroyed through power generation.
Purpose of data	The data are used for calculation of project emissions from methane destroyed through power generation.
Additional comments	Please also refer to the section B.6.1 of the PDD.

Data/parameter:	CEF_{CH4}
Unit	tCO_2e/tCH_4
Description	Carbon emission factor for combusted methane
Source of data	According to the applied methodology
Value(s) applied)	2.75
Choice of data or measurement methods and procedures	The data are used for calculation of project emissions from methane destroyed through power generation.
Purpose of data	The data are used for calculation of project emissions from methane destroyed through power generation.
Additional comments	Please also refer to the section B.6.1 of the PDD.

Data/parameter:	ρ
Unit	t/m^3
Description	Density of CH_4 under normal conditions
Source of data	IPCC default value
Value(s) applied)	0.00067
Choice of data or measurement methods and procedures	The data are used for calculation of project emissions from methane delivered to the power plant.
Purpose of data	The data are used for calculation of project emissions from methane delivered to the power plant.
Additional comments	Please also refer to the section B.6.1 of the PDD.

Data/parameter:	MM_{BL}
Unit	tCH_4
Description	Amount of methane consumed by the 15MW power plant
Source of data	Measured in m^3 and recorded in the log sheets and converted into tCH_4 using IPCC value of 0.00067t/m^3
Value(s) applied)	24,139.73
Choice of data or measurement methods and procedures	Maximum annual value of the four years period prior to project implementation (year 2005-2008) is taken.
Purpose of data	Maximum annual value of the four years period prior to project implementation (year 2005-2008) is taken.
Additional comments	

Data/parameter:	GEN_{BL}
Unit	MWh
Description	Electricity generated by the 15MW power plant
Source of data	Measured
Value(s) applied)	86,089.234
Choice of data or measurement methods and procedures	Maximum annual value of the four years period prior to project implementation (year 2005-2008) is taken.
Purpose of data	Maximum annual value of the four years period prior to project implementation (year 2005-2008) is taken.
Additional comments	

D.2. Data and parameters monitored

Data/parameter:	MM_{ELEC}
Unit	tCH_4
Description	Methane measured delivered to the 120MW power plant during the monitoring period
Measured/calculated/default	Measured
Source of data	Measurements by project participants using gas flow meters, temperature & pressure transmitters and gas concentration meters.
Value(s) of monitored parameter	77,314.04
Monitoring equipment	Gas flow meters (differential pressure transmitter) Accuracy class: 0.20%

Serial numbers		Service time in this monitoring period	Date of last calibration	Validity of calibration
No.1 power house	1505c025060	July 1-Dec. 31, 2015	25/06/2015	24/06/2016
No.2 power house	1505c025061	July 1-Dec. 31, 2015	25/06/2015	24/06/2016
No.3 power house	1503B15027	July 1-Dec. 31, 2015	25/06/2015	24/06/2016
No.4 power house	1503B15028	July 1-Dec. 31, 2015	25/06/2015	24/06/2016

Calibration frequency: annually
Model: 1151DP

Location: refer to meter F in Figure 3

Pressure Transmitters
Accuracy class: 0.20%

Serial numbers		Service time in this monitoring period	Date of last calibration	Validity of calibration
No.1 power house	635	July 1-Dec. 31, 2015	25/06/2015	24/06/2016
No.2 power house	1505C025039	July 1-Dec. 31, 2015	25/06/2015	24/06/2016
No.3 power house	1505C025040	July 1-Dec. 31, 2015	25/06/2015	24/06/2016
No.4 power house	1505C025041	July 1-Dec. 31, 2015	25/06/2015	24/06/2016

Calibration frequency: annually
Model: 1151GP
Location: refer to meter A in Figure 3

Temperature Transmitters
Accuracy class: ±(0.30+0.005｜t｜)

Serial numbers		Service time in this monitoring period	Date of last calibration	Validity of calibration
No.1 power house	7040213	July 1-Dec. 31, 2015	24/06/2015	23/06/2016
No.2 power house	7040214	July 1-Dec. 31, 2015	24/06/2015	23/06/2016
No.3 power house	7040215	July 1-Dec. 31, 2015	24/06/2015	23/06/2016
No.4 power house	7040216	July 1-Dec. 31, 2015	24/06/2015	23/06/2016

Calibration frequency: annually
Model: Pt100
Location: refer to meter A in Figure 3

Concentration meters (methane concentration analyzer)
Accuracy class: ±2.0%

Serial numbers		Service time in this monitoring period	Date of last calibration	Validity of calibration
No.1 power house	30105	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	32623	Dec. 5-Dec. 31, 2015	28/09/2015	27/09/2016
No.2 power house	29561	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	30106	Dec. 5-Dec. 31, 2015	28/09/2015	27/09/2016
No.3 power house	32621	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	34578	Dec. 5-Dec. 31, 2015	28/09/2015	27/09/2016
No.4 power house	34582	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	29557	Dec. 5-Dec. 31, 2015	03/12/2015	02/12/2016

Calibration frequency: annually
Model: 97460
Location: refer to meter C in Figure 3
Note: The interim replacement of Concentration meters for all 4 power houses is due to the calibration activities which require the meters to be delivered to the certified inspection institution.

Measuring/reading/recording frequency:	Continuous/Continuous/Continuous (system) + Hourly (manual) Continuous monitoring, meters in compliance with relevant standards and requirements are used, and gas volumes, pressure, temperature and

	methane concentration are read and consolidated by a distributed control system.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Flow meters, pressure & temperature transmitters and gas concentration meters are checked monthly and calibrated annually. Data are manually recorded hourly (on the hour ±5 minutes) for cross-checking and used as a backup in case the automatic recording system is under abnormal condition.
Purpose of data:	Project emissions: - from methane destroyed MD_{ELEC} (Formula 3 & 5 in the PDD); - from un-combusted methane P_{UM} (Formula 6 in the PDD); Baseline emissions: - for release of methane into atmosphere that is voided by the project BE_{MR} (Formula 10 in the PDD)
Additional comments:	

Data/parameter:	$GEN_{1,y}$
Unit	MWh
Description	Electricity supplied by project activity to North China Grid during the monitoring period
Measured/calculated/default	Measured
Source of data	1. Monitored with power meter installed by the electric grid company and recorded in the form of Settlement Notice issued by the electric grid company (monthly); 2. Manually recorded by JMC hourly for cross-checking and backup.
Value(s) of monitored parameter	450,906.720 (settlement notice for ER calculation) 452,713.536 (manual record for cross-check)
Monitoring equipment	Bidirectional electricity meters (JMC, used for cross-checking and backup) Accuracy class: 0.2S Serial numbers / Date of calibration / Validity of calibration 86384895 (Main) / 10/04/2015 / 09/04/2016 86384896 (Back up) / 10/04/2015 / 09/04/2016 Calibration frequency: annually Model: ZMQ202C Location: refer to meter E_{pp} in figure 3 Bidirectional electricity meters (Grid, used for emission reduction calculations) Accuracy class: 0.2S Serial numbers / Date of calibration / Validity of calibration 142103228909 (Main) / 22/05/2015 / 21/05/2016 142103228910 (Back up) / 22/05/2015 / 21/05/2016 Calibration frequency: annually Model: DTZ 178 Location: refer to meter E_{GRID} in figure 3
Measuring/reading/recording frequency:	Continuous/Continuous/Hourly
Calculation method (if applicable):	Not applicable

QA/QC procedures:	The electricity delivered to the grid are recorded in the power settlement notice issued by the grid company based on the readings of the power meters installed at the Qinchi transformer station in accordance with relevant national and sectoral standards (indicated as point E_{GRID} on Figure 3). The amount of electricity delivered to the grid is double-checked by the readings of the power meters installed at the project 120MW power plant (indicated as point E_{PP} on Figure 3). All the power meters are calibrated annually.
Purpose of data:	Baseline emissions from power generation replaced by the project $BE_{Use,y}$ (Formula 11 in the PDD)
Additional comments:	

Data/parameter:	$GEN_{2,y}$
Unit	MWh
Description	Electricity consumed by the project during the monitoring period which is supplied by North China Grid in case of emergency.
Measured/calculated/default	Measured
Source of data	1. Monitored with power meter installed by the electric grid company and recorded in the form of Settlement Notice issued by the electric grid company (monthly); 2. Manually recorded by JMC hourly for cross-checking and backup.
Value(s) of monitored parameter	0 (settlement notice for ER calculation) 0 (manual record for cross-check)
Monitoring equipment	Bidirectional electricity meters (JMC, used for cross-checking and backup) Accuracy class: 0.2S Serial numbers / Date of calibration / Validity of calibration 86384895 (Main) / 10/04/2015 / 09/04/2016 86384896 (Back up) / 10/04/2015 / 09/04/2016 Calibration frequency: annually Model: ZMQ202C Location: refer to meter E_{pp} in figure 3 Bidirectional electricity meters (Grid, used for emission reduction calculations) Accuracy class: 0.2S Serial numbers / Date of calibration / Validity of calibration 142103228909 (Main) / 22/05/2015 / 21/05/2016 142103228910 (Back up) / 22/05/2015 / 21/05/2016 Calibration frequency: annually Model: DTZ 178 Location: refer to meter E_{GRID} in figure 3
Measuring/reading/recording frequency:	Continuous/Continuous/Hourly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The electricity imported from the grid are recorded in the power settlement notice issued by the grid company based on the readings of the power meters installed at the Qinchi transformer station in accordance with relevant national and sectoral standards (indicated as point E_{GRID} on Figure 3). The amount of electricity imported from the grid is double-checked by the readings of the power meters installed at the project 120 MW power plant (indicated as point E_{PP} on Figure 3). All the power meters are calibrated annually.

Purpose of data:	Baseline emissions from power generation replaced by the project $BE_{Use,y}$ (Formula 11 in the PDD)
Additional comments:	

Data/parameter:	$PC_{CH4,y}$
Unit	%
Description	Concentration of methane (in mass) in extracted gas (%), measured on wet basis
Measured/calculated/default	Measured
Source of data	Daily monitoring by JMC. Meter readings transferred through digital (DCS) system and recorded automatically.
Value(s) of monitored parameter	

Date and time	No.1 Power House	No.2 Power House	No.3 Power House	No.4 Power House
1/7/2015 11:00AM	37.51	38.01	36.25	36.56
1/8/2015 11:00AM	35.11	35.23	35.14	35.99
1/9/2015 11:00AM	31.05	31.26	30.77	31.30
1/10/2015 11:00AM	34.72	34.34	34.86	33.84
1/11/2015 11:00AM	36.83	36.41	34.60	35.30
1/12/2015 11:00AM	37.56	37.71	36.98	37.97

Note: The concentration of methane in extracted gas is measured, read and recorded continuously in compliance with the monitoring requirement. The data recorded at 11AM of the first day of each month has been presented above for illustration purpose only.

Monitoring equipment

Concentration meters (methane concentration analyzer)
Accuracy class: ±2.0%

Serial numbers		Service time in this monitoring period	Date of last calibration	Validity of calibration
No.1 power house	30105	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	32623	Dec. 5-Dec. 31, 2015	28/09/2015	27/09/2016
No.2 power house	29561	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	30106	Dec. 5-Dec. 31, 2015	28/09/2015	27/09/2016
No.3 power house	32621	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	34578	Dec. 5-Dec. 31, 2015	28/09/2015	27/09/2016
No.4 power house	34582	July 1-Dec. 5, 2015	08/12/2014	07/12/2015
	29557	Dec. 5-Dec. 31, 2015	03/12/2015	02/12/2016

Calibration frequency: annually
Model: 97460
Location: refer to meter C in Figure 3
Note: The interim replacement of Concentration meters for all 4 power houses is due to the calibration activities which require the meters to be delivered to the certified inspection institution.

Measuring/reading/recording frequency:	Continuous/Continuous/Continuous (system) + Hourly (manual) Concentration meters, optical and calorific, with accuracy in compliance with relevant national standards.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	Concentration meters are checked monthly and calibrated annually to ensure accuracy.
Purpose of data:	Integrated with the monitoring of MM_{ELEC} (methane delivered to the power plant)

Additional comments:	

Data/parameter:	$PC_{NMHC,y}$
Unit	%
Description	NMHC concentration in coal mine gas
Measured/calculated/default	Measured
Source of data	Testing report by Shanxi Coal Industry Bureau Comprehensive Testing Center on March 12, 2015
Value(s) of monitored parameter	0 (C_2H_6=0.00%, C_3H_8=0.03%, C_4H_{10} (N- butane) =0.00%, C_4H_{10} (Isobutane) =0.00%)
Monitoring equipment	Owned and operated by Shanxi Coal Industry Bureau Comprehensive Testing Center
Measuring/reading/recording frequency:	Annual sampling The gas to be tested is sampled on site annually in accordance with relevant industry standards and procedures. The samples are analyzed by a qualified laboratory.
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The test is implemented by Shanxi Coal Industry Bureau Comprehensive Testing Center. A minimum of 3 samples is collected in secure gas sample vessels, suitable for storage and transport to the laboratory. If one sample is found to be faulty (i.e. gas leakage), the replacement sample will be taken.
Purpose of data:	Verifying whether $PC_{NMHC,y}$ is below 1%
Additional comments:	

Data/parameter:	CEF_{NMHC}
Unit	tCO_2e/t NMHC
Description	Carbon emission factor for combusted non methane hydrocarbons
Measured/calculated/default	Measured (only if $PC_{NMHC,y}$ >1%)
Source of data	Testing report by Shanxi Coal Industry Bureau Comprehensive Testing Center on March 12, 2015
Value(s) of monitored parameter	Not applicable since the $PC_{NMHC,y}$ =0
Monitoring equipment	Owned and operated by Shanxi Coal Industry Bureau Comprehensive Testing Center
Measuring/reading/recording frequency:	To be measured only when NMHC concentration (in mass) in coal mine gas is higher than 1%
Calculation method (if applicable):	Not applicable
QA/QC procedures:	In the gas composition test report issued by Shanxi Coal Industry Bureau Comprehensive Testing Center on March 12, 2015, the concentration of non methane hydrocarbons was 0, therefore, it is not required to measure $CEF_{NMHC.}$
Purpose of data:	Project emissions from combustion of NMHC (Formula 3 in the PDD)
Additional comments:	

Data/parameter:	$MM_{BL,y}$
Unit	tCH_4
Description	Amount of methane consumed by the 15MW power plant during the monitoring period.
Measured/calculated/default	Measured
Source of data	Digital and manual recording in log sheets

<table>
<tr><td>Value(s) of monitored parameter</td><td>7,756.98</td></tr>
<tr><td>Monitoring equipment</td><td>
<u>Gas flow meters</u>
Accuracy class: ±0.5%
<table>
<tr><th>Serial numbers</th><th>Service time in this monitoring period</th><th>Date of last calibration</th><th>Validity of calibration</th></tr>
<tr><td>1207-00247</td><td>July 1-Dec. 31, 2015</td><td>18/06/2015</td><td>17/06/2016</td></tr>
</table>
Calibration frequency: annually
Model: FFM61S500
Location: refer to meter F_{BL} in figure 3

<u>Differential pressure transmitters</u>
Accuracy class: 0.1 grade
<table>
<tr><th>Serial numbers</th><th>Service time in this monitoring period</th><th>Date of last calibration</th><th>Validity of calibration</th></tr>
<tr><td>5058725</td><td>July 1-Dec. 31, 2015</td><td>16/06/2015</td><td>15/06/2016</td></tr>
</table>
Calibration frequency: annually
Model: 3051CD
Location: refer to meter A_{BL} in figure 3

<u>Pressure Transmitters</u>
Accuracy class: 0.1 grade
<table>
<tr><th>Serial numbers</th><th>Service time in this monitoring period</th><th>Date of last calibration</th><th>Validity of calibration</th></tr>
<tr><td>5831829</td><td>July 1-Dec. 31, 2015</td><td>16/06/2015</td><td>15/06/2016</td></tr>
</table>
Calibration frequency: annually
Model: 3051TG
Location: refer to meter A_{BL} in figure 3

<u>Temperature Transmitters</u>
Accuracy class: 0.025%
<table>
<tr><th>Serial numbers</th><th>Service time in this monitoring period</th><th>Date of last calibration</th><th>Validity of calibration</th></tr>
<tr><td>b527145937</td><td>July 1-Dec. 31, 2015</td><td>18/06/2015</td><td>17/06/2016</td></tr>
</table>
Calibration frequency: annually
Model: STT25H
Location: refer to meter A_{BL} in figure 3

<u>Methane concentration analyzer</u>
Accuracy class: ±3.0%
<table>
<tr><th>Serial numbers</th><th>Service time in this monitoring period</th><th>Date of last calibration</th><th>Validity of calibration</th></tr>
<tr><td>55435/1</td><td>July 1-Nov. 17, 2015</td><td>21/11/2014</td><td>20/11/2015</td></tr>
<tr><td>59299/7</td><td>Nov. 17-Dec. 31, 2015</td><td>11/11/2015</td><td>10/11/2016</td></tr>
</table>
Calibration frequency: annually
Model: GTR 196
Location: refer to meter C_{BL} in figure 3
Note: The interim replacement of methane concentration analyzer is due to the calibration activities which require the meters to be delivered to the certified inspection institution.
</td></tr>
<tr><td>Measuring/reading/recording frequency:</td><td>Continuous/Continuous/Hourly

Continuous monitoring, flow meters in compliance with relevant standards and requirements are used. Gas volumes, pressure, temperature and concentration are read and consolidated by a distributed control system</td></tr>
</table>

Calculation method (if applicable):	Not applicable
QA/QC procedures:	All the meters/sensors are checked monthly and calibrated annually to ensure accuracy.
Purpose of data:	The readings of these meters are not used for ER calculation, but for crosschecking only. $MM_{BL,y}$ value are compared against MM_{BL} to ensure no leakage ($MM_{BL,y}$>= MM_{BL}). In case $MM_{BL,y}$< MM_{BL}, the difference will be calculated in terms of the contributing emission reductions, which will be deducted from the total claimed emission reductions. $MM_{BL,y}$ is lower than MM_{BL} in terms of monthly average , therefore the leakage is deducted from the total claimed ERs (please refer to section E.3 and CER calculation sheet).
Additional comments:	

Data/parameter:	$GEN_{BL,y}$
Unit	MWh
Description	Electricity generated by the 15MW power plant during the monitoring period.
Measured/calculated/default	Measured
Source of data	Meter readings and manual records (hourly) for cross-checking
Value(s) of monitored parameter	46,538.18
Monitoring equipment	Electricity meters Accuracy class: 0.2S Serial numbers: 1202006393; Date of calibration: 20/10/2014; Validity of calibration: 19/10/2019 Serial numbers: 1202006393; Date of calibration: 20/07/2015; Validity of calibration: 19/07/2016 Calibration frequency: annually Model: DSSD876 Location: refer to meter E_{BL} in figure 3
Measuring/reading/recording frequency:	Continuous/Continuous/Hourly
Calculation method (if applicable):	Not applicable
QA/QC procedures:	The power meter is calibrated in accordance with relevant national standard.
Purpose of data:	The readings of the meter are not used for ER calculation, but for reference only. $GEN_{BL,y}$ value will be compared against GEN_{BL} to ensure no leakage ($GEN_{BL,y}$>= GEN_{BL}). In case $GEN_{BL,y}$< GEN_{BL}, the difference will be calculated in terms of the contributing emission reductions, which will be deducted from the total claimed emission reductions. $GEN_{BL,y}$ is lower than GEN_{BL} in terms of monthly average , therefore the leakage is deducted from the total claimed ER for the monitoring period (details please refer to section E.3 and CER calculation sheet).
Additional comments:	

D.3. Implementation of sampling plan

>>

Not applicable. Sampling plan is not required for the parameters in the project activity.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

Baseline emissions can be calculated using the formulae below in accordance with the PDD:

$$BE = BE_{MD} + BE_{MR} + BE_{Use}$$

Where:

BE	Baseline emissions (tCO_2e)
BE_{MD}	Baseline emissions from destruction of methane in the baseline scenario (tCO_2e)
BE_{MR}	Baseline emissions from release of methane into the atmosphere that is avoided by the project activity (tCO_2e)
BE_{Use}	Baseline emissions from power generation replaced by this project (tCO_2e)

And:

$$BE_{MD}^{5} = 0$$

$$BE_{MR} = 25 \times MM_{ELEC}$$

$$BE_{Use} = (GEN_{1,y} - GEN_{2,y}) \times EF_{ELEC}$$

Where:

MM_{ELEC}	Methane measured delivered to power plant (tCH_4)
$GEN_{1,y}$	Electricity supplied by project activity to North China Grid (MWh)
$GEN_{2,y}$	Electricity consumed by project activity which is supplied by North China Grid in case of emergency (MWh)
EF_{ELEC}	Emission factors of North China Grid (0.98255 tCO_2e/MWh)

GEN_1 and GEN_2 are continuously measured both in 120MW Power Plant and Grid Company by bidirectional electricity meters. The recordings in the form of Settlement Notice issued by the Grid Company (monthly) are used for calculation and the data manually recorded by JMC hourly are used for cross-checking and backup.

Using the measured data, the results of baseline emissions during monitoring period are shown below:

Table 3: Calculation of baseline emissions

Monitoring Period	MM_{ELEC} (tCH_4)	GEN_1 (MWh)	GEN_2 (MWh)	BE_{MD} (tCO_2e)	BE_{MR} (tCO_2e)	BE_{Use} (tCO_2e)	BE (tCO_2e)
	Measured values			A	B	C	D = A+B+C
01/07/2015-31/07/2015	13,594.98	79,326.720	0	0	339,874.50	77,942.47	417,816.96

[5] See the PDD.

01/08/2015-31/08/2015	13,439.06	78,386.880	0	0	335,976.50	77,019.03	412,995.52
01/09/2015-30/09/2015	12,291.93	71,553.440	0	0	307,298.25	70,285.18	377,583.43
01/10/2015-31/10/2015	12,409.40	73,122.720	0	0	310,235.00	71,846.73	382,081.72
01/11/2015-30/11/2015	12,592.65	73,524.000	0	0	314,816.25	72,241.01	387,057.25
01/12/2015-31/12/2015	12,986.02	75,012.960	0	0	324,650.50	73,703.98	398,354.48
Total	**77,314.04**	**450,906.720**	**0**	**0**	**1,932,851.00**	**443,038.40**	**2,375,889.36**

Therefore, the total baseline emissions during the monitoring period are **2,375,889.36** tCO_2e.

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

Project emissions are calculated with formulae below in accordance with the PDD.

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

Where:

PE	Project emissions (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)

And:

$$PE_{ME}=CONS_{ELEC,PJ}\times CEF_{ELEC} = 0^{6}$$

$$PE_{MD}= MD_{ELEC}\times (CEF_{CH4} + r\times CEF_{NMHC})$$

$$PE_{UM} =GWP_{CH4} \times MM_{ELEC}\times (1-Eff_{ELEC})$$

Where:

$CONS_{ELEC}$	Additional electricity consumption for use of methane (MWh)
CEF_{ELEC}	Carbon emissions factor of electricity used by coal mine (tCO_2e/MWh)
MD_{ELEC}	Methane destroyed through power generation (tCH_4)
CEF_{CH4}	Carbon emission factor for combusted methane (tCO_2e/tCH_4)
r	Relative proportion of NMHC compared to methane
CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (tCO_2e/tNMHC)
GWP_{CH4}	Global warming potential of methane
MM_{ELEC}	Methane measured delivered to power plant (tCH_4)
Eff_{ELEC}	Efficiency of methane destruction /oxidation in power plant

[6] When calculating the ER, the net electricity delivered to the grid is used (as per PDD).

As the NMHC concentration is less than 1% of the coalmine gas throughout the monitoring period, thus the combustion emissions from non-methane hydrocarbons can be ignored[7] (r=0).

Therefore,

$PE_{MD}=MD_{ELEC}\times CEF_{CH4}=(MM_{ELEC}\times Eff_{ELEC})\times CEF_{CH4}=(MM_{ELEC}\times 0.995)\times 2.75$

$PE_{UM}=GWP_{CH4}\times MM_{ELEC}\times (1-Eff_{ELEC})= 25\times MM_{ELEC}\times (1-0.995)$

The results of project emissions calculation during monitoring period are shown in the Table 4.

Table 4: Calculation of project emissions

Monitoring Period	PE_{ME} (tCO_2e)	PE_{MD} (tCO_2e)	PE_{UM} (tCO_2e)	PE (tCO_2e)
	A	B	C	D=A+B+C
01/07/2015-31/07/2015	0	37,199.26	1,699.37	38,898.64
01/08/2015-31/08/2015	0	36,772.63	1,679.88	38,452.52
01/09/2015-30/09/2015	0	33,633.79	1,536.49	35,170.29
01/10/2015-31/10/2015	0	33,955.22	1,551.18	35,506.40
01/11/2015-30/11/2015	0	34,456.64	1,574.08	36,030.72
01/12/2015-31/12/2015	0	35,533.00	1,623.25	37,156.25
Total	**0**	**211,550.54**	**9,664.26**	**221,214.82**

Therefore, the total project emissions during the monitoring period are **221,214.82** tCO_2e.

E.3. Calculation of leakage

>>

As described in the PDD, the leakage of this project is 0.

In addition, for the experimental 15MW power plant, $GEN_{BL,y}$, the electricity generated by the 15MW power plant has been monitored and the volume during this monitoring period is 46,538.18 MWh. The monthly average is 7,756.36 MWh. $MM_{BL,y}$, the volume of methane sent to the 15MW power plant has been monitored and the value for this monitoring period is 7,756.98 tCH_4. The monthly average is 1,292.83 tCH_4.

Table 5 shows that the monthly average values of the methane consumption of 15 MW power plant for this monitoring period is lower than the monthly average values in year 2008[8].

Table 5: Experimental 15MW power plant data comparison

Parameter Period	$MM_{BL,y}$ (tCH_4) 01/07/2015-31/12/2015	MM_{BL} (tCH_4) 01/01/2008-31/12/2008	$GEN_{BL,y}$ (MWh) 01/07/2015-31/12/2015	GEN_{BL} (MWh) 01/01/2008-31/12/2008

[7] The NMHC concentration will continue being monitored annually to check whether its concentration is below or above 1% to determine if the NMHC combustion be included in the project emissions.

[8] Year 2008 was the year with the highest annual values for both MM_{BL} and GEN_{BL} during the period (year 2005-2008) before this project activity was commissioned in 2009. Applying the highest annual values for both MM_{BL} and GEN_{BL} ensure the conservativeness of the CER results. Please also refer to section D.2 of the MR.

Total	7,756.98	24,139.73	46,538.18	86,089.23
Monthly Average	1,292.83	2,011.64	7,756.36	7,174.10

According to the description of section D.2, in case $MM_{BL,y} < MM_{BL}$, the difference will be calculated in terms of the contributing emission reductions, which will be deducted from the total claimed emission reductions. In case $GEN_{BL,y} < GEN_{BL}$, the difference will be calculated in terms of the contributing emission reductions that are not attributable to the project activity and would have been generated in the business as usual scenario by the 15MW power plant. The contributing emission reductions will be deducted from the total claimed emission reductions. The contributing emission reductions can be calculated through the same formula adopted in section E.1, E.2 and E.4 for regular emission reductions calculations. There are only 2 differences: Where MM_{ELEC} appears in the formulae, it is replaced by (MM_{BL}-$MM_{BL,y}$); where ($GEN_{1,y}$ – $GEN_{2,y}$) appears, it is replaced by (GEN_{BL}-$GEN_{BL,y}$). To differentiate, the replaced variables in formula in section E.1 E.2 and E.4 were asterisked in the following Table 6, 7 and 8.

Table 6: Calculation of contributing Baseline Emissions

Monitoring Period	$MM_{BL,y}$ (tCH_4)	MM_{BL} (tCH_4)	$GEN_{BL,y}$ (MWh)	GEN_{BL} (MWh)	$*BE_{MD}$ (tCO_2e)	$*BE_{MR}$ (tCO_2e)	$*BE_{Use}$ (tCO_2e)	$*BE$ (tCO_2e)
	Measured values	Monthly Average in year 2008	Measured values	Monthly Average in year 2008	A	B	C	D = A+B+C
01/07/2015-31/07/2015	1,497.62	2,011.64	8,946.280	7,174.10	0	12,850.60	0.00	12,850.60
01/08/2015-31/08/2015	1,463.18	2,011.64	8,916.140	7,174.10	0	13,711.60	0.00	13,711.60
01/09/2015-30/09/2015	1,123.06	2,011.64	6,641.880	7,174.10	0	22,214.60	522.94	22,737.54
01/10/2015-31/10/2015	1,179.64	2,011.64	7,049.000	7,174.10	0	20,800.10	122.92	20,923.02
01/11/2015-30/11/2015	1,134.99	2,011.64	6,817.240	7,174.10	0	21,916.35	350.64	22,266.99
01/12/2015-31/12/2015	1,358.49	2,011.64	8,167.640	7,174.10	0	16,328.85	0.00	16,328.85
Total	**7,756.98**		**46,538.180**		**0**	**107,822.13**	**996.49**	**108,818.62**

Table 7: Calculation of contributing Project Emissions

Monitoring Period	$*PE_{ME}$ (tCO_2e)	$*PE_{MD}$ (tCO_2e)	$*PE_{UM}$ (tCO_2e)	$*PE$ (tCO_2e)
	A	B	C	D=A+B+C
01/07/2015-31/07/2015	0	1,406.50	64.25	1,470.75
01/08/2015-31/08/2015	0	1,500.74	68.56	1,569.29
01/09/2015-30/09/2015	0	2,431.39	111.07	2,542.46
01/10/2015-31/10/2015	0	2,276.57	104.00	2,380.57
01/11/2015-30/11/2015	0	2,398.74	109.58	2,508.33
01/12/2015-31/12/2015	0	1,787.19	81.64	1,868.84
Total	**0**	**11,801.13**	**539.11**	**12,340.24**

Table 8: Total contributing Emission Reductions

Monitoring Period	*PE (tCO_2e) A	*BE (tCO_2e) B	*ER (tCO_2e) D = B-A
01/07/2015-31/07/2015	1,470.75	12,850.60	11,379.86
01/08/2015-31/08/2015	1,569.29	13,711.60	12,142.32
01/09/2015-30/09/2015	2,542.46	22,737.54	20,195.08
01/10/2015-31/10/2015	2,380.57	20,923.02	18,542.46
01/11/2015-30/11/2015	2,508.33	22,266.99	19,758.67
01/12/2015-31/12/2015	1,868.84	16,328.85	14,460.02
Total	**12,340.24**	**108,818.62**	**96,478.41**

For details of calculation of contributing ERs, please see the worksheet "CER Calculation (PL Calculation)" in the CER calculation spreadsheet.

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	GHG emission reductions or net GHG removals by sinks (t CO_2e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	2,375,889.36	221,214.82	96,478.41	0	2,058,193	2,058,193

Therefore, the emission reductions resulting from the actually measured values are **2,058,193** tCO_2e.

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO_2e)	1,764,702	2,058,193

E.6. Remarks on difference from estimated value in registered PDD

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The ER volume based on the actual monitored values is 2,058,193 tCO_2e, or 16.63%[9] higher than the ex-ante estimation according to the PDD. The major factors which lead to the increase in the actual emission reductions during the current monitoring period is the increase of power generation and the gas consumption. The table 9 below shows that the actual project operation resulted in higher power generation and higher gas consumption when compared to the PDD estimate. Consequently, it results in the increase of ER volume.

Table 9: Comparison of actual result with ex ante PDD estimate

[9] Based on the $GWPCH_4$ is $25tCO_2e/tCH_4$, the expected ER in the PDD is calculated as $3,500,632tCO_2e$/year. Hence, the expected value during this monitoring period is 3,500,632 tCO_2e *184day/365day, which is $1,764,702tCO_2e$. Refer the ER sheet for detail.

	ER Volume (tCO2e) (184 days) [10]	Power Generation (MWh) (184 days)	Gas Consumption (tCH4) (184 days)
Actual	2,058,193	450,906.72	77,314.04
PDD Estimate	1,764,702	414,983.01	61,293.68
% increase	16.63%	8.66%	26.14%

The project technology and the operation model don't be changed, so they are independent of the increase of ER volume.

a. Increased power generation

The main reason for the increased power generation is due to the underestimate of the load factor of the 120 MW power plant in the PDD. A load factor[11] of 80% was adopted in the feasibility study report (FSR) and PDD[12] of the project. At the time of project design, there were no other projects that employed the same advanced and imported technology as the project did in China. The load factor for conventional coal-fired power plant was 5500-6500 operating hours in a year. With the understanding that the gas fired power plant can be 15% more efficient than the coal fired power plant, the operating hours was estimated to be 7000 and adopted in the FSR and PDD. However, in reality, the new advanced technology turned out to be even more efficient than estimated (even longer operating hours). The actual load factor reached 85.1% and operating hour reached 3,758 during this monitoring period.

b. Increased gas consumption

On the other hand, the increase of the gas consumption also contributes to the increase of the ERs. This is mainly because the gas consumption ratio adopted in the latest approved PDD was underestimated. Similar to the reason mentioned above, at the time of project design, there were no other projects that employed the same advanced and imported technology. The gas consumption is estimated based on the experimental data provided by the equipment supplier, Caterpillar.

In reality, according to the data from Caterpillar's technical specification provided years later (which was not available at the time of project design, the gas consumption ratio is 0.175tCH4/MWh[13], which is close to the actual gas consumption ratio: 0.171tCH4/MWh during this monitoring period. It has demonstrated that the value in the PDD (0.148 tCH4/MWh) was markedly underestimated.

In spite of the increase of power generation and gas consumption, both factors have no impact on the additionality of the project and the applicability of the methodology as demonstrated below.

[10] The PDD estimated ER Volume, Power Generation and Gas Consumption values shown in Table 9 have already been proportionate to the number of days for the 15th monitoring period (184 days).

[11] Plant Load factor = Power Generation (MWh) / (Install Capacity (120 MW) * Total hours per year (8760 hrs)).

[12] The annual power generation is 840,000 MWh and the generation net of self-consumption is 823,200 MWh. Therefore, the load factor is 80%. In the PDD, for simplification, the net generation figure was used as the value of GEN1,y and GEN2,y was 0.

[13] Gas consumption ratio (tCH_4/MWh) = Heat consumption (MJ/MWh) / lower heat value of CH_4 (35.16 MJ/m^3)* density of CH_4 0.67 kg/m^3)

1. Impact on the project additionality

In the PDD, the project additionality was justified mainly based on the investment analysis. In the investment analysis, the calculated project IRR was used to compare with the benchmark project IRR of 15%[14]. In the subsequent sensitivity analysis in the PDD, Annual amount of electricity delivered to the grid was identified as a sensitive parameter to the result of project IRR. According to the sensitivity analysis, only when the annual amount of electricity delivered to the grid increases over 17.9%[15] of its base case, the project IRR would come across the benchmark project IRR which is 15%, hence causing the project not additional. As clearly indicated in Table 9 above, the project's actual annual electricity delivered to the grid is 8.66% higher than the PDD estimation. The increase rate does not exceed 17.9% (the breakeven point). As a result, the financial additionality of project does not change. On the other hand, provided that the gas consumption was not included as a component in the project IRR calculation, the increase of gas consumption will not influence the financial additionality. Therefore, the additionality of the project stands.

Besides the financial aspect, the conclusion from common practice analysis in the PDD still holds as the project's size remains 120 MW power plant fuelled by coal mine methane (The largest CMM power generation project in China[16] at the time of submission for registration).

In conclusion, the increase of power generation and CMM gas consumption does not affect the project's additionality upon reassessing the investment analysis and common practice analysis.

2. Impact on the applicability of the methodology

The project has been validated that it met all the applicability criteria of the baseline methodologies ACM0008-version 3 as the project a) extracts CMM by ventilation, pre-mining and post-mining b) utilizes the captured CMM to generate and export electricity c) The extracted CMM is from an underground working coal mine and there is no CBM drainage involved in the project[17].

The actual project operation during this monitoring period (01/07/2015-31/12/2015) does not change any of the aforementioned dimensions and therefore still meets all the applicability criteria of the baseline methodology. As a result, the baseline methodology remains applicable.

[14] Source: "Methods and Parameters for Economic Evaluation of Construction Project (Edition 2)", published by the China National Planning Commission and Ministry of Construction, China Planning Press, July 1993.

[15] Please refer to the registered PDD of the project dated 20/04/2009.

[16] Please refer to the registered PDD of the project dated 20/04/2009.

[17] Please refer to the Validation Report by DNV dated 22/10/2006.

Appendix 1. Contact information of project participants and responsible persons/entities

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Document information

Version	*Date*	*Description*
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB70, Annex 11).
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