MONITORING REPORT

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

Monitoring Report 01
Monitoring period
07/07/2008 to 31/03/2010

Version 9
15 March 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 Nr.22 Kommunarskaya 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:

UA2000013, JI0078
The project is approved as JI-project since 30/12/2009.
(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 Coal Mine Nr.22 Kommunarskaya, has been utilised in a flare, a cogeneration unit, five boilers and a ventilation air heater. The methane has been burned to less harmful CO_2. The cogeneration unit has generated power which has displaced conventionally produced power and gained an additional amount of CO_2 reductions.

The CH_4 has been mainly utilised for power generation and flaring. A part of the CH_4 has been utilised for heat generation in boilers and a ventilation air heater, but while the electronically measuring and data storing monitoring system as described in the PDD has not been installed for the five upgraded coal boilers and the ventilation air heater during the monitoring period, these units have not been monitored.

The flare and the CHP unit have been moved to another location at the coal mine in summer 2009, due to problems with coal dust from a coal mining tipple in the neighbourhood, so that there are production downtimes. At the end of February 2010 there was a temporary lack of gas amount, so the flare stopped production, especially in March 2010.

Table-1 Amount of methane utilised for heat generation

Unit	period	CH_4 [m³/period]	power generated [MWh]
Flare	07/07/2008-31/03/2010	3.775.086	-
Cogeneration unit	27/01/2009-31/03/2010	1.785.079	6.151
Total	**2008-2010**	**5.560.165**	**6.151**

A.4. Monitoring period:

Start date 07/07/2008, flare
27/01/2009, 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 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. This difference in the flaring efficiency has been especially accepted by JISC during a “Request for Review” for the similar project” JI0077 “CMM utilisation on the Coal Mine “Shcheglovskaya-Glubokaya” of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass“. [SG]

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 ACM008 methodology are identical to respective requirements of the baseline setting.

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

There are some deviations to the project installation as described in the PDD. The installation of the second cogeneration unit is still pending to lacking funds. See A.7. for further details.

Table-2 Status of Implementation

Unit: Flare	
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	20/12/2009

Unit: cogeneration unit	
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

*) The manufacturer Pro2 Anlagentechnik GmbH confirms a combustion efficiency of 99.9% according to the German requirements for landfill gas flaring. The lower value from the IPPP 1996 guidelines of 99.5% has been taken into account.

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 a 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

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: 48°06’58’’ N, 38°16’05’’ E

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

There are some deviations to the project installation as described in the PDD. The installation of the boilers was delayed due to the Global Financial Crisis. 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, whereby an adequate monitoring system is still missing. Five smaller boilers instead of two bigger provide better adoption of the heat production depending on the heat demand, especially during the change 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 installation of the ventilation air heater was delayed due to the Global Financial Crisis. 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, whereby an adequate monitoring system is still missing.
In the PDD a flaring capacity of 5 MW was given. The installed flare capacity 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. The modification has been done by the manufacturer.
The installation of the second cogeneration unit is still pending due to lacking funds.

unit	**Planned installation date (PDD)**	**firing capacity**	**Date of installation or *envisaged new date of installation*** **new timetable**	**realised firing capacity or *envisaged 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 (originally 8,525 kW, modified in November 2009)
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	01.2009	1,350 kWel
cogeneration unit 2	1.2009	1,350 kWel	*Spring 2011*	*1,350 kWel*

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

The electronically measuring and data storing monitoring system as described in the PDD has not been installed for the five upgraded coal boilers and the ventilation air heater during the monitoring period. These units have not been monitored. The monitoring system should be installed for the next monitoring period.

A.9. Changes since last verification:

None. First verification.

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

Coal Mine Nr.22 Kommunarskaya
- 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	Range	Uncertainty level of data	Frequency of Measurement	Instal-lation
1	CH_4 concentration	Infrared measurement	Pro2 Anlagentechnik GmbH using gas analysers from Emerson Process Management GmbH&Co. OHG	BINOS 100	12048200300 16	0-100% CH_4	low	Continuous record period 15 min.	2008
2	NMHC concentration	Lab analysis, gas chromatograph	Gazohrom	LHM-8MD	75 307	0-100%	low	yearly	n. n.
3	CMM amount to flare	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	none	n.a.	low	Continuous record period 15 min.	2008
4	Gas flow	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	Rings:361899	Disc 1 0-1,550 m³/h Disc 2 0-2,500 m³/h	low	Continuous record period 15 min.	2008 changed at 11/11/2009
5	Pressure difference	Pressure difference transmitter	Honeywell	ST3000	08W18 C3059154001 001	0-100 mbar	low	Continuous record period 15 min.	2008

6	Pressure	Pressure transmitter Dry ceramic sensor	Noeding	P 121	EX812126961	0-250 mbar, rel	low	Continuous record period 15 min.	2008
7	Temperature	Resistance thermometer	JUMO GmbH & Co. KG	DIN EN 60 751 Type 90.2002	4571	-50-250°C	low	Continuous record period 15 min.	2008
8	Flame temperature	Thermo couple	Herth GmbH	DIN 43733 Type S, PtRh-Pt	61287 until 12/09/2009 71087 Since 12/09/2009	0-1,700°C	low	Continuous record period 15 min.	2008
9	CMM amount to cogenera-tion unit	Standard orifice and pressure difference meter	Pro2 Anlagentechnik GmbH	calculation	none	n.a.	low	Continuous record period 15 min.	2008
10	Gas flow	Standard orifice	Himpe AG	annular chamber standard orifice DIN 19205	Rings:364581	0-1,200 m³/h	low	Continuous record period 15 min.	2008
11	Pressure difference	Pressure difference transmitter	Honeywell	ST3000	08W30 C3088100001 001	0-100 mbar	low	Continuous record period 15 min.	2008
12	Pressure	Pressure transmitter Dry ceramic sensor	Noeding	P 121	EX812127126	0-250 mbar	low	Continuous record period 15 min.	2008
13	Temperature	Resistance thermometer	JUMO GmbH & Co. KG	Type 90.2002	TN005115988 01264830010 0837003 (98026 for calibration)	-40-120°C	low	Continuous record period 15 min.	2008

14	Power production	Electricity meter	Actaris	SL7000 Type – SL761C071	53026020	n.a.	low	Continuous, cumulative value Read period monthly	2009
14a	Power production	Electronical load counter	DEIF	PPU	103461 G 203450000B	n.a.	low	Continuous, cumulative value	2008

B.1.3. Calibration procedures:

Table-5 Monitoring equipment

ID	Data	Uncertainty level of data	Calibration procedure	Last calibration	Calibrator
1	CH_4 concentration	1.5%	Initial calibration made using procedures of manufacturer. Regular calibrations made using procedures of Eco Alliance OOO. Yearly calibration made using procedures of Sumystandart-metrologya.	31/03/2010	Sumystandart metrologya
2	NMHC concentration	2.5%	Calibration made using procedures of Donetskstandartmetrologya.	14/10/2009	Donetskstan-dart-metrologya
3	CMM amount to flare	calculation	none	none	none
4	Gas flow	0.56 %, Disk 1 0.75 %, Disk 2 DIN EN ISO 5167-T.1-4	none	none	none
5	Pressure difference	0.0375%	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumystandart-metrologya.	30/04/2008 31/03/2010	Honeywell Sumystandart metrologya
6	Pressure	0.2%	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumystandart-metrologya.	Initial unknown. 2nd 31/03/2010	Noeding Sumystandart metrologya
7	Temperature	DIN EN 60 751, Class B 0.3+0.005T [K]	Initial calibration made by manufacturer using procedures according to DIN EN 60 751. Further calibration made using procedures of Sumystandart-metrologya.	Initial unknown. 2nd 31/03/2010	JUMO Sumystandart metrologya
8	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, according to DIN 43733.	14/04/2008 01/09/2009	Herth

9	CMM amount to flare	calculation	none	none	none
10	Gas flow	0.57 % DIN EN ISO 5167-T.1-4	none	none	none
11	Pressure difference	0.0375%	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumystandart-metrologya.	21/07/2008 31/03/2010	Honeywell Sumystandart metrologya
12	Pressure	0.2%	Initial calibration made using procedures of manufacturer. Further calibration made using procedures of Sumystandart-metrologya.	Initial unknown. 2nd 31/03/2010	Noeding Sumystandart metrologya
13	Temperature	DIN EN 60 751, Class B 0.3+0.005T [K]	Initial calibration made by manufacturer using procedures according to DIN EN 60 751. Further calibration made using procedures of Sumy standard metrologya.	Initial unknown. 2nd 31/03/2010	JUMO Sumystandart metrologya
14	Power production	0.5%	Initial calibration made by manufacturer using procedures according to IEC61036.	III/2009	Manufacturer
14a	Power production	1%	Initial calibration made using procedures of manufacturer.	Initial unknown.	Manufacturer

*) FSV – Full Scale Value

B.1.4. Involvement of Third Parties:

- The lab analysis for the determination of the NMHC concentration has been done by MAKNII
- The gas chromatograph 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 OOO
- Eco-Alliance OOO 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 emission factor of $CONS_{ELEC,PJ}$	official data of Ukrainian power grid	tCO_{2eq}/MWh	SenterNovem data as accepted by JISC in other verifications, [SG, KD, ZAS] taken instead of not available Ukrainian data, according to the 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, Methodological "Tool to deter-mine 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 2006	%	set at 99.5% (IPCC 2006)
P19 Eff_{HEAT}	Efficiency of methane destruction / oxidation in heat plant	ACM0008 / IPCC 2006	%	set at 99.5% (IPCC 2006)
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

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
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	%	
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_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	
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
P25 PC_{CH4}	Concentration of methane in extracted gas	IR measurement	%	

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
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):

The data are collected, processed and stored using Siemens SIMATIC PLC S7 systems and Siemens WINCC programming software. The PLC and the switchgear are provided by Kuhse GmbH. Every unit is equipped with an own PLC. All data is stored in the internal memory of the PLC's. One time per day all data (also those not required for monitoring) are recalled via GPS to the central Kuhse data base. The server provider ensures regular back ups and archiving. The monitoring relevant data are transmitted every 15 min. from the PLC to a second device – a touch panel and stored on a USB-Stick as backup. The monitoring relevant data are regularly read from the Kuhse internet data base by authorised personnel of Carbon-TF and stored in Excel sheets. For data back up the USB-stick data can be taken.

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 back ups and archiving.

B.4. Special event log:

Both units have been moved to another location at the coal mine in summer 2009, due to problems with coal dust from a coal mining tipple in the neighbourhood, which lead to several shut-downs of the unit, so that there are production downtimes.

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 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 OOO.
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 electronically monitoring system is executed by Carbon-TF.

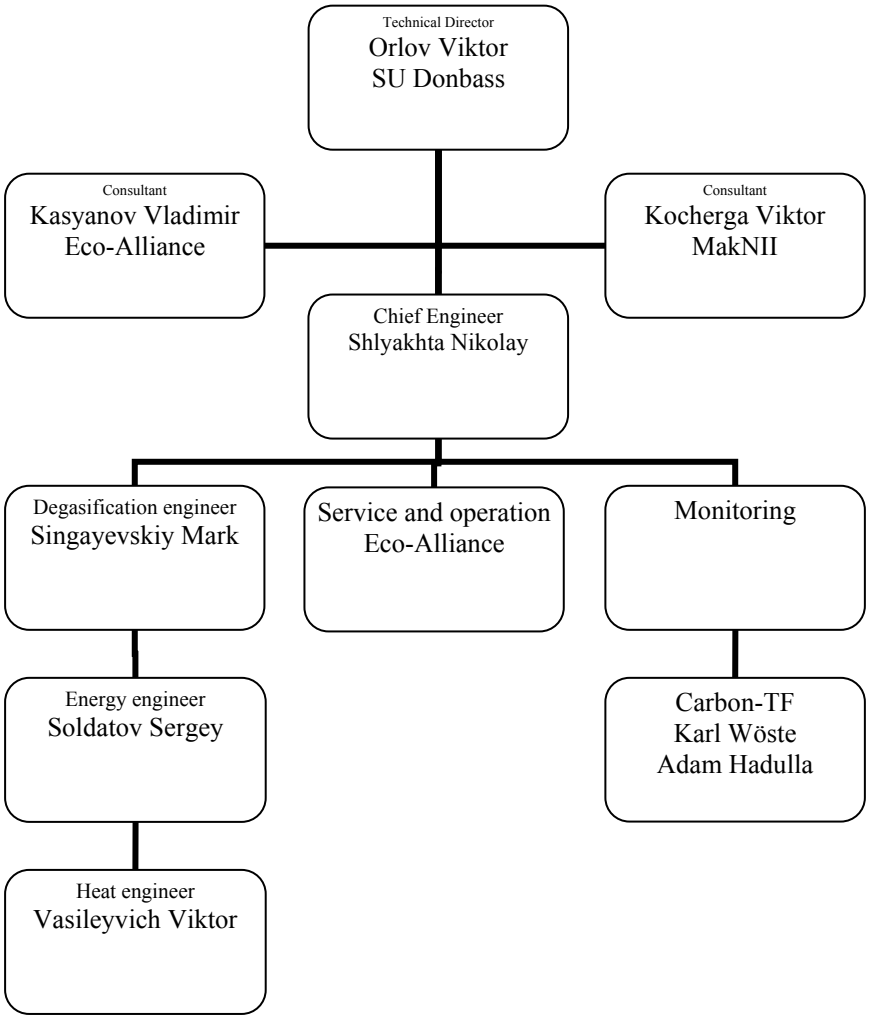


Figure 1 – Organigram

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.

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.

C.3. Internal audits and control measures:

The flare has been checked by AS Wärmetechnik GmbH, the personnel of Eco-Alliance has been trained on the job.

QM procedure:
- The data are recorded automatically
- The recorded data are checked daily by Carbon-TF
- Carbon-TF B.V. prepares monthly reports which are checked by Eco-Alliance OOO
- The paper data are stored at Eco-Alliance OOO.
- Electronic data are stored at Kuhse GmbH, Fraunhofer UMSICHT e.V. and Carbon-TF B.V..
- Back-ups are made regularly Kuhse GmbH, Fraunhofer UMSICHT e.V.and Carbon-TF B.V..
- Carbon-TF prepares the monitoring report, which is checked by Eco-Alliance and the coal mine.

C.4. Troubleshooting procedures:

The units have an automatically shut down system. In case of disturbance the gas supply to the units 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	$PE_y = PE_{ME} + PE_{MD} + PE_{UM}$
P2 PE_{ME}	Project emissions from energy use to capture and use methane	$PE_{ME} = CONS_{ELEC} \text{ X } CEF_{ELEC}$
P3 PE_{MD}	Project emissions from methane destroyed	$PE_{MD} = (MD_{FL} + MD_{ELEC}) \text{ x } (CEF_{CH4} + r \text{ x } CEF_{NMHC})$
P4 PE_{UM}	Project emissions from uncombusted methane	$PE_{UM} = GWP_{CH4} \text{ x } [MM_{ELEC} \text{ x } (1 - Eff_{ELEC}) + PE_{Flare}$
P5, $CONS_{ELEC}$	Additional electricity consumption by the project	$CONS_{ELEC} = 0$
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	$BE_{MR,y} = CMM_{PJ,y} \text{ x } GWP_{CH4}$
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	$BE_{Use,y} = GEN_y * EF_{ELEC}$
B14 $CMM_{PJ,y}$	CMM captured and destroyed in the project activity in year y	$CMM_{PJ,y} = (MD_{FL} + MD_{ELEC})$
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:

A total of 12 random errors resulting from the uncertainties of the measurement equipment have been named and discussed, see <Possible sources of error.pdf> als Annex. for detailed information. The resulting uncertainty has been determined and subtracted from the results.

Table-11 Resulting uncertainties

Nr	Monitoring Method	Uncertainty
F1	Flare, disc 1*)	1.70%
F1a	Flare, disc 2*)	1.79%
M1	CHP	1.69%

*) See Tables - 4 and 5 for further information

The uncertainties have been deducted from the results.

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}]
07/07/2008-31/12/2008	1,689**)	1,639
01/01/2009-31/12/2009	60,000**)	64,834
01/01/2010-31/03/2010	44,573*)	8,671
Total 2008-2010	**106,262**	**75,144**

*) ¼ of 178,292

**) The original PDD has been prepared in 2006; the original calculation of emission reductions was based on a project installation beginning in 2007 and production start date beginning with 2008-01-01. Due to delays in the determination process, also the installation of the project has been delayed. The emission reductions in the final version of the PDD, Version 06, dated 2009-08-06, have been recalculated in August 2009. At that time the real emission reductions for 2008 (1,689 t CO_{2eq}) have been stated in the PDD. For 2009 a value of about 60,000 t CO_{2eq} has been estimated, based on the state of knowledge at that time. The estimation for the years 2010-2012 remained unchanged in comparison to the initial PDD Version.

The monitored emission reductions of 1,639 tCO_{2eq} for 2008, see table D.3., are lower than the emission reductions of 1,689 tCO_{2eq} for 2008 as stated in the PDD due to the deduction of uncertainties requested by TUEV Sued, see Table-11.

The monitored emission reductions for 2009 are slightly higher than the estimated value. At the time of the estimation in August 2009 one flare and one cogeneration unit have been in operation and the results until August 2009 have been extended until December 2009. While the initially low production of the cogeneration unit has been improved in the second half of 2009, the monitored value is higher than the estimated value from the PDD.

The monitored value for the first Quarter 2010 is significantly lower than the prospected value, because the monitoring systems for the boilers and the VAH were not in operation and the emission reductions have not been counted, the second cogeneration unit was not installed and the flare stopped production at the end of February 2010 because of a temporary lacking of gas amount.

D.3.1. Project emissions:

period	project emissions [t CO_{2eq}]
07/07/2008-31/12/2008	270
01/01/2009-31/12/2009	9,811
01/01/2010-31/03/2010	1,199
Total 2008-2010	**11,280**

D.3.2. Baseline emissions:

period	baseline emissions [t CO_{2eq}]
07/07/2008-31/12/2008	1,909
01/01/2009-31/12/2009	74,645
01/01/2010-31/03/2010	9,870
Total 2008-2010	**86,424**

D.3.3. Leakage:

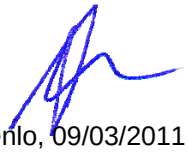
Not applicable.

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

Period	Emission reductions [t CO_{2eq}]
07/07/2008-31/12/2008	1,639
01/01/2009-31/12/2009	64,834
01/01/2010-31/03/2010	8,671
Total 2008-2010	**75,144**

The total GHG emission reduction for the monitoring period 07/07/2008-31/03/2010 is 75,144 t CO_{2eq}.

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



Venlo, 09/03/2011

Annex 1

REFERENCES

- [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

- [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. M000016, 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

- Determination and verification manual (version 01), undated http://ji.unfccc.int/Ref/Guida/index.html

- [KD], JI0079 / UA2000011 CMM utilisation on the Joint Stock Company named Komsomolets Donbassa Coal Mine of DTEK (http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verif/VerifRep.html)

- [SG], JI0077 / UA2000015 CMM utilisation on the Coal Mine Shcheglovskaya-Glubokaya of the State Holding Joint-Stock Company „GOAO Shakhtoupravlenye Donbass" (http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verif/VerifRep.html)

- [ZAS], JI0035 Utilization of Coal Mine Methane at the Coal Mine named after A.F. Zasyadko (http://ji.unfccc.int/JI_Projects/DeterAndVerif/Verif/VerifRep.html)

- [Pro2] Confirmation from Pro2 Anlagentechnik GmbH about the fulfilment of the requirements of German regulations for flares

- supporting evidence documents provided by the coal mine

Annex 2

Technical drawing

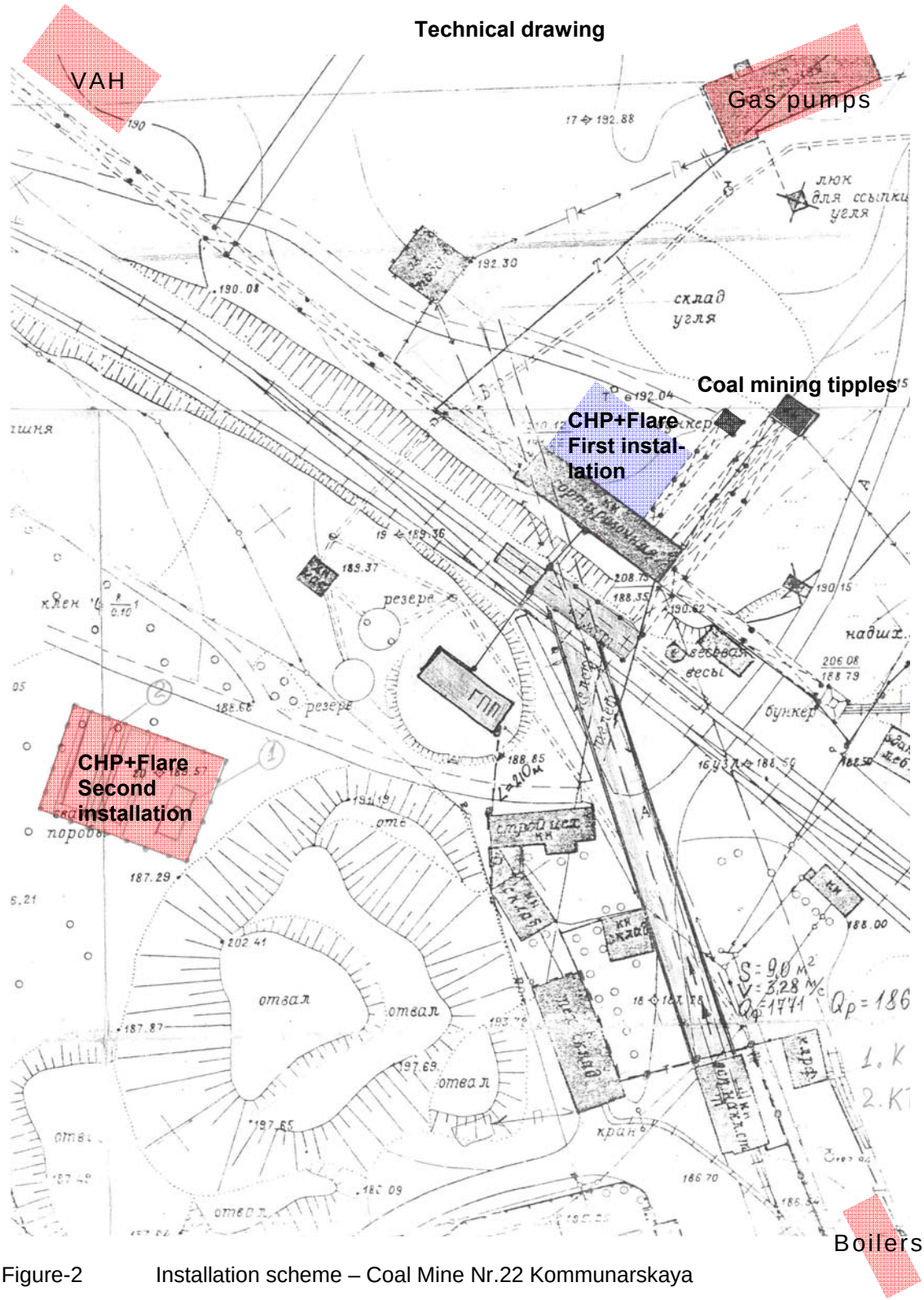


Figure-2 Installation scheme – Coal Mine Nr.22 Kommunarskaya
Initial and second installation since July 2009

Annex 3

Energy and material flowchart including metering positions

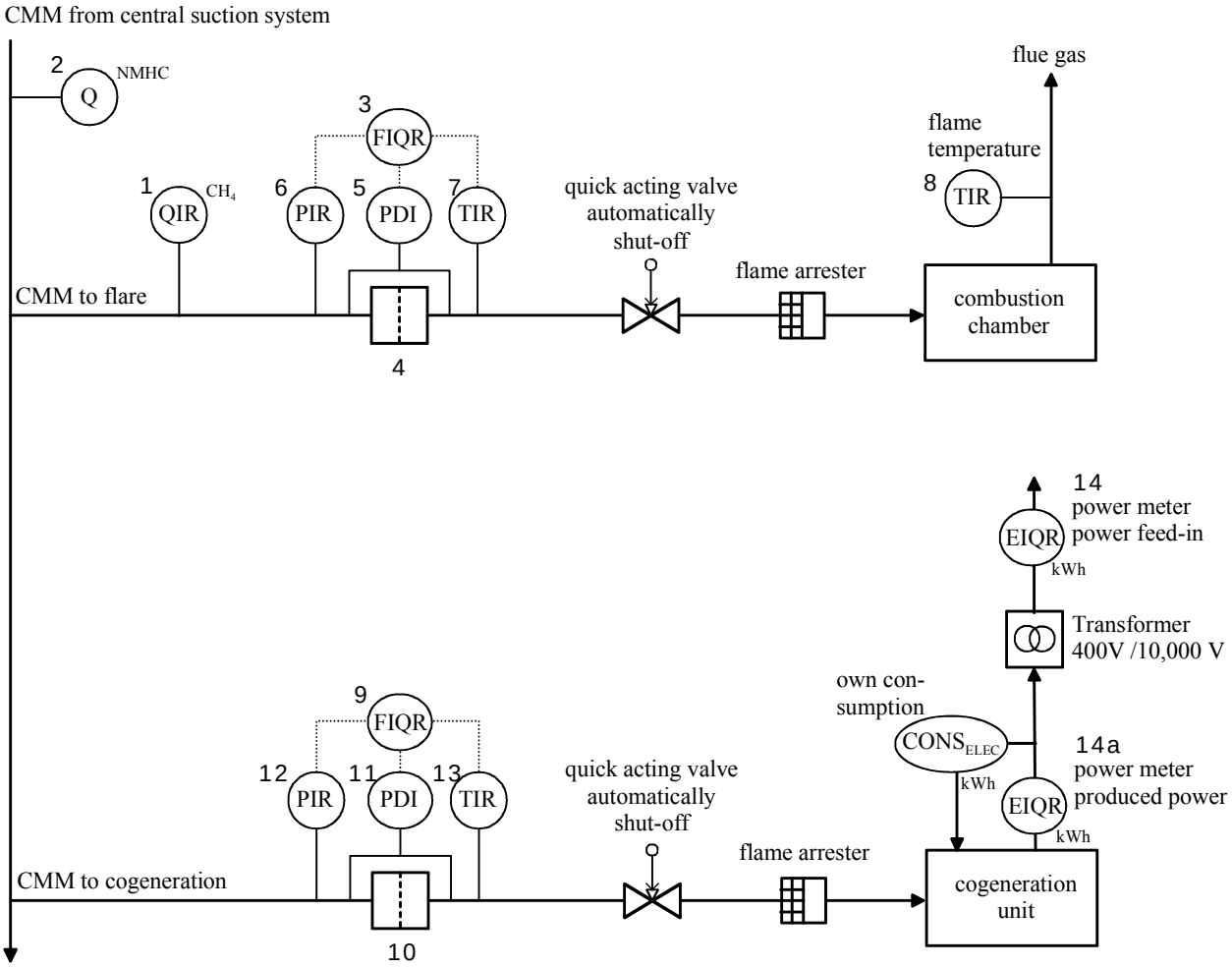


Figure -3 installation scheme and positioning of the meters

Monitoring plan applied

The flare and the cogeneration unit have been equipped with an adequate electronically monitoring system. The monitoring plan applied during the monitoring period is according to the monitoring plan.

Flare

During the first period from 07/07/2008 to 27/01/2009 12:00 the automatically data storage system in the flare was not working. In this period the data have been hand read from the display of the flare and hand recorded in a journal. The data from this journal has been transferred to excel sheets by Carbon-TF.
The automatically system has started operation at 27/01/2009 12:15.
The standard orifice for CMM flow measurement has been changed on 11/11/2009. The new orifice allows a higher measurement range according to the modification of the flare to a higher capacity of 10 MW. The modification is in tune with German requirements on landfill gas flares. [Pro2].

Cogeneration unit
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}. See also Figure-3.

The difference between the both power meters is the own consumption, which is taken as $CONS_{ELEC}$ for the calculation of PE_{ME}.

During the first period the DAVID system was not working, so that the methane amount consummated by the unit has been recalculated using the produced power amount and the average power efficiency determined from the steady operation period.

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

with

V_{CH4}	Methane amount utilised by the cogeneration unit [m³ at standard state conditions]
GEN	Electricity produced by the project [kWh]
Eff_{ELEC}	efficiency of power generation [%] recalculated from later steady operation period
HV_{CH4}	heating value of methane [9.965 kWh/m³ m³ at standard state conditions]

The efficiency of power generation is recalculated from later steady operation period:

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

with

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

Annex 4

Differences between the determined PDD and implemented Project

The differences of the project installation 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.
boilers No: 1 & 2	missing monitoring system	The installation of the monitoring system was delayed due to lacking funds and has been completed after the end of the monitoring period.
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.
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.

ventilation air heater	missing monitoring system	The installation of the monitoring system was delayed due to lacking funds and has been completed after the end of the monitoring period.
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 second cogeneration unit is still pending due to lacking funds.

Annex 5

History of the Document

Version	Date	Nature of Revision
1	19 April 2010	Initial adoption. Published at the JISC website
2	20 August 2010	Revised version, after verification
3	21 October 2010	Revised version, after verification
4	20 December 2010	Revised version, after verification
5	10 February 2011	Revised version, after verification
6	25 February 2011	Revised version, after verification
7	03 March 2011	Revised version, after verification
8	09 March 2011	Revised version, after verification
9	15 March 2011	Revised version