

Duerping Coal Mine Methane Utilization Project

Clean Development Mechanism (CDM)

CER Monitoring Report

Certified Emission Reductions

Monitoring Period: 27 April 2010 – 26 October 2010

CDM Registration No: 1900

Date: 3 November 2010
Version 01

A project designed to meet the baseline and monitoring requirements of UN CDM Approved
Consolidated Methodology

ACM0008 Version 3

“Consolidated baseline methodology for coal bed methane and coal mine methane capture and use
for power (electrical or motive) and heat and/or destruction by flaring”

MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/05/2010

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT

Version number: 01

Date 03/11/2010

Title of project activity: Duerping Coal Mine Methane Utilization Project

Reference number: 1900

Monitoring period number: 04

Monitoring period dates: 27/04/2010 - 26/10/2010 (inclusive)

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

The purpose of the project activity is the utilization and abatement of coal mine methane (CMM) captured in underground coal mine workings to allow safe coal extraction at Duerping coal mine.

The project activity has installed the necessary power generation and abatement equipment; control, monitoring and safety systems; pipe-work and power connections to ensure that a high proportion of the coal mine methane that would normally be released to atmosphere is combusted.

Investment in generation plant is phased. Three 1.7 MW gensets (combined capacity of 5.1 MW) were delivered to the site in November 2007 for installation and they started operation in May 2008. Another four 1.7MW gensets (combined capacity of 6.8 MW) were delivered to the site in October 2009 for installation and it is expected that they will start operation in November 2010. The total combined capacity of the plant is 11.9 MW (5.1 MW Phase 1 plus 6.8 MW Phase 2). This matches the final capacity of 12.0 MW stated within the registered PDD. There will be no development of further phases.

The waste heat recovered from the installed generators will remove the need to consume coal to heat the mine intake air during winter months. The coal stove heating season finished operation on the 31/03/2010 and will re-start again for next heating season on the 01/11/2010 therefore no heat displacement took place during the current monitoring period.

The total emission reductions achieved in this monitoring period are 112,462 tCO₂e.

A.2. Project Participants

The authorized project participants are:

Shanxi Coking Coal Group Company Ltd, a Chinese state-owned enterprise which was established under the laws of the People's Republic of China and having its registered office at Xin Jin Si Road, Taiyuan, Shanxi, PRC (hereinafter referred to as "Jiaomei").

Sindicatum Carbon Capital Ltd, a company incorporated under the laws of England and having its registered office at 33 Duke Street, London, W1U 1JY, United Kingdom (hereinafter referred to as "SCC").

A.3. Location of the project activity:

The coal mine is located in Xingjiashe Town, 20 km west of Taiyuan, the capital of Shanxi Province of the People's Republic of China

The project site lies 8 km south west of the main mine buildings. The coal mine reserves are located within the area: Latitude: North 112° 14' 27" Longitude: East 37° 46' 52"



Figure A.3-1 Location of the project activity

A.4. Technical description of the project

This project involves container-type methane pre-treatment equipment, generator sets, power distribution system, enclosed flare as well as relevant monitoring meters. Detailed information is as the follows:

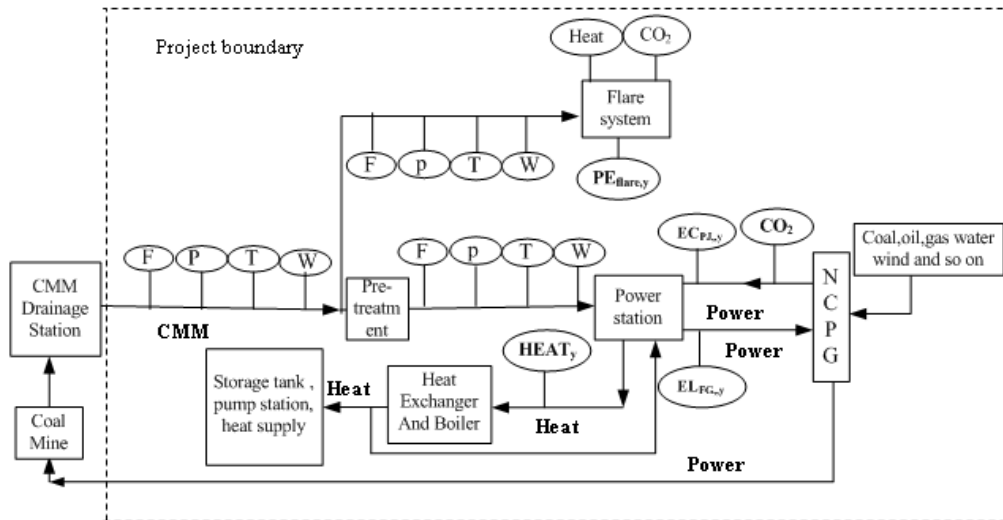


Figure A.4-1 Flow diagram and project boundary

1. Generator sets

Generator sets adopted by the project activity are manufactured by Deutz from Germany. Technical specifications of the generator sets are shown in Table A.4-1.

Table A.4-1 Technology specifications of the generator sets

Items	Parameter
A. Gas engine	
Sets	7
Model	TCG 2020V20
Cylinder numbers	20
Exhaust temperature	442°C
Rated rotational speed	1,500rpm
Manufacturer	Deutz
B. Generator	
Sets	7
Model	DIG 130k/4
Rated capacity	1,750kW
Output voltage	6.3kV
Rated frequency	50Hz
Rated rotational speed	1,500rpm
Power generating efficiency	41.6%
Total efficiency	84.5%
Life time of the gensets	>30 years

2. Heat recovery system

The heat will be recovered from two sections of the project activity, one is the engine water cooling system (no monitoring process associated with this heat displacement) and another is the flue gas (ER calculated from continuous monitoring of hot oil circuit during winter season – therefore no heat displacement ER calculated during current monitoring period).

The excess heat from the cylinder cooling system will be recovered by the engine heat exchangers and provide hot water to the nearby drainage station heating system during winter months. This heat supply is not monitored and therefore no ER calculated as a consequence of the heat displacement.

Table A.4-2 Technical specifications for engine heat exchanger

Manufacturer	Incorporated in Deutz engines
Model	XG-40
Sets	7
Water flow rate	85t/h
Temperature of inlet water	70°C
Temperature of outlet water	78.5°C
Heat recovery capacity	850kW

The heat from the engine flue gas will be recovered by the flue gas/oil heat exchanger and then the heated oil will be transferred (in a closed circuit) to the coal mine shaft air intake during winter months by means of an oil/air heat exchanger.

Table A.4-3 Technical specifications for flue gas/oil heat exchanger

Manufacturer	Shanghai Eagle New Technology Engineering Co., Ltd
Sets	7
Model	EGS0.7-1.0/160/200-FF
Temperature of inlet gas	442°C
Temperature of outlet gas	≤180°C
Temperature of inlet oil	160°C
Temperature of outlet oil	200°C
Flow rate of inlet flue gas	9,480kg/h
Rated heat supply capacity	742kW

Table A.4-4 Technical specifications for oil/air heat exchanger

Manufacturer	Shanghai Eagle New Technology Engineering Co., Ltd
Sets	3
Model	EGS2-1.0/200/160-FF
Temperature of inlet air	-25°C
Temperature of outlet air	120°C
Temperature of inlet oil	200°C
Temperature of outlet oil	160°C
Flow rate of air	38,000Nm ³ /h
Rated heat supply capacity	2,060kW

3. Flaring system

The surplus CMM that can't be utilized by gensets and CMM with CH₄ concentrations in the range of 25-30% will be destroyed by the enclosed flare. The combination of power generation and flaring will optimize the utilization of CMM.

The temperature of the flue gas of the enclosed flare will be continuously monitored in accordance with “Tool to determine project emissions from flaring gases containing methane” in order to ensure that the flare is in normal operation.

Detailed information on the specifications of the enclosed flare is described below:

Table A.4-5 Technical specifications for the Enclosed Flare

Manufacturer	Beijing Fairyland Environmental Technology CO., Ltd
Sets	1
Capacity	300-5,000 Nm ³ /h
Methane concentration in CMM	>25%
Flare temperature	500-1,200 °C
Methane combustion efficiency (%)	>90%

4. Monitoring system

A complete monitoring system will be included in the project activity. The monitoring instruments to be installed include flow meters, methane meters, thermocouples, pressure and temperature gauges as well as electricity meters. All the monitoring instruments meet the relevant accuracy requirements and will be calibrated in accordance with the national standards or the manufacturers' specification.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

ACM0008 version 3 - “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”.

“Tool for the demonstration and assessment of additionality” version 4

“Tool to determine project emissions from flaring gases containing methane”

A.6. Registration date of the project activity:

06/03/2009

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

The fixed 10 years crediting period is chosen for the project activity. The starting date of the crediting period is 06/30/2009 which is different from the date shown in the registered PDD (01/10/2008).

A.8. Name of responsible person(s)/entity(ies):

Mr. Gareth Phillips
Chief Climate Change Officer

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Mr. Sven JP Starckx
Senior Technical Advisor
Monitoring and Verification
sven.starckx@carbon-capital.com

SECTION B. Implementation of the project activity

B.1. Implementation status of the project activity

The implementation of the project activity has been divided into two phases. The first phase (with three 1.7 MW gensets) started operation in May 2008. The second phase (with four additional 1.7MW gensets and a gas pre-treatment unit) have been installed on site and is estimated will start operation in November 2010. The total combined capacity of the plant is 11.9 MW (5.1 MW Phase 1 plus 6.8 MW Phase 2). The waste heat from the installed generators will be recovered and displace the heat generated by coal stoves for heating the shaft air intake at the coal mine during the winter season. No heat displacement has taken place during current monitoring period.

During this monitoring period, no material changes occurred on Phase 1 of the project. Engine number 3 from Phase 1 underwent overhaul (Deutz E50 maintenance) after reparation of B9 cylinder liner, in total engine No3 was not in operation from 10th to 30th of July. Regular power plant maintenance takes place when necessary on the 5th, 15th and 25th of each month when the drainage station switch pumps and therefore gas is not drained and delivered to the power plant for approximately two hours during those dates. It is mainly during those stoppages that the power plant pre-treatment, flare or gensets undergo small maintenance checks.

The four additional second phase engines are expected start operation in November 2010, but were not operating during the period covered by this monitoring report. Special CDM data events at the power plant, such as abnormal monitoring instrumentation performance which impacts the CDM data storage and processing are described in Annex 5 of this report.

There have not been any events or situations that occurred during this monitoring period which may impact the applicability of the methodology.

B.2. Revision of the monitoring plan

Minor revisions to the initial monitoring plan included in the initial registered PDD were made on 18/02/ 2009. The revisions have been validated by TUV-Sued and their conclusions have been reported in validation report (nr. 600500291). A request for revision of the monitoring plan was submitted on

07/07/2009, and approval by the UNFCCC was given on 13/12/2009. This monitoring report has been completed using the revised monitoring plan.

B.3. Request for deviation applied to this monitoring period

No deviation applied to this monitoring period.

B.4. Notification or request of approval of changes

No notification or request of approval of changes from the project activity as described in the registered CDM-PDD.

SECTION C. Description of the monitoring system

In order to guarantee the quality of the data and data collection system, a detailed monitoring manual has been developed and implemented. This detailed monitoring manual (available for verification by a DOE) is based upon the requirements set out in the PDD and revised monitoring plan and addresses as a minimum the items listed below:

- SCC CDM engineers record the value from each CDM monitoring instrument daily using a remote web page system to verify that the readings are within the range set by the manufacturer. Net power values are recorded by Duerping mine operators everyday and handed to SCC CDM engineers on monthly basis. The monitoring instrument data is logged daily and it is available during verification. If the incorrect value persists for more than one hour SCC CDM engineers will ask the on-site operator to check the installation of the instrument and if the problem persists SCC will contact the installation company to replace the faulty instrument with an approved calibrated instrument in the shortest time possible.
- Analysis of CH₄ mass flow against Gross power is performed every month to confirm the back-calculating CH₄ mass flow equations are consistent month to month.

Figure C-1 is the line diagrams showing all relevant monitoring points as per registered PDD. Detailed monitoring diagrams for Phase I and Phase II of the project are included in Annex 6

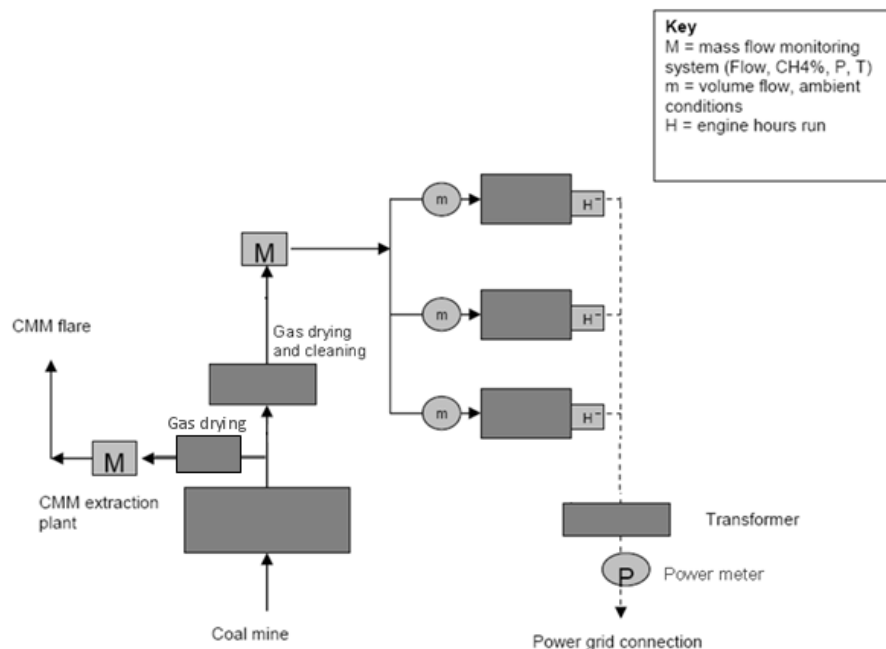


Figure C-1 Line diagram showing all relevant monitoring point

Figure C-2 is the organizational structure of the CDM team.

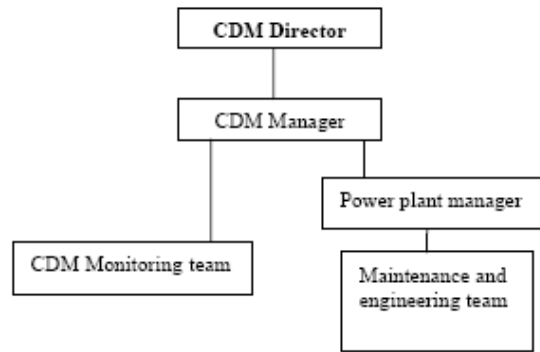


Figure C-2 Organizational structure

An overview of the data collection process is provided in Table 1 and Annex 1.

Table C-1 Data collection process

Parameter	Reference	Procedure / Frequency	Registration	Check and correct primary measurements
Baseline Emissions	The baseline emissions are calculated using the formulae described in the PDD, section B6.1 - using the CDM spreadsheet	Primary data are electronically logged and stored together with keyboard entry data and processed electronically at the start of each month	CDM spreadsheet stored on SCC's Project File S-Server	The SCC project officer performs a consistency check based upon previous months. In case of irregularities data is double checked, corrected as necessary and the amendment logged
Leakage emissions	In accordance with ACM0008 version 3 no leakage is considered for the project activity			
Project Emissions	The project emissions are calculated using the formulae described in the PDD, section B6.1 - using the CDM spreadsheet	Primary data are electronically logged and stored together with keyboard entry data and processed electronically at the start of each month	CDM spreadsheet stored on SCC's Project File S-Server	The SCC project officer performs a consistency check based upon previous months. In case of irregularities data is double checked, corrected as necessary and the amendment logged
Emission Reductions	The emission reductions are calculated using the formulae described in the PDD, section B6.1 - using the CDM spreadsheet	Primary data are electronically logged and stored together with keyboard entry data and processed electronically at the start of each month	CDM spreadsheet stored on SCC's Project File S-Server	The SCC project officer performs a consistency check based upon previous month's records. In case of irregularities data is double checked, corrected as necessary and the amendment logged

Accuracy and calibration of instruments

All measurement devices are maintained to ensure a high level of accuracy. All meters are subject to a quality control regime that includes regular maintenance and are calibrated annually (in the case of V-cones biannually) by *Jiangsu Institute of Metrology* (flare thermocouples), *Institute of Metrological Supervision and Measurement of Hebei Province* (flare, oil heating circuit and engine v-cones and oil v-cone differential pressure transducer) and by *Shanxi Province institute of Metrology Supervision and verification* (rest of CDM instruments). A list of all CDM instruments, their accuracy levels and

calibration certificate numbers are presented in Annex 2 and Annex 3 includes the installation and removal dates of the CDM instruments.

A record is available showing the location and unique identification number of each meter, the calibration status of that meter (date of last calibration and date of next calibration). All CDM instruments have integrated a Serial Number which is used to track the calibration records and installation certificates.

All calibration records are retained two years after the end of the crediting period is over and are available for verification by the DOE.

Archiving of data

Data is archived periodically to a secure and retrievable storage format where it will be held for the crediting period plus 2 years.

Document Control

A document control system has been introduced ensuring that the current versions of necessary documents are available at the point of use. As a part of the document control system, an internal Technical Review Process has been established to ensure the quality of all relevant documents, including the CDM Monitoring Report.

Treatment of missing or corrupted data

Where data in the on-line system are corrupted or missing whilst the plant is operating, the corrupt or missing data can be corrected and justified using installed back-up metering devices, average previous hour readings and gross power readings.

In case errors are identified, both corrective and preventive actions are taken. Annex 7 includes a list of each period during which no CDM data was recorded (all data missing). Missing CDM data records were due to connectivity failure between the Master or Local System Control and Data Acquisition (SCADA) systems and the central computer, preventing the measured CDM value to be recorded in the CDM database system.

Internal Audit

An audit of the data collection and QC/QA system is performed periodically, at least once per year. An internal audit has been carried out end July 2009, begin November 2009 and April 2010 . A copy of the internal audit reports is available for verification by the DOE. Furthermore, a management review is carried out on a yearly basis to assess the operational/verification status, scheduling of audits and verifications, health and safety, improvements to be made and training updates and staffing.

Internal Training

Relevant process operators and CDM technical staff have received in-house refresher training on January 14th by Sven Starckx (Senior Technical Advisor on Monitoring and Verification, SCC) to ensure compliance with the tasks and procedures set out in the monitoring plan. New SCC staff received training on 26th by Ruben Martinez Rubio (CDM Director of CMM Verification Team, SCC). Training records are available for verification by the DOE.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

Data / Parameter:	PE_{me}
Data unit:	tCO ₂
Description:	Project emissions from energy use to capture and use methane
Source of data used:	N/A
Value(s) :	0
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for project emission calculations
Additional comment:	No additional energy is used. Capture and removal of methane is the business as usual scenario.

Data / Parameter:	Eff_{ELEC}
Data unit:	%
Description:	Efficiency of combustion of in power generators
Source of data used:	Default taken from methodology
Value(s) :	99.5% (IPCC)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for project emission calculations
Additional comment:	This figure is built into a spreadsheet for calculating emissions. The spreadsheet is archived periodically and stored in two locations. Access to this figure is controlled. This is a constant so no measurement uncertainty

Data / Parameter:	CONS_{ELEC.PI}
Data unit:	MWh
Description:	Additional electricity consumption for capture and use or destruction of methane
Source of data used:	N/A, since the project activity does not use any additional power when compared to the baseline
Value(s) :	0
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data is used for project emission calculations
Additional comment:	No comment

Data / Parameter:	Eff_{HEAT}
Data unit:	Percentage
Description:	Efficiency of the heat conversion in the baseline
Source of data used:	ACM0008 ver 3
Value(s) :	100 %
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline emission calculations
Additional comment:	The approved methodology provides two different options. Option B is

	selected whereby the boilers are assumed to convert 100% of the heat value of the coal into heat for the mine air. This is a conservative assumption because no data on efficiency of conversion is available.
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Data / Parameter:	MM_i
Data unit:	tCH ₄
Description:	Methane measured sent to use <i>i</i>
Source of data used:	ACM0008 ver 3
Value(s) :	N/A
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	N/A
Additional comment:	No comment

Data / Parameter:	PMM_{pj,i,y}
Data unit:	tCH ₄
Description:	Post-mining CMM captured, sent to and destroyed by use <i>i</i> in the project activity in year <i>y</i>
Source of data used:	ACM0008 ver 3
Value(s) :	N/A
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	The data would be used to calculate baseline emissions
Additional comment:	In line guidance given in the EB 55 report ¹ , as the gas is extracted from the mine within the project boundary of the CDM project activity, and a connection between CMM _{pj,i,y} (pre-mining CMM captured, sent and destroyed) and PMM _{pj,i,y} (post-mining CMM captured, sent to and destroyed) is in the underground mine as specified in ACM0008 version 7, the practice of combined measurement and baseline emissions are determined ex post by measuring the methane emitted from the methane drainage system at the point where it enters the equipment.

Data / Parameter:	Manufacturer's specification for the flare
Data unit:	-
Description:	The flare operation in normal conditions defined by the flare manufacturer specifications provided by Nanjing Shunfen-Pioneer (flow rate 300-5,000m ³ /h and flame temp from 500 – 1,350 °C).
Source of data used:	Commissioning reports, certificates and approval notices provided by manufacturers or suppliers
Value(s) :	-
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is not directly used but just as a reference for project emission calculations
Additional comment:	Implementation of maintenance and calibrations schedules, with results (e.g. calibration certificates) to be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs.

¹ <http://cdm.unfccc.int/UserManagement/FileStorage/JTV1YA8FCHR4W2GMEOQ53SK60P9DLX>

Data / Parameter:	GWP_{CH4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Global warming potential of methane
Source of data used:	2006 Revised IPCC Guidelines
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline and project emission calculations
Additional comment:	-

Data / Parameter:	CEF_{CH4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Carbon emission factor for combusted methane
Source of data used:	2006 Revised IPCC Guidelines
Value(s) :	2.75
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Additional comment:	-

Data / Parameter:	CEF_{ELEC} (also EF_{ELEC})
Data unit:	tCO ₂ /MWh
Description:	CO ₂ emission factor of electricity used by coal mine (also CO ₂ emission factor of the grid)
Source of data used:	Calculated by using ACM0002
Value(s) :	1.03025
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline and project emission calculations
Additional comment:	-

D.2. Data and parameters monitored	
Data / Parameter:	PE_y
Data unit:	tCO ₂ eq
Description:	Project emissions in period y
Measured /Calculated /Default:	Calculated
Source of data:	Calculated from sum of emissions from combustion of methane and emissions of un-combusted methane. 2.75 t CO ₂ per tonne of methane combusted plus 0.005 t CO ₂ per tonne of methane burnt in from un-combusted methane
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	As per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Measurements are taken continuously and logged at nominal 30 second intervals.
Calculation method (if applicable):	
QA/QC procedures applied:	Calculations are performed by spreadsheet which are audited periodically and protected from being over-written or altered by unauthorized personnel. Data is backed up and archived in two different locations, where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. The volume of methane destroyed is correlated with gross power output from the generators.

Data / Parameter:	PE_{md}
Data unit:	tCO ₂ eq
Description:	Project emissions from destruction of methane
Measured /Calculated /Default:	Calculated
Source of data:	Calculated from volume of methane at normal temperature and pressure combusted by generators and flares multiplied by 2.75. Ex ante volume of methane consumed is in Nm ³ , therefore no conversion is necessary before applying the density. For the ex ante prediction no conversion for NTP is required, but ex post, temperature and pressure will be recorded and the volume adjusted to NTP using the gas law $P_1V_1/T_1=P_2V_2/T_2$
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration	As per Annex 2 for details

frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Measurements are taken continuously and logged at nominal 30 second intervals
Calculation method (if applicable):	Volume of pure methane destroyed is calculated from volume and concentration measurements taken every 30 seconds at the inlet to the generators and flare. See MDelec and MDfl below
QA/QC procedures applied:	Calculations are performed by spreadsheet which are audited periodically and protected from being over-written or altered by unauthorized personnel. Data is backed up and archived in two different locations, where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. The volume of methane destroyed is correlated with gross power output from the generators.

Data / Parameter:	PEum
Data unit:	tCO ₂ e
Description:	Un-combusted methane emitted from the generators, flare
Measured /Calculated /Default:	Calculated
Source of data:	Calculated from mass of methane burnt in generators, flare
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Default efficiency is 99.5%, therefore un-combusted methane from generators is 0.005 * PE _{md} . Default efficiency for flares is 90%, therefore un-combusted methane from flare is 0,1*PE _{md} .
Measuring/ Reading/ Recording frequency:	Measurements are taken continuously and logged at nominal 30 second intervals
Calculation method (if applicable):	
QA/QC procedures applied:	Calculations are performed by spreadsheet which are audited periodically and protected from being over-written or altered by unauthorized personnel. Data is backed up and archived in two different locations, where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. The volume of methane destroyed is correlated with gross power output from the generators

Data / Parameter:	MDelec
Data unit:	tCH ₄
Description:	Methane destroyed by power generators
Measured /Calculated /Default:	Calculated
Source of data:	Calculated from the flow and concentration of methane at the inlet to the generators and methane concentration at the manifold to the generators
Value(s) of monitored parameter:	See MMelec and PC CH ₄

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline emission and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	See MMelec and PC CH ₄ . As per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Measurements are taken continuously and logged at nominal 30 second intervals
Calculation method (if applicable):	See MMelec and PC CH ₄
QA/QC procedures applied:	Calculations are performed by spreadsheet which are audited periodically and protected from being over-written or altered by unauthorized personnel. Data is backed up and archived in two different locations, where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. The volume of methane destroyed is correlated with gross power output from the generators.

Data / Parameter:	MM_{ELEC}
Data unit:	tCH ₄
Description:	Methane sent to power plant
Measured /Calculated /Default:	Measured
Source of data:	Measured by a flow meter on the inlet to each generator and summed. For the ex ante prediction on conversion for NTP (given by the methodology as 0.67 kg/m ³) is required, but ex post, temperature and pressure will be recorded and the volume adjusted to NTP using the gas law $P_1 V/T_1 = P_2 V_2/T_2$
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for both baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	V-cone with differential pressure flow meters As per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Measurements are taken continuously and logged at nominal 30 second intervals
Calculation method (if applicable):	The V-cone records gas volumes and the pressure gauge and temperature meter record the gas pressure and temperature. Methane concentration meter records the volumetric CH ₄ concentration.
QA/QC procedures applied:	Calculations are performed by spreadsheet which are audited periodically and protected from being over-written or altered by unauthorized personnel. Data is backed up and archived in two different locations, where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. The volume of methane destroyed is correlated with gross power output from the generators.

Data / Parameter:	CEF-nmhc
Data unit:	tCO ₂ / tNMHC
Description:	Carbon emission factor for combusted non-methane hydrocarbons
Measured /Calculated /Default:	Calculated
Source of data:	If necessary, the value for specific non-methane hydrocarbons will be determined by stoichiometric calculation.
Value(s) of monitored parameter:	Not applicable at this stage because the sum of all non-methane hydrocarbons in gas samples is less than 1% and therefore can be ignored. (See results of gas analysis in Appendix 2)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n/a
Measuring/ Reading/ Recording frequency:	n/a
Calculation method (if applicable):	Derived using measurements described in PCnmhc
QA/QC procedures applied:	n/a

Data / Parameter:	PC CH₄
Data unit:	%
Description:	Percentage of pure methane (wet basis) in drained gas (by volume)
Measured /Calculated /Default:	Measured
Source of data:	Methanometer at the manifold to the generator
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for both baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Methane concentration is measured by proprietary infra red instrumentation mounted in the gas pipework at the gas treatment units. Accuracy of analysis +/-2.5%FSD. Gas analysed as sample (gas dried by pretreatment). Measurements are taken continuously and logged at nominal 30 second intervals. Annex 2 for details
Measuring/ Reading/ Recording frequency:	Continuously, recorded every 30 seconds
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Calculations are performed by spreadsheet which are audited periodically and protected from being over-written or altered by unauthorized personnel. Data is backed up and archived in two different locations, where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs.

Data / Parameter:	PCnmhc
Data unit:	%
Description:	Percentage of non-methane hydrocarbons in CCM, by mass coal mine gas
Measured /Calculated /Default:	Measured
Source of data:	Tube sample analysis as per Annex 4
Value(s) of monitored parameter:	Not applicable at this stage because the sum of all non-methane hydrocarbons in gas samples is less than 1% and therefore can be ignored.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n/a
Measuring/ Reading/ Recording frequency:	Annually, samples of gas are extracted into gas sampling bottles using the appropriate procedures and analyzed by an qualified laboratory, for example, TES Bretby in the UK or an equivalent qualified laboratory in China.
Calculation method (if applicable):	n/a
QA/QC procedures applied:	A minimum of 3 samples are collected in secure gas sample vessels, suitable for storage and transport to the selected laboratory. Samples are taken in accordance with protocol procedures in the CDM monitoring manual and analysed in a qualified laboratory. If one or more samples are found to be faulty (i.e. leaked) replacement samples will be taken. Scanned copies of the analyses are backed up and archived in two different locations, where they will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs.

Data / Parameter:	r
Data unit:	%
Description:	Relative proportion of NMHC compared to methane
Measured /Calculated /Default:	Calculated
Source of data:	Calculated from PC nmhc / PC CH ₄
Value(s) of monitored parameter:	Determined from annual tests of samples of coal mine methane. Not applicable at this stage because the sum of all non-methane hydrocarbons in gas samples is less than 1% and therefore can be ignored.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data are used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	n/a

Measuring/ Reading/ Recording frequency:	Annually, samples of gas are extracted into gas sampling bottles using the appropriate procedures and analyzed by an qualified laboratory, for example, TES Bretby in the UK or an equivalent qualified laboratory in China.
Calculation method (if applicable):	n/a
QA/QC procedures applied:	If applicable, this figure will be built into a spreadsheet for calculating emissions. The spreadsheet is archived periodically and stored in two locations. Access to this figure will be controlled.

Data / Parameter:	GEN_y
Data unit:	MWh
Description:	Electricity generated by the project
Measured /Calculated /Default:	Calculated
Source of data:	Net power is calculated from the difference between gross power from all the generators (positive active power) and the power consumption by the project (negative active power).
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline emission calculations.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Power meter as per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Continuously measured but manually recorded everyday by a site operator.
Calculation method (if applicable):	Positive active power (gross power) and negative active power (power consumed by the project) are both measured continuously with a single power meter located at the link from the generators to the power grid. Net power is calculated from the difference of these two readings.
QA/QC procedures applied:	Calculations are performed by spreadsheet which are audited periodically and protected from being over-written or altered by unauthorized personnel. Data is backed up and archived in two different locations, where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. The net export meter power meter has been approved by the local power company and calibrated and monitored in accordance with their instructions.

Data / Parameter:	BE_y
Data unit:	tCO ₂
Description:	Baseline emissions in year y
Measured /Calculated /Default:	Calculated
Source of data:	Equals BEmr,y. See below
Value(s) of monitored parameter:	Equals BEmr,y. See below

Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Equals BEmr,y. See below
Measuring/ Reading/ Recording frequency:	
Calculation method (if applicable):	Equals BEmr,y. See below
QA/QC procedures applied:	Equals BEmr,y. See below

Data / Parameter:	BEmr,y
Data unit:	tCO2
Description:	Baseline emissions from the release of methane to the atmosphere in year y that is avoided by the project activity.
Measured /Calculated /Default:	Calculated
Source of data:	MDelec
Value(s) of monitored parameter:	See MDelec above
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	See MDelec above
Measuring/ Reading/ Recording frequency:	
Calculation method (if applicable):	See MDelec above
QA/QC procedures applied:	See MDelec above

Data / Parameter:	HEAT_y
Data unit:	GJ
Description:	Heat generation by project
Measured /Calculated /Default:	Calculated
Source of data:	Measurement of flow rate on the oil heating circuit and the oil temperatures on the outward and returning heating pipes
Value(s) of monitored parameter:	No heat generation and utilisation during the monitoring period.
Indicate what the data are used for (Baseline/ Project/ Leakage emission)	This data is used for baseline emission calculations

calculations)	
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	V-cone flow meter and Temperature meter As per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Continuously, recorded every 30 seconds
Calculation method (if applicable):	During heating season (not applicable to current monitoring period) waste heat is transferred from the generators to the mines ventilation, heater and building by way of closed circuit heat transfer system. The circuits are fitted with constant flow pumps, thermocouples in the flow and return pipes and flow meter. Actual heat transferred is determined by measuring the flow, inlet and return temperatures and logging the data.
QA/QC procedures applied:	Temperature and flow rate data is used to calculate heat supplied and this is fed into a data logger for determination of heat supply. Heat will be supplied to meet demand (in winter months) which is determined by need for compliance with mine air temperature regulations and hence on ambient temperature which will also be recorded. Measurement equipment is calibrated and monitored in accordance with manufacturer instructions.

Data / Parameter:	T
Data unit:	Kelvin
Description:	Temperature of CMM
Measured /Calculated /Default:	Measured
Source of data:	Temperature sensor on gas pipework between the treatment unit and the generators
Value(s) of monitored parameter:	As per the spreadsheets
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline emission and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Temperature sensor as per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Continuously, recorded every 30 seconds
Calculation method (if applicable):	
QA/QC procedures applied:	Calibrated and monitored as per manufacturers' instructions. Logging of data and storage for 2 years after crediting lifetime.

Data / Parameter:	MM_{FL}
Data unit:	tCH ₄
Description:	Methane sent to flare
Measured /Calculated /Default:	Measured

Source of data:	Measured continuously using flow meters and CH ₄ levels on the inlet to the flares. Flow, temperature and absolute pressure will be recorded and the volume normalised as per Flaring tool.
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for baseline emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	V-cone with differential pressure flow meters as per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Continuously, recorded every 30 seconds
Calculation method (if applicable):	Pressure, temperature, CH ₄ concentration and flow meters with differential pressure measurement function are used to determine the amount of methane sent to the flares. Mass of methane sent to the flares is determined taking into account the density of methane under normal conditions of temperature and pressure. Density of methane under normal conditions of temperature and pressure is 0.67 kg/m ³ (revised 1996 IPCC Reference manual p.1.24 and 1.16).
QA/QC procedures applied:	Data is backed up and archived in two different locations, where it will be stored for a period of two years after the crediting period or two years after the last issuance of CERs.

Data / Parameter:	MD_{FL}
Data unit:	tCH ₄
Description:	Methane destroyed by flare(s)
Measured /Calculated /Default:	Calculated
Source of data:	Calculated from MM _{FL} and $\eta_{\text{flare,h}}$
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	As per MM _{FL} and $\eta_{\text{flare,h}}$
Measuring/ Reading/ Recording frequency:	n/a
Calculation method (if applicable):	Calculations are performed by spreadsheet (at least monthly) which are audited periodically and protected from being over-written or altered by unauthorized personnel.
QA/QC procedures applied:	Data is backed up and archived in two different locations, where it will be stored for a period of two years after the crediting period or two years after the last issuance of CERs.

Data / Parameter:	PC_{NMHC}
Data unit:	%
Description:	NMHC concentration (in mass) in coal mine gas
Measured /Calculated /Default:	Measured
Source of data:	Measured in an TES Bretby in the UK (as per Annex 4 for details)
Value(s) of monitored parameter:	<0.1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is assumed to be used for the project emission calculations but as it is below based on the external lab test, it can be ignored in accordance with the methodology.
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Annually, samples of gas are extracted into gas sampling bottles using the appropriate procedures and analyzed by an qualified laboratory, TES Bretby in UK
Measuring/ Reading/ Recording frequency:	Annually
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	A minimum of 3 samples were collected in secure gas sample vessels, suitable for storage and transport to the selected laboratory. Samples were taken in accordance with protocol procedures in the CDM monitoring manual and analyzed in a qualified laboratory. If one or more samples are found to be faulty (i.e. leaked) replacement samples will be taken. Scanned copies of the analyses will be backed up and archived in two different locations, where they will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs.

Data / Parameter:	$FV_{RG,h}$
Data unit:	m ³ /h
Description:	volumetric flow rate of the residual gas at normal conditions in the hour h (residual gas to flare)
Measured /Calculated /Default:	Measured
Source of data:	Measured using a flow meter.
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for both baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Flow meter instrument as per Annex 2
Measuring/ Reading/ Recording frequency:	Measurements are taken continuously and logged at nominal 30 second intervals.
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Flow meters are periodically calibrated according to the

	manufacturer's recommendation. Ensure that the same basis is considered for this measurement and the measurement of the volumetric fraction of all components in the residual gas when the residual gas temperature exceeds 60 °C.
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Data / Parameter:	$f_{Vi,h}$
Data unit:	-
Description:	Volumetric fraction of component i in the residual gas in the hour h where i = CH ₄ , CO, CO ₂ , O ₂ , H ₂ , N ₂ (simplified approach will be applied).
Measured /Calculated /Default:	Measured
Source of data:	Measurements by project participants using a continuous gas analyzer
Value(s) of monitored parameter:	As per the spreadsheets in Annex 1
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for both baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Gas monitoring instrument as per Annex 2
Measuring/ Reading/ Recording frequency:	As a simplified approach, project participants may only measure the Methane content of the residual gas and consider the remaining part as N ₂ . Ensure that the same basis is considered for this measurement and the measurement of the volumetric fraction of all components in the residual gas when the residual gas temperature exceeds 60 °C. Measurements are taken continuously and logged at nominal 30 second intervals.
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Analyzers are periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check are performed by comparison with a standard certified gas.

Data / Parameter:	$f_{v CH_4, RG, h}$
Data unit:	-
Description:	volumetric fraction of methane in the residual gas on dry basis in the hour h
Measured /Calculated /Default:	Measured
Source of data:	Measured by project participants using a continuous gas analyzer
Value(s) of monitored parameter:	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for both baseline and project emission calculation
Monitoring equipment (type,	Gas monitoring instrument as per Annex 2

accuracy class, serial number, calibration frequency, date of last calibration, validity)	
Measuring/ Reading/ Recording frequency:	Ensure that the same basis is considered for this measurement and the measurement of the volumetric fraction of all components in the residual gas when the residual gas temperature exceeds 60 °C.
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Analyzers are periodically calibrated according to the manufacturer's recommendation. A zero check and a typical value check is performed by comparison with a standard certified gas.

Data / Parameter:	T_{flare}
Data unit:	°C
Description:	Temperature of the flue gas of the flare
Measured /Calculated /Default:	Measured
Source of data:	Flare thermocouple(s)
Value(s) of monitored parameter:	As per the spreadsheets
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Flare thermocouple(s) type N as per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Continuously, recorded every 30 seconds. Monitored continuously by a Type N thermocouple. A temperature above 500 Degree indicates that a significant amount of gases are being burnt and that the flares is operating.
Calculation method (if applicable):	Not applicable
QA/QC procedures applied:	Data is backed up and archived where it will be stored for the longer of two years longer than the crediting period or two years after the last issuance of CERs. Thermocouples are calibrated according to the manufacturer's specifications.

Data / Parameter:	$\eta_{\text{flare},h}$
Data unit:	%
Description:	Flare efficiency in hour h
Measured /Calculated /Default:	Calculated
Source of data:	T_{flare}
Value(s) of monitored parameter:	0, if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour h . 50, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h , but the manufacturer's specifications on proper operation of the flare are not

	met at any point in time during the hour h. 90, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h.
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This data is used for project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Flare thermocouple(s) type N as per Annex 2 for details
Measuring/ Reading/ Recording frequency:	Measurements are taken continuously and logged at nominal 30 second intervals.
Calculation method (if applicable):	$\eta_{\text{flare},h}$ cannot be directly monitored. Therefore, the parameter T_{flare} is instead monitored in order to measure the flare combustion efficiency (refer to the "Tool to determine project emissions from flaring gases containing methane").
QA/QC procedures applied:	Data is backed up and archived in two different locations, where it will be stored for a period of two years after the crediting period or two years after the last issuance of CERs.

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

The formulae used for determination of the baseline emissions are described in section B.6.1 of the registered PDD for the project activity. It is available on the UNFCCC website.

<http://cdm.unfccc.int/UserManagement/FileStorage/Q3PBR459OM8KI0Y6FATGX1SJW27HNC>

Baseline emissions are calculated as follows:

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{Use,y} \quad (1)$$

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)

$BE_{MD,y}$ Baseline emissions from destruction of methane in the baseline scenario in year y

No methane is destroyed in the baseline scenario therefore $BE_{MD,y}$ are zero.

$BE_{MR,y}$ Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity

The original formula used for $BE_{MR,y}$ calculation in ACM0008/version 03 is as the following:

$$BE_{MR,y} = GWP_{CH_4} \times [\sum_i (CBMe_{i,y} - CBM_{BLi,y}) + \sum_i (CMM_{PJi,y} - CMM_{BLi,y}) + \sum_i (PMM_{PJi,y} - PMM_{BLi,y})] \quad (2)$$

Where,

$BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO ₂ e)
I	Use of methane (flaring, power generation, heat generation, supply to gas grid to various combustion end uses)
$CBMe_{i,y}$	Eligible CBM captured, sent to and destroyed by use i in the project for year y (expressed in tCH ₄) = 0
$CBM_{BLi,y}$	CBM that would have been captured, sent to and destroyed by use i in the baseline scenario in the year y (expressed in tCH ₄) = 0
$CMM_{PJi,y}$	Pre-mining CMM captured, sent to and destroyed by use i in the project activity in year y (expressed in tCH ₄)
$CMM_{BLi,y}$	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) = 0
$PMM_{PJi,y}$	post-mining CMM captured, sent to and destroyed by use i in the project activity in year y (tCH ₄)
$PMM_{BLi,y}$	post-mining CMM that would have been captured, sent to and destroyed by use i in the baseline scenario in year y (tCH ₄) = 0
GWP_{CH_4}	Global warming potential of methane (21 tCO ₂ e/tCH ₄)

In practice, the pre-mining and post-mining methane are indistinguishable, being extracted through the same pumping system in proportions that vary depending on mining activities, atmospheric pressure changes and day to day management of the ventilation systems. In line guidance given in the EB 55 report², as the gas is extracted from the mine within the project boundary of the CDM project activity, and a connection between $CMM_{PJi,y}$ (pre-mining CMM captured, sent and destroyed) and $PMM_{PJi,y}$ (post-mining CMM captured, sent to and destroyed) is in the underground mine as specified in ACM0008 version 7, the practice of combined measurement and baseline emissions are determined ex post by measuring the methane emitted from the methane drainage system at the point where it enters the equipment.

The release of methane into the atmosphere is avoided by the project activity through power generation and destruction in the enclosed flare. Therefore formula (2) can be simplified to:

$$BE_{MR,y} = GWP_{CH_4} \times (MM_{ELEC} + MM_{FL}) \quad (3)$$

Where:

MM_{ELEC}	Methane measured sent to power plant (tCH ₄)
MM_{FL}	Methane measured sent to the flare (tCH ₄)

$BE_{Use,y}$ Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity in year y

² <http://cdm.unfccc.int/UserManagement/FileStorage/JTV1YA8FCHR4W2GMEOQ53SK60P9DLX>

Electricity and heat will be generated by the project activity, therefore baseline emissions from the production of power and heat replaced by the project activity in year y (tCO₂e) is:

$$BE_{use,y} = GEN_y \times EF_{ELEC} + HEAT_y \times EF_{HEAT} \quad (4)$$

Where:

GEN _y	Electricity generated by project activity in year y (MWh)
EF _{ELEC}	Emissions factor of grid electricity replaced by the project activity (tCO ₂ /MWh)
HEAT _y	Heat generation by project activity in year y (GJ)
EF _{HEAT}	Emissions factor for heat production replaced by project activity (tCO ₂ /GJ)

The EF_{ELEC} is calculated as per ACM0002 version 6, from the average of the operating margin and build margin in the North China Power Grid.

EF _{OM}	1.1208
EF _{BM}	0.9397

According ACM0002, the baseline grid emission factor is the simple average of BM and OM:
 $1.1208 + 0.9397 / 2 = 1.03025 \text{ tCO}_2/\text{MWh}$

The emissions factor for displaced heat generation is calculated as follows:

$$EF_{heat,y} = \frac{EF_{CO2,i}}{Eff_{heat}} \times \frac{44}{12} \times \frac{1TJ}{1000GJ} \quad (5)$$

Where:

EF _{heat,y}	Emissions factor for heat generation (tCO ₂ /GJ)
EF _{CO2,i}	CO ₂ emissions factor of fuel used in heat generation (tC/TJ)
Eff _{heat}	Boiler efficiency of the heat generation (%)
44/12	Carbon to Carbon Dioxide conversion factor
1/1000	TJ to GJ conversion factor

Boiler efficiency is taken as 100%.

E.2. Project emissions calculation

The formulae used for determination of the project emissions are described in section B.6.1 of the registered PDD for the project activity. It is available on the UNFCCC website.

<http://cdm.unfccc.int/UserManagement/FileStorage/Q3PBR459OM8KI0Y6FATGX1SJW27HNC>

Project emissions are calculated as follows:

$$PE_y = PE_{ME} + PE_{MD} + PE_{UM} \quad (6)$$

Where:

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

PE_{ME} Project emissions from energy use to capture and use methane

The project activity will consume some electricity during operation. No additional heat or fossil fuel will be consumed. Therefore:

$$PE_{ME} = CONS_{ELEC,PJ} \times EF_{ELEC} \quad (7)$$

But in practice only the readings of the net electricity output ($GEN_y - CONS_{ELEC,PJ}$) is recorded
So:

$$\begin{aligned} BE_{use,y} - PE_{ME} &= GEN_y \times EF_{ELEC} + HEAT_y \times EF_{HEAT} - CONS_{ELEC,PJ} \times EF_{ELEC} \\ &= (GEN_y - CONS_{ELEC,PJ}) \times EF_{ELEC} + HEAT_y \times EF_{HEAT} \end{aligned}$$

Hence in the emission reduction calculations, the PE_{ME} can be treated as zero.

PE_{MD} Project emissions from methane destroyed

Only gensets and flare is installed for the project activity, CMM is not used directly in CMM boilers or distributed into the gas pipelines. Therefore:

$$PE_{MD} = (MD_{FL} + MD_{ELEC}) \times (CEF_{CH_4} + r \times CEF_{NMHC}) \quad (8)$$

with:

$$r = PC_{NMHC} / PC_{CH_4} \quad (9)$$

Where:³

PE _{MD}	Project emissions from CMM destroyed (tCO ₂ e)
MD _{FL}	Methane destroyed through flaring (tCH ₄)
MD _{ELEC}	Methane destroyed through power generation (tCH ₄)
CEF _{CH₄}	Carbon emission factor for combusted methane (2.75 tCO ₂ e/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 ₂ e/tNMHC)
r	Relative proportion of NMHC compared to methane
PC _{CH₄}	Concentration (in mass) of methane in extracted gas (%)
PC _{NMHC}	NMHC concentration (in mass) in extracted gas (%)

As the PC_{NMHC} measured in the external lab is lower than 1% in this monitoring period, it can be ignored. Hence formula can be simplified as:

$$PE_{MD} = CEF_{CH_4} \times (MD_{FL} + MD_{ELEC}) \quad (10)$$

Not all of the methane sent to power plant and flare will be combusted, so a small amount will escape to the atmosphere. The combusted methane is calculated using the following formulas:

$$MD_{ELEC} = MM_{ELEC} \times Eff_{ELEC} \quad (11)$$

Where:

³ Note that throughout this baseline methodology, it is assumed that measured quantities of coal mine gas are converted to tonnes of methane using the measured methane concentration of the coal mine gas and the density of methane.

MD_{ELEC}	Methane destroyed through power generation (tCH ₄)
MM_{ELEC}	Methane measured sent to power plant (tCH ₄)
Eff_{ELEC}	Efficiency of methane destruction/oxidation in power plant (taken as 99.5% from IPCC)

$$MD_{FL} = MM_{FL} - PE_{flare}/GWP_{CH4} \quad (12)$$

Where:

MD_{FL}	Methane destroyed through flaring (tCH ₄)
MM_{FL}	Methane measured sent to flare (tCH ₄)
PE_{flare}	Project emissions from flaring of the residual gas stream (tCO ₂ e)
GWP_{CH4}	Global warming potential of methane (21tCO ₂ e/tCH ₄)

The project emissions from flaring of the residual gas stream (PE_{flare}) shall be calculated following the procedures described in the “Tool to determine project emissions from flaring gases containing Methane”.

To determine project emissions from flaring gases containing methane

For the enclosed flares: Option (a) in the flaring tool of a 90% efficiency default value is used to determine the flare efficiency. Continuous monitoring of compliance with manufacturer’s specification of flare (temperature, flow rate of residual gas at the inlet of the flare) must be performed. If in a specific hour any of the parameters are out of the limit of manufacturer’s specifications, a 50% default value for the flare efficiency is used for the calculations for the specific hour.

Applicable steps are:

- STEP 1: Determination of the mass flow rate of the residual gas that is flared
- STEP 2: Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas
- STEP 5: Determination of methane mass flow rate of the residual gas on a dry basis
- STEP 6: Determination of the hourly flare efficiency
- STEP 7: Calculation of annual project emissions from flaring based on measured hourly values or based on default flare efficiencies.

Option (b) Continuous monitoring of the methane destruction efficiency of the flare (flare efficiency).

The project activity follows the approach described as Option (a) using of 90% default flare efficiency. The manufacturer’s specifications for the operation of the flare and the required data and procedures to monitor the flare operation are documented in the Project Design Document Monitoring Plan.

STEP 1. Determination of the mass flow rate of the residual gas that is flared

This step calculates the residual gas mass flow rate in each hour h , based on the volumetric flow rate and the density of the residual gas. The density of the residual gas is determined using the simplified approach as described in the methodology where only the volumetric fraction of methane is measured and the difference to 100% is considered as nitrogen.

$$FM_{RG,h} = \rho_{RG,n,h} \times FV_{RG,h} \quad (1)$$

Where:

Variable	SI Unit	Description
$FM_{RG,h}$	kg/h	Mass flow rate of the residual gas in hour h
$\rho_{RG,n,h}$	kg/m ³	Density of the residual gas at normal conditions in hour h
$FV_{RG,h}$	m ³ /h	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h

and:

and:

$$\rho_{RG,n,h} = \frac{P_n}{\frac{R_u}{MM_{RG,h}} \times T_n} \quad (2)$$

Where:

Variable	SI Unit	Description
$\rho_{RG,n,h}$	kg/m ³	Density of the residual gas at normal conditions in hour <i>h</i>
P_n	Pa	Atmospheric pressure at normal conditions (101 325)
R_u	Pa.m ³ /kmol.K	Universal ideal gas constant (8 314)
$MM_{RG,h}$	kg/kmol	Molecular mass of the residual gas in hour <i>h</i>
T_n	K	Temperature at normal conditions (273.15)

and:

$$MM_{RG,h} = \sum_i (fv_{i,h} * MM_i) \quad (3)$$

Where:

Variable	SI Unit	Description
$MM_{RG,h}$	kg/kmol	Molecular mass of the residual gas in hour <i>h</i>
$fv_{i,h}$	-	Volumetric fraction of component <i>i</i> in the residual gas in the hour <i>h</i>
MM_i	kg/kmol	Molecular mass of residual gas component <i>i</i>
<i>i</i>		The components CH ₄ , CO, CO ₂ , O ₂ , H ₂ , N ₂

STEP 2. Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas

Determine the mass fractions of carbon, hydrogen, oxygen and nitrogen in the residual gas, calculated from the volumetric fraction of each component *i* in the residual gas (taken as only methane and nitrogen in accordance with the simplification in the methodology), as follows:

$$fm_{j,h} = \frac{\sum_i fv_{i,h} \cdot AM_j \cdot NA_{j,i}}{MM_{RG,h}} \quad (4)$$

Where:

Variable	SI Unit	Description
$fm_{j,h}$	-	Mass fraction of element <i>j</i> in the residual gas in hour <i>h</i>
$fv_{i,h}$	-	Volumetric fraction of component <i>i</i> in the residual gas in the hour <i>h</i>
AM_j	kg/kmol	Atomic mass of element <i>j</i>
$NA_{j,i}$	-	Number of atoms of element <i>j</i> in component <i>i</i>
$MM_{RG,h}$	kg/kmol	Molecular mass of the residual gas in hour <i>h</i>
<i>j</i>		The elements carbon, hydrogen, oxygen and nitrogen
<i>i</i>		The components CH ₄ , CO, CO ₂ , O ₂ , H ₂ , N ₂

STEP 5. Determination of methane mass flow rate in the residual gas

The quantity of methane in the residual gas flowing into the flare is the product of the volumetric flow rate of the residual gas ($FVRG,h$), the volumetric fraction of methane in the residual gas ($fv_{CH4,RG,h}$) and the density of methane ($\rho_{CH4,n,h}$) in the same reference conditions (normal conditions and dry or wet basis). If the residual gas moisture is significant (temperature greater than 60°C), the measured flow rate of the residual gas that is usually referred to wet basis should be corrected to dry basis due to the fact that the measurement of methane is usually undertaken on a dry basis (i.e. water is removed before

sample analysis). In this case the gas temperature throughout the monitoring period is always less than 60°C and measurements are made as received, i.e. wet.

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (13)$$

Where:

Variable	SI Unit	Description
$TM_{RG,h}$	kg/h	Mass flow rate of methane in the residual gas in the hour h
$FV_{RG,h}$	m ³ /h	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h
$fv_{CH4,RG,h}$	-	Volumetric fraction of methane in the residual gas on dry basis in hour h (NB: this corresponds to $fv_{i,RG,h}$ where i refers to methane).
$\rho_{CH4,n}$	kg/m ³	Density of methane at normal conditions (0.716)

STEP 6. Determination of the hourly flare efficiency

The project has an enclosed flare and the flare efficiency in the hour h ($h_{flare,h}$) has been calculated after applying the following conditions:

- 0% if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour h .
- 50%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h , but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour h .
- 90%, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h .

STEP 7. Calculation of annual project emissions from flaring

Project emissions from flaring are calculated as the sum of emissions from each hour h , based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour h ($h_{flare,h}$), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times GWP_{CH4} / 1000 \quad (13)$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h (kgCH ₄ /h)
$\eta_{flare,h}$	Flare efficiency in hour h (%), IPCC default value is taken
GWP_{CH4}	Global warming potential of methane valid for the first commitment period (21tCO ₂ e/tCH ₄).

The calculation for $TM_{RG,h}$ is shown below:

$$TM_{RG,h} = FV_{RG,h} \times \omega_{CH4,y} \times D_{CH4} \quad (14)$$

Where:

$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h (m^3/h)
$\omega_{CH_4,y}$	(also PC_{CH_4}) Volumetric fraction of methane in the residual gas on dry basis in hour h (%)
D_{CH_4}	Methane density (tCH_4/m^3CH_4), density of methane under normal conditions of temperature and pressure is $0.67kg/m^3$ (Revised 1996 IPCC Reference Manual p 1.24 and 1.16)

PE_{UM} Project emissions from un-combusted methane

Not all of the methane sent to power plant and flare will be combusted, so a small amount will escape to the atmosphere. These emissions are calculated using the following:

$$PE_{UM} = GWP_{CH_4} \times MM_{ELEC} \times (1 - Eff_{ELEC}) + PE_{flare} \quad (15)$$

Where:

PE _{UM}	Project emissions from un-combusted methane (tCO ₂ e)
GWP _{CH₄}	Global warming potential of methane (21 tCO ₂ e/tCH ₄)
MM _{ELEC}	Methane measured sent to power plant (tCH ₄)
Eff _{ELEC}	Efficiency of methane destruction in power plant (%) (taken as 99.5% from IPCC)
PE _{flare}	Project emissions from flaring of the residual gas stream (tCO ₂ e), calculated in accordance with formulas (13) and (14)

E.3. Leakage calculation

There is no baseline thermal energy use therefore there is no leakage to consider in this category

E.4. Emission reductions calculation / table

The formula used for determination of the emission reductions is described in section B.6.1 of the registered PDD. Duerping Project Design Document is available on the UNFCCC website.
<http://cdm.unfccc.int/UserManagement/FileStorage/Q3PBR459OM8KI0Y6FATGX1SJW27HNC>

Emission reductions are calculated as the difference between baseline and project emissions for the same period y:

$$ER_y = BE_y - PE_y - LE_y \quad (16)$$

Where:

ER _y	Emissions reductions of the project activity during the year y (tCO ₂ e)
BE _y	Baseline emissions during the year y (tCO ₂ e)
PE _y	Project emissions during the year y (tCO ₂ e)
LE _y	Leakage emissions in year y (tCO ₂ e) = 0

The total of the emission reductions achieved during this monitoring period is shown as the following:

Total baseline emissions:	134,412tCO ₂ e
Total project emissions:	21,950tCO ₂ e
Total leakage:	0

Total emission reductions: 112,462tCO₂e

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	= 378,748 × 6/12 = 189,374	112,462

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

There is no **increase** in the actual emission reductions achieved during the current monitoring period from that stated in the registered CDM-PDD. The ex-ante emission reduction calculation of the registered PDD estimates a total of 189,374 tCO₂e for the current monitoring period (calculation as per table in section E.5), however only 112,462 ER have actually been generated during the current monitoring period due to installation and commissioning delays of Phase 2 of the project.

History of the document

Version	Date	Nature of revision
01	EB 54, Annex 34 28 May 2010	Initial adoption.
Decision Class: Regulatory Document Type: Guideline, Form Business Function: Issuance		

Annex 1 Monitoring / Calculation Details

GENERATOR

Period		Volumetric Flow Rate	PC CH ₄	Volumetric Flow Rate CH ₄	MM ELEC	MDelec	BE (MR _y)	PE(MD)	PE(UM)	PE _y	GEN _y	GEN _y x EFelec	HEAT _y	HEAT _y x Eff heat	BE (USE _y)	BE(y)
Unit		m ³	%	m ³	(tCH ₄)	(tCH ₄)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	(tCO ₂ e)	MWh				(tCO ₂ e)	tCO ₂ e
Index		A1	A2	A	B	C	D	E	F	G	H	I	J1	J2	K	L
from	to			= A1 x A2	= A x ρ _{CH₄}	= B x Effelec	= B x GWP _{CH₄}	= B x CEF _{CH₄} x EFF _{ELEC}	=B x GWP _{CH₄} x (1 - EFF _{ELEC})	= E + F	(Power Meter)	= H x EFF _{ELEC}		= J1x EF _{HEAT}	= I + J	=D+K
27-Apr-10	26-May-10	1,974,732	35	691,302	463	461	9,727	1,267	49	1,316	2,519	2,595	0	0	2,595	12,322
27-May-10	26-Jun-10	2,135,543	35	755,404	506	504	10,629	1,385	53	1,438	2,955	3,044	0	0	3,044	13,673
27-Jun-10	26-Jul-10	1,523,463	39	593,442	398	396	8,350	1,088	42	1,130	2,367	2,439	0	0	2,439	10,788
27-Jul-10	26-Aug-10	1,846,144	41	747,880	501	499	10,523	1,371	53	1,424	2,935	3,024	0	0	3,024	13,546
27-Aug-10	26-Sep-10	2,160,477	38	814,081	545	543	11,454	1,492	57	1,550	3,313	3,413	0	0	3,413	14,867
27-Sep-10	26-Oct-10	1,900,033	38	725,939	486	484	10,214	1,331	51	1,382	3,108	3,202	0	0	3,202	13,416

Constants:

Density Methane at normal conditions (ρ_{CH₄}) = 0,67 kg/m³ (Revised 1996 IPCC Reference Manual p.1.24 and 1.16).

GWP_{CH₄} is the Global Warming Potential (GWP) for methane = 21 tCO₂e/tCH₄

CEF_{CH₄} is the carbon emission factor of coal mine methane = 2,75tCO₂e/tCH₄

EFF_{ELEC} is efficiency of the methane destruction in the power plant = 99,5% (IPCC)

EF_{ELE} is the emissions factor of electricity (grid, captive or a combination) replaced by project = 1.03025 tCO₂/MWh

EF_{HEAT} is the emissions factor for heat production replaced by project activity = 0.09405 tCO₂/GJ

PC CH₄ is the methane concentration of CMM gas delivered to the engines

The percentage of non-methane hydrocarbons in the coal mine gas PC_{NMHC} have been below 1% during the whole monitoring period and, in accordance with the methodology, can be ignored for the emission reduction calculations. See gas analysis laboratory results in Annex 4 (originals will be provided during verification).

Data Collection Process Gensets

The continuous CDM monitoring system at site records data every 30 seconds.

- V-cone differential pressure (dP) to engines (3 V-cones)
- Methane concentration (PC_{CH_4}) gas delivered to engines (one at the manifold pipe)
- Gauge pressure (P) gas to engines (one at the manifold)
- Barometric pressure
- Gas temperature (T) gas delivered to engines (one at the manifold pipe)

30 seconds input data are used for calculation and outcome is aggregated into hourly, daily etc.

The only CDM parameter that is not recorded with the 30s frequency is the net power output which although is measured continuously it is manually recorded everyday by a site operator.

Back up data (generators running hours and generators gross power) is continuously recorded from the site PLCs in case CDM monitoring instruments fail to record the gas delivery to the power plant or flare.

Spreadsheets containing 30' readings and calculations are available for verification by the DOE.

FLARE

Period		Volumetric Flow Rate	fv CH ₄	Volumetric Flow Rate CH ₄	MM (Flare)	BE (MRy)	BE(y)	MD (FLARE)	PE(MD)	MM (Flare) x (1-Eff)	PE (UM)	PEy	ER
Unit		m ³	%	m ³	(tCH ₄)	(tCO ₂ e)	(tCO ₂ e)	(tCH ₄)	(tCO ₂ e)	(tCH ₄)	(tCO ₂)	(tCO ₂ e)	(tCO ₂ e)
Index		M2	M2	M	N	O	P	Q	R	S	T	U	V
from	to			= M1 x M2	= M x ρ _{CH₄}	= N x GWP _{CH₄}	= O	= ∑ {N((hourly) x η flare,h)}	= Q x CEF _{CH₄}	= ∑ {N((hourly) x (1-η flare,h)}	= S x GWP _{C_{H4}}	= R + T	= P - U
27-Apr-10	26-May-10	1,878,873	36	671,801	450	9,452	9,452	392	1,078	58	1,219	2,297	7,155
27-May-10	26-Jun-10	1,701,598	36	605,367	406	8,518	8,518	332	914	73	1,541	2,455	6,063
27-Jun-10	26-Jul-10	1,571,021	36	567,840	380	7,990	7,990	335	922	45	949	1,871	6,119
27-Jul-10	26-Aug-10	1,638,211	37	602,844	404	8,482	8,482	353	970	51	1,074	2,044	6,438
27-Aug-10	26-Sep-10	1,994,121	37	746,091	500	10,497	10,497	438	1,206	61	1,290	2,495	8,002
27-Sep-10	26-Oct-10	1,998,652	38.62	771,920	517	10,861	10,861	455	1,252	62	1,297	2,549	8,312

Constants:

Density Methane at normal conditions (ρ_{CH₄}) = 0,67 kg/m³ (Revised 1996 IPCC Reference Manual p.1.24 and 1.16).

fv CH₄ volumetric fraction of methane in the residual gas delivered to the flare

GWP_{CH₄} is the Global Warming Potential (GWP) for methane = 21 tCO₂e/tCH₄

CEFCH₄ is the carbon emission factor of coal mine methane = 2,75tCO₂e/tCH₄

Data Collection Process Flare

The continuous CDM monitoring system at site records data every 30 seconds.

- V-cone differential pressure (DP) to flare (2 V-cones)
- Methane concentration (PC CH₄) gas delivered to flare (one at the manifold pipe)
- Gauge pressure (P) gas to flare (one at the manifold)
- Barometric pressure
- Gas temperature (T) gas delivered to flare (one at the manifold pipe)

The methane destruction efficiency of the flare in the hour h is defined (Flaring Tool, Annex 13) as the ratio between the mass flow rate of methane delivered to the flare and the mass flow rate of methane in residual gas stream that is flared (both on dry basis and normal conditions).

In the case of enclosed flares there is a set of default values for the flare efficiency according to the performance of the flare. These sets values are:

$Eff_{flare} = 0\%$ if the temperature in the exhaust gas of the flare (T_{flare}) is below 500 °C for more than 20 minutes during the hour h.

$Eff_{flare} = 50\%$, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h, but the manufacturer's specifications on proper operation of the flare are not met at any point in time during the hour h.

$Eff_{flare} = 90\%$, if the temperature in the exhaust gas of the flare (T_{flare}) is above 500 °C for more than 40 minutes during the hour h and the manufacturer's specifications on proper operation of the flare are met continuously during the hour h.

Spreadsheets containing 30' readings and calculations are available for verification by the DOE.

Annex 2 CDM Monitoring equipment calibration certificates

Table 2.1 Monitoring Equipment calibrated in 2008 and 2009 before current monitoring period

Item	Name	Instrument type	SN	Scale	Calibration certificate	Previous Calibration date	Last calibration calibration	Accuracy class	
								Accuracy class	Reference source
1	T gas flare	SBWZPK-241(PT100)	908174	0-100 °C	JZRX 20093950	2009-8-10	2010-8-9	Class A (allowable deviation $\pm(0.15+0.002 t)$)	Manufacturer Technical Specification
2	T gas engine	WZP-240(PT100)	908273	-200-450 °C	JZRX 20093951	2009-8-10	2010-8-9	Class A (allowable deviation $\pm(0.15+0.002 t)$)	Manufacturer Technical Specification
3	Flare thermocouple	Honeywell STT830-173-TC.M3.W1.CD-WEEO-H10S-T7G6-A05T(Y) 240-2D-000	070668960	0-1300 °C	H2009-1264252	2009-9-20	2010-9-19	Class I (allowable deviation $\pm(0.0075 t)$)	Manufacturer Technical Specification
			070668959	0-1300 °C	H2009-1264251	2009-9-20	2010-9-19		
			080104620	0-1300 °C	H2009-1264249	2009-9-20	2010-9-19		
4	P gas flare	3051 TG1A2B21AB4E5M5	4793856	0-207Kpa	JZYL20090144	2009-8-11 (cal certificate issued on 2009-8-12)	2010-8-10	$\pm 0.075\%$	Manufacturer Technical Specification
5	P gas engine	KH-AFY801	72848	0-40KPa	JZYL20090143	2009-8-11 (cal certificate issued on 2009-8-12)	2010-8-10	$\pm 0.5\%$	Manufacturer Technical Specification
6	Flare CH%	Guardian plus, model: 97460	26063	0-100%	JZYL20090146	2009-8-5	2010-8-4	$\pm 2.5\%$	Manufacturer Technical Specification
7	Phase 1 engine CH4%	Guardian plus, model:97460	26062	0-100%	JZYL20090147	2009-8-5	2010-8-4	$\pm 2.5\%$	Manufacturer Technical Specification
8	Barometric pressure	Rosemount TA1A2B21JE5Q4	4980061	0-141.33KPa	JZYL20090133	2009-8-4	2010-8-3	$\pm 0.075\%$	Manufacturer Technical Specification
9	V-cone engine 1	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW08IIKC24FWN	7092005	0-1900m3/hr	TE08-JZ0003	2008-8-13	2010-8-12	$\pm 0.5\%$	Manufacturer Technical Specification

10	DP engines 1	Rosemount 3051 CD1A22A1AM5B4K5	4879836	0-6.22KPa	JZYL20090135	2009-8-4	2010-8-3	±0.075%	Manufacturer Technical Specification
11	V-cone engine 2	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW08IHKC24FWN	7092003	0-1900m3/hr	TE08-JZ0005	2008-8-13	2010-8-12	±0.5%	Manufacturer Technical Specification
12	DP engines 2	Rosemount 3051 CD1A22A1AM5B4K5	4879835	0-6.22KPa	JZYL20090136	2009-8-4	2010-8-3	±0.075%	Manufacturer Technical Specification
13	V-cone engine 3	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW08IHKC24FWN	7092004	0-1900m3/hr	TE08-JZ0004	2008-8-13	2010-8-12	±0.5%	Manufacturer Technical Specification
14	DP engines 3	Rosemount 3051 CD1A22A1AM5B4K5	4870527	0-6.22KPa	JZYL20090137	2009-8-4	2010-8-3	±0.075%	Manufacturer Technical Specification
15	V-cone 1# for flare	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW10IAB24FWN	7102301	0-3000m3/hr	TE08-JZ0002	2008-8-13	2010-8-12	±0.5%	Manufacturer Technical Specification
16	DP 1# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870526	0-6.22KPa	JZYL20090139	2009-8-4	2010-8-3	±0.075%	Manufacturer Technical Specification
17	V-cone 2# for flare	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW10IAB24FWN	7102302	0-3000m3/hr	TE08-JZ0001	2008-8-13	2010-8-12	±0.5%	Manufacturer Technical Specification
18	DP 2# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870528	0-6.22KPa	JZYL20090134	2009-8-4	2010-8-3	±0.075%	Manufacturer Technical Specification
19	Power meter	Jiangsu linyang Electronics Co., Ltd DSSD71	0040		JZDN20091031	2009-8-5	2010-8-4	Active power: 0.5S/1.0	Manufacturer Technical Specification

Table 2.2 Monitoring Equipment calibrated in 2010 during current monitoring period

No.	Name	Instrument type	SN	Scale	Calibration certificate	Calibration date	Next date for calibration	Accuracy class	
								accuracy class	Reference source
1	Flare gas T	SBWZPK-241(PT100)	611056	0-300 °C	JZRX 20104517	2010-8-3	2011-8-2	Class A (allowable deviation $\pm(0.15+0.002 t)$)	Manufacturer Technical Specification
2	Phase 1 engine gas T	WZP-240(PT100)	-	-200-450 °C	JZRX 20104695	2010-7-23	2011-7-22	Class A (allowable deviation $\pm(0.15+0.002 t)$)	Manufacturer Technical Specification
3	Flare thermal couples	Honeywell STT830-173-TC.M3.W1.CD-WEEO-H10S-T7G6-A05T (Y)240-2D-000	070668960	0-1300 °C	JZRX20105479	2010-8-18	2011-8-17	Class I (allowable deviation $\pm(0.0075 t)$)	Manufacturer Technical Specification
			080609834	0-1300 °C	H2010-0002564	2010-6-12	2011-6-11		
			080104620	0-1300 °C	JZRX20105480	2010-8-18	2011-8-17		
4	Flare gas P	3051 TG1A2B21AB4E5M5	4793856	0-207Kpa	JZYL20100150	2010-7-26	2011-7-25	$\pm 0.075\%$	Manufacturer Technical Specification
5	Phase 1 engine gas P	KH-AFY801	72848	0-40KPa	JZYL20100149	2010-7-26	2011-7-25	$\pm 0.5\%$	Manufacturer Technical Specification
6	Flare CH ₄ %	Guardian plus, model:97460	26063	0-100%	JZYL20100147	2010-7-26	2011-7-25	$\pm 2.5\%$	Manufacturer Technical Specification
7	Phase 1 engine CH ₄ %	Guardian plus, model:97460	26062	0-100%	JZYL 20100148	2010-7-26	2011-7-25		
8	Barometric pressure	Rosemount TA1A2B21JE5Q4	4980063	0-141.33KPa	JZYL 20100145	2010-7-22	2011-7-21	$\pm 0.075\%$	Manufacturer Technical Specification
9	V-cone engine I	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW08IIKC24FWN	7092005	0-1900m ³ /hr	TE10-JZ0013	2010-7-27	2012-7-26	$\pm 0.5\%$	Manufacturer Technical Specification

10	DP engines 1	Rosemount 3051 CD1A22A1AM5B4K5	4879836	0-6.22KPa	TE10-JZ0020	2010-7-27	2011-7-26	±0.075%	Manufacturer Technical Specification
11	V-cone engine 2	MOORE-KINGWAYS (SHANGHAI)CONTROL SYSTEM CO.,LTD KVVW08IHKC24FWN	7092003	0-1900m3/hr	TE10-JZ0015	2010-7-27	2012-7-26	±0.5%	Manufacturer Technical Specification
12	DP engines 2	Rosemount 3051 CD1A22A1AM5B4K5	4879835	0-6.22KPa	TE10-JZ0016	2010-7-27	2011-7-26	±0.075%	Manufacturer Technical Specification
13	V-cone engine 3	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW08IHKC24FWN	7092004	0-1900m3/hr	TE10-JZ0014	2010-7-27	2012-7-26	±0.5%	Manufacturer Technical Specification
14	DP engines 3	Rosemount 3051 CD1A22A1AM5B4K5	4870527	0-6.22KPa	TE10-JZ0018	2010-7-27	2011-7-26	±0.075%	Manufacturer Technical Specification
15	V-cone 1# for flare	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW10IAB24FWN	7102301	0-3000m3/hr	TE10-JZ0012	2010-7-27	2012-7-26	±0.5%	Manufacturer Technical Specification
16	DP 1# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870526	0-6.22KPa	TE10-JZ0017	2010-7-27	2011-7-26	±0.075%	Manufacturer Technical Specification
17	V-cone 2# for flare	MOORE-KINGWAYS (SHANGHAI) CONTROL SYSTEM CO.,LTD KVVW10IAB24FWN	7102302	0-3000m3/hr	TE10-JZ0011	2010-7-27	2012-7-26	±0.5%	Manufacturer Technical Specification
18	DP 2# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870528	0-6.22KPa	TE10-JZ0019	2010-7-27	2011-7-26	±0.075%	Manufacturer Technical Specification
19	6.3KV power meter	Jiangsu linyang Electronics Co., Ltd DSSD71	0073		JZDN 20101030	2010-7-21	2011-7-20	Active power: 0.5S/1.0	Manufacturer Technical Specification

Annex 3 CDM instruments removal and installation dates

Table 3.1 CDM instruments removal and installation dates

No	Location	Type	SN	Scale	Installation Date 1	Removal Date for calibration	Installation Date after calibration
1	V-cone engine 1	KVW08IIKC24FWN	7092005	0-1900m3/hr	2008-08-15	2010-07-24	2010-07-29
2	DP engines 1	Rosemount 3051 CD1A22A1AM5B4K5	4879836	0-6.22KPa	2009-08-04	2010-07-24	2010-07-29
3	V-cone engine 2	KVW08IIKC24FWN	7092003	0-1900m3/h	2008-08-15	2010-07-24	2010-07-29
4	DP engines 2	Rosemount 3051 CD1A22A1AM5B4K5	4879835	0-6.22KPa	2009-08-04	2010-07-24	2010-07-29
5	V-cone engine 3	KVW08IIKC24FWN	7092004	0-1900m3/h	2008-08-15	2010-07-24	2010-07-29
6	DP engines 3	Rosemount 3051 CD1A22A1AM5B4K5	4870527	0-6.22KPa	2009-08-04	2010-07-24	2010-07-29
7	V-cone 1# for flare	KVW10IIB24FWN	7102301	0-3000m3/hr	2008-08-15	2010-07-24	2010-07-29
8	DP 1# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870526	0-6.22KPa	2009-08-04	2010-07-24	2010-07-29
9	V-cone 2# for flare	KVW10IIB24FWN	7102302	0-3000m3/hr	2008-08-15	2010-07-24	2010-07-29
10	DP 2# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870528	0-6.22KPa	2009-08-04	2010-07-24	2010-07-29
11	Power meter	DSSD71	0040	NA	2008-08-05	2010-07-26	Replaced
12			0073	NA	-	-	2010-07-26
13	Engine CH4%	Guardian plus 97460	26062	0-100%	2009-08-05	Calibrated on site	
14	Flare CH4%	Guardian plus 97460	26063	0-100%	2010-04-23	Calibrated on site	
15	P gas engine	KH-AFY801	72848	0-40KPa	2009-08-11	Calibrated on site	
16	P gas flare	3051 TG1A2B21AB4E5M5	4793856	0-207Kpa	2009-08-11	Calibrated on site	
17	T gas flare	SBWZPK-241(PT100)	908174	0-100 °C	2009-08-11	2010-08-04	Replaced
18			611056	0-300 °C	-	-	2010-08-04
19	T gas engine	WZP-240(PT100)	908273	-200-450 °C	2009-08-11	2010-08-04	Replaced
20			NA	-200-450 °C	-	-	2010-08-04
21	Barometric pressure	Rosemount TA1A2B21JE5Q4	4980061	0-141.33KPa	2009-08-04	2010-08-04	Replaced
22			4980063	0-141.33KPa	-	-	2010-08-04
23	Flare thermal couples	STT830-173- TC.M3.W1.CD-WEEO- H10S-T7G6- A05T(Y)240-2D-000	070668959	0-1300 °C	2009-09-23	2010-06-26	Replaced
24			080609834	0-1300 °C	-	-	2010-06-26
25			070668960	0-1300 °C	2009-09-23	2010-07-29	2009-09-01
26			080104620	0-1300 °C	2009-10-05	2010-07-29	2009-09-01

Annex 4 Gas analysis Duerping drainage station results by TES Bretby



TEST REPORT



Customer: Sindicatum Carbon Capital, 34 Highland Road, Mansfield, Nottinghamshire NG18 4PT

Date analysed: 24 March 2010
Date sampled: 12 March 2010

Date received: 22 March 2010
Site: Duerping Power Plant

Report No 40585

TUBE NO	SAMPLE REF	Analysis % v/v							
		CO ₂	CH ₄	O ₂	CO	C ₂ H ₆	C ₃ H ₈	n-C ₄ H ₁₀	n-C ₅ H ₁₂
746	Inlet @ 1035	1.07	35.0	10.19	0.0015	0.04	<0.02	<0.02	<0.02
135	Inlet @ 1037	1.08	36.0	10.14	0.0016	0.04	<0.02	<0.02	<0.02
109	Inlet @ 1041	1.10	36.0	10.12	0.0015	0.04	<0.02	<0.02	<0.02
Accuracy of Analytical Method		±0.02	±1.0	±0.05	±0.0001	±0.02	±0.02	±0.02	±0.02
Method of Analysis		1	1	2	1	3	3	3	3

Method of Analysis: 1 Infra Red 3 G.C. – F.I.D.
2 Paramagnetic

Analyst: I Thornewill

Customer Analytical Requirements
CO₂, CH₄, O₂, CO, C₂H₆, C₃H₈, C₄H₁₀, C₅H₁₂

By Letter

Authorised by:
I Thornewill

Authorised by:

I Thornewill, Senior Analyst
Direct Dial: 01 283 554461

Issue Date: 25 March 2010

Page: 2 of 2
End of Report

TES Bretby accepts no responsibility for the collection of any of the samples referred to in this report.

Annex 5 Special data events

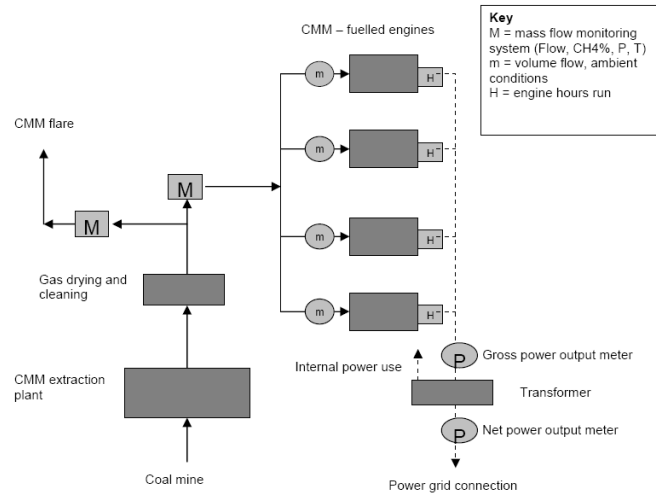
Table 5.1 Special CDM data events

Start Time (GMT)	End time (GMT)	Event / Cause	Action taken
2010-4-27 00:13:30	2010-4-27 01:44:00	Flare CH ₄ instrument inlet blocked and displayed CH ₄ % value is 0	Replace with the previous hour data
2010-5-17 5:10:00	2010-5-17 6:17:30	Flare running with the flame temperatures below 500C	CH ₄ % flare is zeroed at 5:00hrs
2010-5-27 8:42:30	2010-5-27 8:52:00	No.2 and No.3 engines running with CH ₄ display at 20%	Back calculation from gross power
2010-6-1 1:16:00	2010-6-1 1:55:00	Flare running with the flame temperatures below 500C	CH ₄ % flare is zeroed at 1:00hrs
2010-7-9 1:16:00	2010-7-9 1:32:00	Wrong CH ₄ % display for flare because site engineer modified CH ₄ % scale	CH ₄ % data system settings re-established
2010-9-23 01:05	2010-9-23 01:20	Nanjing Shunfeng Engineers modified maximum temperature on thermocouples to 1300C from 1200C.	None required
2010-9-29 23:34:30	2010-9-29 8:52:00	PLC Communications failure. No data available	All process data is zeroed
2010-10-20 5:48	2010-10-20 06:00	Engine real CH% below 30%, but engine 2 was running	Mass flow back calculation form gross power

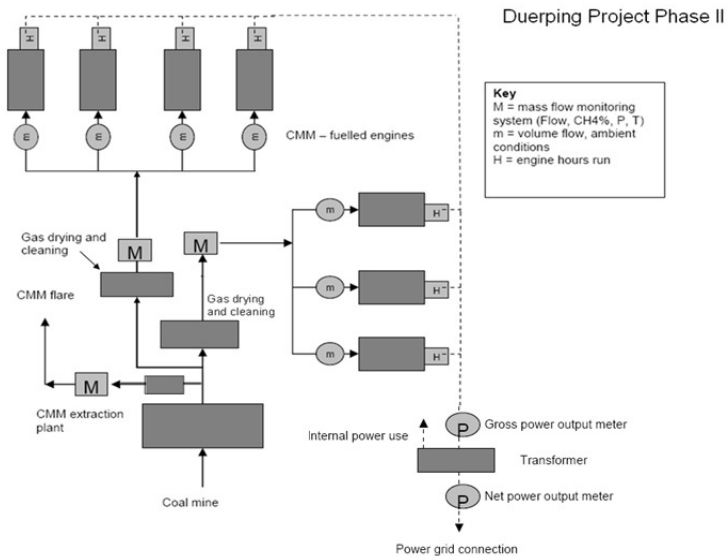
Annex 6 Process flow diagrams

The locations of methane flow monitoring to the CMM utilization plant are shown in the schematic below. Monitoring of the waste heat supply from the engines to the shaft heater has been excluded from the diagram for clarity. Phase 1 will only cover 3 engines (see section B.4 or the registered PDD). Note during phase I the transformer has not yet been installed.

Schematic Flow Diagram showing completed project:



Detailed flow diagram showing completed project:



Annex 7 Missing CDM data

Table 7.1 All data missing during current monitoring period

Start Time	End Time
2010-04-27 12:00:30	2010-04-27 12:00:30
2010-04-27 23:32:30	2010-04-28 06:18:30
2010-04-28 06:30:30	2010-04-28 06:30:30
2010-04-28 07:50:30	2010-04-28 07:52:00
2010-04-28 09:58:30	2010-04-28 09:59:00
2010-04-29 05:12:30	2010-04-29 05:12:30
2010-04-29 07:56:30	2010-04-29 07:57:30
2010-04-29 08:14:30	2010-04-29 08:16:00
2010-04-29 09:54:30	2010-04-29 09:55:00
2010-04-30 04:36:30	2010-04-30 04:38:00
2010-04-30 04:44:30	2010-04-30 04:45:30
2010-04-30 04:52:30	2010-04-30 04:53:30
2010-04-30 05:02:30	2010-04-30 05:02:30
2010-04-30 05:14:30	2010-04-30 05:15:30
2010-04-30 05:34:30	2010-04-30 05:35:00
2010-04-30 08:04:30	2010-04-30 08:05:30
2010-04-30 09:26:30	2010-04-30 09:27:30
2010-05-01 04:14:30	2010-05-01 04:16:00
2010-05-01 09:58:30	2010-05-01 09:59:00
2010-05-02 02:04:30	2010-05-02 02:05:00
2010-05-02 12:44:30	2010-05-02 12:45:00
2010-05-03 03:20:30	2010-05-03 03:21:30
2010-05-03 03:22:30	2010-05-03 03:24:00
2010-05-03 12:12:30	2010-05-03 12:14:00
2010-05-03 13:32:30	2010-05-03 13:33:00
2010-05-03 13:36:30	2010-05-03 13:37:30
2010-05-04 02:38:30	2010-05-04 02:40:00
2010-05-04 08:04:30	2010-05-04 08:05:00
2010-05-04 10:10:30	2010-05-04 10:11:00
2010-05-08 02:52:30	2010-05-08 02:53:30
2010-05-10 02:06:30	2010-05-10 02:07:30
2010-05-17 09:06:30	2010-05-17 09:06:30
2010-05-21 01:14:30	2010-05-21 01:16:30
2010-05-21 01:28:30	2010-05-21 01:29:30
2010-05-21 01:34:30	2010-05-21 01:35:30
2010-05-25 08:22:30	2010-05-25 08:22:30
2010-05-27 11:42:30	2010-05-27 11:42:30
2010-05-28 08:14:30	2010-05-28 08:15:30
2010-05-30 08:04:30	2010-05-30 08:05:00
2010-05-30 08:10:30	2010-05-30 08:10:30
2010-05-30 11:36:30	2010-05-30 11:45:00
2010-05-30 22:06:30	2010-05-30 22:06:30
2010-05-31 22:52:30	2010-05-31 23:20:30
2010-06-01 09:40:30	2010-06-01 09:40:30
2010-06-02 07:16:30	2010-06-02 07:19:30
2010-06-02 08:10:30	2010-06-02 08:11:30
2010-06-03 08:16:30	2010-06-03 08:16:30
2010-06-07 01:20:30	2010-06-07 01:20:30
2010-06-08 01:58:30	2010-06-08 02:10:30

2010-06-08 23:36:30	2010-06-08 23:42:00
2010-06-11 02:14:30	2010-06-11 02:15:30
2010-06-12 08:50:30	2010-06-12 08:51:00
2010-06-12 09:02:30	2010-06-12 09:03:30
2010-06-12 09:04:30	2010-06-12 09:06:00
2010-06-13 09:30:30	2010-06-13 09:31:30
2010-06-13 09:38:30	2010-06-13 09:39:30
2010-06-15 08:12:30	2010-06-15 08:12:30
2010-06-15 08:16:30	2010-06-15 08:17:30
2010-06-15 08:22:30	2010-06-15 08:22:30
2010-06-15 08:24:30	2010-06-15 08:25:00
2010-06-15 08:40:30	2010-06-15 08:49:00
2010-06-15 08:52:30	2010-06-15 08:52:30
2010-06-15 09:00:30	2010-06-15 09:01:00
2010-06-15 09:06:30	2010-06-15 09:06:30
2010-06-18 09:06:30	2010-06-18 09:07:30
2010-06-21 03:32:30	2010-06-21 03:32:30
2010-06-23 02:36:30	2010-06-23 09:35:00
2010-06-24 14:10:30	2010-06-24 14:11:00
2010-06-24 14:50:30	2010-06-24 14:51:00
2010-06-24 15:34:30	2010-06-24 15:35:30
2010-06-24 16:44:30	2010-06-24 16:44:30
2010-06-24 16:46:30	2010-06-24 16:46:30
2010-06-25 07:54:30	2010-06-25 08:02:00
2010-06-27 08:28:30	2010-06-27 08:31:00
2010-06-29 03:12:30	2010-06-29 03:13:00
2010-07-01 14:16:30	2010-07-01 14:17:30
2010-07-01 14:18:30	2010-07-01 14:18:30
2010-07-02 03:00:30	2010-07-02 03:12:00
2010-07-03 08:18:30	2010-07-03 08:19:00
2010-07-03 09:44:30	2010-07-03 09:44:30
2010-07-04 01:04:30	2010-07-04 01:07:00
2010-07-05 08:38:30	2010-07-05 08:40:30
2010-07-06 23:00:30	2010-07-06 23:06:00
2010-07-08 03:02:30	2010-07-08 03:03:30
2010-07-10 21:18:30	2010-07-10 21:25:00
2010-07-12 03:34:30	2010-07-12 03:37:00
2010-07-12 03:48:30	2010-07-12 04:03:00
2010-07-14 06:32:30	2010-07-14 06:35:00
2010-07-14 06:36:30	2010-07-14 06:37:30
2010-07-14 06:42:30	2010-07-14 06:43:30
2010-07-14 09:28:30	2010-07-14 09:29:00
2010-07-14 10:04:30	2010-07-14 10:05:00
2010-07-14 10:08:30	2010-07-14 10:10:30
2010-07-15 08:38:30	2010-07-15 08:40:30
2010-07-16 23:02:30	2010-07-16 23:03:30
2010-07-16 23:06:30	2010-07-16 23:07:00
2010-07-24 01:04:30	2010-07-24 01:13:00
2010-07-24 02:38:00	2010-07-24 04:42:00
2010-07-24 09:48:30	2010-07-24 09:48:30
2010-07-24 12:56:30	2010-07-24 12:59:00
2010-07-25 09:16:30	2010-07-25 09:18:30
2010-07-25 09:34:30	2010-07-25 09:35:00

2010-07-26 03:32:30	2010-07-26 03:34:00
2010-07-26 03:38:30	2010-07-26 03:39:00
2010-07-26 10:40:30	2010-07-26 10:41:00
2010-07-30 07:44:30	2010-07-30 08:15:00
2010-08-05 08:20:30	2010-08-05 08:22:00
2010-08-06 08:14:30	2010-08-06 08:15:30
2010-08-11 08:16:30	2010-08-11 08:18:00
2010-08-16 08:52:30	2010-08-16 08:54:00
2010-08-18 08:54:30	2010-08-18 09:10:00
2010-08-18 18:50:30	2010-08-18 19:01:00
2010-08-27 10:52:30	2010-08-27 12:07:30
2010-08-27 12:23:00	2010-08-27 12:23:00
2010-08-29 07:48:30	2010-08-29 08:16:00
2010-08-29 08:36:30	2010-08-29 08:38:00
2010-08-29 08:54:30	2010-08-29 08:56:30
2010-08-30 10:30:30	2010-08-30 10:31:00
2010-09-02 17:56:30	2010-09-02 18:20:00
2010-09-08 08:22:30	2010-09-08 08:26:00
2010-09-08 08:36:30	2010-09-08 08:38:30
2010-09-08 09:02:30	2010-09-08 09:03:00
2010-09-10 05:48:30	2010-09-10 05:50:00
2010-09-10 16:38:30	2010-09-10 16:46:00
2010-09-10 17:38:30	2010-09-10 17:39:30
2010-09-10 17:42:30	2010-09-10 18:08:00
2010-09-10 18:34:30	2010-09-10 18:36:30
2010-09-10 18:46:30	2010-09-10 18:49:30
2010-09-10 20:22:30	2010-09-10 20:23:30
2010-09-10 20:34:30	2010-09-10 20:38:00
2010-09-10 23:42:30	2010-09-10 23:44:30
2010-09-10 23:54:30	2010-09-10 23:56:00
2010-09-14 09:44:30	2010-09-14 09:47:30
2010-09-22 08:58:30	2010-09-22 08:59:30
2010-09-22 10:22:30	2010-09-22 10:23:00
2010-09-22 11:02:30	2010-09-22 11:04:00
2010-09-22 12:00:30	2010-09-22 12:00:30
2010-09-22 15:56:30	2010-09-22 15:58:00
2010-09-24 03:22:30	2010-09-24 03:24:00
2010-09-25 05:56:30	2010-09-25 06:15:30
2010-09-27 09:10:30	2010-09-27 09:12:00
2010-09-28 03:18:30	2010-09-28 03:33:00
2010-09-28 10:04:30	2010-09-28 10:06:00
2010-09-28 10:14:30	2010-09-28 10:16:00
2010-09-28 10:38:30	2010-09-28 10:38:30
2010-09-28 11:38:30	2010-09-28 11:40:30
2010-09-28 23:34:30	2010-09-29 06:11:00
2010-09-29 06:12:30	2010-09-29 06:14:00
2010-09-29 06:26:30	2010-09-29 06:33:30
2010-09-29 06:36:30	2010-09-29 08:25:00
2010-09-29 08:38:30	2010-09-29 08:44:00
2010-09-29 08:46:30	2010-09-29 08:51:30
2010-10-05 15:20:30	2010-10-05 15:22:00
2010-10-05 15:42:30	2010-10-05 15:43:00
2010-10-06 09:06:30	2010-10-06 09:08:00

2010-10-08 09:06:30	2010-10-08 09:11:00
2010-10-08 22:13:00	2010-10-08 22:13:00
2010-10-09 21:28:30	2010-10-09 21:31:00
2010-10-20 08:30:30	2010-10-20 08:31:00
2010-10-20 22:26:30	2010-10-20 22:51:30