MONITORING REPORT

JI0077 - CMM utilisation on the coal mine Shcheglovskaya-Glubokaya of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass“

Monitoring Report 02
Monitoring period
01/01/2008 to 31/03/2010

Version 7
21 January 2011

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Annexes

SECTION A. General project activity information

A.1 Title of the project activity:

CMM utilisation on the coal mine Shcheglovskaya-Glubokaya of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass“

Party involved (*) ((host) indicates a host Party)	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Netherlands	Carbon-TF B.V.	no
Ukraine (host)	State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass“	no

A.2. JI registration number:

UA2000015, JI0077

The project is approved as JI-project since 08/12/2009. (http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verification/FinDet.html)

See Annex 1 for further references.

A.3. Short description of the project activity:

In this project CMM, which has been sucked out of the active coal mine “Shcheglovskaya-Glubokaya”, has been utilised in upgraded previous coal boilers, a ventilation air heater, a flare, a cogeneration unit and an emergency generator. The methane has been burned to less harmful CO_2. The units have generated heat and power which have displaced conventionally produced heat and power and gained an additional amount of CO_2 reductions.

The CH_4 has been utilised mainly for heat generation in boilers and a ventilation air heater, so that natural fluctuations from day to day and year to year due to changing ambient temperature had wide influence on the total CH_4-amount utilised. Usually there is a high utilisation amount in the winter periods and a low utilisation amount in the summer periods. The bigger winter boilers are in operation in the winter period only. In spring the winter boilers are shut down and the summer boilers are starting operation and are working until the begin of the next heating period in autumn. A glance into the monitored data shows a lot of non-operation periods for the boilers, especially in summer periods. This is because the boilers are working in cycling mode, stop and go, depending on heat demand. The operation times of winter and summer boilers are shown in Table-15 (Annex 3). Regular maintenance and inspection of the complete heating system took place each with September and October 2008 and 2009.

The ventilation air heater is working only in a short period of about four months in the winter.

The emergency generator is not running in the winter.

The operation times of the ventilation air heater and the emergency generator are shown in Table-16 (Annex 3).

The production of the flare has been lowered since November 2009 and the flare has been shut down at 02/02/2010 due to lacking gas amount.

The cogeneration unit stopped operation at 22/01/2010 due to a short circuit and started operation at 02/02/2010.

Starting with the winter 2009/2010 the available utilisable CMM amount has significantly fallen down. The reason is a change to a new coal seam, which has surprisingly only very low CH_4 concentration. Consequently the CH_4-utilisation decreased.

Table-1 Amount of methane utilised for heat and power generation

Unit	**period**	**CH_4 [m³/period]**	**Heat and power generated [MWh]**
Winter boilers (No 1, 3 and 4)	01/01/2008-31/03/2010	8,444,914	63,115
Summer boilers	01/01/2008-31/03/2010	647,238	4,773
Ventilation Air Heater	01/01/2008-31/03/2010	919,505	9,025
Flare	01/01/2008-31/03/2010	2,062,137	n.a.
Cogeneration unit	01/01/2008-31/03/2010	638,612	2,122
Emergency generator	01/01/2008-31/03/2010	1,235,008	4,430
Total	**2008-2010**	**13,947,414**	n.a.

A.4. Monitoring period:

Start date 01/01/2008, winter boilers and ventilation air heater
13/04/2008, summer boiler
12/05/2008, emergency generator
27/05/2009, flare
30/10/2009, cogeneration unit

End date 31/03/2010, all units

Start day and end day included.

A.5. Methodology applied to the project activity (incl. version number):

A.5.1. Baseline methodology:

The approved consolidated methodology 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") has been used to identify the baseline scenario of the proposed JI project [ACM0008].

According to ACM0008 the methodological "Tool to determine project emissions from flaring gases containing methane", EB 28 Meeting report, Annex 13, has been taken for the determination of the project emissions from flaring. In difference to the flaring tool, a combustion efficiency of 99.5%, according to the IPCC 1996 guidelines, has been taken into account instead of the default value of 90% as given in the flaring tool.

A.5.2. Monitoring methodology:

A monitoring plan provided by the "Approved consolidated baseline methodology ACM0008", Version 03, Sectoral Scope: 8 and 10, EB28 is applied to the project [ACM0008]. According to ACM0008 the methodological "Tool to determine project emissions from flaring gases containing methane", EB 28 Meeting report, Annex 13, has been taken for the determination of the project emissions from flaring. In difference to the flaring tool, a combustion efficiency of 99.5%, according to the IPCC 1996 guidelines, has been taken into account instead of the default value of 90% as given in the flaring tool. This is according to the PDD.

Applicability requirements for the monitoring plan of the ACM008 methodology are identical to respective requirements of the baseline setting.

A.6. Status of implementation including time table for major project parts:

The project has been widely installed as planned in the PDD. Only one flare is missing and should be installed in 2011

Table-2 Status of Implementation

Units: three identical upgraded previously coal fired boilers	
Manufacturer: Biysk Boiler Plant	
Type: DKV-10-13	
Serial Numbers (not visible)**:** 470 (No 1), 11781 (No 3), 12645 (No 4)	
Inventar Numbers (visible)**:** 227655 (No 1), 227654 (No 3), 227652 (No 4)	
Capacity: 3-7 Gcal/h (approx. 7,6 MW)	
Efficiency heat generation: 90%	
Activity Inventar Nummer 227652 (No 4)	**Status**
year of construction	1967
last major overhaul	2008 – Ukrteploservis, 2009- Donbassvugleavtomatika
Last inspection	2007 - Derzhpromnaglyad
Upgrade, initial operation, first tests	Summer 2006
Start of operation	October 2006
Planned installation date [PDD]	10/2006
Activity Inventar Nummer 227654 (No 3)	**Status**
year of construction	1967
Last inspection	2008 - Derzhpromnaglyad
Upgrade, initial operation, first tests	Summer 2007
Start of operation	October 2007
Planned installation date [PDD]	10/2006
Activity Inventar Nummer 227655 (No 1)	**Status**

year of construction	1957
Last inspection	2008 - Derzhpromnaglyad
Upgrade, initial operation, first tests	Summer 2006
Start of operation	October 2006
Planned installation date [PDD]	10/2006

Units: two identical upgraded previously coal fired boilers	
Manufacturer: Biysk Boiler Plant	
Type: E-1/9	
Serial Numbers	
Inventar Numbers (visible)**:** 227656, 227657	
Capacity: 1 Gcal/h (approx. 1.167 MW)	
Efficiency heat generation: 89%	
Activity Inventar Nummer 227656	**Status**
year of construction	
last major overhaul	2008 - Ukrteploservis
Last inspection	2007 - Derzhpromnaglyad
Upgrade, initial operation, first tests	Summer 2006
Start of operation	Summer 2006
Planned installation date [PDD]	06/2006
Activity Inventar Nummer 227657	**Status**
year of construction	
Last inspection	2008 - Derzhpromnaglyad
Upgrade, initial operation, first tests	Summer 2006
Start of operation	Summer 2006
Planned installation date [PDD]	06/2006

Unit: ventilation air heater (VAH)	
Manufacturer: Kamensk Plant	
Type: WGS 1.0	
Serial Number: 3, 4, 8, 10	
Capacity: four modules a 1 MW	
Efficiency heat generation: 98.5%	
Activity	**Status**
year of construction	1997-1999
Last inspection	2007 - Derzhpromnaglyad
Upgrade, initial operation, first test	Summer 2006
Start of operation	01/11/2006
Planned installation date [PDD]	11/2006

The ventilation air heater consists of four identical modules, three of which can be in operation simultaneously due to due to restrictions from the ventilation shaft. So a maximum of 3 MW heat capacity results.

Unit: Flare	
Manufacturer: Pro2 Anlagentechnik GmbH	
Type: KGUU 5/8	
Serial Number:142401	
Capacity: 10 MW	
Efficiency methane combustion: 99.5%	
Combustion temperature: 850°C	
Activity	**Status**
Year of construction	2008
Last inspection	2009 – AS Wärmetechnik GmbH
Start of operation	29/05/2009
Planned installation date [PDD]	03/2009

Unit: cogeneration unit	
Manufacturer: Pro2 Anlagentechnik GmbH using a gas engine from Deutz AG	
Type: NC620K16	
Serial Number: 146401	
Capacity: 3.750 MW firing, 1.35 MW_{el}, 0.93 MW_{th}	
Activity	**Status**
Year of construction	2000
Last major overhaul	September 2009
Last inspection	none
Date of installation	October 2009
Start of operation	29/10/2009
Planned installation date [PDD]	06/2009

Unit: emergency generator	
Manufacturer: Pervomaysk Diesel Factory	
Type: BGZHCHN 25-34-I (БГЖЧН 25-34-I)	
Serial Number: IFYUYA (ИФЮЯ) 1440000 103	
Capacity: approc. 1.111 MW firing, 0.4 MW_{el}	
Activity	**Status**
Year of construction	1996
Last major overhaul	
Last inspection	
Start of operation	07/2006
Planned installation date [PDD]	07/2006

The coordinates given in the PDD uses the SK-42 reference system which uses a slightly different reference ellipsoid than the WGS84 system used by Google. The SK-42 system and the substantial cartography are still in use in the most CIS countries and Ukraine too.
The WKS84 coordinates are: 47°03’45’’ N, 37°51’55’’ E

A.7. Intended deviations or revisions to the registered PDD:

The installation of the second flare is delayed due to the Global Financial Crisis. It is planned to install the flare in 2011 [SG-156]. The additionality of the project has been checked and is still given.

unit	installation date (PDD)	firing capacity	Date of installation or *envisaged new date of installation* new timetable
boiler No: 1	10.2006	7,600 kW	October 2006
boiler No: 2	10.2006	7,600 kW	October 2006
boiler No: 3	10.2007	7,600 kW	October 2007
summer boiler 1	6.2006	700 kW	Summer 2006
summer boiler 2	6.2006	700 kW	Summer 2006
ventilation air heater	11.2006	3,000 kW	November 2006
emergency power generation unit	07.2006	400 kW total ..160 KW CMM	July 2006
flare No: 1	03.2009	5,000 kW	March 2009
flare No: 2	09.2009	5,000 kW	*Summer 2011*
cogeneration unit	06.2009	1,350 kW_{el}	October 2009

A.8. Intended deviations or revisions to the registered monitoring plan:

For the winter boilers and the VAH mainly handwritten data stored in utilisation journals and Excel sheets are available. An electronically measurement system has been installed first in December 2009 - January 2010 and started operation at 24/02/2010.
All boiler and data are recorded manually in a 1 hour cycle in a boiler operation journal. The boiler and VAH data in the Excel sheets are stored in a 6 h cycle.

The heat produced by the project has not been measured but calculated using the utilised methane amount. See Annex A3.2 for details.

The electronically measuring and data storing monitoring system as described in the PDD has not been installed for the two summer boilers and the emergency power generation during the monitoring period. The heat produced by the summer boilers and the power amount produced by the emergency power generation have not been measured but calculated using the utilised methane amount.

The monitoring procedures applied during the monitoring period are described in Annex 3.

A.9. Changes since last verification:

Initial and first periodic verification took place in the context of greening AAU. Since then a flare including an electronically monitoring system according to the PDD has been installed in March 2009 and put in operation in May 2009.
A cogeneration unit including an electronically monitoring system according to the PDD has been installed and put in operation in October 2009.

An electronically monitoring system according to the PDD has been installed for the monitoring of the winter boilers and the VAH in December 2009 and put in operation in March 2010.

The summer boilers and the emergency power generator have been equipped with the same measurement systems as the winter boilers and the VAH. Handwritten data monitoring started at 13/04/2008 for the summer boilers and at 12/05/2008 for the emergency power generator.
An electronically monitoring system according to the PDD has been installed in spring 2010 have been put in operation in summer 2010.

A.10. Person(s) responsible for the preparation and submission of the monitoring report:

Coal Mine Shcheglovskaya-Glubokaya
- Viktor Ivanovich Orlov, Chief Engineer

Eco-Alliance OOO
- Vladimir Kasyanov, Managing Director
- Olga Samus, Consultant

Carbon-TF B.V
- Adam Hadulla, Director Business Development
- Karl Wöste, Senior Consultant

SECTION B. Key monitoring activities

B.1. Monitoring equipment:

B.1.2. Table providing information on the equipment used (incl. manufacturer, type, serial number, date of installation, date of last calibration, information to specific uncertainty, need for changes and replacements):

Table-4 Monitoring equipment

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
1	CMM amount to boilers [1)] Method 1	Pitot tube / pressure and pressure differ-rence meters	none	calculation	none	low	Every 6 hours (two times per shift)	11/2007	n.a
1a	Gas velocity	Pitot-Static Tube	n.n.	n. n.	070	low	Every 6 hours (two times per shift)	11/2007	n.a
1b	Pressure difference	Inclined tube manometer, water filled	Mikromanometr MMN-240	TU-25-01-277-70	4471	low	Every 6 hours (two times per shift)	11/2007	0-300 mm H_2O
1c	Pressure	Mercury filled U-Tube	n. n.	n. n.	none	low	Every 6 hours (two times per shift)	11/2007	0-360 mm Hg
1d	Temperature	Thermometer	n. n.	n. n.	none	low	Every 6 hours (two times per shift)	11/2007	0-100°C

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
1e	Barometric Pressure	Barometer	Gidrometrpribor	MD-49-2	31020	low	Every 6 hours (two times per shift)	11/2007	600-800 mm Hg
2	CH_4 concentration	Infrared measurement[3)]	GVT[3)]	Gas analyser TP 2301[3)]	Nr. 481[3)] TU 25-05-1141-71 Nr. 6560[3)] TU 25-05.1141-71 Nr.7596[3)] TU 25-05-1141-71 Nr. 5897[3)] TU 25-05-1141-76	low	Continuous record period in journals 12 h, in Excel sheets 6 h	1978 1983 1973 1982	0-100% CH_4
3	NMHC concentration	Gas chromatograph	Gazochrom	LHM-8MD	75 307	low	yearly	n. n.	0-100%
4	CMM amount to ventilation air heater / emergency power generation [2)] Method 1	Pitot tube / pressure difference pick-up	n.a.	calculation	n.a.	medium	record period in electronical system 2 times per day (one time per shift)	11/2007	n.a
4a	Gas velocity	Pitot-Static Tube	n. n.	n. n.	071	low	Every 6 hours (two times per shift)	11/2007	n.a
4b	Pressure difference	Inclined tube manometer, water filled	Mikromanometr MMN-240	TU-25-01-277-71	2909	low	Every 6 hours (two times per shift)	11/2007	0-300 mm H_2O

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
4c	Pressure	Mercury filled U-Tube	n. n.	n. n.	none	low	Every 6 hours (two times per shift)	11/2007	0-360 mm Hg
4d	Temperature	Thermometer	n. n.	n. n.	none	low	Every 6 hours (two times per shift)	11/2007	0-100°C
5	CMM amount to boilers Method 2	Standard orifice and pressure difference meter	ECO-Alliance OOO	calculation	none	low	Continuous record period 15 min.	03/2010	n.a
5a	Gas flow	Standard orifice	Himpe AG	Annular chamber standard orifice DIN 19205	none	low	Continuous record period 15 min.	10/2009	0-8,000 m^3/h
5b	Pressure difference	Pressure difference transmitter	Honeywell	STD-3000	09W33 C3180872001001	low	Continuous record period 15 min.	10/2009	0-100 mbar
5c	Pressure	Pressure transmitter	Siemens	SITRANS P Serie Z 7MF1564	AZB/X1110844	low	Continuous record period 15 min.	10/2009	0-1.6 bar abs
5d	Temperature	Resistance thermometer	JUMO	dTRANS TO1 Typ 90.2820/10	TN00515987 01266669010 08400007	low	Continuous record period 15 min.	10/2009	-40-120°C
5e	CH_4 concentration	Infrared meter	SIEMENS	ULTRAMAT 23	F-Nr-N1-WN-925	low	Continuous record period 15 min.	03/2010	0-100% CH_4

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
6	CMM amount to VAH Method 2	Standard orifice and pressure difference meter	ECO-Alliance OOO	calculation	none	low	Continuous record period 15 min.	03/2010	n.a
6a	Gas flow	Standard orifice	Himpe AG	Annular chamber standard orifice DIN 19205	none	low	Continuous record period 15 min.	10/2009	0-1,200 m^3/h
6b	Pressure difference	Pressure difference transmitter	Honeywell	STD-3000	09W12 C3149127001001	low	Continuous record period 15 min.	10/2009	0-100 mbar
6c	Pressure	Pressure transmitter	Siemens	SITRANS P Serie Z 7MF1564	AZB/X1110845	low	Continuous record period 15 min.	10/2009	0-1.6 bar abs
6d	Temperature	Resistance thermometer	JUMO	dTRANS TO1 Typ 90.2820/10	TN00515987 01266669010 08400002	low	Continuous record period 15 min.	10/2009	-40-120°C
7	CMM amount to flare	Standard orifice and pressure differrence meter	Pro2 Anlagentechnik GmbH	calculation	none	low	Continuous record period 15 min.	03/2009	n.a
7a	Gas flow	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	none	low	Continuous record period 15 min.	03/2009 changed at 13/11/2009	Disc 1 0-1,550 m^3/h Disc 2 0-2,500 m^3/h
7b	Pressure difference	Pressure difference transmitter	Honeywell	STD-3000	C3059154001003	low	Continuous record period 15 min.	03/2009	0-100 mbar

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
7c	Pressure	Pressure transmitter	Noeding	P 121 E02-311	EX812126966	low	Continuous record period 15 min.	03/2009	0-250 mbar, rel
7d	Temperature	Resistance thermometer	JUMO GmbH	dTRANS TO1 Typ 90.2820/10	4571/1	low	Continuous record period 15 min.	03/2009	-40-120°C
7e	CH_4 concentration	Infrared meter	Pro 2 Anlagen-technik GmbH	BINOS 100	120482003017	low	Continuous record period 15 min.	03/2009	0-100% CH4
8	CMM amount to cogenera-tion unit	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	none	low	Continuous record period 15 min.	10/2009	n.a.
8a	Gas flow	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	none	low	Continuous record period 15 min.	10/2009	0-1,200 m³/h
8b	Pressure difference	Pressure difference transmitter	Honeywell	STD-3000	C3059154001002	low	Continuous record period 15 min.	10/2009	0-100 mbar
8c	Pressure	Pressure transmitter	Noeding	P 121	EX812127132	low	Continuous record period 15 min.	10/2009	0-250 mbar
8d	Temperature	Resistance thermometer	JUMO GmbH	dTRANS TO1 Typ 90.2820/10	TN00515988 01264830010 08370001 (98023 for calibration)	low	Continuous record period 15 min.	10/2009	-40-120°C

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
9	Flame temperature of the flare	Thermo couple	Herth GmbH	DIN 43733, Type S, PtRh-Pt	66503 until 11/10/2009 71089 since 11/10/2009	low	Continuous record period 15 min.	03/2009 11/10/2009	0-1,700°C
10	Power production	Electricity meter	NZR	IGZ-FDWB7307	475072	low	Continuous, cumulative value Read period monthly/daily	2006	n.a.
10a	Power production	Electricity meter	Kuhse	KMU45B	49500 until 21/01/2010 82365 since 02/02/2010	low	Continuous, cumulative value Read period monthly/daily	10/2009	0-400 V 0-5A
11	Heat production winter boilers	Calculation	ECO-Alliance OOO	none	none	low	Continuous record period 15 min.	03/2010	n.a
11a	Inlet temperature one measurement for all three boilers 1,3,4	Resistance thermometer	AOZT «TERA»	TSP U 1-3 PT-100	09456	low	Continuous record period 15 min.	10/2009	-50-250°C
11.4	Heat production boiler 4	Heat meter	ECO-Alliance OOO	calculation	none	low	Continuous record period 15 min.	03/2010	n.a
11.4a	Water flow Boiler 4	Standard orifice	Lvivpribor	n.a.	4	low	Continuous record period 15 min.	10/2009	0-400 m³/h

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
11.4b	Pressure difference	Pressure difference transmitter	Lvivpribor	DM3583M	19 Inventar Nr: 105321	low	Continuous record period 15 min.	10/2009	0-25 kPa
11.4c	Indication	Chart Recorder	Lvivpribor	KSD-023	9056848	low	Continuous record period 15 min.	10/2009	0-400 m³/h
11.4d	Outlet temperature Boiler 4	Resistance thermometer	AOZT «TERA»	TSP U 1-3 PT-100	09444	low	Continuous record period 15 min.	10/2009	-50-250°C
11.3	Heat production boiler 3	Heat meter	ECO-Alliance OOO	calculation	none	low	Continuous record period 15 min.	10/2009	n.a
11.3a	Water flow Boiler 3	Standard orifice	Lvivpribor	n.a.	3	low	Continuous record period 15 min.	10/2009	0-250 m³/h
11.3b	Pressure difference	Pressure difference transmitter	Lvivpribor	DM3583M	71329 Inventar Nr: 105621	low	Continuous record period 15 min.	10/2009	0-25 kPa
11.3c	Indication	Chart Recorder	Lvivpribor	KSD-023	4014777	low	none	10/2009	0-250 m³/h
11.3d	Outlet temperature Boiler 3	Resistance thermometer	AOZT «TERA»	TSP U 1-3 PT-100	09448	low	Continuous record period 15 min.	10/2009	-50-250°C
11.1	Heat production boiler 1	Heat meter	ECO-Alliance OOO	calculation	none	low	Continuous record period 15 min.	10/2009	n.a

ID	Data	Method	Manufacturer	Classification	Serial number	Uncertainty level of data	Frequency of Measurement	Instal-lation	Range
11.1a	Water flow Boiler 1	Standard orifice	Lvivpribor		1	low	Continuous record period 15 min.	10/2009	0-320 m³/h
11.1b	Pressure difference	Pressure difference transmitter	Lvivpribor	DM3583M	n.n. Inventar Nr: 101503	low	Continuous record period 15 min.	10/2009	0-25 kPa
11.1c	Indication	Chart Recorder	Lvivpribor	KSD-023	8087123	low	none	10/2009	0-320 m³/h
11.1d	Outlet temperature Boiler 1	Resistance thermometer	AOZT «TERA»	TSP U 1-3 PT-100	09451	low	Continuous record period 15 min.	10/2009	-50-250°C

1) The CMM amount measurement system is utilised for the winter boilers in the winter period and moved to summer boilers in the summer period
2) The CMM amount measurement system is utilised for the VAH in the winter period and moved to the emergency power generator in the summer period
3) 2 of 4 units used simultaneously, the lower value is recorded

B.1.3. Calibration procedures:

Table-5 Monitoring equipment

ID	Data	Uncertainty level of data (high/medium/low)	Calibration procedure	Last calibration	Calibrator
1	CMM amount to boiler, Method 1	5.3% **)	Calculation	none	none
1a	Gas velocity Pitot-Tube	n.a.	Calibration made using procedures of Donbasvugle-avtomatyka.	29/10/2007 22/10/2008 16/10/2009	Donbassugle-avtomatyka
1b	Pressure difference	0.33% of FSV*)	Calibration made using procedures of Donbasvugle-avtomatyka.	29/10/2007 22/10/2008 16/10/2009	Donbassugle-avtomatyka
1c	Pressure	0.25% of FSV*)	none	none	none
1d	Temperature	2.5%	none	none	none
1e	Barometric Pressure	1.0%	Calibration made using procedures of Donbasvugle-avtomatyka.	29/10/2007 22/10/2008 16/10/2009	Donbassugle-avtomatika
2	CH_4 concentration	2.5%)	Calibration made using procedures of Donbasvugle-avtomatyka.	Nr. 5897 20/09/2006 15/08/2008 27/08/2009 Nr.7596 18/07/2006 27/08/2009 Nr. 481 20/06/2008 15/09/2009 Nr.6560 22/08/2007 20/06/2008	Donbasvugle-avtomatyka OOO
3	NMHC concentration	2.5%	Calibration made using procedures of Donetskstandart-metrologya.	14/10/2009	Donetsk-standart-metrologya

4	CMM amount to ventilation air heater, Method 1	5.3% **)	Calculation	none	none
4a	Gas velocity Pitot-Tube	n.a.	Calibration made using procedures of Donbasvugle-avtomatyka.	29/10/2007 22/10/2008 16/10/2009	Donbassugle-avtomatyka
4b	Pressure difference	0.33% of FSV*)	Calibration made using procedures of Donbasvugle-avtomatyka.	29/10/2007 22/10/2008 16/10/2009	Donbassugle-avtomatyka
4c	Pressure	0.25% of FSV*)	none	none	none
4d	Temperature	2.5%	none	none	none
5	CMM amount to boilers Method 2		Calculation	none	none
5a	Gas flow	0.74 % DIN EN ISO 5167-T.1-4	none	none	none
5b	Pressure difference	0.0375 %	Calibration made using procedu-res of manufacturer.	15/09/2009	Honeywell
5c	Pressure	0.5%	Calibration made using procedu-res of manufacturer.	n.a.	SIEMENS
5d	Temperature	DIN EN 60 751, Class B 0.3+0.005T [K]	Calibration made using procedu-res of manufacturer.	n.a.	JUMO
5e	CH_4 concentration	1.5 %	Initial calibration made using procedures of Siemens. Regular calibrations made using procedures of Eco-Alliance OOO.	n.a. maintenance journals	SIEMENS Eco-Alliance OOO
6	CMM amount to VAH Method 2		Calculation	none	none
6a	Gas flow	0.54 % DIN EN ISO 5167-T.1-4	none	none	none
6b	Pressure difference	0.0375 %	Calibration made using procedu-res of manufacturer.	15/09/2009	Honeywell

6c	Pressure	0.5%	Calibration made using procedures of manufacturer.	n.a.	SIEMENS
6d	Temperature	DIN EN 60 751, Class B 0.3+0.005T [K]	Calibration made using procedures of manufacturer.	n.a.	JUMO
7	CMM amount to flare		Calculation	none	none
7a	Gas flow	0.56%, disc 1 0.75%, disc 2 DIN EN ISO 5167-T.1-4	none	none	none
7b	Pressure difference	0.0375%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya	30/04/2008 31/03/2010	Honeywell Sumystandart metrologya
7c	Pressure	0.2%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart metrology	n.a. 31/03/2010	Noeding Sumystandart metrologya
7d	Temperature	DIN EN 60 751, Class B 0.3+0.005T [K]	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart metrology	n.a. 31/03/2010	JUMO Sumystandart metrologya
7e	CH_4 concentration	1.5%	Initial calibration made using procedures of manufacturer. Calibration made using procedures of Sumystandartmetrology Calibrations made using procedues of Eco-Alliance OOO every two weeks	n.a. 31/03/2010 Maintenance journals	Pro2 GmbH Sumystandart-metrology Eco-Alliance OOO
8	CMM amount to cogeneration unit		Calculation	none	none
8a	Gas flow	0.56 % DIN EN ISO 5167-T.1-4	none	none	none

8b	Pressure difference	0.0375%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart metrologya.	30/04/2008 31/03/2010	Honeywell Sumystandart metrologya
8c	Pressure	0.2%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart metrology	n.a. 31/03/2010	Noeding Sumystandart metrologya
8d	Temperature	DIN EN 60 751, Class B 0.3+0.005T [K]	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart metrology	n.a. 31/03/2010	JUMO Sumystandart metrologya
9	Flame temperature of the flare	DIN 43733, Class 2 0°C - 600°C +/-1.5 K 600°C - 1600°C +/- 0.25%	Calibration made using procedures of manufacturer. No recalibration, thermocouple is supposed to be changed at least one time per year, according to the flaring tool.	17/04/2008 01/09/2009	Herth
10	Power production	Class 1 IEC 1036	Initial calibration made using procedures according to German Calibration Act (EichG).	2006***)	NZR
10a	Power production	0.1% U 0.15% I	Initial calibration made using procedures of manufacturer.	n.a. 02/02/2010	Kuhse/Pro2
11	Heat production winter boilers		none	none	none
11a	Inlet tempera-ture - one measurement for all three boilers	0.5%	Calibration made using procedu-res of manufacturers.	n.a.	TERA
11.4	Heat production boiler 4		none	none	none
11.4a	Water flow boiler 4	2.5%	none	none	none
11.4b	Pressure difference boiler 4	1.5%	Calibration made using procedu-res of Donbasvugleavtomatyka.	12/10/2009	Donbassvugle avtomatyka.
11.4c	Indication	1.0%	Calibration made using procedu-res of Donbasvugleavtomatyka.	12/10/2009	Donbassvugle avtomatyka.
11.4d	Outlet temperature boiler 4	0.5%	Calibration made using procedu-res of manufacturers.	n.a.	TERA

11.3	Heat production boiler 3		none	none	none
11.3a	Water flow boiler 3	2.5%	none	none	none
11.3b	Pressure difference boiler 3	1.5%	Calibration made using procedu-res of Donbasvugleavtomatyka.	12/10/2009	Donbassvugle avtomatyka.
11.3c	Indication	1.0%	Calibration made using procedu-res of Donbasvugleavtomatyka.	12/10/2009	Donbassvugle avtomatyka.
11.3d	Outlet temperature boiler 3	0.5%	Calibration made using procedu-res of manufacturers.	n.a.	TERA
11.1	Heat [3)] roduction boiler 1		None	none	none
11.1a	Water flow [3)] boiler 1	2.5%	none	none	none
11.1b	Pressure difference boiler 1	1.5%	Calibration made using procedu-res of Donbasvugleavtomatyka.	14/10/2009	Donbassvugle avtomatyka.
11.1c	Indication	1.0%	Calibration made using procedu-res of Donbasvugleavtomatyka.	14/10/2009	Donbassvugle avtomatyka.
11.1d	Outlet temperature boiler 1	0.5%)	Calibration made using procedu-res of manufacturers.	n.a.	TERA

*) FSV – Full Scale Value
**) according to propagation of uncertainty
***) The calibration has been provided in Germany according to the German Calibration Act. The calibration is manifested by a test badge (Eichmarke) fixed to the unit and valid for 8 years.

B.1.4. Involvement of Third Parties:

- The lab analysis for the determination of the NMHC concentration has been done by MAKNII, the analysis protocols have been provided to TUEV Sued.
- The calibration of CH_4-concentration and some measurement units has been done by DTOV Donbasvugleavtomatyka, the calibration protocols have been provided to TUEV Sued.
- Sumystandartmetrologya has calibrated some units, the calibration protocols have been provided to TUEV Sued.
- Eco-Alliance OOO supported the coal mine with the collecting of the monitoring data, electronically collected data and hand written journals have been provided to TUEV Sued
- Emissions-Trader ET GmbH has supervised the data for plausibility and completeness.

B.2. Data collection (accumulated data for the whole monitoring period):

B.2.1. List of fixed default values:

Table-6 List of ex-ante fixed values

ID number	Data variable	Source of data	Data unit	Comment
P8, B49 $CEF_{ELEC,PJ}$	Carbon emission factor of $CONS_{ELEC,PJ}$	official data of Ukrainian power grid	t CO_{2eq}/MWh	SenterNovem data taken instead of not available Ukrainian data, according to information given in the PDD: 2008: 0.695 2009: 0.680 2010: 0.666 2011: 0.651 2012: 0.636
P13 Eff_{FL}	Flare combustion efficiency	IPCC 1996, Methodological “Tool to determine project emissions from flaring gases containing methane”	t CH_4	Set to: 99.5 % for: T_{Flame} > 850°C [PDD, IPCC] 90% for: 500°C < T_{Flame}< 850°C [AM_Tool_07] 0% for: T_{Flame} < 500°C [AM_Tool_07]
P16 Eff_{ELEC}	Efficiency of methane destruction / oxidation in power plant	ACM0008 / IPCC 1996	%	set at 99.5% (IPCC 1996)
P19 Eff_{HEAT}	Efficiency of methane destruction / oxidation in heat plant	ACM0008 / IPCC 1996	%	set at 99.5% (IPCC 1996)
P23, B19 CEF_{CH4}	Carbon emission factor for combusted methane	ACM0008 / IPCC 2006	t CO_2eq/t CH_4	set at 2.75 t CO_2eq/t CH_4
P28, B18 GWP_{CH4}	Global warming potential of methane	ACM0008 / IPCC 2006	t CO_2eq/t CH_4	set at 21

B55 $EF_{CO2,Coal}$	CO_2 emission factor of fuel used for captive power or heat	IPCC 2006 1 Introduction Table 1.2	tCO_2/MWh	set to 0.3406 tCO_2/MWh Using the value for “Other Bituminous Coal” of 94,600 kg CO_2/TJ
B57 Eff_{heat}	Energy efficiency of heat plant	Boiler pass VAH pass	%	90.0 % upgraded winter boiler (measured value) 98.5 % ventilation air heater 89.0 % summer boilers
HV_{CH4}	Heating value of methane	DIN ISO 6976	kWh/m³ kWh/kg	set to 9.965 kWh/m³ equal to 13.899 kWh/kg

B.2.2. List of variables:

Table-7 List of variables

ID number	Data variable	Source of data	Data unit	Comment
P1 PE_y	Project emissions in year y	monitored data	tCO_{2eq}	calculated using formulae from the PDD
P2 PE_{ME}	Project emissions from energy use to capture and use methane	monitored data	tCO_{2eq}	calculated using formulae from the PDD
P3 PE_{MD}	Project emissions from methane destroyed	monitored data	tCO_{2eq}	calculated using formulae from the PDD
P4 PE_{UM}	Project emissions from uncombusted methane	monitored data	tCO_{2eq}	calculated using formulae from the PDD
P5 $CONS_{ELEC,PJ}$	Additional electricity consumption by project	monitored data	MWh	calculated using operation hours of the flares
P11 MD_{FL}	Methane destroyed by flaring	monitored data	t CH_4	calculated using formulae from the PDD
P12 MM_{FL}	Methane sent to flare	monitored data	t CH_4	calculated using formulae from the PDD
P14 MD_{ELEC}	Methane destroyed by power generation	monitored data	t CH_4	calculated using formulae from the PDD
P15 MM_{ELEC}	Methane sent to power plant	monitored data	t CH_4	calculated using formulae from the PDD
P17 MD_{HEAT}	Methane destroyed by heat generation	monitored data	t CH_4	calculated using formulae from the PDD
P18 MM_{HEAT}	Methane sent to heat generation	flow meter	t CH_4	handwritten journals
P24 CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various)	lab analysis	-	Calculated if applicable
P25 PC_{CH4}	Concentration of methane in extracted gas	IR measurement	%	handwritten journals
P26 PC_{NMHC}	NMHC concentration in coal mine gas	lab analysis	%	Used to check if more than 1% of emissions and to calculate r

P27 r	Relative proportion of NMHC compared to methane	lab analysis	%	Calculated if applicable, based on the lab analysis.
B1 BE_y	Baseline emissions in year y	monitored data	t CO_{2eq}	calculated using formulae from the PDD
B3 $BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity	monitored data	t CO_{2eq}	calculated using formulae from the PDD
B4 $BE_{Use,y}$	Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity in year y	monitored data	t CO_{2eq}	calculated using formulae from the PDD
B14 $CMM_{PJ,y}$	CMM captured and destroyed in the project activity in year y	flow meter	t CH_4	equal to P17,MD_{HEAT}
B46 GEN_y	electricity generation by project	monitored data	MWh	
B47 $HEAT_y$	Heat generation by project	monitored data	MWh	calculated using P17 and B57, method 1 measured, method 2
PE_{Flare}	Project emissions from flaring	monitored data	t CO_{2eq}	Calculated using formula from the flaring Tool [AM_Tool_07]

B.2.3. Data concerning GHG emissions by sources of the project activity

Table-8 GHG emissions by sources of the project activity

ID number	Data variable	Source of data	Data unit	Comment
P12 MM_{FL}	Methane sent to flare	monitored data	t CH_4	calculated using formulae from the PDD
P15 MM_{ELEC}	Methane sent to power plant	monitored data	t CH_4	calculated using formulae from the PDD
P18 MM_{HEAT}	Methane sent to heat generation, consisting of: Methane sent to boilers Methane sent to VAH	Sum of flow meters	t CH_4	handwritten journals, electronic records
P25 PC_{CH4}	Concentration of methane in extracted gas	IR measurement	%	handwritten journals, electronic records

B.2.4. Data concerning GHG emissions by sources of the baseline

Table-9 GHG emissions by sources of the baseline

ID number	Data variable	Source of data	Data unit	Comment

B14 $CMM_{PJ,y}$	CMM captured and destroyed in the project activity in year y	Sum of flow meters	t CH_4	sum of boilers, VAH, flare and cogeneration
B47 $HEAT_y$	Heat generation by project	monitored data	MWh	sum of heat generated by boilers + VAH
B46 GENy	electricity generation by project	monitored data	MWh	

B.2.5. Data concerning leakage

Not applicable.

B.2.6. Data concerning environmental impacts

Not applicable.

B.3. Data processing and archiving (incl. software used):

Method 1 for boilers, VAH and emergency power generator:

Data are recorded in hand written journals and transferred to Microsoft Excel Sheets.
The journals are stored by the coal mine. The Excel-sheets are stored by the coal mine, Eco-Alliance and Carbon-TF.

Method 2 for boilers and VAH and regular monitoring for flare and cogeneration:

Two different but similar systems are used for electronically data collection.

Data from the boilers and the VAH are collected, processed and stored using a Siemens SIMATIC PLC S7 system and Siemens WINCC programming software. All data is stored in the internal memory about 2 GB. One time per hour the data are sent via GPS to an Internet-based Server data base. The server provider ensures regular back up's and archiving. Further on the data is stored and archived by Eco-Alliance OOO.
The data can be read any time from the internet data base by authorised personnel. The utilised methane amount is automatically calculated and stored in the PLC. As all input data are stored, the automatically calculation can by checked in retrospect any time.

Data from the flare and the cogeneration unit are collected, processed and stored using a Siemens SIMATIC PLC S7 system and Siemens WINCC programming software. All data is stored in the internal memory about 2 GB. The data are read daily by Kuhse GmbH via GPS and stored in the Kuhse database in Germany. The data can be viewed any time using special access software provided by Kuhse. Kuhse ensures regular back ups and archiving. The data are regularly reviewed by Carbon-TF and Eco-Alliance OOO. Carbon-TF provides regularly storing and archiving of the data as well as regularly transfer to Excel sheets for analysis, evaluation and reporting procedures.
The data can be read any time from the Kuhse data base by authorised personnel. The utilised methane amount is automatically calculated and stored in the PLC. As all input data are stored, the automatically calculation can by checked in retrospect any time.

For plausibility checks and potential data back up, data recorded by coal mine personnel in hand written journals can be taken. The journals are stored by the coal mine.

B.4. Special event log:

Starting with the winter 2009/2010 the available utilisable CH_4 amount has significantly fallen down. The reason is a change to a new coal seam, which has surprisingly only very low CH_4 concentration.

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan:

C.1.1. Roles and responsibilities:

The general project management is implemented by the Technical Director of Shakhtoupravlenye Donbass, the Holding Company of the Shcheglovskaya-Glubokaya Coal Mine, through supervision and coordination of activities of his subordinates, such as deputy director on surface degasification, heat technician, and heads of safety engineering departments.
Daily a group of mechanics and electricians who are responsible for the measures and maintenance of all technological equipment and measuring instruments are present on-site. There are two shifts, 12 h each. For every shift there is one person on-duty responsible for the proper operation and keeping of the journals.
Overview calculations about the methane amount utilised are made on a monthly and yearly basis and notified in the journal. The monitoring system is supervised by the administration of the coal mine under the existing control and reporting system. The general supervision of the new electronically monitoring system is executed by Eco-Alliance OOO, who is consultant for the coal mine

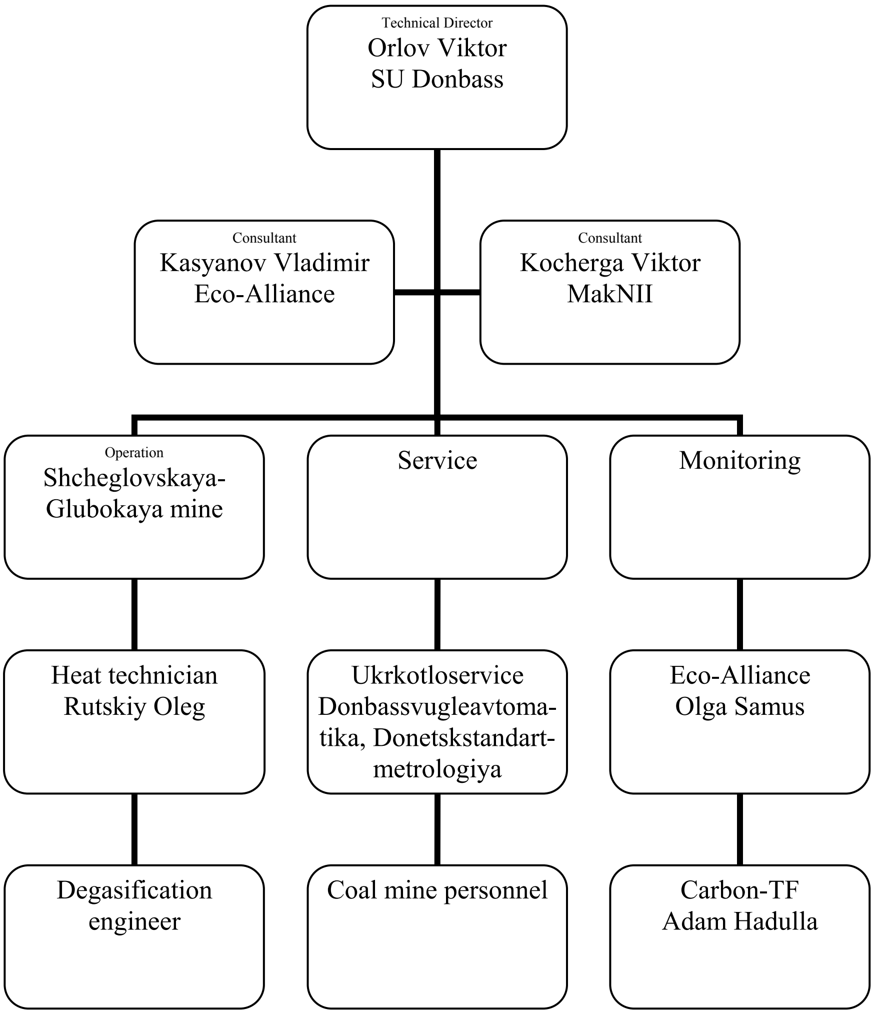


Figure 1 – Organigram

C.1.2. Trainings:

The employees responsible for the monitoring control have been trained on–the–job during the installation of the system.
The responsible personnel of Eco-Alliance has been trained on the handling with CMM-utilisation units and the applied monitoring systems, during an eight week long practical course in Germany in the autumn of 2005 and a two-week practical course in August/September 2008. In this courses which has been carried out by A-TEC Anlagentechnik GmbH, a Joint-Venture participant of Eco-Alliance, also the basic principles of emissions trading and the background of the monitoring has been explained. A-TEC Anlagentechnik GmbH is already running several CMM utilisation plants and monitoring systems in Germany.
These trained personnel is the basis of a team of engineers, which should establish a specialised service team in the Ukraine and instruct further operating and monitoring personnel, as well for this project.

C.2. Involvement of Third Parties:

- MakNII Institute, the “State Makeyevka Institute for Research and Education for Safe Work in the Coal Mining Industry”, a subsidiary of the “Ukrainian Ministry for Fuel and Energy”, has been involved for the lab analysis (NMHC) of the CMM.
- Ukrkotloservis has been involved for the service of the boiler.
- Donbasvugleavtomatyka OOO has been involved for the regular calibrations and service of the measurement and control equipment of the boilers and VAH.

C.3. Internal audits and control measures:

The results of the upgraded boiler have been compared with the coal boilers. The data are plausible, no major deviations have been found. The efficiency of the upgraded boiler has been measured and has been found to be better than that for the coal boilers.
During the efficiency measurements the heat produced by the boiler has been measured and verified. The measurements confirm the plausibility of the flow and concentration measurement units and the calculation method for the produced heat amount (see Section D, Table-10, B47).

QM procedure:
- The data are recorded in journals by the coal mine personnel
- The journals are checked daily by the chief heat technician
- And cross-checked monthly by Eco Alliance OOO
- Eco Alliance prepares monthly reports which are checked by Carbon-TF B.V.
- The paper data are stored at the coal mine.
- Electronic data are stored at Eco-Alliance and Carbon-TF.
- Back-ups are made regularly by Eco-Alliance and Carbon-TF.
- Carbon-TF prepares the monitoring report, which is checked by Eco-Alliance and the coal mine.

C.4. Troubleshooting procedures:

The general troubleshooting for the boiler and the VAH hasn’t changed. In case of disturbance the gas supply to the boiler is shut down by a quick acting valve and the CMM supplied by the degasification system of the coal mine is blown to the atmosphere.

SECTION D. Calculation of GHG emission reductions

D.1. Table providing the formulas used:

Table-10 Formulae used taken from the PDD.

ID number	Data variable	Formula
P1 PE_y	Project emissions in year y	$PE_y = PE_{ME} + PE_{MD} + PE_{UM}$
P3 PE_{MD}	Project emissions from methane destroyed	$PE_{MD} = (MD_{FL} + MD_{ELEC} + MD_{HEAT})$ x $(CEF_{CH4} + r$ x $CEF_{NMHC})$
P4 PE_{UM}	Project emissions from uncombusted methane	$PE_{UM} = GWP_{CH4}$ x $[MM_{ELEC}$ x $(1 - Eff_{ELEC}) + MM_{HEAT}$ x $(1 - Eff_{HEAT})] + PE_{Flare}$
P5, $CONS_{ELEC}$	Additional electricity consumption by the project	$CONS_{ELEC} = h_{FL}$ x P_M x $Eff_M /1000$
P18 MM_{HEAT}	Methane sent to heat generation	$MM_{HEAT} = MM_{HEAT,BOILERS} + MM_{HEAT,VAH}$
P27 r	Relative proportion of NMHC compared to methane	$r = PC_{NMHC} / PC_{CH4}$
B1 BE_y	Baseline emissions in year y	$BE_y = BE_{MR,y} + BE_{Use,y}$
B3 $BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity	$BE_{MR,y} = CMM_{PJ,y}$ x GWP_{CH4}
B4 $BE_{Use,y}$	Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity in year y	$BE_{Use,y} = GEN_y$ x $EF_{ELEC} + (HEAT_y / Eff_{HEAT,coal})$ x EF_{HEAT}
B14 $CMM_{PJ,y}$	CMM captured and destroyed in the project activity in year y	$CMM_{PJ,y} = (MD_{FL} + MD_{ELEC} + MD_{HEAT})$
B46 GEN_y	Electricity generation by project	$GEN_y = GEN_{CHP} + (MD_{EPG}$ x Eff_{EPG} x $HV_{CH4})$
B47 $HEAT_y$	Heat generation by project	$HEAT = (MD_{HEAT,WBoil}$ x $Eff_{HEAT,WBoil} + MD_{HEAT,SBoil}$ x $Eff_{HEAT,SBoil} + MD_{HEAT,VAH}$ x $Eff_{HEAT,VAH})$ x HV_{CH4}
ER	Emission reductions	$ER_y = BE_y - PE_y$
PE_{Flare}	Project emissions from flaring	$PE_{flare,y} = \sum_{h=1}^{8760} TM_{RG,h} x (1 - \eta_{flare,h}) x \frac{GWP_{CH4}}{1000}$

D.2. Description and consideration of measurement uncertainties and error propagation:

Obvious errors in the journals have been corrected by Emission-Trader ET GmbH during the supervision of the documents. Corrected data are marked red.
In addition to the uncertainty of the measuring meters, the hand reading of the meters causes additional uncertainties. A total of 12 random errors and 6 systematic errors resulting from the uncertainties of the measurement equipment as well as hand readings and handling of the data have been named and discussed, see <Possible sources of error.pdf> for detailed information. For each of the both monitoring methods a resulting uncertainty has been determined and subtracted from the results.

Table-11 Resulting uncertainties for Method 1 and Method 2

Monitoring Method	Period	Uncertainty
Method 1	01/01/2008 to 19/02/2010	5.3%
Method 2		
Flare 1	since 27/05/2009	1,70%
Flare 1a	since 13/11/2009	1,79%
CHP 1	since 30/10/2009	1,69%
Winter boilers	since 24/02/2010	1,91%
VAH	since 24/02/2010	1,79%
Power production	since 30/10/2009	1,00%

D.3. GHG emission reductions (referring to B.2. of this document):

Period	Prospected emission reductions, PDD [t CO_{2eq}]	Monitored emission reductions [t CO_{2eq}]
01/01/2008-31/12/2008	136,256	82,128
01/01/2009-31/12/2009	172,819	94,507
01/01/2010-31/03/2010	43,173*)	35,556
Total 2008-2010	**352,248**	**212,191**

**) ¼ of* 172,692

D.3.1. Project emissions:

period	project emissions [t CO_{2eq}]
01/01/2008-31/12/2008	10,723
01/01/2009-31/12/2009	13,074
01/01/2010-31/03/2010	4,682
Total 2008-2010	**28,479**

D.3.2. Baseline emissions:

period	baseline emissions [t CO_{2eq}]
01/01/2008-31/12/2008	92,851
01/01/2009-31/12/2009	107,581
01/01/2010-31/03/2010	40,238
Total 2008-2010	**240,670**

D.3.3. Leakage:

Not applicable.

D.3.4. Summary of the emissions reductions during the monitoring period:

Period	Emission reductions [t CO_{2eq}]
01/01/2008-31/12/2008	82,128
01/01/2009-31/12/2009	94,507
01/01/2010-31/03/2010	35,556
Total 2008-2010	**212,191**

The total GHG emission reduction for the monitoring period 01/01/2008-31/03/2010 is 212,191 t CO_{2eq}.

This monitoring report has been prepared by Carbon-TF B.V.
Responsible person: Adam Hadulla

Venlo, 21/01/2011

Annex 1

REFERENCES

- [PDD], Project Design Document; Version 07, dated 2009-08-06
- [IPCC], Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Reference Manual (Volume 3), Chapter Energy, 1.4.1 Unoxidized Carbon, Page 1.32, 1996, http://www.ipcc-nggip.iges.or.jp/public/gl/invs6a.htm
- [ACM0008], Approved consolidated baseline methodology ACM0008 – 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, version 03, EB28 http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html
- [AM_Tool_07], Methodological "Tool to determine project emissions from flaring gases containing methane", EB 28, Meeting report, Annex 13
- [SG-1; …; SG-156,] supporting evidence documents provided by the coal mine
- Final Determination Report for the project: JI0077 CMM utilisation on the coal mine Shcheglovskaya-Glubokaya of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass" Report No: 2008-1321 Rev 02, by DNV Det Norske Veritas, dated 2009-08-07
- The project is approved as JI-project since 08/12/2009 (http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verification/FinDet.html) Registration numbers UA2000015, JI0077
- Letter of Approval, Nr. M000015, issued on 2008-03-26 by the Ukraine (host party)
- Letter of Approval, Nr. 2008JI04, issued on 2008-04-22 by the Kingdom of the Netherlands (investor party)
- Determination and verification manual (version 01), undated http://ji.unfccc.int/Ref/Guida/index.html

Annex 2

Technical drawing

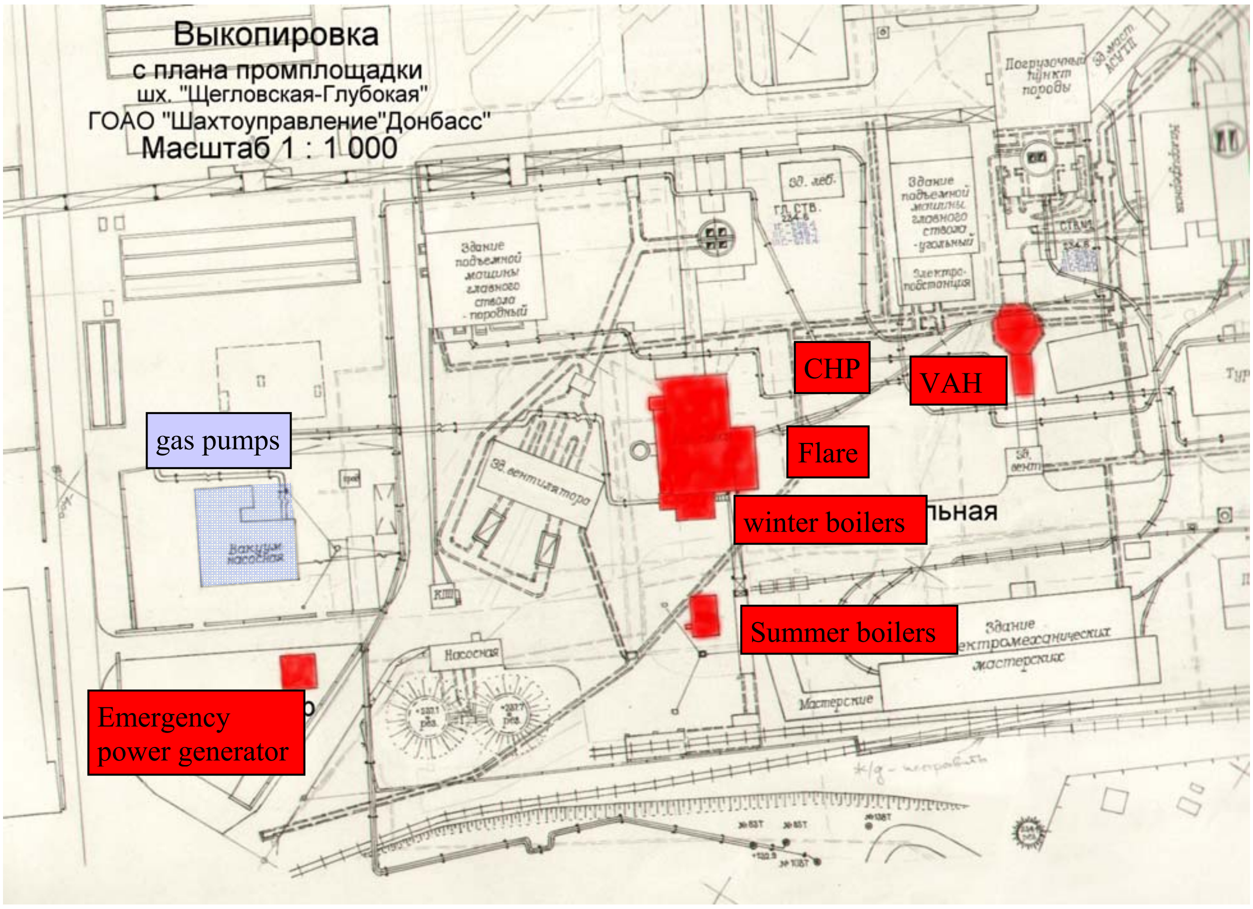


Figure-1 Installation scheme – Coal Mine Shcheglovskaya-Glubokaya

Annex 3

Energy and material flowchart including metering positions

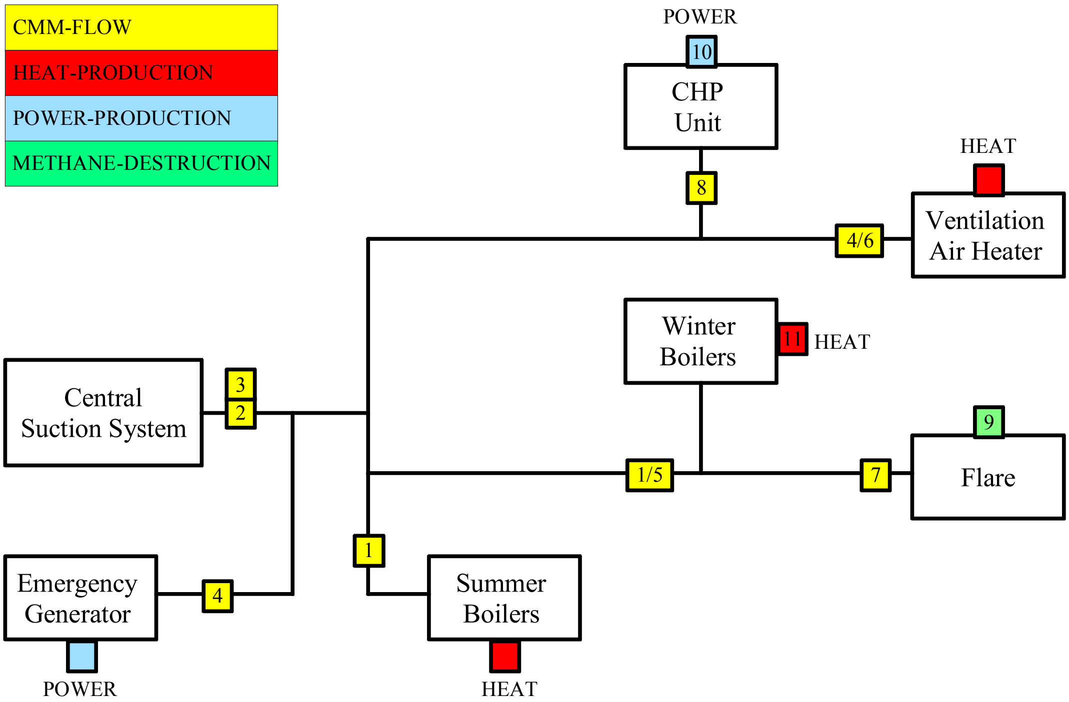


Figure -2 Installation scheme and positioning of the meters

The hand recorded measuring system (1) has been utilised rotationally on winter and summer boilers.

The hand recorded measuring system (4) has been utilised rotationally on VAH and Emergency Power Generator.

A3.1 Monitoring plan applied

The monitoring plan applied during the monitoring period provides mainly handwritten data. In the beginning of the monitoring period the data have been read manually from the electronic devices and hand written in Journals and Excel sheets. This method is the most common practice in Ukraine.

The flare and the cogeneration unit have been equipped with an adequate electronically monitoring system from beginning of the operation.
The electronic monitoring equipment for the winter boilers and the VAH has been installed first in October-December 2009 and put operation in February 2010 at the end of the monitoring period.

The summer boilers and the emergency power generator have not been equipped with an electronically monitoring system until the end of the monitoring period. Only hand written data are available.

A3.2 Monitoring procedures:

Method 1

The boiler data (temperatures, pressures etc.) are recorded manually in a 1 h cycle in a boiler operation journal. These boiler operation data are recorded for safety reasons and proper operation of the boiler. These journals are stored and the data are available for the monitoring period. In the same manner VAH data are recorded.

The monitoring system includes:

- Measurement of the gas speed in the main gas supply pipe
- Measurement of pressure and temperature of the gas and barometric pressure for flow correction
- CH_4 concentration

Two sets of measurement units have been installed, one for the winter boilers and summer boilers and one for the VAH and emergency power generator. The first system (1) has been utilised rotationally on summer and winter boilers. The second system (4) has been utilised rotationally on VAH in the winter period and the emergency power generator in the summer. The operation times are given in Tables 15 and 16.

Table-15 Operation intervals for CMM flow measuring System 1

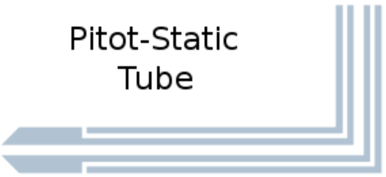
Date	System 1	
01/01/2008, 00:00 – 13/04/2008, 7:00	Winter Boiler	
13/04/2008, 13:00 – 07/10/2008, 7:00		Summer Boiler
07/10/2008, 13:00 – 20/04/2009, 7:00	Winter Boiler	
20/04/2009, 13:00 – 14/10/2009, 1:00		Summer Boiler
14/10/2009, 07:00 – 19/02/2010, 7:00	Winter Boiler	
Electronically system on winter boilers working since 24/02/2010, 0:00		

Table-16 Operation intervals for CMM flow measuring System 4

Date	System 4	
01/01/2008, 00:00 – 26/02/2008, 7:00	Ventilation Air Heater	
12/05/2008, 13:00 – 20/11/2008, 7:00		Emergency Power Generator
25/11/2008, 13:00 – 10/03/2009, 7:00	Ventilation Air Heater	
11/03/2009, 13:00 – 01/10/2009, 7:00		Emergency Power Generator
07/12/2009, 13:00 – 19/02/2010, 7:00	Ventilation Air Heater	
Electronically system on ventilation air heater working since 24/02/2010, 0:00		

All data concerning the CMM, which is fed into the boilers and the VAH are read manually from the electronic devices, but stored electronically in Excel sheets. The data are collected two times per shift (every 6 hours) by the shift personnel and recorded manually in a CMM journal. One time per week the hand written data in the CMM journal are checked by the heat technician of the coal mine and transferred into Excel sheets.

The gas flow is determined using a Pitot-Static Tube measuring dynamic gas pressure according to the Bernoulli Law.



In this tube the measured dynamic pressure, the pressure difference between the stagnation pressure and the static pressure, is proportional to the velocity of the gas.

$$V = \sqrt{\frac{2 * (p_t - p_s)}{\rho}}$$

With known diameter of the pipe the volume flow is given.

$$\dot{V} = v * \frac{d^2 * \pi}{4}$$

The flow is corrected to standard state conditions using measurements of gas pressure and temperature and the barometric pressure.

All needed formulae are included in the Excel sheets, so only raw data have to be transferred to the sheets.

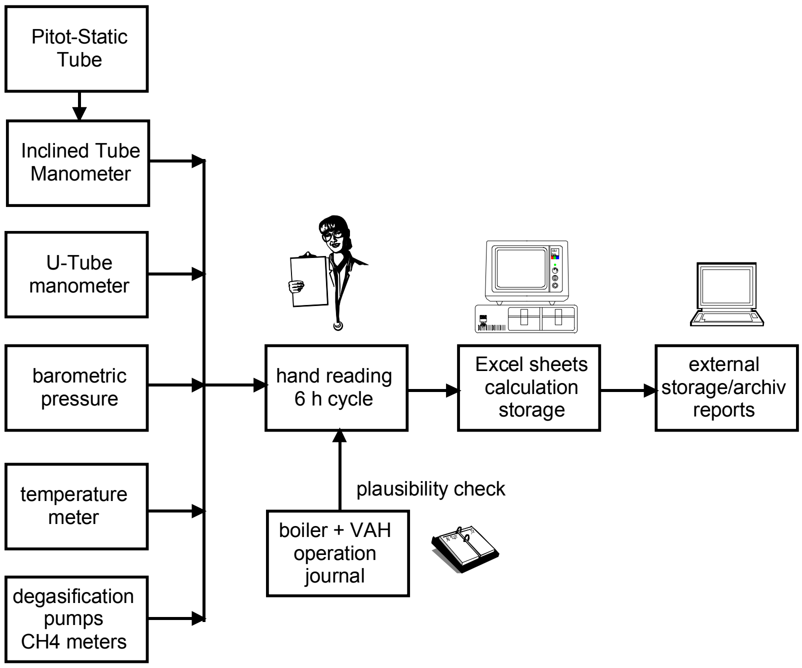


Figure-3 data flow scheme – Method 1

Method 2 - Electronically system

The flare and the cogeneration unit have been equipped with an adequate electronically monitoring system from the beginning. The monitoring plan applied during the monitoring period is according to the monitoring plan.
The winter boilers have been updated with an electronically system, which started operation at 24/02/2010. The summer boilers have been updated with an electronically system after the monitoring period.

Flare
The automatically system has started operation at 27/05/2009
The standard orifice for CMM flow measurement has been changed on 11/11/2009. An orifice with an bigger diameter has been built in.
In the period from 27/05/2009 to 20/07/2009 several system drop outs, bug-fixes and restarts led to missing data and some timestamp shifts in the electronically data.
In principle the electronically recorded data and hand written journal are matching each other and plausibility is given. Due to the numerous failures in the electronically system, the hand written data have been taken fro calculation of the methane amount utilised. Starting with 20/07/2009 the time stamps are in tune and no obvious differences can be found. Since then only electronically data are taken.

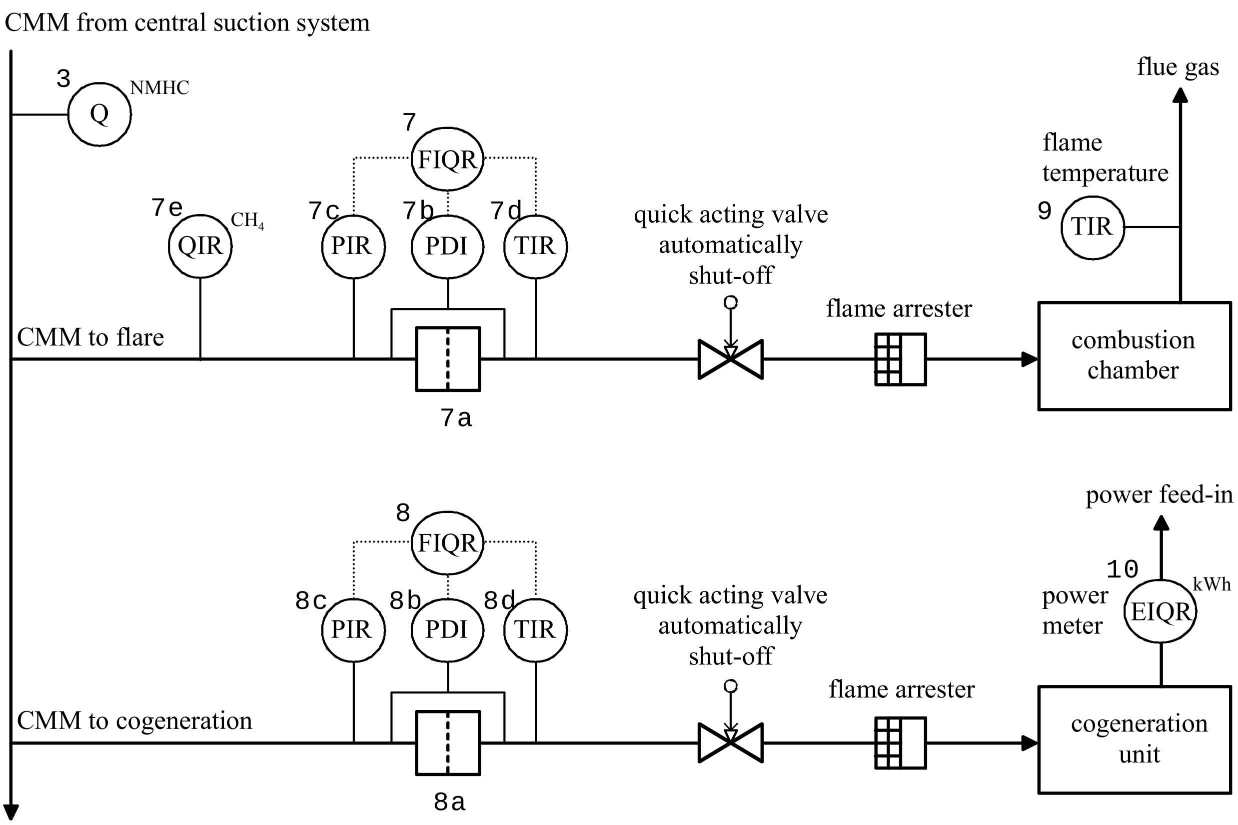


Figure -4 Installation scheme and positioning of the meters, flare and CHP

Cogeneration unit
The power amount of the emergency power generator has been counted from the beginning by a mechanical counter (NZR). In the beginning only few readings took place. While the counter counts continuously this doesn't matter for the total result, so only intermediate results are missing. Since

05/02/2010 daily counter readings are recorded in the journals. For the determination of the power amount produced the difference between the start value (30/10/2009) and the end value (07/04/2009) from the mechanical meter (NZR) has been taken.
The monthly intermediate values have been recalculated using the monthly CH_4 consumption and an average efficiency of power production of 34.21%. The efficiency has been determined using the produced power amount and the total CH_4 amount utilised in the cogeneration unit. These intermediate values are for information only.

$$Eff_{ELEC} = \frac{GEN}{\dot{V}_{CH4} \times HV_{CH4}}$$

with

Eff_{ELEC}	efficiency of power generation
GEN	electricity produced by the project [kWh]
V_{CH4}	methane amount utilised by the cogeneration unit [m³ at standard state conditions]
HV_{CH4}	heating value of methane [9.965 kWh/m³]; m³ at standard state conditions]

There is also an electronically power rating meter (KMU) built-in in the cogeneration engine. In the monitoring period this meter has not been recorded electronically, but has been recorded by the coal mine personnel in journals from 05/11/2009 to 21/01/2010.
The original power rating meter has been destroyed on 21/01/2010 and a new unit has been installed on 02/02/2010.

The own consumption of the cogeneration unit $CONS_{ELEC}$ has been calculated using an average own consumption of 3.5% of the produced power amount according to the PDD.

Emergency Power Cogeneration unit
The power amount of the emergency power generator has not been counted. The electricity production has been recalculated using the methane amount consummated by the unit and the power efficiency as given in the PDD.

$$GEN = \dot{V}_{CH4} \times Eff_{ELEC} \times HV_{CH4}$$

with

GEN	electricity produced by the project [kWh]
V_{CH4}	methane amount utilised by the cogeneration unit [m³] at standard state conditions
Eff_{ELEC}	efficiency of power generation; set to 36% as given in the PDD
HV_{CH4}	heating value of methane [9.965 kWh/m³]; m³ at standard state conditions

Heat generation

The heat meters shown in figure 5 were not in operation during the monitoring period. The heat amount has not been measured but calculated using the utilised CH_4 amount and the boiler efficiencies.

$$HEAT = (MD_{HEAT,WBOIL} \text{ x } Eff_{HEAT,WBOIL} + MD_{HEAT,SBoil} \text{ x } Eff_{HEAT,SBoil} + MD_{HEAT,VAH} \text{ x } Eff_{HEAT,VAH}) \text{ x } HV_{CH4}$$

with

HEAT	heat generated by the project [MWh]
$MD_{HEAT,WBoil}$	methane amount destroyed by winter boilers [t CH_4]
$Eff_{HEAT,WBoil}$	efficiency of heat production in winter boilers; set to 90.0%

$MD_{HEAT,SBoil}$	methane amount destroyed by summer boilers [t CH_4]
$Eff_{HEAT,SBoil}$	efficiency of heat production in summer boilers; set to 89%
$MD_{HEAT,VAH}$	methane amount destroyed by ventilation air heater [t CH_4]
$Eff_{HEAT,VAH}$	efficiency of heat production in ventilation air heater; set to 98.5%
HV_{CH4}	heating value of methane [9.965 kWh/m³]; m³ at standard state conditions

In the PDD a value of 96% for the upgraded winter boiler is given. This value seems to be too high, so that a reduced value of 90%, according to an efficiency determination performed by the coal mine together with Donbassvugleavtomatyka has been taken into account.

Measurement at other boilers at other coal mines have shown real efficiencies in the range of 65-80%, so that an additionally deduction of 15% have been taken into account.
The resulting values are 75% for the winter boilers and 74% for the summer boilers.

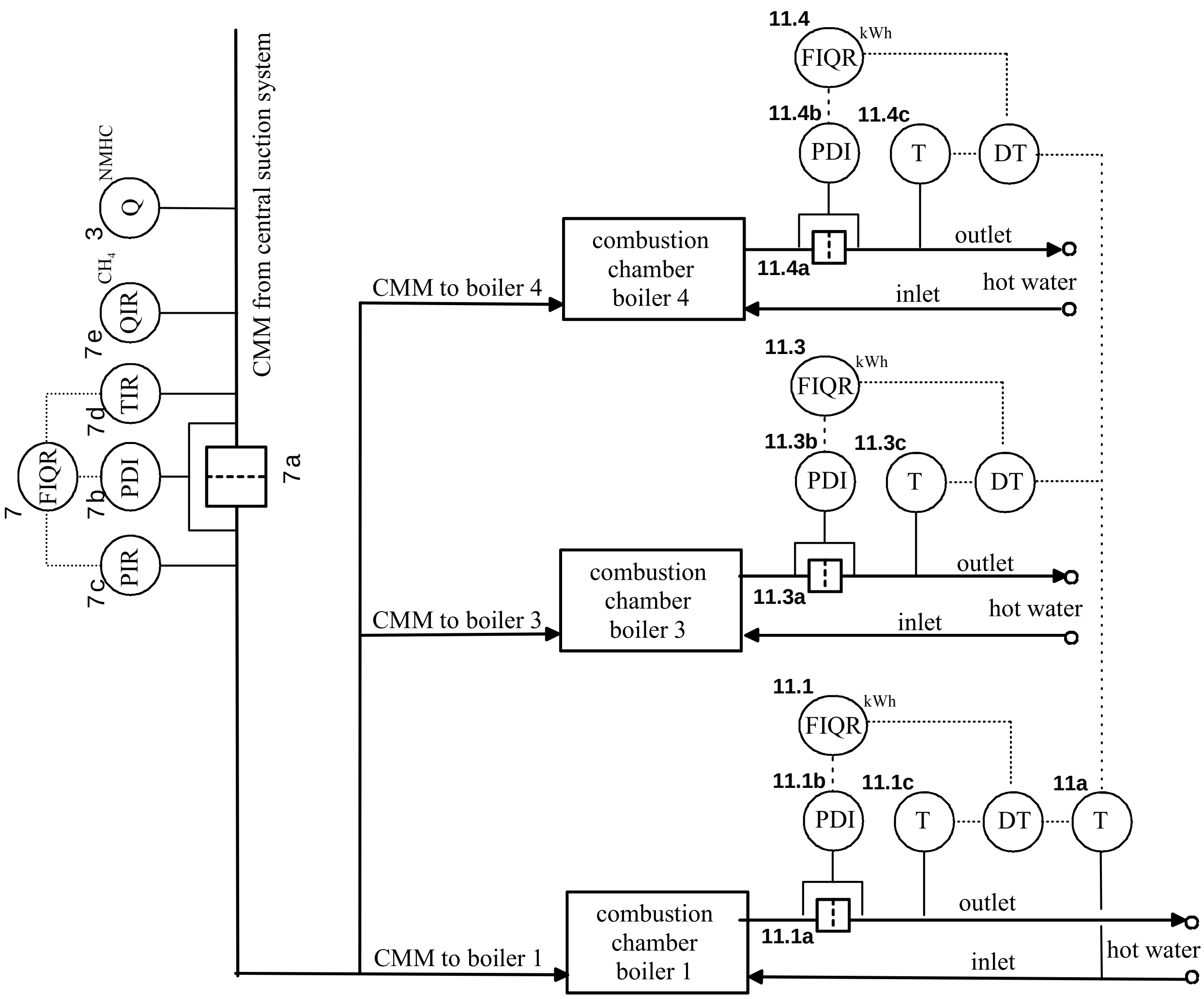


Figure -5 Installation scheme and positioning of the meters, winter boilers 1, 3 and 4

Annex 4

History of the Document

Version	Date	Nature of Revision
1	13 April 2010	Initial adoption. Published at the JISC website
2	12 August 2010	Revised version, after verification
3	18 August 2010	Revised version, after verification
4	25 November 2010	Revised version, after verification
5	28 December 2010	Revised version, after TÜV Süd CB review
6	10 January 2011	Revised version, after TÜV Süd CB review
7	21 January 2011	Revised version, after TÜV Süd CB review