Duerping Coal Mine Methane Utilization Project

Clean Development Mechanism (CDM)

CER Monitoring Report

Certified Emission Reductions

Monitoring Period: 27 October 2009 – 26 April 2010

CDM Registration No: 1900

Date: 28 April 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"

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1 General Project Activity Information

1.1 Title of Project Activity

Project 1900: Duerping Coal Mine Methane Utilization Project - China.

1.2 CDM Registration date and crediting period

Registration Date: 6 March 2009
Crediting Period: 10 years.

1.3 Contact Details

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1.4 Short Description of the project activity

The purpose of the project activity is the utilization and abatement of coal mine methane 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 will be phased, totaling 5.1MW in year 1 and expanding progressively as gas supply is expanded up to an expected maximum of about 12.0 MW. Currently operational capacity is 5.1 MW (generating power) while another 6.8 MW have already been delivered and will be commissioned during May 2010.

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 June 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 v04.09. There will be no development of further phases.

During project development, about 15% of the gas emitted by the underground mining operations was being captured by methane drainage and 85% exhausted to the atmosphere as ventilation air methane (VAM). During the course of the project, the mine anticipates raising the capture efficiency substantially with a possible target of 40%.

The project will contribute to sustainable development by improving local air quality and reducing greenhouse gas emissions, and will not lead to the consumption of significant natural resources. There will not be any material increase in energy consumption because the pumping station has already been installed in order to comply with mine safety requirements, therefore any electricity used by the pumping station is included in the baseline. Generator noise is mitigated by sound-proof containment. Emissions from the generators will not exceed environmental standards.

The waste heat from the installed generators will remove the need to consume coal to heat the mine intake air during winter months, further saving natural resources and contributing to improved local air quality. The coal stove for the current heating season started operation on the 1st of November 2009 and ended on 31st of March 2010 while the heat recovery system associated with Duerping CMM power plant started operation on the 6th of December 2009 at 04:49:00 GMT (with the installation of the v-cone on the oil circuit pipe) and ended with the last ER's being generated on the 13th of April 00:00GMT based on the residual from heat recovery system (12th of April 02:11:00 GMT stopped heat supply to oil heat exchanger - 12th of April 23:28:30 GMT stopped the oil pumps) therefore supplying all the ventilation heat demand from the 1st until 12th of April.

The project will provide social benefits through improved health and safety for workers and economic benefits by providing a new source of clean electricity displacing coal-fired power, and heat displacing coal burning in boilers.

Technology transfer benefits will arise from the installation of state-of-the-art power generation and heat recovery equipment and associated safety and monitoring equipment and control systems.

Location of the project activity

The coal mine is located 20 km west of Taiyuan, the capital of Shanxi Province.
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 1 Location of the project activity.

The 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").

1.5 Monitoring Period Covered

The monitoring period covered by this monitoring report: 27 October 2009 – 26 April 2010 (inclusive). The subsequent verification period will commence 27th April 2010 00:00h GMT.

1.6 Methodology applied to the Project Activity

ACM0008 ver. 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".
A revised Monitoring Plan was submitted on July 07, 2009 and approved by the UNFCCC given on 13th December, 2009, which serves as the basis for this CDM Monitoring Report – see below.

1.7 Deviations or revisions to the registered PDD or Monitoring Plan

Minor revisions to the initial monitoring plan included in the registered PDD v04.09 dd. 18 Feb. 2009 have been made. 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 has been submitted on July 07, 2009.
A request for revision of the monitoring plan was submitted on July 07, 2009, and approval by the UNFCCC given on 13th December, 2009. This monitoring report has been completed using the revised monitoring plan.

1.8 Special (accidental) events occurring during this reporting period

During the monitoring period, no material changes occurred. Special CDM data events are described in Annex 5 of this report.

1.9 Changes since Last CER Verification

There have not been any changes at Duerping power plant since last verification due to engineering requirements regarding Phase I or Phase II that would produce any impact on CER.

2 Monitoring Plan

2.1 Parameters Monitored

The parameters monitored and the monitoring procedure applied for determination of the emission reductions is described in detail in the revision of the monitoring plan validated by TUV Sued and submitted for approval to the UNFCCC dd. 21st August, 2009, the Duerping Project Design Document is available on the UNFCCC website.
http://cdm.unfccc.int/UserManagement/FileStorage/Q3PBR459OM8KI0Y6FATGX1SJW27HNC

An overview of the parameters monitored is provided in section 3 and details of the equipment used in the monitoring in Annex
2. The location of measurement devices installed during the time current Verification takes place is shown in Figure 2 below. Annex 6 includes the process flow diagrams at different stages during the project development.

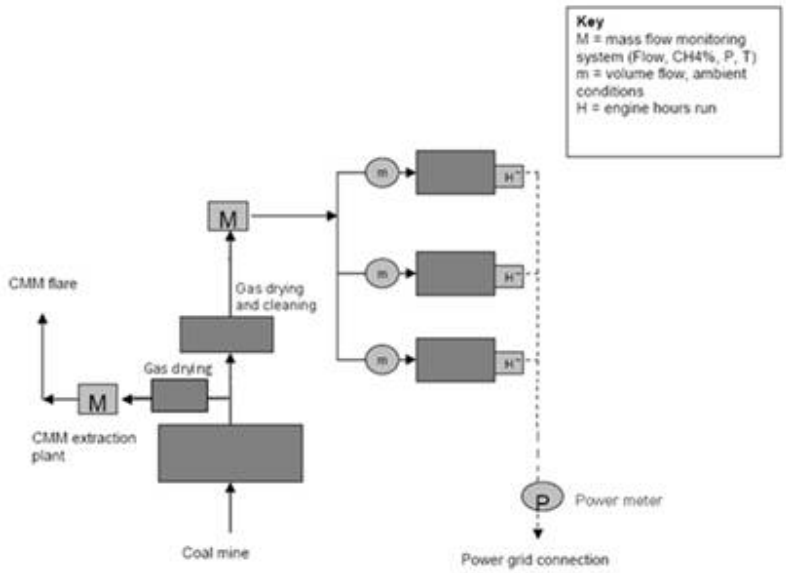


Figure 2 Location of the measurement devices

2.2 Quality Assurance /Quality Control

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 designated operational entity (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 log 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 CH_4 mass flow against Gross power is performed every month to confirm the back-calculating CH_4 mass flow equations are consistent month to month.

An overview of the data collection process is provided in Table 1 and Annex 1. Detailed formulae for the calculation of emissions are presented in Section 3.

Table 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	In accordance with ACM0008 v3 no leakage is considered in the Project			
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
Emissions 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 months. 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 presented in Annex 2).

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 (except Flare Thermocouples) have integrated a Serial Number which is used to track the calibration records and installation certificates. In order to guarantee the appropriate installation of calibrated thermocouples SCC provides the installation certificates of each thermocouple with the installation dates matching the historical performance of the instrument.

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 30th June to 2nd July 2009, 5th and 6th November 2009 and 15th of April 2010. A copy of the internal reports is available for verification by the DOE.

Internal Training

Relevant process operators and CDM technical staff have received training to ensure compliance with the tasks and procedures set out in the monitoring plan. Training records are available for verification by the DOE.

3 Formulae used to calculate Emission Reductions

The formulae used for calculation are in accordance with the approved consolidated methodology CDM-EB ACM0008 version 03 "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".

The above methodology draws on:

- ACM0002 Version 06 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"
- "Tool to determine project emissions from flaring gases containing methane"

3.1 Baseline Emissions

The formulae used for determination of the baseline emissions are described in section B.6.1 of the Project Design Document v4.09 dated 18 February 2009. Duerping Project Design Document is available on the UNFCCC website.
http://cdm.unfccc.int/UserManagement/FileStorage/Q3PBR459OM8KI0Y6FATGX1SJW27HNC

Baseline emissions are calculated as follows:

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

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 the destruction of methane in the baseline scenario) are zero.

$$BE_{MRy} = GWP_{CH4} \times [\sum_i (CBMe_{i,y} - CBM_{BL\,i,y}) + \sum_i (CMM_{PJi,y} - CMM_{BL\,i,y}) + \sum_i (PMM_{PJi,y} - PMM_{BL\,i,y})] \quad \textbf{(2)}$$

Where,

$BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity (tCO_2e)
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
$CMM_{PJ,i,y}$	Pre-mining CMM captured, sent to and destroyed by use *i* in the project activity in year y (expressed in tCH_4)
$CMM_{BL,i,y}$	Pre-mining CMM that would have been captured, sent to and destroyed by use *i* in the baseline scenario in year y (expressed in tCH_4) = 0
$PMM_{PJ,i,y}$	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_{CH4}	Global warming potential of methane (21 tCO_2e/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.

The baseline emissions are determined ex post by measuring the methane emitted from the methane drainage system at the point where it enters the equipment.

Baseline emissions from grid power

The CEF_electricity is calculated as per ACM0002 v6, from the average of the operating margin and build margin in the North China Power Grid. The build margin is calculated from the newly installed capacity since 1999, which represents just over 20% of the total grid.

CEF_OM	1.1208	China Electric Power Yearbook 2006
CEF_BM	0.9397	China Electric Power Yearbook 2006

According ACM0002, the baseline emission factor is the simple average of BM and OM:

1.1208+0.9397/ 2 = 1.03025 tCO_2/MWh

Emission factor for heat generation

The baseline scenario includes existing heat generation that is replaced by the project activity. The Emissions Factor for displaced heat generation is calculated as follows:

$$EF_{heat,y} = \frac{EF_{CO2,i}}{Eff_{heat}} \times \frac{44}{12} \times \frac{1TJ}{1000GJ} \quad \textbf{(3)}$$

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% . During this monitoring period no heating occurred.

Total emissions displaced by use of coal mine methane

There are no pre-mining activities (including CBM) or post-mining activities.

There is no vehicle fuel used by this project, and therefore $VFUEL_y \times EF_V$ is not considered. Also, heat provided by the boilers is waste heat, and therefore creates zero emissions so EF_{HEAT} is also not considered.

Therefore, $PBE_{Use,y}$ is defined for this project as:

$$PBE_{Use,y} = GEN_y \times EF_{ELEC} + HEAT_y \times EF_{HEAT} \quad \textbf{(4)}$$

Where,

$PBE_{Use,y}$	Potential total baseline emissions from the production of power or heat replaced by the project activity in year y (tCO_2e)
GEN_y	Electricity generated by project activity in year y (MWh), including through the use of CBM
EF_{ELEC}	Emissions factor of electricity (grid, captive or a combination) replaced by project (tCO_2/MWh) = 1.03025 (see above)
$HEAT_y$	Heat generation by project activity in year y (GJ), including through the use of CBM

3.2 Project Emissions

The formulae used for determination of the project emissions are described in section B.6.1 of the Project Design Document v4.09 dated 18 February 2009. Duerping Project Design Document is available on the UNFCCC website.
http://cdm.unfccc.int/UserManagement/FileStorage/Q3PBR459OM8KI0Y6FATGX1SJW27HNC

Project emissions are calculated as follows:

$$PE_y = PE_{ME} + PE_{MD} + PE_{UM} \quad \textbf{(5)}$$

where:

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

PE_{ME} = 0 because the project activity simply takes the methane already captured and released in the baseline scenario. No additional energy is utilised.

$$PE_{MD} = (MD_{FL} + MD_{ELEC} + MD_{HEAT} + MD_{GAS}) \times ((1-r) \times CEF_{CH4} + r \times CEF_{NMHC}) \quad \textbf{(6)}[1]$$

with:

$$r = PC_{NMHC} / PC_{CH4} \quad \textbf{(7)}$$

where:[2]

PE_{MD}	Project emissions from CMM/CBM destroyed (tCO_2e)
MD_{FL}	Methane destroyed through flaring (tCH_4)
MD_{ELEC}	Methane destroyed through power generation (tCH_4)
MD_{HEAT}	Methane destroyed through heat generation (tCH_4) = 0
MD_{GAS}	Methane destroyed after being supplied to gas grid or for vehicle use (tCH_4) = 0
CEF_{CH4}	Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4)

[1] A factor of (1-r) is included to correctly weight the CEF by percentage of the respective gases
[2] 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.

CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane) ($tCO_2eq/tNMHC$)
r	Relative proportion of NMHC compared to methane
PC_{CH4}	Concentration (in mass) of methane in extracted gas (%)
PC_{NMHC}	NMHC concentration (in mass) in extracted gas (%)

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

$$PE_{UM} = GWP_{CH4} \times \sum_i MM_i \times (1 - Eff_i) \quad \textbf{(8)}$$

where:

PE_{UM}	Project emissions from un-combusted methane (tCO_2e)
GWP_{CH4}	Global warming potential of methane (21 tCO_2e/tCH_4)
I	Use of methane (flaring, power generation, heat generation, supply to gas grid to various combustion end uses)
MM_i	Methane measured sent to use i (tCH_4)
Eff_i	Efficiency of methane destruction in use i (%)

Eff_{ELEC} (Efficiency of methane destruction/oxidation in power plant) will be taken as 99.5% from the 2006 Revised IPCC Guidelines for efficiency of methane oxidation/destruction in a power plant and as prescribed in ACM0008 version 03.

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:

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

Where:

Variable	SI Unit	Description
$\rho_{RG,n,h}$	kg/m^3	Density of the residual gas at normal conditions in hour *h*
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 *h*
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 *h*
$fv_{i,h}$	-	Volumetric fraction of component *i* in the residual gas in the hour *h*
MM_i	kg/kmol	Molecular mass of residual gas component *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 *j* in the residual gas in hour *h*
$fv_{i,h}$	-	Volumetric fraction of component *i* in the residual gas in the hour *h*
AM_j	kg/kmol	Atomic mass of element *j*
$NA_{j,i}$	-	Number of atoms of element *j* in component *i*
$MM_{RG,h}$	kg/kmol	Molecular mass of the residual gas in hour *h*
j		The elements carbon, hydrogen, oxygen and nitrogen
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 (*fvCH4,RG,h*) and the density of methane (ρ*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 60ºC), 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 60ºC 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 (Tflare) is below 500 °C for more than 20 minutes during the hour *h*.
- 50%, if the temperature in the exhaust gas of the flare (Tflare) 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 (Tflare) 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 (*TMRG,h*) and the flare efficiency during each hour *h* (h*flare,h*), as follows:

$$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} \times (1 - \eta_{flare,h}) \times \frac{GWP_{CH4}}{1000} \quad (15)$$

Where:

Variable	SI Unit	Description
$PE_{flare,y}$	tCO_2e	Project emissions from flaring of the residual gas stream in year *y*
$TM_{RG,h}$	kg/h	Mass flow rate of methane in the residual gas in the hour *h*
$\eta_{flare,h}$	-	Flare efficiency in hour *h*
GWP_{CH4}	tCO_2e/tCH_4	Global Warming Potential of methane valid for the commitment period

3.3 Leakage

There is no baseline thermal energy use and therefore no leakage to consider in this methodology (see section B.6.1 of the Project Design Document v4.09 dated 18 February 2009. Duerping Project Design Document is available on the UNFCCC website.
http://cdm.unfccc.int/UserManagement/FileStorage/Q3PBR459OM8KI0Y6FATGX1SJW27HNC

3.4 Emission Reductions

The formula used for determination of the emission reductions is described in section B.7.1 of the Project Design Document v4.09 dated 18 February 2009. 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:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(9)}$$

where:

ER_y	Emissions reductions of the project activity during the year *y* (tCO_2e)
BE_y	Baseline emissions during the year *y* (tCO_2e)
PE_y	Project emissions during the year *y* (tCO_2e)
LE_y	Leakage emissions in year y (tCO_2e) = 0

4 Calculation of Emission Reductions

The data required to calculate baseline emissions, project emissions and leakage emissions is transferred to a protected spreadsheet on a secure, maintained server for electronic computation of the emission reductions using the formulae described in the previous section.

A hard copy sample of the CDM spreadsheet, check calculations and a temporary computer access code to facilitate inspection of the full data and algorithms will be provided to the DOE for verification purposes. The results of the monitoring process for the monitoring period stated are summarized below – more details are provided in Annex 1.

The monitoring period in this monitoring report covers the following period: 27 October 2009 00:00 GMT to 26 April 2010 24:00 GMT. The Power Meter records monthly net power generated by the power plant on the 26th of each month at 10:00 Beijing time; that is 03:00 GMT during summer and 02:00 GMT during winter on the 26th of each month. As a consequence it is necessary to balance the net power values at the beginning and end of the monitoring period by adding or subtracting, respectively, from the original power figures. The extra (positive or negative) power used to balance the monthly power figure is based on the average power rate for the corresponding month or the month closer to the missing data period.

	Original Monthly NET power MWh	Revised Monthly NET power MWh
November	2,087	2,025
December	2,093	2,093
January	2,128	2,128
February	2,573	2,573
March	2,629	2,629
April	2,584	2,657

4.1 Baseline Emissions

Baseline emissions are calculated as per formula 1 as indicated in section 3.1.

Period		**BE_MD**	**BE_MR**	**BE_USE**	**BEy**
From	**To**	**(tCO2e)**	**(tCO2e)**	**(tCO2e)**	**(tCO2e)**
		A	B	C	=A+B+C
27 Oct 09	26 Nov 09	0	17686	2087	19772
27 Nov 09	26 Dec 09	0	16228	2457	18685
27 Dec 09	26 Jan 10	0	20278	2628	22907
27 Jan 10	26 Feb 10	0	19962	3154	23116
27 Feb 10	26 Mar 10	0	21908	3197	25105
27 Mar 10	26 Apr 10	0	20611	2995	23607
TOTALS		0	116673	16519	133192

4.2 Project Emissions (PE)

Project emissions are calculated as per formula 5 as indicated in section 3.2.

Period		PE_ME	PE_MD	PE_UM	PEy
From	To	(tCO2e)	(tCO2e)	(tCO2e)	(tCO2e)
		A	B	C	=A+B+C
27 Oct 09	26 Nov 09	0	2165	1156	3320
27 Nov 09	26 Dec 09	0	1988	1045	3034
27 Dec 09	26 Jan 10	0	2458	1505	3963
27 Jan 10	26 Feb 10	0	2430	1406	3836
27 Feb 10	26 Mar 10	0	2654	1639	4293
27 Mar 10	26 Apr 10	0	2490	1600	4089
TOTALS		0	14185	8350	22535

During the monitoring period no additional energy used.

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).

4.3 Leakage

Not applicable (LE_y=0).

4.4 Emission Reductions ($tCO2_e$)

Emission reductions are calculated as per formula 9 as indicated in section 3.4.
The emission reductions during the specific periods are presented in the table below.

Period		BEy	PEy	LEy	ERy
From	To	(tCO2e)	(tCO2e)	(tCO2e)	(tCO2e)
		A	B	C	=A-B-C
27 Oct 09	26 Nov 09	19772	3320	0	16452
27 Nov 09	26 Dec 09	18685	3034	0	15652
27 Dec 09	26 Jan 10	22907	3963	0	18943
27 Jan 10	26 Feb 10	23116	3836	0	19280
27 Feb 10	26 Mar 10	25105	4293	0	20812
27 Mar 10	26 Apr 10	23607	4089	0	19517
TOTALS		133191	22535	0	110656

4.5 Comparison Actual Emission Reductions and PDD estimate ($tCO2_e$)

Estimate of emission reductions within the registered PDD (section A.4.4)		**Actual Emission reductions Claimed in tonnes of CO2 e**
Years	**Annual estimation of emission reductions in tonnes of CO2 e**	
Oct-Dec 08	41,325	None (registered march 6th, 2009)
2009	325,395	6 March – 26 June 09: 50,213 (First Verification period for which a monitoring report is currently available on the UNFCCC(1) website and being verified by SGS Ltd 27 June 09 – 26 Oct 09: 54,296 ((Second Verification period for which a monitoring, verification/certification reports are currently available on the UNFCC(1) website with the actual CERs issued 22nd April 2010) (27 October 09 – 31 Dec 09 as part of Third Verification period – approximate tCO2e = 33,590)
2010	378,748	27 Oct 09 – 26 April 10 110,656 Current (Third Verification) period (1 Jan 10 – 26 April 10 as part of Third Verification period – approximate tCO2e = 77,066)
2011 2012 2013 2014 2015 2016 2017 Jan-Sep 2018	378,748 378,748 378,748 378,748 378,748 378,748 378,748 284,061	
Total estimated reductions	3,680,764	
Total number of crediting years	10	
Annual average over the crediting period of estimated reductions	368,076	

(1) http://cdm.unfccc.int/Projects/DB/TUEV-SUED1214838535.8/view

Annex 1 Monitoring / Calculation Details

GENERATOR

Period		Volumetric Flow Rate	PC CH4	Volumetric Flow Rate CH4	MM ELEC	MDelec	BE (MRy)	PE(MD)	PE(UM)	PEy	GENy	GENy x EFelec	HEATy x Eff heat	HEATy	BE (USE,y)	BE(y)	ER (period)
Unit		m3	%	m3	(tCH4)	(tCH4)	(tCO2e)	(tCO2e)	(tCO2e)	(tCO2e)	MWh				(tCO2e)	tCO2e	tCO2e
Index		A1	A2	A	B	C	D	E	F	G	H	I	J1	J2	K	L	M
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	= L - G
27 Oct 09	26 Nov 09	1435619	39.3	564788	378	377	7947	1035	40	1075	2025	2087	0	0	2087	10033	8958
27 Nov 09	26 Dec 09	1413742	39.6	559388	375	373	7871	1026	39	1065	2093	2156	3202	301	2457	10328	9263
27 Dec 09	26 Jan 10	1617041	36.1	583371	391	389	8208	1069	41	1111	2128	2192	4634	436	2628	10836	9726
27 Jan 10	26 Feb 10	1985443	36.3	721650	484	481	10154	1323	51	1374	2573	2651	5354	504	3154	13308	11934
27 Feb 10	26 Mar 10	2035220	35.5	722611	484	482	10167	1325	51	1376	2629	2708	5196	489	3197	13364	11989
27 Mar 10	26 Apr 10	1942318	35.4	688079	461	459	9681	1261	48	1310	2657	2737	2749	259	2995	12677	11367

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 tCO_2e/tCH_4
CEF_{CH4} is the carbon emission factor of coal mine methane = 2,75tCO_2e/tCH_4
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 tCO_2/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 CH4) 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 CH4	Volumetric Flow Rate CH4	MM (Flare)	BE (MRy)	BE(y)	MD (FLARE)	PE(MD)	MM (Flare) x (1-Eff)	PE (UM)	PEy	ER
Unit		m3	%	m3	(tCH4)	(tCO2e)	(tCO2e)	(tCH4)	(tCO2e)	(tCH4)	(tCO2)	(tCO2e)	(tCO2e)
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_{CH4}	= R + T	= P - U
27 Oct 09	26 Nov 09	1766300	39.19	692180	464	9739	9739	411	1129	53	1116	2245	7494
27 Nov 09	26 Dec 09	1512833	39.26	594000	398	8358	8358	350	963	48	1006	1969	6389
27 Dec 09	26 Jan 10	2329010	36.83	857877	575	12070	12070	505	1389	70	1464	2853	9218
27 Jan 10	26 Feb 10	1897998	36.73	697081	467	9808	9808	403	1107	65	1355	2462	7346
27 Feb 10	26 Mar 10	2302100	36.25	834469	559	11741	11741	483	1330	76	1588	2917	8824
27 Mar 10	26 Apr 10	2107914	36.85	776827	520	10930	10930	447	1228	74	1551	2780	8150

Constants:

Density Methane at normal conditions (ρ_{CH4}) = 0,67 kg/m3 (Revised 1996 IPCC Reference Manual p.1.24 and 1.16).
fv CH_4 volumetric fraction of methane in the residual gas delivered to the flare
GWP_{CH4} is the Global Warming Potential (GWP) for methane = 21 $tCO2e/tCH_4$
$CEFCH_4$ is the carbon emission factor of coal mine methane = 2,75$tCO2e/tCH_4$

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 (Tflare) 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 (Tflare) 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 (Tflare) 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 Monitoring Equipment

Item	Name	Instrument type	SN	scale	Calibration certificate	Calibration date	Next date for calibration
1	T gas flare	SBWZPK-241(PT100)	908174	0-100 ℃	JZRX 20093950	2009-8-10	2010-8-9
2	T gas engine	WZP-240(PT100)	908273	-200-450 ℃	JZRX 20093951	2009-8-10	2010-8-9
3	P gas flare	3051 TG1A2B21AB4E5M5	4793856	0-207Kpa	JZYL20090144	2009-8-11 (cal certificate issued on 2009-8-12)	2010-8-10
4	P gas engine	KH-AFY801	72848	0-40KPa	JZYL20090143	2009-8-11 (cal certificate issued on 2009-8-12)	2010-8-10
5	flare CH4% (1)	Guardian plus, model:97460	26065	0-100%	JZYL20090138	2009-8-5	2010-8-4
6	flare CH4% (2)	Guardian plus, model:97460	26063	0-100%	JZYL20090146	2009-8-5	2010-8-4
7	engine CH4%	Guardian plus, model:97460	26062	0-100%	JZYL20090147	2009-8-5	2010-8-4
8	V-cone engine 1	MOORE-KINGWAYS (SHANGHAI)CONTROL SYSTEM CO.,LTD KVW08IIKC24FWN	7092005	0-1900m3/hr	TE08-JZ0003	2008-8-13	2010-8-12
9	DP engines 1	Rosemount 3051 CD1A22A1AM5B4K5	4879836	0-6.22KPa	JZYL20090135	2009-8-4	2010-8-3
10	V-cone engine 2	MOORE-KINGWAYS (SHANGHAI)CONTROL SYSTEM CO.,LTD KVW08IIKC24FWN	7092003	0-1900m3/hr	TE08-JZ0005	2008-8-13	2010-8-12

Item	Name	Instrument type	SN	scale	Calibration certificate	Calibration date	Next date for calibration
11	DP engines 2	Rosemount 3051 CD1A22A1AM5B4K5	4879835	0-6.22KPa	JZYL20090136	2009-8-4	2010-8-3
Item	Name	Instrument type	SN	scale	calibration certificate	Calibration date	Next date for calibration
12	V-cone engine 3	MOORE-KINGWAYS (SHANGHAI)CONTROL SYSTEM CO.,LTD KVW08IIKC24FWN	7092004	0-1900m3/hr	TE08-JZ0004	2008-8-13	2010-8-12
13	DP engines 3	Rosemount 3051 CD1A22A1AM5B4K5	4870527	0-6.22KPa	JZYL20090137	2009-8-4	2010-8-3
14	V-cone 1# for flare	MOORE-KINGWAYS (SHANGHAI)CONTROL SYSTEM CO.,LTD KVW10IIAB24FWN	7102301	0-3000m3/hr	TE08-JZ0002	2008-8-13	2010-8-12
15	DP 1# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870526	0-6.22KPa	JZYL20090139	2009-8-4	2010-8-3
16	V-cone 2# for flare	MOORE-KINGWAYS (SHANGHAI)CONTROL SYSTEM CO.,LTD KVW10IIAB24FWN	7102302	0-3000m3/hr	TE08-JZ0001	2008-8-13	2010-8-12
17	DP 2# for flare	Rosemount 3051 CD1A22A1AM5B4K5	4870528	0-6.22KPa	JZYL20090134	2009-8-4	2010-8-3
18	Absolute pressure for barometric pressure	Rosemount TA1A2B21JE5Q4	4980061	0-141.33KPa	JZYL20090133	2009-8-4	2010-8-3
19	power meter	Jiangsu linyang Electronics Co., Ltd DSSD71	0040		JZDN20091031	2009-8-5	2010-8-4

Item	Name	Instrument type	SN	scale	Calibration certificate	Calibration date	Next date for calibration
20	Flare thermocouple	Honeywell STT830-173-TC.M3.W1.CD-WEEO-H10S-T7G6-A05T(Y)240-2D-000	070668960	0-1300 ℃	H2009-1264252	2009-9-20	2010-9-19
21			070668959	0-1300 ℃	H2009-1264251	2009-9-20	2010-9-19
22			080104620	0-1300 ℃	H2009-1264249	2009-9-20	2010-9-19
23	V-cone for oil	MOORE-KINGWAYS (SHANGHAI)CONTROL SYSTEM CO.,LTD KVW06IIAB24FWN	9102801	0-180000Kg/hr	TE09-JZ0015	2009-12-02	2011-12-01
24	DP for oil	Rosemount: 3051CD2A22A1AM5B4K5	4870525	0-62.2KPa	TE09-JZ0016	2009-12-02	2010-12-01
25	T- Oil outlet	SBWZPK-241	611052	0-300 ^{0}C	JZRX 20094516	2009-8-12	2010-8-11
26	T- Oil return	Shanghai Hongda WZPK（Pt100）	070907964	0-200 ^{0}C	JZRX 20093395	2009-10-23	2010-10-22

Annex 3 CDM instruments installation dates

Table 3.1 CDM instruments installed before the start of current monitoring period

No	location	Type	SN	Scale	Installation Date
1	DP engines 1	3051 CD1A22A1AM5B4K5	4879836	0-6.22KPa	8/4/2009
2	DP engines 2	3051 CD1A22A1AM5B4K5	4879835	0-6.22KPa	8/4/2009
3	DP engines 3	3051 CD1A22A1AM5B4K5	4870527	0-6.22KPa	8/4/2009
4	DP 1# for flare	3051 CD1A22A1AM5B4K5	4870526	0-6.22KPa	8/4/2009
6	Absolute pressure	TA1A2B21JE5Q4	4980061	0-141.33KPa	8/4/2009
7	DP 2# for flare	3051 CD1A22A1AM5B4K5	4870528	0-6.22KPa	8/5/2009
8	power meter	DSSD71	0040	-	8/5/2009
9	engine CH4%	Guardian plus, model:97460	26062	0-100%	8/5/2009
10	flare CH4% (1)	Guardian plus, model:97460	26065	0-100%	8/5/2009
11	P gas engine	KH-AFY801	72848	0-40KPa	8/11/2009
12	P gas flare	3051 TG1A2B21AB4E5M5	4793856	0-207Kpa	8/11/2009
13	T gas engine	WZP-240(PT100)	908273	-200-450 ℃	8/11/2009
14	T gas flare	SBWZPK-241(PT100)	908174	0-100 ℃	8/11/2009
15	Flare thermocouple	Honeywell	070668960	0-1300 ℃	9/23/2009
16	Flare thermocouple	Honeywell	80104609	0-1300 ℃	9/23/2009
17	Flare thermocouple	Honeywell	70668959	0-1300 ℃	9/23/2009
18	Flare thermocouple	Honeywell	80104620	0-1300 ℃	10/5/2009

Table 3.2 CDM instruments replaced or installed during current monitoring period

No	location	Type	SN	Scale	Calibration date	Installation Date	Removal Date
1	T- Oil outlet	SBWZPK-241	611052	0-300 ^{0}C	8/12/2009	5/12/2009	
2	T- Oil return	Shanghai Hongda WZPK（Pt100）	070907964	0-200 ^{0}C	10/23/2009	5/12/2009	
3	V-cone for oil	Moore-Kingways (Shanghai) Control System Co. Ltd. KVW06IIAB24FWN	9102801	0-180,000 kg/hr	12/2/2009	6/12/2009	
4	DP for oil	Rosemount: 3051CD2A22A1AM5B4K5	4870525	0-62.2kPa	12/2/2009	6/12/2009	
5	flare CH_4%(1)	Guardian plus, model:97460	26065	0-100%	8/5/2009	15/08/2008	23/04/2010
5	flare CH_4%(2)	Guardian plus, model:97460	26063	0-100%	8/5/2009	23/04/2010	

Annex 4 Gas analysis Duerping drainage station results by TES Bretby

TES Bretby

TEST REPORT

UKAS TESTING 1513

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

Date analysed: 24 March 2010 | Date received: 22 March 2010
Date sampled: 12 March 2010 | Site: Duerping Power Plant | **Report №** 40585

TUBE NO	SAMPLE REF	Analysis % v/v							
		CO_2	CH_4	O_2	CO	C_2H_6	C_3H_8	n-C_4H_{10}	n-C_5H_{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; 2 Paramagnetic; 3 G.C. – F.I.D.

Analyst: I Thornewill

Customer Analytical Requirements	By Letter	Authorised by:
CO_2, CH_4, O_2, CO, C_2H_6, C_3H_8, C_4H_{10}, C_5H_{12}		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.

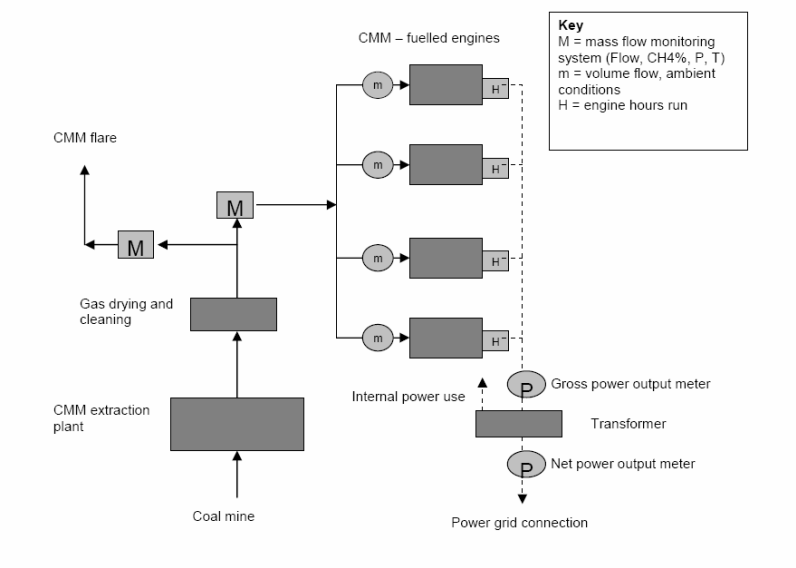
Annex 5 Special data events

Start date	Finish date	Event	Solution
12:19:30 8-Dec-09	14:34:00 9-Dec -09	Oil inlet and outlet temperatures have IP address swapped	Exchange inlet and outlet temperature reading in the Revised Raw data file
09:02:30 12-Feb-10	09:02:30 12-Feb-10	Flare Guardian Plus instrument reads100% CH4	Replace CH4 flare by CH4 engine in the Revised Raw data file
07:41:00 9-Feb-10	24:00:00 26-April-10	T_TORCH_BURNING_6 displays 1200C^{o} values intermittently	Zero this Thermocouple data in the Revised Raw data file
09:00:00 22-April-10	06:18:00 23-April-10	Flare Guardian Plus readings abnormal	1. Replace CH_4 flare by CH_4 engine in the Revised Raw data file 2. Replace damaged Instrument by new calibrated Guardian plus (see Annex 3)

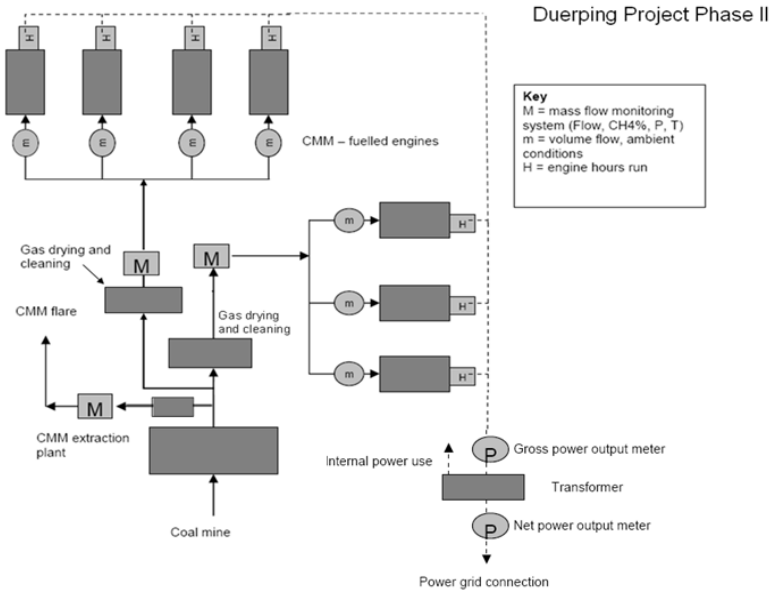
Annex 6 Process flow diagrams

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

Star time	End time	Status
01:30:30 29/Oct/09	-	All CDM data missing
03:02:30 30/Oct/09	03:03:00 30/Oct/09	All CDM data missing
03:04:30 30/Oct/09	03:05:00 30/Oct/09	All CDM data missing
09:28:30 30/Oct/09	09:45:00 30/Oct/09	All CDM data missing
09:46:30 30/Oct/09	09:47:30 30/Oct/09	All CDM data missing
09:48:30 30/Oct/09	10:02:30 30/Oct/09	All CDM data missing
04:30:30 02/Nov/09	-	All CDM data missing
07:10:30 02/Nov/09	-	All CDM data missing
09:30:30 03/Nov/09	-	All CDM data missing
08:46:30 09/Nov/09	08:47:30 09/Nov/09	All CDM data missing
12:56:30 11/Nov/09	12:57:00 11/Nov/09	All CDM data missing
16:08:30 11/Nov/09	16:11:00 11/Nov/09	All CDM data missing
17:02:30 11/Nov/09	17:05:00 11/Nov/09	All CDM data missing
01:56:30 12/Nov/09	01:57:00 12/Nov/09	All CDM data missing
02:02:30 12/Nov/09	02:04:00 12/Nov/09	All CDM data missing
02:20:30 12/Nov/09	-	All CDM data missing
09:50:30 12/Nov/09	09:52:30 12/Nov/09	All CDM data missing
16:52:30 12/Nov/09	16:54:00 12/Nov/09	All CDM data missing
09:20:30 13/Nov/09	09:22:30 13/Nov/09	All CDM data missing
09:24:30 13/Nov/09	09:25:00 13/Nov/09	All CDM data missing
14:10:30 13/Nov/09	-	All CDM data missing
17:34:30 13/Nov/09	17:35:00 13/Nov/09	All CDM data missing
02:50:30 26/Nov/09	-	All CDM data missing
04:30:30 01/Dec/09	04:41:30 01/Dec/09	All CDM data missing
04:50:30 01/Dec/09	04:51:30 01/Dec/09	All CDM data missing
08:06:30 03/Dec/09	-	All CDM data missing
08:20:30 03/Dec/09	08:21:00 03/Dec/09	All CDM data missing
16:24:30 03/Dec/09	-	All CDM data missing
08:14:30 05/Dec/09	08:16:00 05/Dec/09	All CDM data missing
20:46:30 05/Dec/09	20:48:00 05/Dec/09	All CDM data missing
20:58:30 05/Dec/09	20:59:00 05/Dec/09	All CDM data missing
06:40:30 06/Dec/09	06:41:30 06/Dec/09	All CDM data missing
06:46:30 07/Dec/09	06:47:30 07/Dec/09	All CDM data missing
06:54:30 07/Dec/09	06:55:30 07/Dec/09	All CDM data missing
10:12:30 07/Dec/09	10:13:30 07/Dec/09	All CDM data missing
12:16:30 08/Dec/09	12:19:00 08/Dec/09	All CDM data missing
14:54:30 08/Dec/09	14:58:00 08/Dec/09	All CDM data missing
05:40:30 09/Dec/09	-	All CDM data missing
14:34:30 09/Dec/09	14:37:00 09/Dec/09	All CDM data missing
07:04:30 10/Dec/09	-	All CDM data missing
08:04:30 11/Dec/09	08:06:00 11/Dec/09	All CDM data missing

06:48:30 12/Dec/09	06:56:30 12/Dec/09	All CDM data missing
07:06:30 12/Dec/09	07:07:00 12/Dec/09	All CDM data missing
07:10:30 12/Dec/09	07:11:00 12/Dec/09	All CDM data missing
07:12:30 12/Dec/09	07:13:00 12/Dec/09	All CDM data missing
08:48:30 12/Dec/09	-	All CDM data missing
02:04:30 13/Dec/09	-	All CDM data missing
03:20:30 19/Dec/09	03:21:00 19/Dec/09	All CDM data missing
03:54:30 19/Dec/09	03:55:30 19/Dec/09	All CDM data missing
05:12:30 19/Dec/09	05:13:00 19/Dec/09	All CDM data missing
05:58:30 19/Dec/09	05:59:30 19/Dec/09	All CDM data missing
07:50:30 20/Dec/09	07:51:00 20/Dec/09	All CDM data missing
07:58:30 28/Dec/09	-	All CDM data missing
09:06:30 28/Dec/09	09:07:30 28/Dec/09	All CDM data missing
09:12:30 28/Dec/09	09:13:00 28/Dec/09	All CDM data missing
09:20:30 28/Dec/09	09:22:00 28/Dec/09	All CDM data missing
02:20:30 02/Jan/10	02:21:00 02/Jan/10	All CDM data missing
09:24:30 02/Jan/10	09:27:00 02/Jan/10	All CDM data missing
01:46:30 03/Jan/10	01:56:00 03/Jan/10	All CDM data missing
02:24:30 03/Jan/10	-	All CDM data missing
02:30:30 03/Jan/10	-	All CDM data missing
09:56:30 07/Jan/10	10:00:00 07/Jan/10	All CDM data missing
10:04:30 07/Jan/10	10:07:30 07/Jan/10	All CDM data missing
11:54:30 07/Jan/10	11:56:00 07/Jan/10	All CDM data missing
12:46:30 07/Jan/10	12:48:30 07/Jan/10	All CDM data missing
14:38:30 07/Jan/10	14:40:30 07/Jan/10	All CDM data missing
14:54:30 07/Jan/10	14:56:30 07/Jan/10	All CDM data missing
15:02:30 07/Jan/10	15:04:00 07/Jan/10	All CDM data missing
15:14:30 07/Jan/10	15:15:30 07/Jan/10	All CDM data missing
15:34:30 07/Jan/10	15:37:00 07/Jan/10	All CDM data missing
16:16:30 07/Jan/10	16:18:00 07/Jan/10	All CDM data missing
06:02:30 10/Jan/10	-	All CDM data missing
09:14:30 10/Jan/10	-	All CDM data missing
11:38:30 11/Jan/10	11:40:00 11/Jan/10	All CDM data missing
09:36:30 12/Jan/10	-	All CDM data missing
09:28:30 14/Jan/10	09:32:00 14/Jan/10	All CDM data missing
11:08:30 14/Jan/10	11:27:30 14/Jan/10	All CDM data missing
13:08:30 14/Jan/10	13:17:30 14/Jan/10	All CDM data missing
13:20:30 14/Jan/10	13:27:30 14/Jan/10	All CDM data missing
04:32:30 15/Jan/10	04:33:00 15/Jan/10	All CDM data missing
05:28:30 15/Jan/10	05:29:00 15/Jan/10	All CDM data missing
09:38:30 15/Jan/10	09:41:30 15/Jan/10	All CDM data missing
09:44:30 15/Jan/10	09:47:30 15/Jan/10	All CDM data missing
09:58:30 15/Jan/10	10:01:30 15/Jan/10	All CDM data missing
12:40:30 15/Jan/10	12:42:00 15/Jan/10	All CDM data missing

02:54:30 17/Jan/10	02:55:00 17/Jan/10	All CDM data missing
15:38:30 17/Jan/10	-	All CDM data missing
19:06:30 17/Jan/10	19:18:00 17/Jan/10	All CDM data missing
17:02:30 18/Jan/10	17:29:00 18/Jan/10	All CDM data missing
10:54:30 19/Jan/10	11:09:00 19/Jan/10	All CDM data missing
01:40:30 20/Jan/10	-	All CDM data missing
01:42:30 20/Jan/10	01:52:00 20/Jan/10	All CDM data missing
03:10:30 20/Jan/10	03:11:30 20/Jan/10	All CDM data missing
03:14:30 20/Jan/10	03:15:00 20/Jan/10	All CDM data missing
04:08:30 20/Jan/10	-	All CDM data missing
04:14:30 20/Jan/10	04:16:00 20/Jan/10	All CDM data missing
08:08:30 20/Jan/10	08:09:30 20/Jan/10	All CDM data missing
06:18:30 24/Jan/10	06:19:00 24/Jan/10	All CDM data missing
06:50:30 24/Jan/10	-	All CDM data missing
23:12:30 24/Jan/10	23:14:30 24/Jan/10	All CDM data missing
17:30:30 26/Jan/10	17:31:00 26/Jan/10	All CDM data missing
06:24:30 27/Jan/10	06:25:00 27/Jan/10	All CDM data missing
04:24:30 28/Jan/10	04:25:30 28/Jan/10	All CDM data missing
04:34:30 28/Jan/10	04:35:30 28/Jan/10	All CDM data missing
04:36:30 28/Jan/10	04:37:30 28/Jan/10	All CDM data missing
07:04:30 28/Jan/10	07:06:00 28/Jan/10	All CDM data missing
03:48:30 29/Jan/10	03:49:00 29/Jan/10	All CDM data missing
12:04:30 01/Feb/10	12:07:00 01/Feb/10	All CDM data missing
08:24:30 02/Feb/10	08:25:30 02/Feb/10	All CDM data missing
08:06:30 03/Feb/10	08:07:30 03/Feb/10	All CDM data missing
01:52:30 04/Feb/10	01:53:30 04/Feb/10	All CDM data missing
01:56:30 04/Feb/10	01:57:00 04/Feb/10	All CDM data missing
09:24:30 05/Feb/10	09:26:00 05/Feb/10	All CDM data missing
14:56:30 08/Feb/10	14:59:30 08/Feb/10	All CDM data missing
22:40:30 08/Feb/10	22:41:00 08/Feb/10	All CDM data missing
22:46:30 08/Feb/10	22:48:00 08/Feb/10	All CDM data missing
22:52:30 08/Feb/10	-	All CDM data missing
23:14:30 08/Feb/10	23:16:00 08/Feb/10	All CDM data missing
23:26:30 08/Feb/10	23:27:00 08/Feb/10	All CDM data missing
01:40:30 09/Feb/10	-	All CDM data missing
03:34:30 09/Feb/10	-	All CDM data missing
03:42:30 09/Feb/10	-	All CDM data missing
06:20:30 09/Feb/10	06:21:00 09/Feb/10	All CDM data missing
08:22:30 15/Feb/10	08:25:30 15/Feb/10	All CDM data missing
06:18:30 23/Feb/10	06:19:30 23/Feb/10	All CDM data missing
01:04:30 26/Feb/10	-	All CDM data missing
01:06:30 26/Feb/10	01:08:00 26/Feb/10	All CDM data missing
01:44:30 26/Feb/10	-	All CDM data missing
02:32:30 26/Feb/10	02:33:30 26/Feb/10	All CDM data missing

02:50:30 26/Feb/10	-	All CDM data missing
04:08:30 26/Feb/10	04:09:30 26/Feb/10	All CDM data missing
04:10:30 26/Feb/10	04:11:30 26/Feb/10	All CDM data missing
04:12:30 26/Feb/10	04:14:00 26/Feb/10	All CDM data missing
05:34:30 26/Feb/10	05:35:30 26/Feb/10	All CDM data missing
07:46:30 05/Mar/10	07:47:00 05/Mar/10	All CDM data missing
07:54:30 05/Mar/10	07:55:00 05/Mar/10	All CDM data missing
08:56:30 05/Mar/10	-	All CDM data missing
04:26:30 12/Mar/10	04:28:00 12/Mar/10	All CDM data missing
05:58:30 12/Mar/10	05:59:00 12/Mar/10	All CDM data missing
07:34:30 12/Mar/10	07:35:30 12/Mar/10	All CDM data missing
02:10:30 13/Mar/10	-	All CDM data missing
02:14:30 13/Mar/10	02:15:00 13/Mar/10	All CDM data missing
02:20:30 13/Mar/10	02:21:00 13/Mar/10	All CDM data missing
23:20:30 14/Mar/10	23:21:30 14/Mar/10	All CDM data missing
23:22:30 14/Mar/10	23:23:00 14/Mar/10	All CDM data missing
01:54:30 15/Mar/10	-	All CDM data missing
02:28:30 15/Mar/10	-	All CDM data missing
02:38:30 15/Mar/10	02:40:00 15/Mar/10	All CDM data missing
03:10:30 15/Mar/10	03:11:00 15/Mar/10	All CDM data missing
03:12:30 15/Mar/10	03:13:00 15/Mar/10	All CDM data missing
03:40:30 15/Mar/10	-	All CDM data missing
04:18:30 15/Mar/10	04:19:00 15/Mar/10	All CDM data missing
04:26:30 15/Mar/10	04:27:30 15/Mar/10	All CDM data missing
05:46:30 15/Mar/10	05:47:00 15/Mar/10	All CDM data missing
06:10:30 15/Mar/10	06:11:00 15/Mar/10	All CDM data missing
07:50:30 15/Mar/10	07:52:00 15/Mar/10	All CDM data missing
08:28:30 15/Mar/10	-	All CDM data missing
09:36:30 15/Mar/10	09:37:30 15/Mar/10	All CDM data missing
09:42:30 15/Mar/10	-	All CDM data missing
16:42:30 15/Mar/10	16:43:30 15/Mar/10	All CDM data missing
16:48:30 15/Mar/10	16:49:00 15/Mar/10	All CDM data missing
17:42:30 15/Mar/10	17:44:00 15/Mar/10	All CDM data missing
21:22:30 15/Mar/10	-	All CDM data missing
21:36:30 15/Mar/10	21:37:30 15/Mar/10	All CDM data missing
22:04:30 15/Mar/10	22:05:00 15/Mar/10	All CDM data missing
22:22:30 15/Mar/10	22:23:30 15/Mar/10	All CDM data missing
22:24:30 15/Mar/10	22:25:30 15/Mar/10	All CDM data missing
23:08:30 15/Mar/10	23:11:00 15/Mar/10	All CDM data missing
02:50:30 16/Mar/10	-	All CDM data missing
03:46:30 16/Mar/10	03:47:00 16/Mar/10	All CDM data missing
03:48:30 16/Mar/10	03:49:30 16/Mar/10	All CDM data missing
03:52:30 16/Mar/10	03:53:00 16/Mar/10	All CDM data missing
03:58:30 16/Mar/10	03:59:30 16/Mar/10	All CDM data missing

04:16:30 16/Mar/10	-	All CDM data missing
06:18:30 16/Mar/10	-	All CDM data missing
18:26:30 16/Mar/10	18:27:30 16/Mar/10	All CDM data missing
18:28:30 16/Mar/10	-	All CDM data missing
18:32:30 16/Mar/10	18:33:00 16/Mar/10	All CDM data missing
18:58:30 16/Mar/10	18:59:00 16/Mar/10	All CDM data missing
02:36:30 17/Mar/10	02:37:30 17/Mar/10	All CDM data missing
02:50:30 19/Mar/10	-	All CDM data missing
05:34:30 19/Mar/10	-	All CDM data missing
22:28:30 19/Mar/10	22:38:30 19/Mar/10	All CDM data missing
01:08:30 24/Mar/10	01:09:00 24/Mar/10	All CDM data missing
07:06:30 25/Mar/10	07:07:30 25/Mar/10	All CDM data missing
07:14:30 25/Mar/10	-	All CDM data missing
07:54:30 25/Mar/10	07:55:30 25/Mar/10	All CDM data missing
08:14:30 25/Mar/10	08:15:00 25/Mar/10	All CDM data missing
08:52:30 25/Mar/10	08:54:00 25/Mar/10	All CDM data missing
07:58:30 27/Mar/10	07:59:30 27/Mar/10	All CDM data missing
13:50:30 27/Mar/10	13:51:00 27/Mar/10	All CDM data missing
14:08:30 27/Mar/10	14:09:30 27/Mar/10	All CDM data missing
05:54:30 29/Mar/10	-	All CDM data missing
06:00:30 29/Mar/10	06:01:00 29/Mar/10	All CDM data missing
06:10:30 29/Mar/10	06:11:00 29/Mar/10	All CDM data missing
13:38:30 29/Mar/10	13:39:00 29/Mar/10	All CDM data missing
08:24:30 03/Apr/10	08:25:30 03/Apr/10	All CDM data missing
08:26:30 03/Apr/10	-	All CDM data missing
08:32:30 03/Apr/10	08:34:00 03/Apr/10	All CDM data missing
08:40:30 03/Apr/10	08:41:30 03/Apr/10	All CDM data missing
06:38:30 05/Apr/10	06:39:30 05/Apr/10	All CDM data missing
06:52:30 05/Apr/10	06:53:30 05/Apr/10	All CDM data missing
18:16:30 05/Apr/10	18:17:30 05/Apr/10	All CDM data missing
02:10:30 07/Apr/10	02:11:30 07/Apr/10	All CDM data missing
03:06:30 07/Apr/10	03:07:30 07/Apr/10	All CDM data missing
04:36:30 07/Apr/10	04:37:00 07/Apr/10	All CDM data missing
04:50:30 07/Apr/10	-	All CDM data missing
08:34:30 08/Apr/10	-	All CDM data missing
08:36:30 08/Apr/10	08:37:00 08/Apr/10	All CDM data missing
09:04:30 08/Apr/10	-	All CDM data missing
08:42:30 11/Apr/10	10:31:00 11/Apr/10	All CDM data missing
08:16:30 12/Apr/10	08:18:00 12/Apr/10	All CDM data missing
08:34:30 12/Apr/10	08:35:00 12/Apr/10	All CDM data missing
00:10:30 13/Apr/10	00:11:30 13/Apr/10	All CDM data missing
00:50:30 13/Apr/10	00:51:00 13/Apr/10	All CDM data missing
14:56:30 13/Apr/10	14:57:30 13/Apr/10	All CDM data missing
15:08:30 13/Apr/10	15:09:00 13/Apr/10	All CDM data missing

02:48:30 14/Apr/10	02:50:00 14/Apr/10	All CDM data missing
23:00:30 15/Apr/10	23:15:30 15/Apr/10	All CDM data missing
21:20:30 17/Apr/10	21:21:00 17/Apr/10	All CDM data missing
03:50:30 18/Apr/10	03:51:30 18/Apr/10	All CDM data missing
03:56:30 18/Apr/10	03:57:00 18/Apr/10	All CDM data missing
00:46:30 19/Apr/10	00:47:00 19/Apr/10	All CDM data missing
07:42:30 19/Apr/10	07:44:00 19/Apr/10	All CDM data missing
08:50:30 19/Apr/10	08:51:30 19/Apr/10	All CDM data missing
02:26:30 21/Apr/10	02:27:30 21/Apr/10	All CDM data missing
03:46:30 21/Apr/10	03:47:30 21/Apr/10	All CDM data missing
03:54:30 21/Apr/10	-	All CDM data missing
08:38:30 21/Apr/10	-	All CDM data missing
13:16:30 21/Apr/10	13:20:00 21/Apr/10	All CDM data missing
03:30:30 22/Apr/10	03:31:30 22/Apr/10	All CDM data missing
03:40:30 22/Apr/10	03:42:00 22/Apr/10	All CDM data missing
03:50:30 22/Apr/10	03:51:00 22/Apr/10	All CDM data missing
03:52:30 22/Apr/10	-	All CDM data missing
04:56:30 22/Apr/10	04:57:00 22/Apr/10	All CDM data missing
09:04:30 22/Apr/10	09:22:30 22/Apr/10	All CDM data missing
08:34:30 26/Apr/10	09:20:00 26/Apr/10	All CDM data missing
09:22:30 26/Apr/10	-	All CDM data missing
09:56:30 26/Apr/10	09:57:00 26/Apr/10	All CDM data missing
10:34:30 26/Apr/10	-	All CDM data missing