MONITORING REPORT

JI0078 - CMM utilisation on the Coal Mine № 22 “Kommunarskaya” of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass“

Monitoring Report 04
Monitoring period
01/05/2012 to 31/12/2012

Version 4
08 April 2013

CONTENTS

Annexes

SECTION A. General project activity information

A.1 Title of the project activity:

CMM utilisation on the Coal Mine Nr.22 Kommunarskaya of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass“

Table - 1 Parties involved in the project

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)	PUBLIC JOINT STOCK COMPANY “COLLIERY GROUP “DONBAS” [1]	no

A.2. JI registration number:

UA2000013, JI0078

The project is approved as JI-project since 30/12/2009.
(http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verification/FinDet.html)

Details of the project approval can be found under Annex I of this Monitoring Report.

A.3. Short description of the project activity:

In this project CMM (coal mine methane), which has been sucked out of the active coal mine Coal Mine Nr.22 Kommunarskaya, has been utilised in flares, cogeneration units, boilers and a ventilation air heater. The methane has been burned to less harmful CO_2. The cogeneration units have generated power which has displaced conventionally produced power and gained an additional amount of CO_2 reductions.

In June 2012 Flare 2 has been shut down and has been moved off the site.

A second cogeneration unit has been installed in June 2012 and started production on 08/06/2012.

The ventilation air heater was working only for a short period of time from October 2012 till December 2012.

Table - 2 Amount of methane utilised for heat and power generation and flaring

Unit	Period	CH_4 [t/period]	Heat generated [MWh]	Power generated [MWh]
Flares	01/05/2012-31/12/2012	6,909	n.a.	n.a.

[1] The name of the project owner changed to PUBLIC JOINT STOCK COMPANY “COLLIERY GROUP “DONBAS”, see Annex 4 for justification

Boilers	01/05/2012-31/12/2012	739	5,327	n.a.
Ventilation air heater	01/05/2012-31/12/2012	135	1,845	n.a.
Cogeneration units	01/05/2012-31/12/2012	1,824	n.a.	9,757
Total	01/05/2012-31/12/2012	**9,606**	**7,173**	**9,757**

Values are taken from overall emission reduction table Excel-Spreadsheet “ER-K22-2012-05-01_to_2012-12-31.v2.xls”.

A.4. Monitoring period:

Start date 01/05/2012

End date 31/12/2012

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 with some project specific adjustments 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 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 guidelines, has been taken into account instead of the default value of 90% as given in the flaring tool.*

Applicability requirements for the monitoring plan of the ACM0008 methodology are identical to respective requirements of the baseline setting.

** The value 99.5% of combustion efficiency was determined during the determination of the project and has not changed since that time.*

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

The project installation has been implemented as described in the PDD. The second cogeneration has been installed instead of previously installed flare in June 2012. See A.9. for further details.

Table - 3 Status of Implementation

Unit: Flare 1	
Manufacturer: Pro2 Anlagentechnik GmbH	
Type: KGU 5/8	
Serial Number: 142301	
Capacity: 10 MW	
Efficiency methane destruction: 99.5%	
Combustion temperature: 850°C	
Activity	**Status**
Year of construction	2008
Last inspection	2009 – AS Wärmetechnik GmbH
Start of operation	18/12/2008

Unit: Flare 2	
Manufacturer: Pro2 Anlagentechnik GmbH	
Type: KGU 5/8	
Serial Number: 1256	
Capacity: 8 MW	
Efficiency methane destruction: 99.5%	
Combustion temperature: 850°C	
Activity	**Status**
Year of construction	2005
Last inspection	10/08/2010 – Eco Alliance
Start of operation	08/08/2010
End of operation	27/06/2012

Unit: Flare 3	
Manufacturer: Pro2 Anlagentechnik GmbH	
Type: KGU 5/8	
Serial Number: 142401	
Capacity: 10 MW	
Efficiency methane destruction: 99.5%	
Combustion temperature: 850°C	
Activity	**Status**
Year of construction	2008
Last inspection	2009 – AS Wärmetechnik GmbH
Start of operation	05/11/2010

Unit: cogeneration unit 1	
Manufacturer: Pro2 Anlagentechnik GmbH using a gas engine from Deutz AG	
Type: NC620K16	
Serial Number: CHP unit:143901; Gas engine: 69886800270	
Capacity: 3.750 MW firing, 1.35 MW_{el}, 0.93 MW_{th}	
Activity	**Status**
Year of construction	2004
Last major overhaul	June 2008
Last inspection	none
Start of operation	29/01/2009
Planned installation date [PDD]	01/2008

Unit: cogeneration unit 2	
Manufacturer: Pro2 Anlagentechnik GmbH using a gas engine from Deutz AG	
Type: NC620K16	
Serial Number: CHP unit:167001; Gas engine: 0130183/01	
Capacity: 3.750 MW firing, 1.35 MW_{el}, 0.93 MW_{th}	
Activity	**Status**
Year of construction	2001
Last major overhaul	March 2012
Last inspection	none
Start of operation	08/06/2012
Planned installation date [PDD]	01/2009

Unit: boilers, 5 identical units, previously coal fired steam boilers, upgraded to hot water production with CMM-burners	
Manufacturer: Monastyrishchenskiy Mashzavod named after 60-years of October	
Type:E-1,0-0,9	
Serial Numbers: Nr.1 - Serial (not visible, but stated in pass) 17998, Inventar (visible) 228648 Nr.2 - Serial 10364, Inventar 229444 Nr.3 - Inventar 229415 Nr.4 - Inventar 228576 Nr 5 - Inventar 228944	
Capacity: 5 x 1 GCal heat production	
Activity	**Status**
Year of construction	2008 - 228648 and 229444 2009 - 229415, 228576, 228944
Last major overhaul	none
Last inspection	none
Start of operation	October 2008 - 228648 and 229444 October 2009 - 29415, 228576, 228944
Planned installation date [PDD]	12/2007

The ventilation air heater consists of three modules, two modules of 1.0 MW and one module of 0.75 MW. The modular technology provides better regulation response of the heat production depending on the heat demand.

Unit: ventilation air heater	
Manufacturer: Kamensky Zavod	
Type: VGS 1,0	
Serial Numbers: 245969, 245970 two identical modules	
Capacity: 2 x 1.0 MW heat production 245969	
Activity	**Status**
Year of construction	2009
Last major overhaul	none
Last inspection	none
Start of operation	October 2009
Planned installation date [PDD]	01/2008

Unit: ventilation air heater	
Manufacturer: Promgazapparat	
Type: KRON - 6U	
Serial Numbesr: 246216	
Capacity: 1 x 0.75 MW heat production	
Activity	**Status**
Year of construction	2009
Last major overhaul	none
Last inspection	none
Start of operation	October 2009
Planned installation date [PDD]	01/2008

Table - 4 Implementation plan

unit	**Planned installation date (PDD)**	**firing capacity**	**Date of installation new timetable**	**realised firing capacity**
boiler No: 1 & 2	12/2007	2 x 3,150 kW 6,300 kW total	10/2008 – two units 10/2009 – three units	5 x 1,167 kW 5,835 kW total
flare No: 1	12/2007	5,000 kW	12/2008	10,000 kW
flare No: 2	-	-	08/2010-06/2012*	8,000 kW
flare No: 3	-	-	10/2010	10,000 kW
ventilation air heater	1/2008	3,000 kW	10/2009	2 x 1,000 kW 1 x 750 kW 2,750 kW total

cogeneration unit 1	1/2008	1,350 kWel	12/2008	1,350 kWel
cogeneration unit 2	1/2009	1,350 kWel	06/2012	1,350 kWel

*) Flare 2 has been removed in June 2012 and replaced with Cogeneration Unit 2

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 WGS84 coordinates are:

Main Shaft: 48°07'10'' N, 38°13'03'' E
Air Shaft: 48°06'58'' N, 38°16'05'' E

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

None.

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

A revised monitoring plan has been provided. See <Revised Monitoring Plan-K22.V6a.pdf>

A.8.1 Revisions to the monitoring plan occurred during current monitoring period

The value of the CO2 emission factor of fuel used for captive power or heat was changed. The reason for changing is update of the data source. Now for calculation of the factor the value of 25.99 t C/TJ for "Bituminous Coal" is used.
Proposed revision improve the accuracy and applicability of information collected compared to the original monitoring plan without changing conformity with the relevant rules and regulations for the establishment of monitoring plans and selected methodology ACM0008.

A.8.2 Revisions to the monitoring plan determined during previous verifications.

The calculation of the emission reductions is not calculated on a yearly basis, but for an individual period. See A.4. for detailed data.
Flow data and flare efficiency as well as the methane amount destroyed by flaring MD_{Fl} are calculated in 15 min. intervals in Excel sheets. The main emissions variables for project emissions, baseline emissions and emissions reductions are calculated on a monthly basis. Yearly sums and a total sum for the monitoring are calculated.
The formula for the calculation of project emissions from uncombusted methane has been updated. Formulae from the «Methodological "Tool to determine project emissions from flaring gases containing methane"» [AM_Tool_07]) have been applied, see Annex 4. The calculation of project emissions from uncombusted methane from flaring is now more accurate.
The heat amount produced by the ventilation air heater is not measured but calculated using the utilised methane amount.
Additionally monitoring procedures applied during the monitoring period are described in Annex 3.

New source for CO_2 emission factor of fuel used for captive power or heat was taken for more applicability as it was published by national authority. The factor is now calculated using the value for "Other Bituminous Coal" of 25.87 t C/TJ from "National Inventory Report of Anthropogenic Emissions from Sources and Absorption by Absorbers of Greenhouse Gases in Ukraine for 1990-2009" Baseline carbon emission factor for other bituminous coal approved in Ukraine.

A.9. Changes since last verification:

The Flare 2 which has been installed on 08/08/2010, has been shut down on 27/06/2012 and removed off the site. Second Cogeneration Unit has been installed on 06/2012 and is now using the methane which was previously utilised in Flare 2. The installation plan at the main shaft is now in tune with the PDD.

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

PJSC "COLLIERY GROUP "DONBAS"
- Viktor Ivanovich Orlov, Chief Engineer

Eco-Alliance
- Vladimir Kasyanov, Managing Director
- Pavel Shelegeda, Deputy Director
- Aleksandr Didenko, Monitoring Assistant
- Viktor Avtonomov, Monitoring Assistant

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 - 5 Monitoring equipment

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
1	CH_4 concentration	Infrared measurement	Pro2 Anlagentechnik GmbH using gas analysers from Emerson Process Management GmbH&Co. OHG	Pro2 SAS1 / BINOS 100	120482003016	0-100% CH_4	Continuous record period 15 min.	2008	1.5%	Yearly calibration made using procedures of Sumy standard metrologya. Calibrations made using procedures of Eco Alliance every 2 weeks.	02/12/2011	Sumy Standart-metrologya Eco-Alliance
2	NMHC concentration	lab analysis Gas-phase Chromatograph	Gazohrom	LHM-8MD	75	0-100%.	yearly	n. n.	2.5%	The approved laboratory is responsible for regular recalibrations of the system.	07/11/2011 19/12/2012	Donetskstandart metrologya
3	CMM amount to flare 1 (calculated with meters IDs: 4, 5, 6, 7, 8)	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	n.a.	n.a.	Continuous record period 15 min.	2008	calculation	none	n.a.	n.a.
4	Gas flow (flare 1)	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	Rings:361899 501871 (K22-F1)	0-2,500 m^3/h	Continuous record period 15 min.	2008 Disk changed on 11/11/2009	0.75 % DIN EN ISO 5167-T.1-4	Yearly calibration made using procedures of Sumy Standard metrologya.	27/12/2011 21/09/2012 passport to flow meter №501871 (K22-F1)	Sumy standart metrologya

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
5	Pressure difference (flare 1)	Pressure difference transmitter	Honeywell	ST3000	08W18 C30591540010 01	0-100 mbar	Continuous record period 15 min.	2008	0.25%	Yearly calibration made using procedures of Sumy Standard metrologya.	09/12/2011 certificate № 2352 13/09/2012 certificate № 1717	Sumy Standart Metrologya
6	Pressure (flare 1)	Pressure transmitter Dry ceramic sensor	Noeding	P121-E02-311	EX812126961	0-250 mbar, rel	Continuous record period 15 min.	2008	0.25%	Yearly calibration made using procedures of Sumy Standard metrologya.	29/12/2011 certificate № 2484 13/09/2012 certificate № 1719	Sumy Standart Metrologya
7	Temperature (flare 1)	Resistance thermometer	JUMO GmbH & Co. KG	Type 90.2002	98026/2	-50-250°C	Continuous record period 15 min.	2008	DIN EN 60 751, Class B 0.3+0.005T	Yearly calibration made using procedures of Sumy Standard metrologya.	29/12/2011	Sumy Standart Metrologya
8	Flame temperature, Flare 1	Thermo couple	Herth GmbH	DIN 43733 Type S, PtRh-Pt	76205 until 03/09/2012 81155	0-1,700°C	Continuous record period 15 min.	Sept. 2012	DIN 43733, Class 2 0°C - 600°C +/-1.5 K 600°C - 1600°C +/- 0.25%	Calibration made using procedures of manufacturer, according to DIN 43733. No recalibration, thermocouple is supposed to be changed at least one time per year, according to the flaring tool	none	Herth
9	CMM amount to cogeneration unit (calculated with meters IDs: 10, 11, 12, 13)	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	none	n.a.	Continuous record period 15 min.	2008	calculation	none	n.a.	n.a.

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
10	Gas flow (cogeneration unit)	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	Rings:364581 491973	0-1,200 m³/h	Continuous record period 15 min.	2008	0.57 % DIN EN ISO 5167-T.1-4	Yearly calibration made using procedures of Sumy Standard metrologya.	11/11/2011 21/09/2012 passport to flow meter № 491973	Sumy standart metrologya
11	Pressure difference (cogeneration unit)	Pressure difference transmitter	Honeywell	ST3000	08W30 C3088100001001	0-100 mbar	Continuous record period 15 min.	2008	0.25%	Yearly calibration made using procedures of Sumy Standard metrologya.	11/10/2011 certificate № 2179 13/09/2012 certificate № 1716	Sumy Standart Metrologya
12	Pressure (cogeneration unit)	Pressure transmitter Dry ceramic sensor	Noeding	P121-E02-311	EX812127126	0-250 mbar	Continuous record period 15 min.	2008	0.25%	Yearly calibration made using procedures of Sumy Standard metrologya.	11/10/2011 certificate № 2178 13/09/2012 certificate № 1718	Sumy Standart Metrologya
13	Temperature (cogeneration unit)	Resistance thermometer	JUMO GmbH & Co. KG	Type 90.2002	TN005115988 01264830010 0837003 (98026 for calibration)	-40-120°C	Continuous record period 15 min.	2008	DIN EN 60 751, Class B 0.3+0.005T	Yearly calibration made using procedures of Sumy Standard metrologya.	11/10/2011 11/09/2012 passport to Resistance thermometer № 98026	Sumy Standart Metrologya
14	Power production	Electricity meter	Actaris	SL7000 Type – SL761C07	53026020	n.a	Continuous, cumulative value Read period monthly	2009	0.5%	Initial calibration made by manufacturer. Calibration is spent 1 time in 6 years	03/2009 passport to Electricity meter	Manufacturer

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
14a	Power production	Electronical load counter	DEIF	PPU	103461 G 203450000B	n.a.	Continuous, cumulative value	2008	1%	Initial calibration made using procedures of manufacturer. Further calibration isn't needed as this measurement equipment is used for internal (technical) register.	Initial calibration by manufacturer.	Manufacturer
15	CMM amount to flare 3 (calculated with meters IDs: 16, 17, 18, 19, 20, 21)	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	none	n.a.	Continuous record period 15 min.	29/10/2010		Calculation	None	none
16	Gas flow (flare 3)	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	501871 (SG-F1)	0-2,500 m³/h	Continuous record period 15 min.	29/10/2010	0.75% DIN EN ISO 5167-T.1-4	Yearly calibration made using procedures of Sumy Standard metrologya.	03/10/2011 23/10/2012 passport to flow meter № 501871 (SG-F1)	Sumy Standart Metrologya
17	Pressure difference (flare 3)	Pressure difference transmitter	Honeywell	STD-3000	08W18 C3059154001003	0-100 mbar	Continuous record period 15 min.	29/10/2010	0.25%	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumy standard metrologya. Calibration frequency – 1 year.	30/11/2011 certificate № 2501 28/09/2012 certificate № 1807	Sumystandart-metrologya

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
18	Pressure (flare 3)	Pressure transmitter	Noeding	P121-E02-311	EX812126966	0-250 mbar, rel	Continuous record period 15 min.	29/10/2010	0.25%	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumy standard metrologya. Calibration frequency – 1 year.	30/11/2011 certificate № 2502 28/09/2012 certificate № 1820	Sumystandart-metrologya
19	Temperature (flare 3)	Resistance thermometer	JUMO GmbH	dTRANS TO1 Typ 90.2820/10	4571/1	-50-250°C	Continuous record period 15 min.	29/10/2010	DIN EN 60 751, Class B 0.3+0.005T	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumy standard metrologya. Calibration frequency – 1 year.	30/11/2011 23/10/2012 passport to Resistance thermome-ter № 4571/1	Sumystandart-metrologya
20	CH_4 concentration (flare 3)	Infrared meter	Pro 2 Anlagen-technik GmbH	BINOS 100	120482003017	0-100% CH_4	Continuous record period 15 min.	29/10/2010	1.5%	Yearly calibration made using procedures of Sumy standard metrologya. Calibrations made using procedures of Eco Alliance every 2 weeks.	02/12/2011 10/12/2012 passport to gasanalizer № 120482003 017	Eco-Alliance Sumystandart-metrologya

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
21	Flame temperature, flare 3	Thermo couple	Herth GmbH	DIN 43733, Type S, PtRh-Pt	76538 until 30/07/2012 81154	0-1,700°C	Continuous record period 15 min.	Aug. 2011 Jul. 2012	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	none	Herth
22	CMM amount to flare 2 (calculated with meters IDs: 23, 24, 25, 26, 27, 28)	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	none	n.a.	Continuous record period 15 min.	08/2010		Calculation	none	none
23	Gas flow (flare 2)	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	486343	0-2,500 m³/h	Continuous record period 15 min.	13/11/2009	0.75% DIN EN ISO 5167-T.1-4	Yearly calibration made using procedures of Sumy standard metrologya.	18/10/2011 passport to flow meter № 486343	Sumy Standart Metrologya
24	Pressure difference (flare 2)	Pressure difference transmitter	Honeywell	STD-3000	0609 C2801413001001	0-100 mbar	Continuous record period 15 min.	03/2009	0.25%	Yearly calibration made using procedures of Sumy standard metrologya.	18/10/2011 certificate № 2005	Sumy Standart Metrologya
25	Pressure (flare 2)	Pressure transmitter	Noeding	P 121-EB4-311	Ex612124593	0-250 mbar, rel	Continuous record period 15 min.	03/2009	0.25%	Yearly calibration made using procedures of Sumy standard metrologya.	18/10/2011 certificate № 2006	Sumy Standart Metrologya
26	Temperature (flare 2)	Resistance thermometer	JUMO GmbH	dTRANS TO1 Typ 90.2820/10	4571	-50-150°C	Continuous record period 15 min.	03/2009	DIN EN 60 751, Class B 0.3+0.005T	Yearly calibration made using procedures of Sumy standard metrologya.	18/10/2011	Sumy Standart Metrologya

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
27	CH_4 concentration (flare 2)	Infrared meter	Pro 2 Anlagen-technik GmbH	BINOS 100	49939003	0-100% CH_4	Continuous record period 15 min.	03/2009	1.5%	Yearly calibration made using procedures of Sumy standard metrologya. Calibrations made using procedures of Eco Alliance every 2 weeks.	19/12/2011 passport to gasanalizer № 49939003	Sumy Standart Metrologya Eco-Alliance
28	Flame temperature, flare 2	Thermo couple	Herth GmbH	DIN 43733, Type S, PtRh-Pt	77056	0-1,700°C	Continuous record period 15 min.	Oct. 2011	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	n.a.	Herth
29	CMM amount to boilers (calculated with meters IDs: 30, 31, 32, 33)	Standard orifice and pressure difference meter	ECO-Alliance	calculation	none		Continuous record period 15 min.	05/2010	n.a.	Calculation	n.a	n.a.
30	Gas flow (boilers)	Standard orifice	PRPE "Energoteh"	Annular chamber standard orifice DIN 19205	40	0-2,000 m^3/h,	Continuous record period 15 min.	05/2010	none	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumy standard metrologya. Calibration frequency – 1 year.	17/04/2012 passport to flow meter № 40	PRPE "Energoteh" Sumy standard metrologya.

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
31	Pressure difference (boilers)	Pressure difference transmitter	Siemens	SITRANS P DS III	N1-AO11-9174903	0-60 mbar	Continuous record period 15 min.	04/2011	0.0375 %	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 certificate № 676	Sumy standard metrologya.
32	Pressure (boilers)	Pressure transmitter	Noeding	P 121 E02-311	Ex812127127	0-250 mbar rel	Continuous record period 15 min.	05/2010	0.25%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 certificate № 680	Sumy standard metrologya.
33	Temperature (boilers)	Resistance thermometer	AOZT «TERA»	TSP U 1-3	09453	-50-250°C	Continuous record period 15 min.	05/2010	0.5%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 passport to Resistance thermometer № 09453	AOZT «TERA» Sumy standard metrologya.
34	Heat production boilers	Calculation	ECO-Alliance	none	none	n.a.	Continuous record period 15 min.	11/2010	none	calculation	n.a.	n.a.

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
35	Hot water flow (boilers)	Standard orifice	PRPE "Energoteh"	Annular chamber standard orifice DIN 19205	41	46,42-250 m^3/h	Continuous record period 15 min.	11/2010	none	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	17/04/2012 passport to flow meter № 41	"Energoteh" Sumystandart-metrologya
36	Pressure of hot water (the - chamber)	Pressure difference transmitter	Siemens	SITRANS P Serie Z 7MF1564	AZB/XD188388	0-10 bar abs	Continuous record period 15 min.	11/2010	0.25%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 certificate № 677	Siemens Sumystandart-metrologya
37	Pressure of hot water (the + chamber)	Pressure transmitter	Siemens	SITRANS P Serie Z 7MF1564	AZB/XD188387	0-10 bar abs	Continuous record period 15 min.	11/2010	0.25%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 certificate № 678	Siemens Sumystandart-metrologya

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
38	Temperature on an input (boilers)	Resistance thermometer	AOZT «TERA»	TSP U 1-3	09454	-50-250°C	Continuous record period 15 min.	11/2010	0.5%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 passport to Resistance thermometer № 09454	AOZT «TERA» Sumystandart-metrologya
39	Temperature of hot water	Resistance thermometer	AOZT «TERA»	TSP U 1-3	09439	-50-250°C	Continuous record period 15 min.	11/2010	0.5%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 passport to Resistance thermometer № 09439	AOZT «TERA» Sumystandart-metrologya
40	CMM amount to VAH (calculated with meters IDs: 41, 42, 43, 44)	Standard orifice and pressure difference meter	ECO-Alliance	none	none	n.a.	Continuous record period 15 min.	05/2010	none	calculation	n.a.	n.a.
41	Gas flow (VAH)	Standard orifice	PRPE "Energoteh"	Annular chamber standard orifice DIN 19205	39	0-800 m^3/h	Continuous record period 15 min.	05/2010	none	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	17/04/2012 passport to flow meter № 39	"Energoteh" Sumystandart-metrologya

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
42	Pressure difference (VAH)	Pressure difference transmitter	Siemens	SITRANS P DS III	N1-AO11-9174904	0-60 mBar	Continuous record period 15 min.	04/2011	0.0375 %	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 certificate № 671	Siemens Sumy standard metrologya.
43	Pressure (VAH)	Pressure transmitter	Noeding	P 121 EE5-311	Ex812126972	-500-250 mBar, rel	Continuous record period 15 min.	04/2011	0.25%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 certificate № 679	Noeding Sumystandart-metrologya
44	Temperature (VAH)	Resistance thermometer	AOZT «TERA»	TSP U 1-3	09441	-50-250°C	Continuous record period 15 min.	05/2010	0.5%	Initial calibration made using procedures of manufacturer. Further calibrations made using procedures of Sumystandart-metrologya. Calibration frequency – 1 year.	11/04/2012 passport to Resistance thermometer № 09441	AOZT «TERA» Sumystandart-metrologya
45	CMM amount to cogeneration unit 2 (calculated with meters IDs: 46, 47, 48, 49)	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	none	n.a.	Continuous record period 15 min.	2012	calculation	none	n.a.	n.a.

ID	Data	Method	Manufacturer	Classification	Serial number	Range	Frequency of Measurement	Installation	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
46	Gas flow (cogeneration unit)	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	486343	0-1,200 m^3/h	Continuous record period 15 min.	June 2012	0.57 % DIN EN ISO 5167-T.1-4	Yearly calibration made using procedures of manufacturer. Calibration frequency – 1 year.	By manufacturer	Himpe AG
47	Pressure difference (cogeneration unit)	Pressure difference transmitter	Honeywell	ST3000	8716-00698798004	0-400 mbar	Continuous record period 15 min.	June 2012	0.25%	Yearly calibration made using procedures of manufacturer. Calibration frequency – 1 year.	By manufacturer	Honeywell
48	Pressure (cogeneration unit)	Pressure transmitter Dry ceramic sensor	Noeding	P121-EE5-311	EX812127135	0-250 mbar	Continuous record period 15 min.	June 2012	0.25%	Yearly calibration made using procedures of manufacturer. Calibration frequency – 1 year.	By manufacturer	Noeding
49	Temperature (cogeneration unit)	Resistance thermometer	JUMO GmbH & Co. KG	Type 90.2002	12/11	-40-120°C	Continuous record period 15 min.	June 2012	DIN EN 60 751, Class B 0.3+0.005T	Yearly calibration made using procedures of manufacturer. Calibration frequency – 1 year.	By manufacturer	Jumo
50	Power production	Electricity meter	Landis & Gyr	ZMB210DR58	67 460 277	n.a	Continuous, cumulative value	June 2012	0.5%	Initial calibration made by manufacturer.	By manufacturer	Manufacturer
51	Power production	Electronical load counter	DEIF	AGC	500040675.10	n.a.	Continuous, cumulative value	June 2012	1%	Initial calibration made by manufacturer. Further calibration isn't needed as this measurement equipment is used for internal (technical) register.	By manufacturer	Manufacturer

For some meters the calibration was made not exactly on date as per calibration frequency mentioned in the table because of delays in the work of calibration organization.

B.1.3. Involvement of Third Parties:

- The lab analysis for the determination of the NMHC concentration has been done by MAKNII
- The gas chromatograph for NMHC analysis has been calibrated by Donetskstandartmetrologya
- Initial calibrations have been provided by the manufacturers, further calibrations have been done by Sumystandartmetrologya.
- Regular calibration of CH_4-concentration has been done by Eco Alliance
- Eco-Alliance supported the coal mine with the collecting of the monitoring data.
- Carbon-TF B.V. 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 dioxide emission factor of $CONS_{ELEC,PJ}$	National Environmental Investment Agency of Ukraine, NEIA	tCO_{2eq}/MWh	Official Ukrainian data have been published on12/05/2011 at the NEIA website. According to the information given in the PDD these data are taken into account. Set to: 1.063 t CO_2 / MWh for 2012. Value for thermal power plants which are connected to the Ukrainian Power grid. [NEIA]
P13 Eff_{FL}	Flare combustion efficiency	monitored data, revised monitoring plan	%	Set to: 99.5 % for: $T_{Flame} > 850°C$ [PDD, ACM0008/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	%	set at 99.5% (IPCC)
P19 Eff_{HEAT}	Efficiency of methane destruction / oxidation in heat plant	ACM0008 / IPCC	%	set at 99.5% (IPCC)
P23, B19 CEF_{CH4}	Carbon dioxide emission factor for combusted methane	ACM0008 / IPCC	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	t CO_2eq/t CH_4	set at 21

B55 EF_{HEAT}	CO_2 emission factor of fuel used for captive power or heat	National Inventory Report of Anthropogenic Emissions from Sources and Absorption by Absorbers of Greenhouse Gases in Ukraine for 1990-2010	tCO_2/MWh	set to 0.3298 tCO_2/MWh Using the value for "Bituminous Coal" of 25.99 t C/TJ, [NEIA-2]
B57 Eff_{COAL}	Energy efficiency of previously coal fired heat plant	Technical report	%	86 % upgraded boiler (measured value)
Eff_{VAH}	Efficiency of the heat generation by ventilation air heater	Technical report	%	Set to 74.2% (measured value)
HV_{CH4}	Heating value of methane	DIN EN ISO 6976	kWh/m³ MWh/kg	set to 9.965 kWh/m³ equal to 13.899 MWh/kg

B.2.2. List of variables:

Table - 7 List of variables

ID number	Data variable	Source of data	Data unit	Comment
P1 PE	Project emissions	monitored data	tCO_{2eq}	calculated using formula (1) from the revised Monitoring Plan
P2 PE_{ME}	Project emissions from energy use to capture and use methane	monitored data	tCO_{2eq}	calculated using formula (2) from the revised Monitoring Plan
P3 PE_{MD}	Project emissions from methane destroyed	monitored data	tCO_{2eq}	calculated using formula (3) from the revised Monitoring Plan
P4 PE_{UM}	Project emissions from uncombusted methane	monitored data	tCO_{2eq}	calculated using formula (9) from the revised Monitoring Plan
P5 $CONS_{ELEC,PJ}$	Additional electricity consumption by project	power meter	MWh	measured
P11 MD_{FL}	Methane destroyed by flaring	monitored data	t CH_4	calculated using formula (5) from the revised Monitoring Plan
P12 MM_{FL}	Methane sent to flare	flow meter	t CH_4	measured
PE_{Flare}	Project emissions from flaring	monitored data	t CO_{2eq}	calculated using formula (9a) from the revised Monitoring Plan
T_{Flame}	Flame temperature of the flare	thermo couple	°C	measured
P14 MD_{ELEC}	Methane destroyed by power generation	monitored data	t CH_4	calculated using formula (6) from the revised Monitoring Plan
P15 MM_{ELEC}	Methane sent to power plant	flow meter	t CH_4	measured

P17 MD_{HEAT}	Methane destroyed by heat generation	monitored data	t CH_4	calculated using formula (7) from the revised Monitoring Plan
P18 MM_{HEAT}	Methane sent to heat generation	monitored data	t CH_4	calculated using formula (7a) from the revised Monitoring Plan
MM_{Boiler}	Methane sent to boilers	flow meter	t CH_4	measured
MM_{VAH}	Methane sent to ventilation air heater	flow meter	t CH_4	measured
P24 CEF_{NMHC}	Carbon dioxide emission factor for combusted non methane hydrocarbons (various)	lab analysis	t CO_2/t_{NMHC}	Calculated if applicable
P25 PC_{CH4}	Concentration of methane in extracted gas	IR measurement	%	measured
P26 PC_{NMHC}	NMHC concentration in coal mine gas	lab analysis	%	Used to check if more than 1% of emissions and to calculate r, if applicable
P27 r	Relative proportion of NMHC compared to methane	lab analysis	%	Calculated if applicable, based on the lab analysis.
B1 BE	Baseline emissions	monitored data	t CO_{2eq}	calculated using formula (10) from the revised Monitoring Plan
B3 BE_{MR}	Baseline emissions from release of methane into the atmosphere that is avoided by the project activity	monitored data	t CO_{2eq}	calculated using formula (14) from the revised Monitoring Plan
B4 BE_{Use}	Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity	monitored data	t CO_{2eq}	calculated using formula (24) from the revised Monitoring Plan
B14 CMM_{PJ}	CMM captured and destroyed in the project activity	monitored data	t CH_4	calculated using formula (14a) from the revised Monitoring Plan
B46 GEN	electricity generation by project	power meter	MWh	measured
B47 HEAT	Heat generation by project	monitored data	MWh	calculated using formula (25) from the revised Monitoring Plan
$HEAT_{Boiler}$	Heat generation by boilers	heat meter	MWh	measured
$HEAT_{VAH}$	Heat generation by Ventilation Air Heater	monitored data	MWh	calculated using formula (26) from the revised Monitoring Plan

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	Sum of three flow meters

P15 MM_{ELEC}	Methane sent to power plant	flow meter	t CH_4	measured
P18 MM_{HEAT}	Methane sent to heat generation	monitored data	t CH_4	calculated using formula (7a) from the revised Monitoring Plan
P25 PC_{CH4}	Concentration of methane in extracted gas	IR measurement	%	measured
P26 PC_{NMHC}	NMHC concentration in coal mine gas	lab analysis	%	Used to check if more than 1% of emissions and to calculate r.

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}	CMM captured and destroyed in the project activity	Sum of flow meters	t CH_4	sum of boilers, VAH, flare and cogeneration
B47 HEAT	Heat generation by project	monitored data	MWh	sum of heat generated by boiler + VAH
B46 GEN	electricity generation by project	monitored data	MWh	measured

B.2.5. Data concerning leakage

Not applicable.

B.2.6. Data concerning environmental impacts

PJSC “COLLIERY GROUP “DONBAS” is the owner of two coal mines, coal mine Shcheglovskaya-Glubokaya and Coal Mine Nr 22 Kommunarskaya. PJSC “COLLIERY GROUP “DONBAS started works on reducing greenhouse gas emissions already in 2006. As first pilot CMM utilisation two previously coal fired boilers at the coal mine Shcheglovskaya-Glubokaya have been upgraded with CMM burning systems. This early action has been verified as Greening AAU’s. In the second phase further CMM utilisation units followed and the second JI project at Coal Mine Nr 22 Kommunarskaya was initiated. At the time nearly all of the CMM from the suction system of both coal mines is utilised and no longer blown into atmosphere.

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

Three 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. Eco-Alliance ensures regular back up’s and archiving. 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. 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.

The CMM flow to the cogeneration unit is not registered by the PLC of the unit. The data are recorded by a DAVID System (Data acquisition and visualisation device) developed by the Fraunhofer Institute UMSICHT. The data are stored in the internal memory of the DAVID. One time per day the data are recalled via GPS to the central data base at the Fraunhofer Institute and are available via an internet front end. The server provider ensures regular backups and archiving.

For plausibility checks and potential data backup, 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:

None.

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 PJSC “COLLIERY GROUP “DONBAS”, the Holding Company of the Coal Mine Nr.22 Kommunarskaya, 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. The operation and maintenance of the plant is provided by Eco Alliance.
The monitoring system is supervised by the administration of the coal mine under the existing control and reporting system. The general supervision of the electronically monitoring system is executed by Carbon-TF.

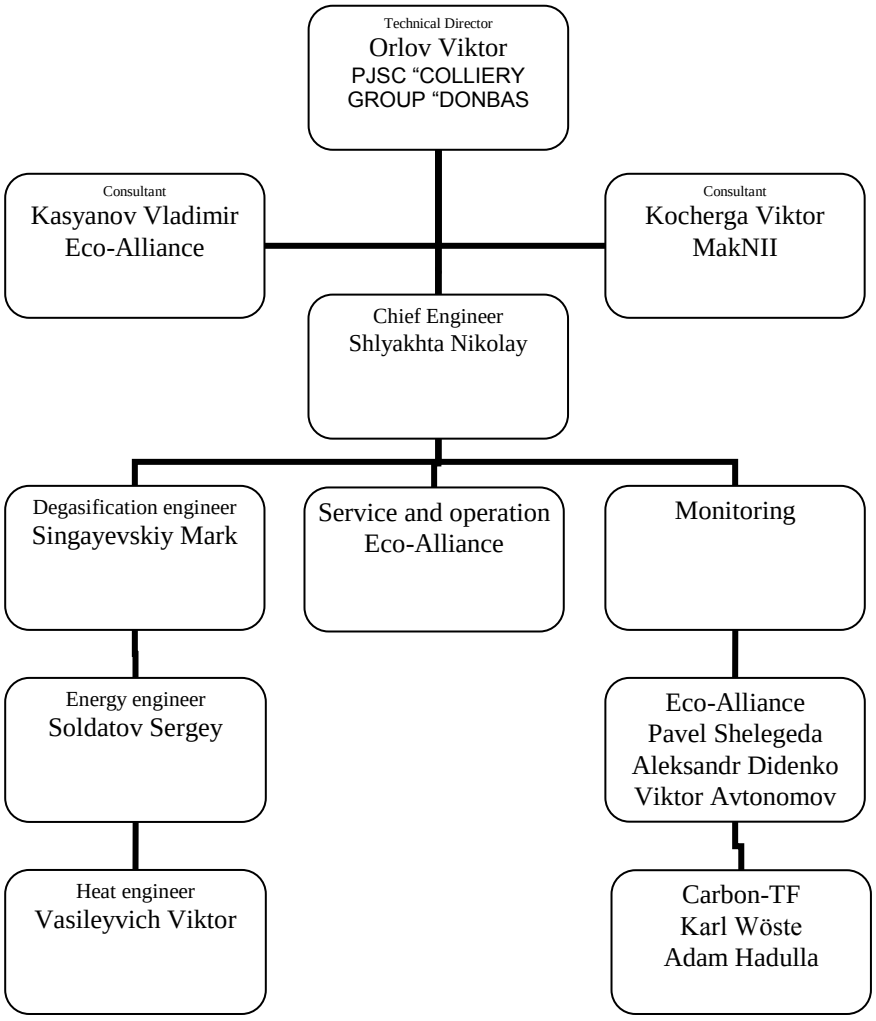

Figure 1 – Organigram

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.

During current monitoring period no new personnel were employed so no new training was conducted.

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.
- Sumystandardmetrologya has been involved for the regular calibrations and service of the monitoring devices

C.3. Internal audits and control measures:

Methane concentration and CMM flow data of the flares are compared with the indication of the meters from the vacuum pump station for plausibility. The coal mine personnel have been instructed by Eco-Alliance.

QM procedure:
- Electronic data are stored at Eco-Alliance and Carbon-TF.
- Back-ups are made regularly by staff of Eco-Alliance and Carbon-TF.
- A monitoring engineer from Eco-Alliance checks the data from web-site every day and makes internal weekly reports.
- Monitoring engineer from Eco Alliance prepares monthly reports which are checked by Carbon-TF B.V.
- Carbon-TF prepares the monitoring report, which is checked by Eco-Alliance and the coal mine.
- Additionally data are recorded manually in journals by the coal mine personnel
- The journals are checked daily by the chief heat technician and cross-checked monthly by monitoring engineer from Eco Alliance
- The paper data are stored at the coal mine.
- Every 2 weeks a monitoring engineer from Eco-Alliance makes audits and remarks this in the operation journal.
- The mechanic on duty from the coal mine makes daily audits.
- Eco-Alliance makes service audits every month.

C.4. Troubleshooting procedures:

The general troubleshooting for the boilers and the VAH are available at the coal mine. The coal mine personnel are instructed to follow the procedures. In case of disturbance the gas supply to the boilers and the ventilation air heater are shut down by a quick acting valve and the CMM supplied by the degasification system of the coal mine is blown to the atmosphere. The flares and the cogeneration unit are is also automatically shut down in case of faults.

SECTION D. Calculation of GHG emission reductions

D.1. Table providing the formulas used:

Table - 10 Formulae used taken from the revised Monitoring Plan

ID number	Data variable	Nr.	Formula
P1 PE	Project emissions	(1)	$PE = PE_{ME} + PE_{MD} + PE_{UM}$
P2 PE_{ME}	Project emissions from energy use to capture and use methane	(2)	$PE_{ME} = CONS_{ELEC,PJ} \times CEF_{ELEC,PJ}$
P3 PE_{MD}	Project emissions from methane destroyed	(3)	$PE_{MD} = (MD_{FL} + MD_{ELEC} + MD_{HEAT}) \times (CEF_{CH4} + r \times CEF_{NMHC})$
P4 PE_{UM}	Project emissions from uncombusted methane	(9)	$PE_{UM} = GWP_{CH4} \times [MM_{ELEC} \times (1 - Eff_{ELEC}) + MM_{HEAT} \times (1 - Eff_{HEAT})] + PE_{Flare}$
PE_{Flare}	Project emissions from flaring	(9a)	$PE_{Flare} = (MM_{FI} - MD_{FI}) \times GWP_{CH4}$
P11 MD_{FL}	Methane destroyed by flaring	(5)	$MD_{FL} = \sum_{i=1}^{n} MM_{FL,i} x \eta_{flare,i}$
P14 MD_{ELEC}	Methane destroyed by power generation	(6)	$MD_{ELEC} = MM_{ELEC} \times Eff_{ELEC}$
P17 MD_{HEAT}	Methane destroyed by heat generation	(7)	$MD_{HEAT} = MM_{HEAT} \times Eff_{HEAT}$
P18 MM_{HEAT}	Methane sent to heat generation	(7a)	$MM_{HEAT} = MM_{Boiler} + MM_{VAH}$
P27 r	Relative proportion of NMHC compared to methane	(4)	$r = PC_{NMHC} / PC_{CH4}$
B1 BE	Baseline emissions	(10)	$BE = BE_{MR} + BE_{Use}$
B3 BE_{MR}	Baseline emissions from release of methane into the atmosphere that is avoided by the project activity	(14)	$BE_{MR} = CMM_{PJ} \times GWP_{CH4}$
B4 BE_{Use}	Baseline emissions from the production of power, heat or supply to gas grid replaced by the project activity	(24)	$BE_{Use} = GEN \times EF_{ELEC} + (HEAT / Eff_{COAL}) \times EF_{HEAT}$
B14 CMM_{PJ}	CMM captured in the project activity	(14a)	$CMM_{PJ} = MM_{FL} + MM_{ELEC} + MM_{HEAT}$
B47 HEAT	Heat generation by project	(25)	$HEAT = HEAT_{Boiler} + HEAT_{VAH}$
$HEAT_{VAH}$	Heat generation by VAH	(26)	$HEAT_{VAH} = (MD_{VAH} \times Eff_{VAH}) \times HV_{CH4}$
ER	Emission reductions	(18)	$ER = BE - PE$

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

Some minor errors which have been identified in hand written operation journals have been corrected. Mistakes were made during the writing the data from the monitor into journals.

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

The tables below provide yearly values. Monthly values are calculated and can be verified in the Excel-Spreadsheet "ER-K22-2012-05-01_to_2012-12-31.v2.xls".

D.3.1. Comparison:

Period	**Prospected emission reductions, PDD [t CO_{2eq}]**		**Monitored emission reductions [t CO_{2eq}]**	
	Full year	Proportionally for the monitoring period	in tonnes and percentage of prospected emissions	
01/05/2012-31/12/2012	177,767 (2012)	118,511	183,838	155.2%

The monitored values are higher than the prospected values in 2012 because of the steady operation of installed additional flare and increasing of methane amount at the air shaft of the coal mine.

D.3.2 Monitored project emissions

Monitored project emissions [t CO2eq]	
period	01/05/2012-31/12/2012
methane destruction	
flaring	22,855
heat generation	2,482
power generation	5,182
additional power consumption	
power generation	342
Total	**30,861**

D.3.3 Monitored baseline emissions

Monitored baseline emissions [t CO_2eq]	
period	01/05/2012-31/12/2012
flaring	145,085
heat generation	18,347

power generation	38,296
production of heat that is displaced by the project	2,599
production of power that is displaced by the project	10,372
Total	**214,699**

D.3.4 Project emissions, baseline emissions and resulting emission reductions

Project emissions and emission reductions during the 4th monitoring period				
period	Monitored project emissions (tonnes of CO2 equivalent)	Monitored leakage (tonnes of CO2 equivalent	Monitored baseline emissions (tonnes of CO2 equivalent)	Monitored emissions reductions (tonnes of CO2 equivalent)
01/05/2012-31/12/2012	30,861	-	214,699	183,838

Annex 1

REFERENCES

- [PDD], Project Design Document; Version 06, dated 2009-08-06
- Final Determination Report for the project: JI0078 CMM utilisation on the Coal Mine Nr.22 Kommunarskaya of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass“ Report No: 2008-1643 Rev 01, by DNV Det Norske Veritas, dated 2009-08-02
- Letter of Approval, Nr. 3873/11/10-08, issued on 2008-03-26 by the Ukraine (host party)
- Letter of Approval, Nr. 2008JI05, issued on 2008-04-22 by the Kingdom of the Netherlands (investor party)
- The project is approved as JI-project since 30/12/2009 (http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verification/FinDet.html) Registration numbers UA2000013, JI0078
- [NEIA] Baseline carbon emission factor for electric power approved in Ukraine: http://www.neia.gov.ua/nature/doccatalog/document?id=127498
- [NEIA-2] Baseline carbon emission factor for bituminous coal approved in Ukraine: 25,99 t C/TJ (National Inventory Report of Anthropogenic Emissions from Sources and Absorption by Absorbers of Greenhouse Gases in Ukraine for 1990-2010, Table P2.41)
- [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
- Determination and verification manual (version 01), undated http://ji.unfccc.int/Ref/Guida/index.html
- supporting evidence documents provided by the coal mine

Annex 2

Technical drawing

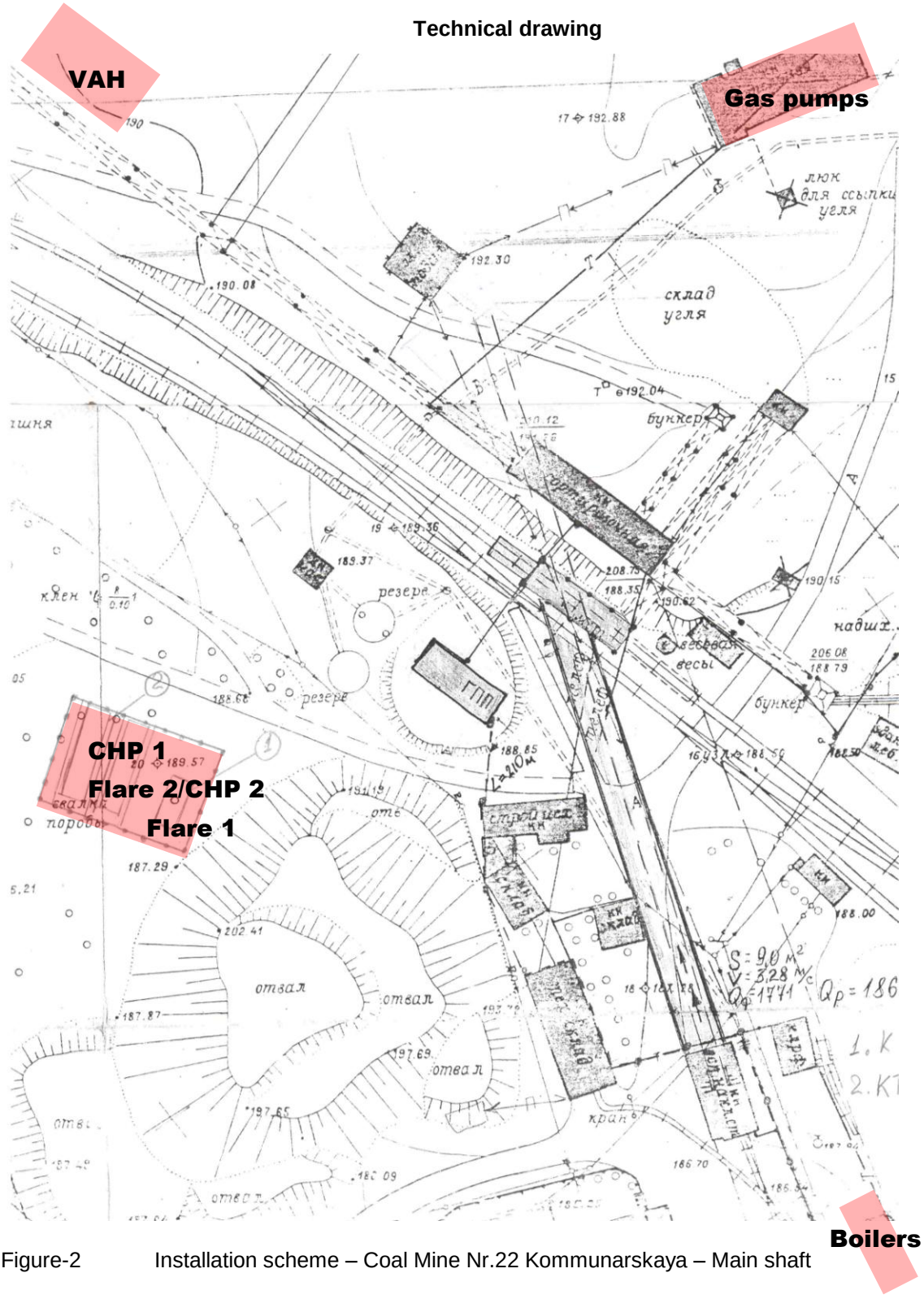

Figure-2 Installation scheme – Coal Mine Nr.22 Kommunarskaya – Main shaft

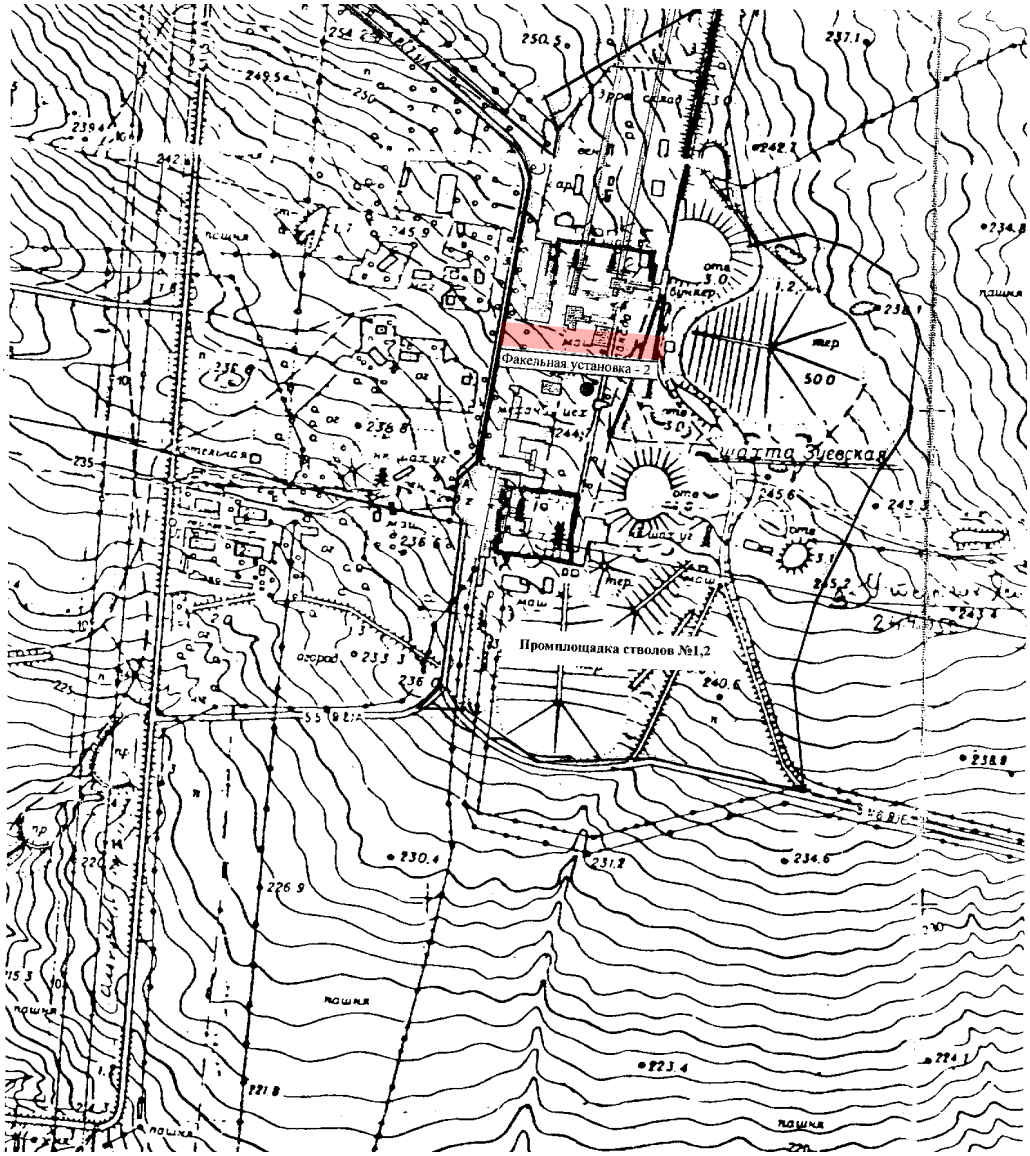

Figure-3 Installation scheme – Coal Mine Nr.22 Kommunarskaya – Air shaft

Annex 3

Energy and material flowchart including metering positions

A3.1 Monitoring procedure:

The electronically data storage system is fully in operation. Manual records (journals) are still used by the coal mine and can be taken for backup. The heat produced by the VAH is not measured but calculated using the utilised methane amount. The general installation schemes are given in Figure-3 for the main shaft and Figure-4 for the air shaft.

A3.2 Project emissions from flaring

The formula for the calculation of project emissions from uncombusted methane has been updated. The calculation of project emissions from uncombusted methane from flaring are now more accurate.

In the PDD the formula for project emissions from uncombusted methane is given as per:

$$PE_{UM} = GWP_{CH4} \times [(MM_{FL} \times (1 - Eff_{FL}) + MM_{ELEC} \times (1 - Eff_{ELEC}) + MM_{HEAT} \times (1 - Eff_{HEAT})] \quad (9) \text{ old}$$

In the revised monitoring plan the formula (9) has been replaced by the following formula:

$$PE_{UM} = GWP_{CH4} \times [MM_{ELEC} \times (1 - Eff_{ELEC}) + MM_{HEAT} \times (1 - Eff_{HEAT})] + PE_{flare} \quad (9) \text{ new}$$

PE_{Flare} is calculated using adopted formulae from the «Methodological “Tool to determine project emissions from flaring gases containing methane”» [AM_Tool_07] and ACM0008 Version 5. The original formulae refers to a yearly basis. The formulae have been adapted in the revised monitoring plan to variable monitoring periods:
The original formulae are:

$$PE_{flare} = \sum_{i=1}^{n} TM_{RG,i} x (1 - \eta_{flare,i}) x \frac{GWP_{CH4}}{1000} \quad (9a)$$

where:

PE_{flare}	Project emissions from flaring in the regarded period (t CO_2eq)
$TM_{RG,i}$	Mass flow rate of methane in the regarded interval i (kg/interval)
$\eta_{flare,i}$	flare efficiency in the interval i
GWP_{CH4}	Global warming potential of methane (21 tCO_2eq/tCH_4)
n	number of samples (intervals) in the regarded period

and

$$MD_{FL} = MM_{FL} - (PE_{flare}/GWP_{CH4}) \quad (5)$$

where:

MD_{FL}	Methane destroyed through flaring in the regarded period (t CH_4)
MM_{FL}	Methane sent to flaring in the regarded period (t CH_4)
PE_{flare}	Project emissions from flaring in the regarded period (t CO_2eq)
GWP_{CH4}	Global warming potential of methane (21 tCO_2eq/tCH_4)

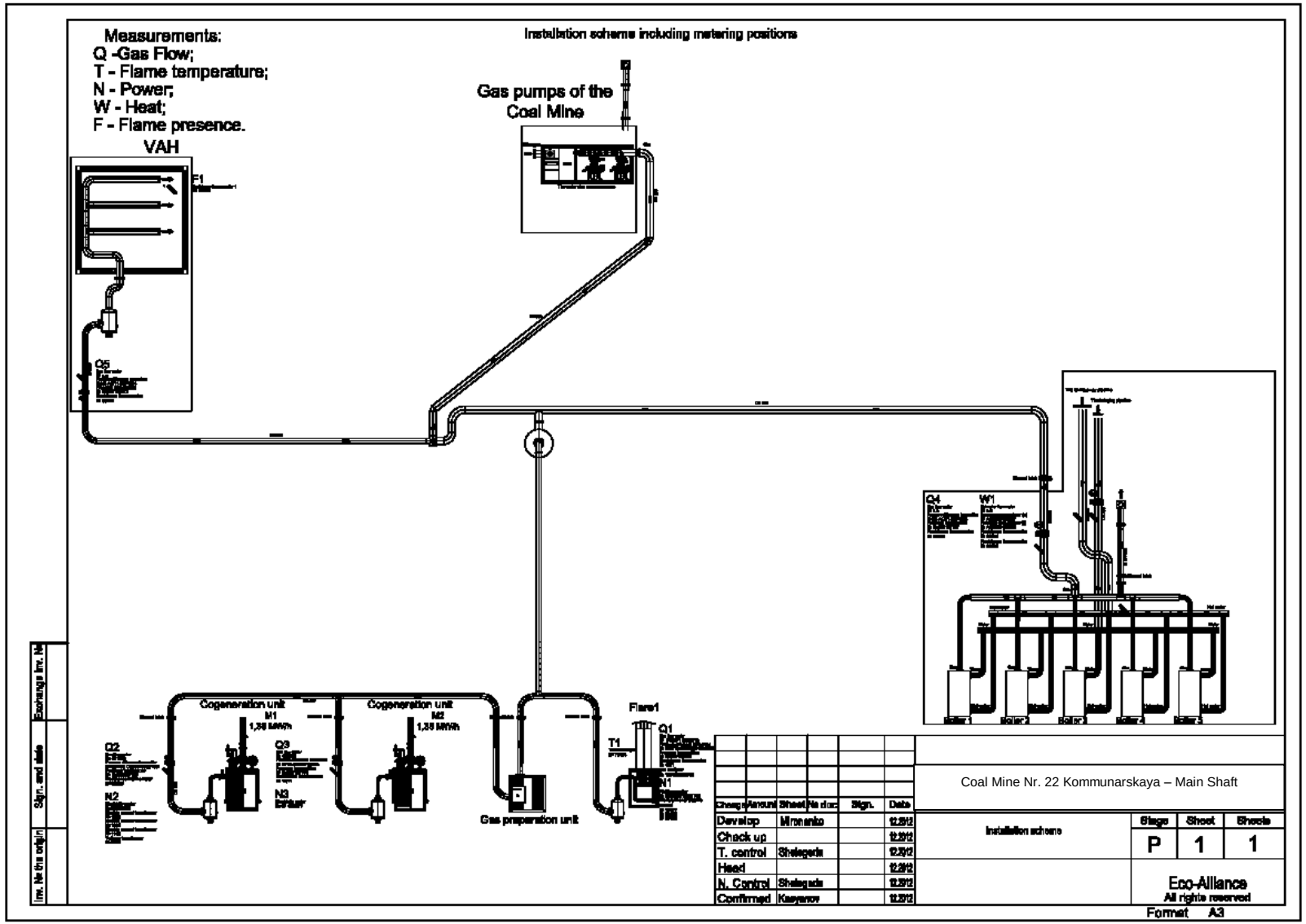

Figure -4 General installation scheme at main shaft

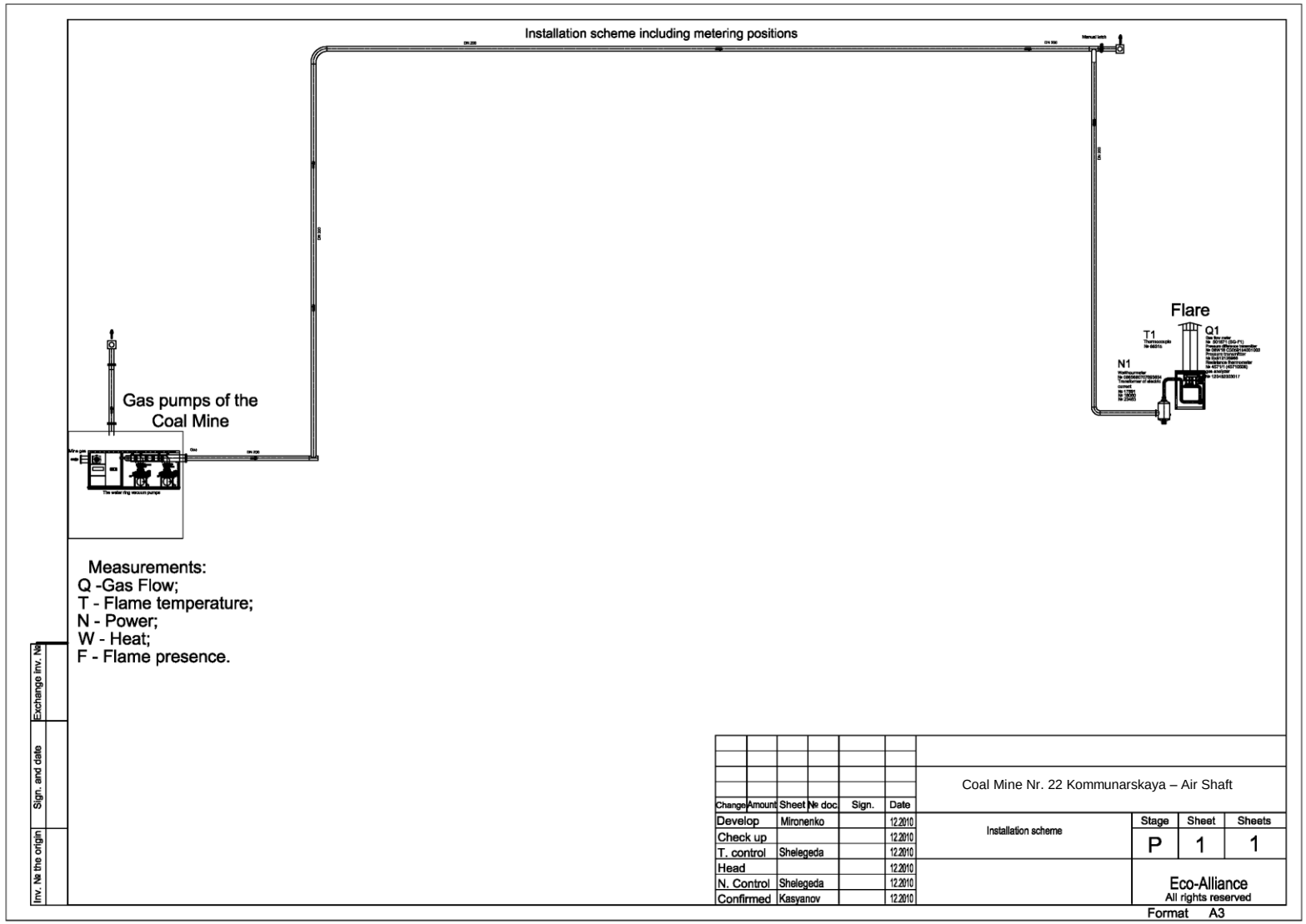

Figure -5 General installation scheme at air shaft

In the revised monitoring plan and this monitoring report, formulae 9a and 5, see above have been resolved to fit better to the monitored data.

The project emissions from flaring are calculated using the equation:

$PE_{flare} = (MM_{FI} - MD_{FL}) * GWP_{CH4}$ (9a)

where:

PE_{flare} Project emissions from flaring in the regarded period (t CO_2eq)
MD_{ELEC} Methane destroyed through power generation (t CH_4)
MM_{ELEC} Methane measured sent to power plant (t CH_4)
GWP_{CH4} Global warming potential of methane (21 tCO_2eq/tCH_4)
The formula for the methane destroyed through flaring is:

$$MD_{FL} = \sum_{i=1}^{n} MM_{FL,i} x \eta_{flare,i} \quad (5)$$

where:
MD_{FL} Methane destroyed through flaring (t CH_4)
$MM_{FL,i}$ Methane sent to flaring in the interval i (t CH_4)
$\eta_{flare,i}$ Efficiency of methane destruction/oxidation in flare in the interval i, see below
n number of samples (intervals) in the regarded period

The interval is set to 15 min during the monitoring period, which is more accurate than the 1 h intervals from the «Methodological “Tool to determine project emissions from flaring gases containing methane”» [AM_Tool_07])

For $\eta_{flare,i}$ three different values are taken, depending on the current combustion temperature $T_{Flame,i}$ of the flare in the interval i:

$T_{Flame,i}$	$\eta_{flare,i}$	Source
> 850°C	99.5%	[PDD, revised monitoring plan Section D.1.1 and Annex 3]
500-850°C	90.0%	[AM_Tool_07-15]
< 500°C	0%	[AM_Tool_07-15]

where:
$T_{Flame,i}$ Flame temperature of the flare in the regarded interval i (°C)
$\eta_{flare,i}$ flare efficiency in the interval i

A.3.3 Cogeneration unit

CHP 1
There are two power meters installed. The first power meter DEIF PPU (ID 14a) is an electronically counter, which is counting the produced power amount directly at the generator.
The second power counter ACTARIS SL-7000 (ID 14) is a smart power meter, which is counting the power amount, which is fed-in into the grid after the transformer. This counter is taken as GEN for the calculation of BE_{Use}.

CHP 2

There are two power meters installed. The first power meter DEIF AGC (ID 51) is an electronically counter, which is counting the produced power amount directly at the generator.

The second power counter Landis & Gyr ZMB210DR58 (ID 50) is a smart power meter, which is counting the power amount, which is fed-in into the grid after the transformer. This counter is taken as GEN for the calculation of BE_{Use}.

A3.4 Heat generation by VAH

The heat amount produced by the VAH has can not be measured, so it is calculated using the utilised CH_4 amount and the combustion efficiency.

$HEAT_{VAH} = MD_{VAH} \times Eff_{VAH} \times HV_{CH4}$

with

$HEAT_{VAH}$	heat generated by the ventilation air heater [MWh]
MD_{VAH}	methane amount destroyed by ventilation air heater [t CH_4]
Eff_{VAH}	efficiency of heat production in ventilation air heater; set to 74.2%
HV_{CH4}	heating value of methane [9.965 kWh/m³ equals to 13.899 MWh/t]

Annex 4

Differences between the determined PDD and implemented project[2]

There are some differences between the determined PDD and implemented project. The conditions defined by paragraph 33 of the JI guidelines are still met for the project.

- The physical location of the project has not changed.
- The emission sources have not changed.
- The baseline scenario has not changed.
- The changes are consistent with the JI specific approach and/or the clean development mechanism (CDM) methodology upon which the determination was prepared for the project.

The differences of the project implementation as described in the PDD and the implemented project are listed in the table below.

unit	difference	justification
boilers No: 1 & 2*	delay	The installation of the boilers was delayed due to lacking funds especially due to the Global Financial Crisis.
boilers No: 1 & 2*	changed number of units and changed capacity 5 units a 1,167 kW with a total of 5,835 kW instead of 2 units with 3,150 kW and a total of 6,300 kW	There have been multiple proposals at the time of the PDD preparation. A proposal different to that one described in the PDD has been realised. Instead of the installation of two new boilers as described in the PDD, five small coal boilers have been purchased from another coal mine and have been upgraded with a CMM burner system. Five smaller boilers instead of two bigger provide better adoption of the heat production depending on the heat demand, especially during the changes from winter to summer period. Ukrainian units have been chosen for economical reasons like better support with spare parts and already existing experience at the coal mine. The difference between the planned and installed heat production capacity is negligible as the actually heat demand of the coal mine is the leading factor for the heat production.
flare No: 1*	delay	The installation of the flare was delayed due to lacking funds due to delayed project registration.
flare No: 1*	changed firing capacity 10 MW instead of 5 MW	In the PDD a flaring capacity of 5 MW was given. The installed flare has originally a capacity of up to 8.525 MW and has been slightly modified to reach an extended capacity of up to 10 MW. This allowed a higher utilisation of CH_4 in the beginning of the project while the installation of the other units was delayed.
ventilation air heater*	delay	The installation of the ventilation air heater was delayed due to lacking funds especially due to the Global Financial Crisis.

[2] *This Annex contains the information about differences between the determined PDD and implemented project for all determined monitoring periods.*

ventilation air heater*	changed capacity 2.7 MW instead of 3.0 MW	Instead of the installation of three identical modules as stated in the PDD, two bigger modules a 1 MW and one smaller module with 0.75 MW, with a total of 2.75 MW have been installed. Newer planning status showed that 2.7 MW is sufficient for the coal mine. The difference between the planned and installed heat production capacity is negligible as the actually heat demand of the coal mine is the leading factor for the heat production.
cogeneration unit 1*	delay	The installation of the cogeneration unit was delayed due to lacking funds especially due to the Global Financial Crisis.
cogeneration unit 2**	delay	The installation of the cogeneration unit was delayed due to lacking funds especially due to the Global Financial Crisis.
flare 2**	Temporarily additional implementation (instead of cogeneration unit 2)	The second flare has been installed due to the big amount of still unused methane at the coal mine. The utilisation of methane has increased and additional environmental benefit is gained. The second flare has been originally installed at the coal mine Molodogvardeyskaya in August 2007. After one year of operation the flare has been moved to the coal mine Krasnoarmeyskaya-Zapadnaya Nr.1 in July 2008 but has not been put in operation by the coal mine. In Summer 2010 this flare has been installed by Eco-Alliance at the Coal Mine Nr.22 Kommunarskaya as flare Nr 2 and started operation at 08/08/2010. The flare was shut down in June 2012 and removed.
flare 3**	additional implementation	The third flare has been installed at the Air Shaft of the Coal Mine Nr. 22 Kommunarskaya. The CH_4 production of the coal mine is actually much higher than expected. For safety reasons a second degasification station has been installed at the Air Shaft in addition to the Main Shaft. A part of this gas is utilised in the third flare. The utilisation of methane by the project activity has increased and additional environmental benefit is gained. The flare Nr.3 has been originally installed at the Coal Mine Shcheglovskaya-Glubokaya also owned by „Colliery Group “Donbas“. Due to the lacking gas amount at the coal mine Shcheglovskaya-Glubokaya the flare has been moved to the Air Shaft of the «Coal Mine Nr.22 Kommunarskaya» and started operation at 05/11/2010.

The name of the project owner has been changed.** The old name “State-run Coal Mine Asscociation „GOAO Shakhtoupravlenye Donbass”” is no longer valid, the new name is:

PUBLIC JOINT STOCK COMPANY “COLLIERY GROUP “DONBAS”

The identifying number and domicile of the legal entity as well as the place of registration remain unchanged.

The change of name has been reported to JISC. JISC has decided that the title of the project 0078 registered in the JI Information system can not be changed and the title of the project will keep the old name of the company.

** - these deviations were verified during first monitoring period;*

*** - these deviations were verified during second monitoring period***.**

Annex 5

History of the Document

Version	Date	Nature of Revision
1	14 December 2012	Initial adoption
2	21 January 2013	December data added
3	12 March 2013	Revised version
4	08 April 2013	Revised version