JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

“Power generation from the coal mine methane at the Sukhodolskaya-Vostochnaya Mine”

Document version: 06
Sectoral Scope: 8, Mining and Mineral Production
Date: 25/04/2011

Prepared by: Green Gas Germany GmbH

Title of the project in Ukrainian language:
«ВИРОБНИЦТВО ЕЛЕКТРОЕНЕРГІЇ З ШАХТНОГО МЕТАНУ НА ШАХТІ «СУХОДІЛЬСЬКА-СХІДНА»

Title of the project in Russian language:
“Производство энергии из шахтного метана на шахте „Суходольская- Восточная“

A.2. Description of the project:

The Donetsk basin (Donbass) is the largest industrial region of Ukraine with coal, metallurgic and chemical industries. Donbass is one of the most hazardous regions of Ukraine in terms of environmental pollution. Donetsk Basin coal resource professionals estimate that the basin contains 231 billion tonnes of coal reserves, including 170 to 180 billion tonnes of reserves that are classified as recoverable, i.e. located at the depths of 500 to 1,800 meters and in seams that are greater than 0.3 meters thick. In terms of coal rank, the coal in the Donetsk Basin ranges from lignite to highly metamorphized bituminous. The total mass of dispersed organic matter in rocks and coal layers reaches 1,680 billion tonnes, which includes 1,210 billion tonnes within a depth of between 500 and 1,800 meters. (Zaidenvarg,1993).[1]

Situation existing prior to the starting date of the project

As shown in Table A.4.2.1. under Section A.4.2., different methods of methane drainage can occur during the life-cycle of a mine if the stratigraphical conditions within the coal mine allow the different drainage types.
At the Sukhodolskaya-Vostochnaya Mine, some of the drainage types are not taken into consideration due to the stratigraphical conditions of the seams within the coal mine and the surrounding area (please see further under Section A.4.2). In order to classify the feasible and not feasible drainage types, Table A.2.1 below shows all drainage types as per their feasibility at the Sukhodolskaya-Vostochnaya Mine.

Table A.2.1. Feasible and not feasible drainage types[2]

Drainage types		Current situation	Project forecast
Coal Bed Methane (CBM)		Not feasible	Not feasible
Pre-mining CMM (CMM)		Not feasible	Not feasible
Post-mining	Underground boreholes	Yes	Yes

[1] http://www.epa.gov/cmop/docs/ukraine_handbook.pdf
[2] According to the document “Technical review report of the Sukhodolskaya Vostochnaya Coal Mine – Historical gas extraction and future gas predictions and “Independent Technical Review of Sukhoolskaya-Vostochnaya CMM; DMT-No.:34109919”

CMM (PMM)	Goaf wells	Yes	Yes
Ventilation Air Methane (VAM)		Yes	Yes

At the Sukhodolskaya-Vostochnaya Mine only post-mining CMM is drained due to low permeability of the strata. The exclusion of other drainage types was elaborated in a separate document ("Technical review report of the Sukhodolskaya-Vostochnaya Coal Mine – Historical gas extraction and future gas predictions" – dated 18/08/2010. The draining types of post-mining CMM will be described more detailed under Section A.4.2.

Baseline Scenario

Currently only a small portion of the total amount of coal mine gas is utilised within two CMM-fired steam boilers for the production of steam, used for the generation of hot water and other heating purposes of the Mine. Both CMM-fired steam boilers belong to a separate registered JI-project under the project identification UA1000031 ("Utilization of Coal Mine Methane at the Coal Mine Sukhodilska-Skhidna"). As both CMM-fired steam boilers have a set capacity which is 50% of the technical capacity, the main portion of the extracted coal mine gas is vented into the atmosphere via several cold stacks.

Project Scenario

The project will reduce methane emissions by utilizing the CMM which would be otherwise vented into the atmosphere in the absence of this project. Methane-fuelled power generators will be installed to satisfy the electrical consumption of the Mine, which will reduce electricity off take from the national grid. A high temperature flare (HT-flare facility) will be installed as a methane destruction scheme for surplus CMM due to inherent fluctuations in CMM production. The project shall be phased to maximize emission reductions. The first phase (Phase 1) of the project is the installation of flaring facility to begin reducing emission as quickly as possible. The second phase (Phase 2) is the installation of methane-fuelled power generators to satisfy the mine's electrical base load consumption.

In September 2006 Green Gas Interantional Ltd. started negotiations with OJSC Krasnodonvuhillya following the aim of erecting a JI project including flaring and power generation on the Sukhodolskaya-Vostochnaya Mine. In 2007 Green Gas Interantional Ltd. and OJSC Krasnodonvuhillya signed the Memorandum of Understanding. In June 2009 project received the Letter of Endorsement (LoE) issued by the National Environmental Investments Agency of Ukraine (NEIA). Table A.2.2. below shows the milestones of the project according to the JI components and the parties involved. Green Gas International Ltd., Green Gas Germany GmbH and Green Gas Krasnodon LLC are not considered as project participants.

Table A.2.2. Summary of the milestones

Date	Milestone / Activity
September 2006	**Start of negotiations** (Green Gas International Ltd. and OJSC Krasnodonvuhillya)
05/03/2007	**Signing of the Memorandum of Understanding (MoU)** (Green Gas International Ltd. and OJSC Krasnodonvuhillya)
02/08/2007	**Feasibility study of possible project scenarios** (Green Gas International Ltd.)
28/04/2008	**Initial Term Sheet of the Project**
23/03/2009	**Submission of the Project Idea Note (PIN)** (Green Gas International B.V.)
03/06/2009	**Issuance of the Letter of Endorsement (Nr. 577/23/7)** (National Environmental Investments Agency of Ukraine (NEIA))
16/12/2009	**Signing of all project relevant agreements**

	(Green Gas International on behalf of Green Gas Ukraine Holdings B.V. and OJSC Krasnodonvuhillya)
January 2010	**Order of the flare** (Green Gas Krasnodon LLC)
February 2010	**Contract with the Design Institute (Design Tasks for phase 1 and phase 2)** Green Gas Krasnodon LLC and "Luhansk Coal Industry Enterprises Projecting Institute "LUGANSKDIPROSHAKHT"
May 2010	**Initial drafting of the PDD** (Green Gas Germany GmbH)
15/09/2010	**Signing of the contract with the determining entity** (Green Gas Krasnodon LLC and Bureau Veritas Certification Holding SAS)
13/10/2010	**Initial submission of the PDD** (Green Gas Germany GmbH)
04/11/2010	**On-site visit on the Sukhodolskaya-Vostochnaya Mine**

A.3. Project participants:

Table A.3.1. Project participants

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)
Ukraine (host)	OJSC Krasnodonvuhillya	No
Netherlands	Green Gas Ukraine Holdings B.V.	No

A.4. Technical description of the project:

A.4.1. Location of the project:

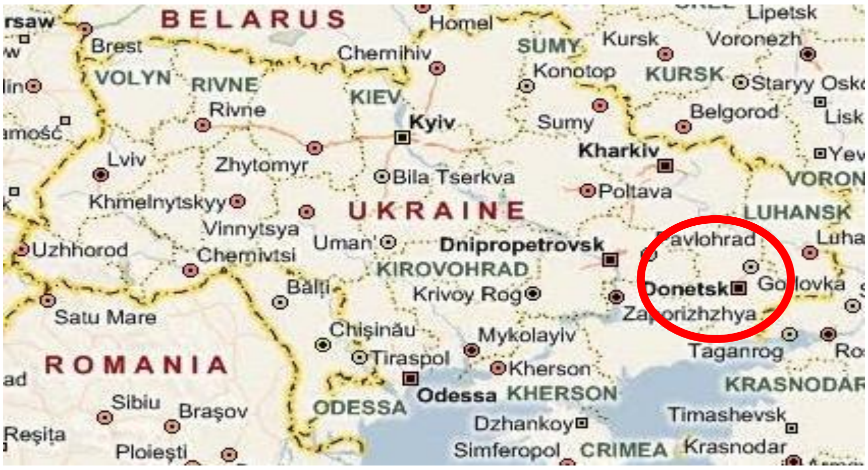

Figure A.4.1.1 Location of project in Ukraine

A.4.1.1. Host Party(ies):

Ukraine

A.4.1.2. Region/State/Province etc.:

Luhansk region

A.4.1.3. City/Town/Community etc.:

The mine is near the town of Krasnodon and Sukhodolsk in the eastern part of Luhansk Oblast.

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

The location of the project was identified with following GPS coordinates:
Longitude → 39°47'9'' / Latitude → 48°21'9''

The Ukrainian name of the Mine is Sukhodilska-Skhidna Mine and in Russian Sukhodolskaya-Vostochnaya. In order to give the Project a unique identification (an already existing JI-project was registered with the Ukrainian name Sukhodilska-Skhidna), the name in Russian was chosen.

Figure A.4.1.4.1 Location of project in Krasnodon (Luhansk region)

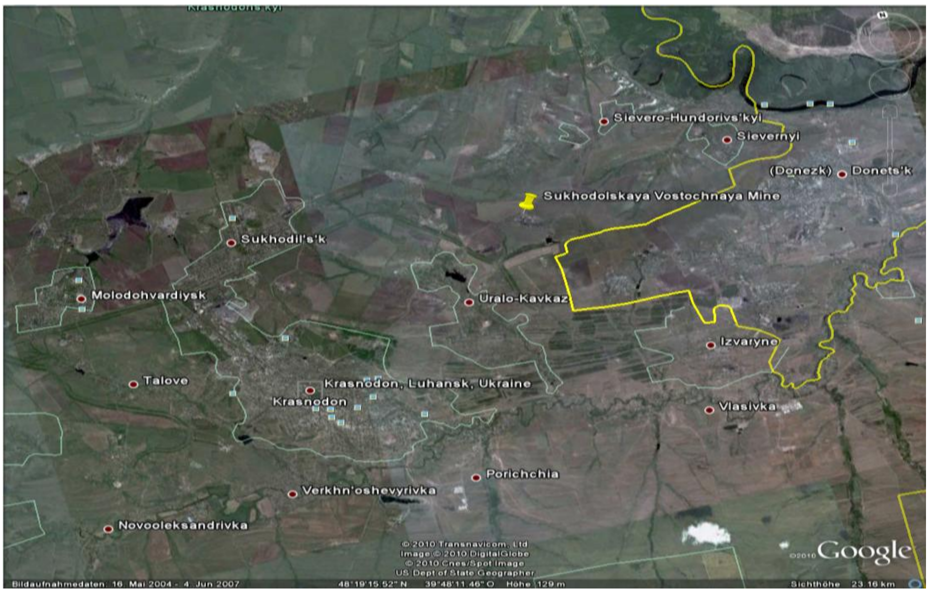

Figure A.4.1.4.2 Mine location picture

A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project:

Coal Mine Methane (CMM), defined as the methane component of gases released from the strata and coal seams in a working mine. CMM is either captured as pre-mining CMM (also known as pre drainage) prior to the mining process from underground boreholes or as post-mining CMM (also known as post drainage) during or after completion of the mining process from vertical surface goaf wells, underground inclined or horizontal boreholes, gas drainage galleries or other goaf gas capture techniques, including drainage of sealed areas, in the mine. Both pre- and post-mining CMM is drained in parallel to Ventilation Air Methane (VAM), which is defined as methane mixed with ventilation air in the mine that is circulated in sufficient quantity to dilute the methane to low concentrations for safety reasons.

The table below shows the relevant types of drainage which take place during the life-cycle of a mine. Some of the types are not feasible at the mine due to the stratigraphical conditions[2] Ibid of the seams within the coal mine and the surrounding area.

Table A.4.2.1. Methods of methane drainage on mines

Drainage type	Definition
Coal Bed Methane (CBM)	**Term for methane originating in coal seams that is drained via surface boreholes without any mining activity taking place.**
Pre-mining CMM (CMM)	**Methane extraction prior the mining process from underground boreholes in the mine (for safety reasons).**
Post-mining CMM (PMM)	**Methane extraction during or after the mining process from vertical surface goaf wells or underground inclined (horizontal) boreholes. Drainage of**

	sealed areas (for safety reasons).
Ventilation Air Methane (VAM)	**Methane mixed with the ventilation air in the mine that is circulated in sufficient quantity to dilute the existing methane.**

The license is divided into three areas which are from West to East, block 1, and block 2 and block 3. During 2009 there were three working coal faces. All extraction takes place in seams with a thickness of about 210 cm. Coal faces are about 250 m long and longwalls are ventilated in U-form or Y-form, supported by gas drainage.

The first working longwall during 2009 was longwall 12 (block 1) producing about 1,000 tons of coal per day. The second one, longwall 23 (block 2) was producing about 1,200 tons of coal per day and longwall 36 (block 3) with 600 tons of coal per day.

As stated under Section A.2, block 3 is not considered in the project due to its low potential under an economical and ecological point of view. The drained coal mine gas from the degasification system of block 3 is discharged to atmosphere at a remote location which does not belong to the project.

Stratigraphical information

The Donetsk basin (Donbass) is of Carboniferous age and covers an area of about 60,000 km². Within the basin more than 330 coal seams are known to a depth of 1,800 m. At Krasnodon about 24 seams are bedded in the sedimentary rock sequence.

At the Sukhodolskaya-Vostochnaya Mine, mining takes place in a depth of 800 - 1,000 m. There are major seams (coal seams, sandstone and sandy shale seams) with different characterizations of thickness (please see Table A.4.2.2. below). Further seams are existent, but less than 30 cm thick. The single seam mined at Sukhodolskaya-Vostochnaya Mine is the coal seam (I_3) with a thickness between 190 and 210 cm (see example in Table A.4.2.2. for block 2)[3].

Table A.4.2.2. Depth and thickness of seams at block 2 – Longwall 23 west (former Longwall 24)

ID	Seam	Depth (m)	Thickness (cm)
$K_2/4$	Sandstone	610	1,700
	Sandy shale	620	333
K_2	Sandy shale	635.9	2,763
$K_1/1$	Sandstone	695.5	2,200
	Sandy shale	720.9	2,790
$I_4/1$	Sandstone	754.9	1,200
	Sandy shale	764.4	685
	Coal	767.9	30
$I_3/1$	Sandstone	779.9	2,300

[3] Figures extracted from the "Independent Technical Review of Sukhodolskaya-Vostochnaya CMM; DMT-No.:34109919; Annex 2

	Sandy shale	795.7	855
	Coal	800-1,000	190
$I_2/2$	Sandstone	1,051.7	3,000
	Sandy shale	1,072	1,065
	Coal	1,077.7	70

The surrounding rocks are composed of rhythmic sandstone, sandy shale, and shale and limestone stratification. Thick sandstones layers, some 10 m thick each, are predominant and with porosity up to 9%. Coal faces are about 250 m long and longwalls are ventilated in U-form or Y-form, supported by gas drainage.

The coal series of the Donbass area are unique for their no uniform bedding. Therefore, the coal-bearing strata of the lower carbonic occur along the south-western flank of the Donetsk bending flexure, where recoverable coal reserves are concentrated within a contour interval of 400 to 500 meters. The coal seams are clustered in groups with the interval between such groups ranging from 30 to 80 meters. Within each group, individual seams generally have intervals between them that range from 3 to 20 meters[1]Ibid.

Gas drainage technique of the mine

As described under section A.2, only post-mining CMM is feasible at Sukhodolskaya-Vostochnaya Mine. The different types of CMM extraction occurs according to following processes:

- Surface vertical boreholes (“goaf wells”)
- Cross-measures boreholes (“Underground boreholes”)

Surface vertical boreholes (“goaf wells”)

The goaf wells are drilled from locations on the surface vertically above the longwall extraction area.
Longwall 12 east and 24 east goaf wells are linked by a surface pipeline serving blocks 1 and 2. The coal mine gas coming from the surface goaf wells is extracted by liquid-ring vacuum pumps, installed within a concrete building, called surface goaf wells vacuum pumping station (SGW-VPS) located at the central vacuum pumping station (CVPS), the central facilities and main buildings of the Mine.

Currently only a small portion of the total amount of coal mine gas is utilised within two CMM-fired steam boilers for the production of steam, used for the generation of hot water and other heating purposes of the Mine. As mentioned under Section A.2, both CMM-fired steam boilers are part of a separate JI project. The main portion of the extracted coal mine gas is currently vented into the atmosphere via several cold stacks installed at the Mine.

Cross-measures boreholes (“Underground boreholes”)

Cross-measures boreholes are being drilled from behind the longwall face to penetrate gas horizons in the roof above the longwall goaf. Currently these boreholes collect free gas from the goaf but in the project the boreholes will collect gas directly from source in the satellite gas horizons.
The cross-measures boreholes are connected to a sub-surface degasification system pipeline. Presently this pipeline serves Longwall 24 east. The gas exits to the surface via a borehole close to a set of several, outdoors installed liquid-ring vacuum pumps from the Mines’ underground degasification system, named the sub-surface drainage vacuum pumping station (SSD-VPS) which is also located at the vacuum pumping station (CVPS), at the central facilities and main buildings of the Mine.

The extracted coal mine gas is currently discharged to atmosphere via a cold stack installed on the SSD-VPS. In addition to the SSD-VPS, a further pumping station at the remote location in the Southern part of the mine is connected to the pipeline serving the underground boreholes of Longwall 12. By the end of 2010 the sub-surface degasification system serving Longwall 12 will be modified so that it exits from underground via a new connecting borehole close to the SSD-VPS.

In the figures below (Figure A.4.2.1. and Figure A.4.2.2*)*, the Longwall 12 and Longwall 24 east are shown, as their procedures are different (Longwall 12 is advancing and Longwall 24 is retreating).

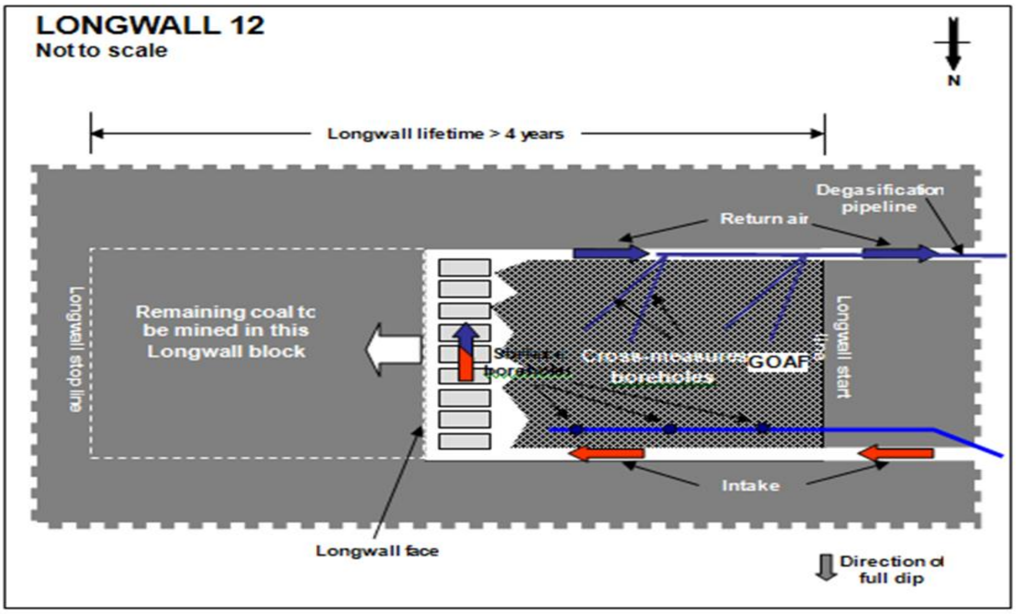

Figure A.4.2.1. Longwall 12 scheme (top view)

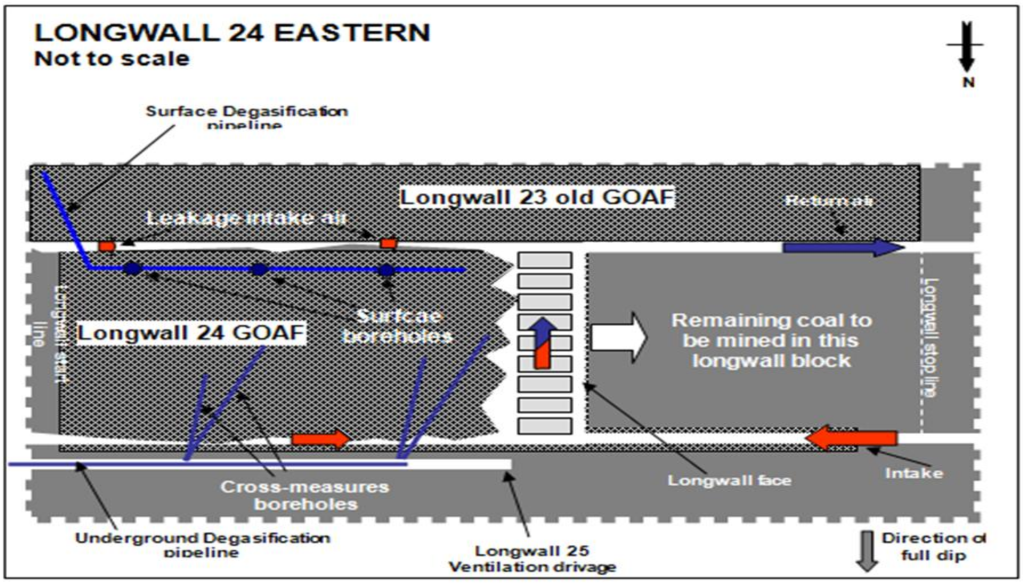

Figure A.4.2.2. Longwall 24 scheme (top view)

Project activity

The project will utilize the unutilised CMM which is currently vented into the atmosphere from the sub-surface underground boreholes and also the remaining unused CMM within the two CMM-fired steam boilers which are part of a separate JI-project.

The project will be a combination of flaring equipment for destruction of extracted CMM and power generation which would otherwise be purchased from the national grid by the Mine in the absence of the project activity. Currently electricity for the Sukhodolskaya-Vostochnaya Coal Mine production sites and facilities is purchased from the grid. Power consumes at the production sites are supplied by the grid through a VPS-110 electric power substation at a voltage of 110/6 kV**.** In the envisaged project the electricity generated will be supplied for own consumption of the mine.. Electricity exchange at the project site will take place at an existing substation at the Sukhodolskaya-Vostochnaya Mine.
The project intends to utilize the existing vacuum pumps at both pumping stations (SGW and SSD-VPS) for flaring and power generation therefore no additional blowers are required.

Table A.4.2.3. Installation of project equipment

Phases	Capacity	Units	Project steps	Term
P1	25 MWth	1	Order of the flare facility	January 2010
			Shipment of the flare facility	July 2010
			Commissioning of the flare facility	October 2010
			Start of flaring captured CMM	October 2010
	3.2 MWel	2	Order of the CMM-fired gensets	January 2011
P2	25 MWth	1	Relocation of the flare facility	October 2011
			Commissioning of the flare facility	November 2011
	3.2 MWel	2	Shipment of the CMM-fired gensets	October 2011
			Commissioning of the CMM-fired gensets	January 2012
			Start of generating electricity	January 2012

As mentioned in the table above, the realisation of the project will be divided into two phases:

Phase 1

In the first phase (Phase 1), all available CMM will be sent to and combusted by an enclosed high temperature flare (HT-flare) to avoid respectively reduce further CMM emissions to the atmosphere and to generate emission reduction units (ERUs) in a short term. The nominal combustion capacity of this flare will be 25 MWth, equivalent to a volumetric flow rate of 2,500 Nm^3 of pure methane (CH_4) per hour.

Phase 2

In the second phase of the project (Phase 2), the CMM Flaring Plant will be extended by a CMM Power Plant respectively CMM utilisation plant, comprising two CMM-fired gas engine-driven electricity generators (hereafter referred as “gensets”). The available CMM will be preferentially used as fuel gas for the generation of electricity, while excess CMM will be flared by the existing HT-flare. The installed electrical capacity will be approx. 3.2 MWel, which corresponds to the Mine’s usual base load.

The generated electricity will be fed via step-up transformers (one per genset) as medium voltage (6 kV) into the grid of the local utility named “Ukrenergougol”. This, in turn, is connected to the high voltage (110 kV) national grid. To avoid that electricity will be fed into the national grid, the CMM utilisation plant will be fitted with a power management system.

Flaring equipment

In phase 1 of the project, flaring equipment and all corresponding piping system and control units will be installed at the Mine located at the central vacuum pumping station (CVPS). The high temperature flare provides safe and environmentally-friendly combustion of CMM. The exhaust gas emissions meet the stringent requirements which will be achieved with combustion temperatures between 1,000 – 1,200°C and a defined residence time of > 0.3s.

As soon as the start command is given and the required start pressure is reached the flare starts up. Ignition is activated by an automatic ignition device. The burner control unit controls the ignition process and monitors the flame. The combustion is automatically regulated by the air supply in relation to the optimum combustion temperature. All control functions are integrated in a weather proof control cabinet, wired up ready for connection.

Table A.4.2.4. Technical specification of the flare

Type:	HOFGAS®–CFM4c 25000
Manufacturer:	Hofstetter Umwelttechnik AG, 3324 Hindelbank, Switzerland
Unit:	1
Processing equipment and working principle:	Combustion of CMG within a sufficiently elongated and heat insulated combustion chamber, leading to the required combustion temperature at required residence time and finally to an invisible flame; combustion air flaps (supply air louvre flaps) for the control of the amount of combustion air according to the optimum combustion temperature (combustion temperature control); automatic gas burner control unit along with the appropriate accessoires (flame detector, ignition transformer, spark plug, etc.) for the ignition control and flame monitoring of the combustion process.
Burner capacity:	maximum 25,000 kW
Combustion temperature:	1,000 – 1,200 °C
Residence time:	> 0.3 s
Other:	The flare will be fully equipped with the necessary sensors and actors as well as all necessary safety devices (e.g. flame arrestors, pressure and temperature limiters, etc.) for the reliable and safe operation of the system and to fulfil the corresponding safety requirements. The combustion process (ignition, re-start, flame detection, etc.) will be controlled and monitored by an approved automatic gas burner control unit (e.g. Kromschröder IFS) and the appropriate accessories like flame detector (e.g. UV-sensor Kromschröder UVS), ignition transformer (e.g. Kromschröder TZI), ignition electrode or spark plug, etc. The main facilities will be installed outdoors while all equipment which does not need to be installed directly at or nearby the combustion chamber of the flare will be installed within the containerised process technology room.

Power consumption:	Approximately 200 MWh/a (240VAC, 50Hz, 25KWel)
Flaring efficiency:	> 99.95%
Operating hours:	8,000 oh/a

Electrical power generators

In phase 2 of the project, two CMM-fired gensets' will extend the project and generate electrical power to the Mine. Therefore reduce the amount of electricity generated by national grid.

Table A.4.2.5. Technical specification of the gensets

Type:	TCG 2020 V16[4]
Manufacturer:	MWM GmbH, 68167 Mannheim, Germany
Unit:	2
Processing equipment and working principle:	High-efficient, state-of-the-art 16 cylinder reciprocation IC gas engine; working principle is the Miller-cycle, similar to the Otto-cycle; including turbocharger, intercooler and gas train for CMG-applications and all necessary cooling water, lubrication oil and exhaust gas systems; 400V-50Hz-AC generator; switchgear including low voltage power distribution, generator protection and synchronisation device and automatic control system; all necessary safety and monitoring devices for the safe and reliable operation of gensets.
Engine power, mechanical:	1,605 kW_{mech}
Electrical power:	1,560 kW_{el} @ cosine phi 1.0
Fuel consumption:	approximately 3,606 kW_{fuel}
Motor jacket water heat:	796 kW_{th}
Exhaust gas heat:	788 kW_{th}
Electrical efficiency:	43.3 %
Thermal efficiency:	43.9 %
Total efficiency:	87.2 %

[4] The technical data of the gensets are based on the data for natural gas applications and might slightly vary for CMG applications.

Electricity utilisation

Based on the current production rate, the average electric power consumption of the Mine, which is taken from the national electricity grid of the Ukraine, is approximately 210,000 kWh/day with seasonal fluctuations of 170,000..190,000 kWh/day in summer and 225,000..250,000 kWh/day in winter.
This corresponds to an average power consumption of 8.75 MWel, not taking into account any fluctuations over the day.

Based on the power consumption recordings of the Mine, the base load of the mine can be deemed to be approximately 3.12 MWel and the peak load to be approx. 12 MWel.

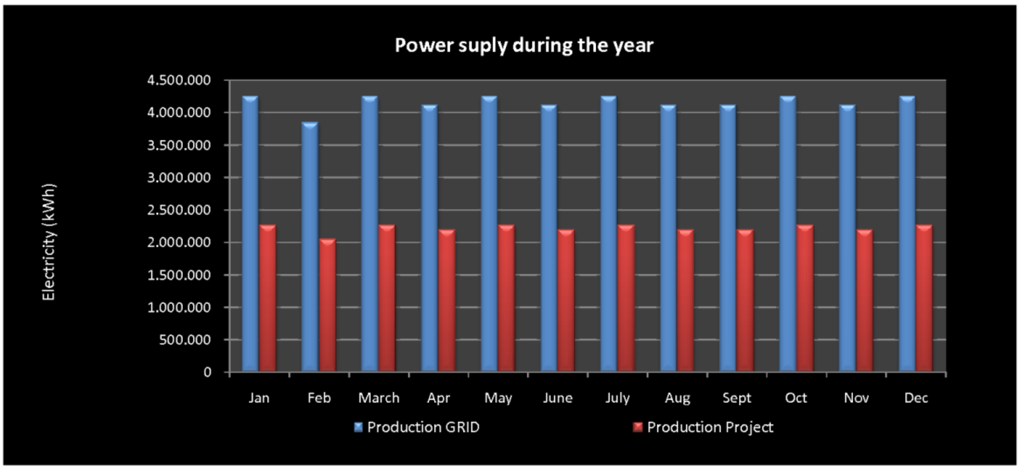

Figure A.4.2.3. Power supply to the Mine

Heat utilisation

The project will not consider any heat utilisation as there is already a separate existing JI project covering the Mine's heat demands through two CMM-fired steam boilers. Both boiler facilities have been commissioned during the last two years.

During the project activity, no displacement of CMM which would have otherwise been used for thermal energy generation will occur due to a redesigned gas supply system which enables the primarily gas supply from the SGW-VPS to the existing CMM-fired steam boilers. Only the remaining amount of CMM which the CMM-fired steam boilers will not combust due to the technical capacity, will be used for the project activity together with the complete gas coming from the SSD-VPS.

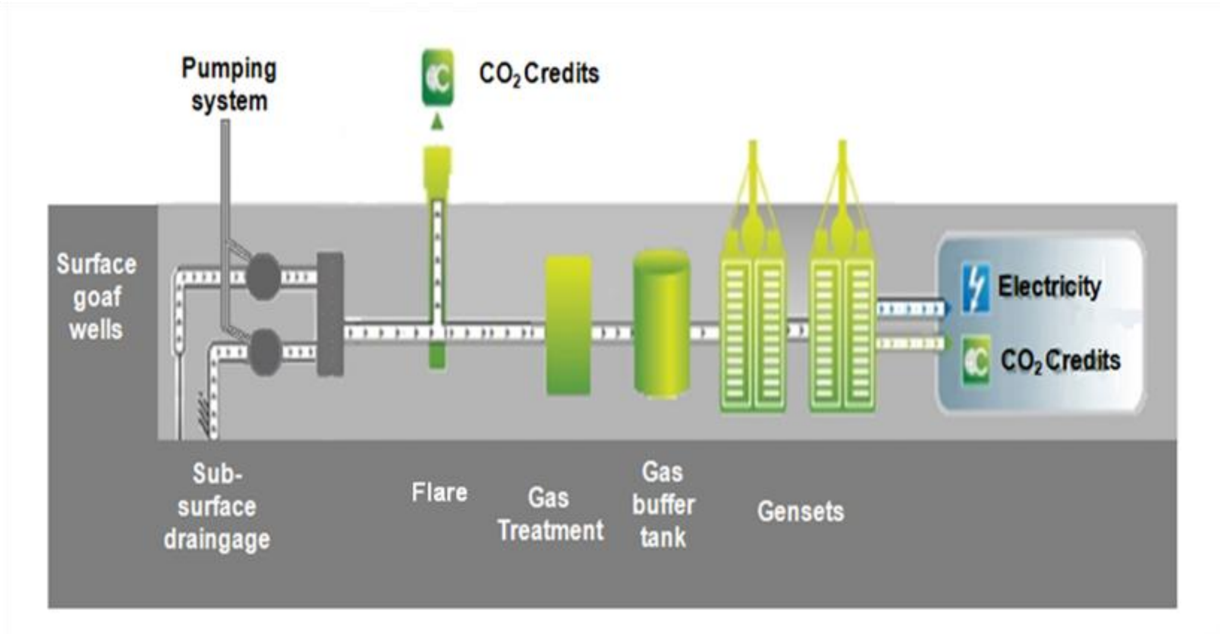

Figure A.4.2.4. General scheme of the installation with main project components

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

According to Kyoto Protocol accepted the addition to United Nations Framework Convention on Climate Change and the enactment of the Cabinet of Ministers of Ukraine No. 206 dated February 22, 2006 Sukhodolskaya-Vostochnaya Mine executes a complex of provision intended for recover of captured methane which is a greenhouse gas (GHG).

The emission reductions are based on the conversion of CMM with its main component methane (GWP 21) into CO_2 in combustion processes. In absence of the project the whole CMM amount, which should be converted into CO_2 in the power generation units as well as in the flares would otherwise be released unused into the atmosphere as more harmful methane. The technical capacity of the CMM-fired steam boilers (registered under another JI project) do not exceed a specific amount of fuel consumption so that most of the extracted coal mine gas still would have been released into the atmosphere in the absence of the project activity.

According to the Ukrainian law “On the ecological examination” all projects that can result in violation of ecological norms and /or negative influence on the state of natural environment are subject to ecological examination. In order to comply with regulation the coal mine will submit the project, which stipulates CMM utilization activities, to the Ukrainian Ministry of Environmental Protection for preliminary state ecological expertise.
The project is not "business-as-usual" and faces several barriers, both in terms of prevailing practice and the economic attractiveness of the project. In section B of this PDD, it is shown that the emission reductions would not occur in absence of the project.

Within the crediting period the project activity is estimated to reduce **605,003 tonnes of CO2 equivalent**.

A.4.3.1. Estimated amount of emission reductions over the crediting period:

Table A.4.3.1. Estimated emission reductions during the crediting period

	Years
Length of the crediting period	2.2 years
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2010 (1st November – 31st December)	39,111
2011	234,672
2012	331,220
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	605,003
Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	279,232

Table A.4.3.2. Estimated emission reductions post 2012 until end of operational lifetime

Prospective emission reductions for the years 2013 - 2020	
Year	Estimate of annual emission reductions in tonnes of CO_2e
2013	331,220
2014	331,206
2015	331,222
2016	331,222
2017	331,222
2018	331,222
2019	331,222
2020 (01 January - 31 October)	305,479
Total estimated emission reductions over the period (tonnes of CO2 equivalent)	2,624,015

A.5. Project approval by the Parties involved:

The acceptance of the project by the host party, Ukraine has been stated with a Letter of Endorsement, Nr. 577/23/7, issued on 03/06/2009, issued by the National Environmental Investments Agency of Ukraine (NEIA).

Beside the issued LoE as described above, the Host Country has not issued the Letter of Approval yet. The Designated National Authority of the Netherlands has issued the Letter of Approval on the 29/11/2010 under the reference number 2010JI33.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

The JI specific approach on the basis of the approved consolidated baseline and monitoring methodology ACM0008 (Version 07) *"Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive (and heat and/or destruction through flaring or flameless oxidation."* has been used to identify the baseline scenario of the proposed JI project.

Applicability of the JI specific approach on the basis of the ACM0008 Version 7 methodology

The project involves the extraction of CMM from underground boreholes and gas surface drainage technique through goaf wells to capture CMM. This extraction activity is listed as one of the applicable extraction activities. The captured methane will be destroyed through utilisation to produce electricity and through flaring. Remaining, not used methane will be vented for safety reasons.

Ex-ante projections have been made for methane extraction and utilisation. The CMM is captured through existing mining activities. The following steps apply to the coal mine:

- The mine is not an open cast mine
- The mine is not an abandoned/decommissioned coal mine
- There is no capture of virgin coal-bed methane
- There is no usage of CO2 or any other fluid/gas to enhance CMM drainage. In step 1 below, the method of extraction is described more in detail

Hence the JI specific approach on the basis of the ACM0008 Version 7 methodology is fully applicable to this JI project.

Step 1. Identification of technically feasible options for capturing and/or using CBM or CMM

Step la. Options for extraction

According to the JI specific approach on the basis of the ACM0008 Version 7 methodology, all technically feasible options to extract CMM have to be listed. The technically feasible options are:

A. Ventilation air methane
B.1 Pre-mining CMM captured by underground boreholes
B.2 Pre-mining CMM captured by surface drainage wells
B.1a During mining CMM captured by underground boreholes
B.2a During mining CMM captured by surface drainage wells
C.1 Post-mining CMM captured by underground boreholes
C.2 Post-mining CMM captured by surface drainage wells
D Possible combinations of options A, B, and C, with the relative shares of gas specified.
D.1 Pre-mining, post-mining and during mining CMM captured by underground boreholes
D.2 Pre-mining, post-mining and during mining CMM captured by surface drainage wells

The main amount of methane on the project site is currently released to the atmosphere together with the ventilation air stream, called ventilation air methane (VAM) – option A. Due to the required fraction of methane not greater than 1%, the concentration of methane within VAM is too low and for that reason not included in the utilization scheme in mine and not considered in the PDD.

As per option B.1 and B.2, the gas drainage techniques concerning pre-mining CMM is not available at the Sukhodolskaya-Vostochnaya Mine due to low permeability of the seam. As shown in Table A.2. , pre-mining CMM is not feasible due to the very poor amount of gas which could be drained during the period until the goaf reaches the boreholes (from surface or underground boreholes due to the reason that CMM is only released in the boreholes as a result of mining activities. Any boreholes not affected by mining, do not produce gas.

As per the definition in the JI specific approach on the basis of the ACM0008 Version 7 methodology, during mining CMM is not defined on page 2 and under goaf, the released gas is only available for post-mining CMM extraction. According to the definitions of the Methodology, options B.1a and B.2a are not considered in the PDD.

Within the project, the drainage techniques extract post-mining CMM. With other words, options C.1 and C.2 are taken into consideration in the PDD and described more in detail under Section A.4.2 within the PDD. The relative share of gas specified within the post-mining technique is in a range of 51 – 80 % of CMM in the coal mine gas drained from surface goaf wells and 44% drained through underground boreholes.

Resuming the description above, option D, D.1 and D.2 are not taken into consideration as the extraction of CMM does not occur as a combination of different steps of the mining activity (e.g. pre-mining, during mining and post-mining).

Step lb. Options for extracted CBM and CMM treatment

Several approaches can be taken to treat the captured CMM of the project:

i. Venting
ii. Using/destroying ventilation air methane rather than venting it
iii. Flaring of CMM
iv. Use for additional grid power generation
v. Use for additional captive power generation
vi. Use for additional heat generation
vii. Feed into gas pipeline (to be used as fuel for vehicles or heat/power generation)
viii. Possible combinations of options i to vii with the relative shares of gas treated under each option specified

All of these options are considered as possible alternatives for CMM treatment. In step 3 of this section some of these options will be further developed into baseline scenario alternatives. The project activity considers option viii. – The combination of option iii. Flaring and option iv. - Use for additional grid power generation as besides option i. - Venting, no other options are taken into consideration.

Step lc. Options for energy production

The options for energy production are included in the options iv. to viii. listed in step 1b above.
As mentioned under step 1b, the project activity considers options viii. in which the option of grid power generation (option iv.) is considered. The Sukhodolskaya-Vostochnaya Mine receives the electricity from a local utility named “Ukrenergougol”. This local utility supplies fed in the electricity into a private electricity grid which covers all end-users (e.g. ventilators of the mine, buildings, electrical devices, existing boiler project (separate JI-project).

The gensets which will be installed within phase 2 of the project activity will replace electricity which otherwise would be fed into the private electricity grid by the local utility named “Ukrenergougol”. The electricity demand of the Sukhodolskaya-Vostochnaya Mine will be covered by the electricity generation by the project (two installed gensets within phase 2) and the electricity produced by the local utility.

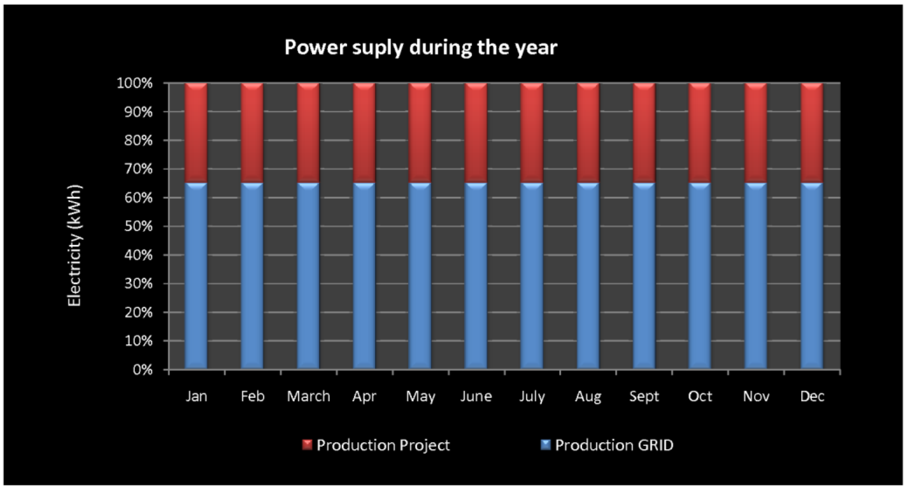

Figure B.1.1. Share of electricity fed into the electricity grid at the Mine

Step 2. Eliminate baseline options that do not comply with legal or regulatory requirements

According to the national safety regulations, the coal mine methane has to be extracted. There is no regulation in place that would require any specific utilisation of the extracted methane. On the other side there is no national regulation in place that would prohibit any use of CMM, e.g. for heat and/or electricity generation. Therefore, all the alternatives listed in step lb are in compliance with the existing regulations.

Step 3. Formulation of the baseline scenario alternatives

The following alternatives can be considered for implementation at the project site and are in compliance with the options listed in step lb and step lc. In any case the coal mine has to extract the CMM from the mine for safety reasons. Therefore the alternatives below assume extraction as described in step la and describe in detail the alternatives for treatment and utilisation.

Alternative i. - Venting of CMM

Since there are no legal requirements for treatment and utilisation of the captured CMM, it is common practice at Ukrainian coal mines to release the CMM into the atmosphere. This alternative is partially the actual situation before project implementation – all of the CMM extracted is mostly released into the atmosphere or captured and combusted within CMM-fired steam boilers. The CMM-fired steam boilers are not part of the project as they belong to an already existing JI-project.

The energy demand and supply of the coal mine in this scenario would continue in the following way:

- Electricity would be supplied by the national/regional grid
- On-site heat demand would be supplied by the existing CMM-fired steam boilers which are registered as a separate JI-project.

Alternative ii. Using/destroying ventilation air methane rather than venting it

At the Sukhodolskaya-Vostochnaya Mine the ventilation air methane is released into the atmosphere through main surface fans. Due to the required fraction of methane not greater than 1%, the concentration of methane within VAM is too low and for that reason not included in the utilization scheme in mine and not considered in the PDD.

The energy needs of the mine will be supplied in the same way as described in alternative i.

Alternative iii. Flaring of CMM

The flaring of the captured methane is not required by any existing national regulations. Only cold stacks are installed at the mine in order to release the extracted methane from the underground of the mine. The infrastructure for methane flaring does not exist at the coal mine, so that additional investment would be required. The operation would generate additional costs. Without revenues from emissions trading this alternative would only generate costs and is economically not feasible.

The energy needs of the mine would be supplied in the same way as described in alternative i. This alternative represents a part of the project scenario, see alternative viii.

Alternative iv. – Use for additional grid power generation

The captured methane could be utilised in a power plant for electricity generation. Possible power plant alternatives are:

a) Conventional steam power plant, CMM-fired

b) Combined gas-steam power plant, CMM-fired

c) Gas turbine, CMM-fired

d) Gas engine, CMM-fired

e) Fuel cell, CMM-fired

The energy needs of the mine would be supplied in the same way as described in alternative i.

Alternative v. –Use for additional captive power generation

The captured methane could be utilised for captive power generation, especially to cover the electrical and thermal energy demand. Possible alternatives are those listed under point iv. – Use for additional grid power generation and under point vi. – Use for additional heat generation.

Furthermore a combined heat and power generation is possible and eligible through CMM-fired cogeneration units. The option of captive power generation is not part of the project scenario as the Sukhodolskaya-Vostochnaya Mine purchases electricity from the local utility named “Ukrenergougol” due to the reason that no power plant exists currently at the Mine and therefore no replacement of any power plant will occur by the project activity.
The energy needs of the mine would be supplied in the same way as described in alternative i.

Alternative vi. – Use for additional heat generation

In this case a new heat generation plant should be constructed and connected to a heating system outside the coal mine, e.g. a district heating system, possible heat generation plant alternatives are:

a) Conventional CMM-fired steam boiler

b) Conventional CMM-fired hot water boiler

The existing two CMM-fired steam boilers which are registered under a separate JI-project cover the heat demand of the Mine. As the whole thermal energy demand is covered through the two existing CMM-fired steam boilers, no additional thermal energy generation is required. Therefore no additional heat generation is considered in the project scenario.

The energy needs of the mine would be supplied in the same way as described in alternative i.

Alternative vii. – Feed into a gas pipeline (to be used as fuel vehicles or heat /power generation)

There are three possible ways to utilise the captured methane:

a) Feeding into a gas pipeline
b) Compression of the gas and usage as fuel for vehicles
c) Liquefaction of the gas and transportation in tanks for utilisation by external users

In case a) feeding into a gas pipeline, a new connection to an existing pipeline has to be made. Depending on the quality specification of the pipeline operator, most likely an additionally methane enrichment plant could be required.

The energy needs of the mine would be supplied in the same way as described in alternative i.

Alternative viii. – Possible combinations of alternatives i. to vii.

There are numerous possible combinations of the alternatives i. to vii. so that only the project scenario should be described in the following.

The CMM should be utilised for grid power generation and for flaring due to the reason that two already existing CMM-fired steam boilers would supply the Mine with thermal energy to cover the heat demand. The electricity produced by the project scenario should be consummated by the extracted coal mine which consists of the remaining amount of CMM coming from the SGW-VPS and the complete extracted amount of CMM from SSD-VPS.

Venting of excess CMG via a cold stack in parallel to the HT-Flare in case the HT-Flare has reached its maximum capacity and the fraction of methane is below the required fraction of methane by the gensets.

The project scenario consists of the following utilisation steps according to two different phases:

Phase 1:

In the first phase all available CMM will be sent to and combusted by an enclosed high temperature flare (HT-flare), to avoid respectively reduce further CMM emissions to the atmosphere and to generate emission reduction units (ERUs) in a short term. The nominal combustion capacity of this flare will be 25 MWth, equivalent to a volumetric flow rate of 2,500 Nm^3 $CH4$ per hour.

Phase 2:

In the second phase of the project (Phase 2), the CMM Flaring Plant will be extended by a CMM utilisation plant, comprising two CMM-fired gas gensets. The available CMM is preferentially to be used as fuel gas for the generation of electricity, while excess CMM will be flared by the existing HT-flare. The installed electrical capacity will be approx. 3.2 MWel, which corresponds to the Mine's usual base load.

The relative shares of gas vary during a year, mainly depending on the heat demand of the Mine (summer/winter period) due to the reason that the project scenario will - besides the utilization of extracted CMM through the SSD-VPS - use the remaining amount of CMM extracted from the SGW-VPS which is sent to the CMM-fired steam boilers (separate JI-project).

In a separate calculation, all possible CMM utilising facilities within the baseline and project scenario were taken into consideration to visualize the share of utilization for phase 1 and phase 2.
Figure B.1.2. shows the relative shares of CMM used for heat generation (separate JI-project and baseline scenario), flaring of the extracted CMM and venting of further excess of not used CMM. The shares are relative to the total amount of the extracted CMM (100%)
Figure B.1.3. shows the relative shares in phase 2 where CMM will be used for heat (already existing JI-project), electricity generation, flaring and venting. Flaring, electricity generation and venting are within the project scenario).

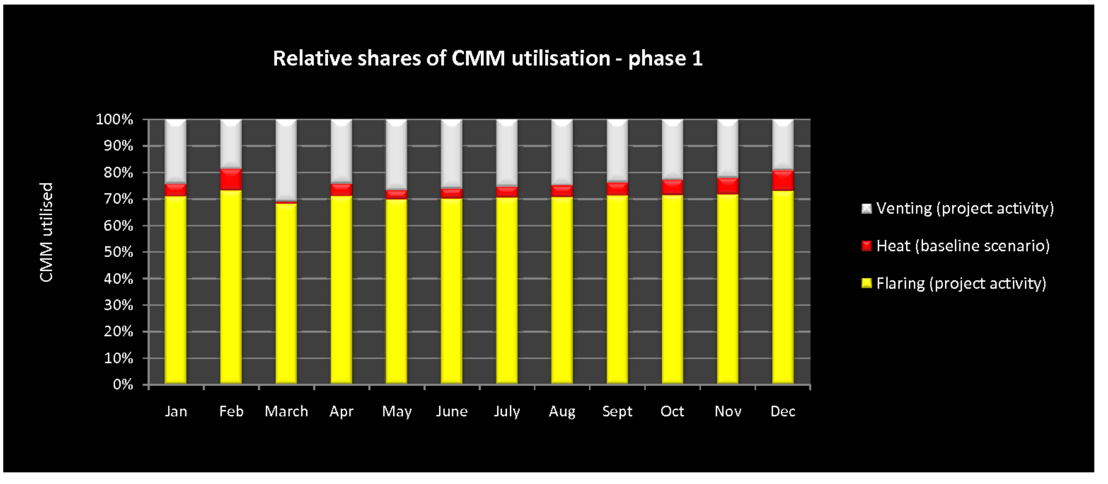

Figure B.1.2. Share of Heat, Flaring and Venting - phase 1

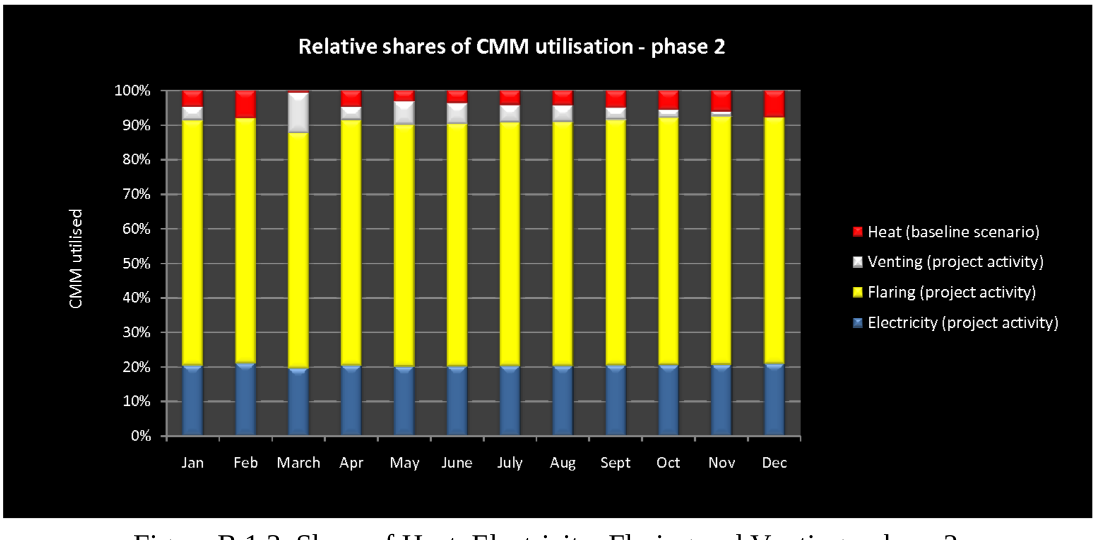

Figure B.1.3. Share of Heat, Electricity, Flaring and Venting - phase 2

Step 4. Elimination of baseline scenario alternatives that face prohibitive barriers

In this section the possible alternatives formulated above will be checked against the existing economic and other barriers for their implementation. Non-realistic alternatives will be eliminated.

Alternative i. Venting

The existing national regulations require that captured CMM has to be vented for safety reasons. There are no legal requirements that prohibit venting or require mines to utilise CMM. This alternative represents the current situation in the absence of the proposed project activity. There are no barriers or external factors that prevent this alternative to be continued.
Therefore, this scenario can be considered to be a realistic alternative.

Alternative ii. Using/destroying ventilation air methane rather than venting it

As already mentioned under step 3, the ventilation air methane at the Sukhodolskaya-Vostochnaya Mine is released into the atmosphere through main surface fans as the fraction of methane is too low (value is equal or less than 1%). Due to the required fraction of methane not greater than 1%, the concentration of methane within VAM is too low and for that reason, this alternative is technically not viable, neither the use nor the destruction due to the low concentration of the methane in the ventilation air.
Therefore this alternative faces a prohibitive barrier and is eliminated.

Alternative iii. Flaring of CMM

Flaring of CMM is not required by the existing national regulation. Additional investment has to be made by the project owners to install the flare facility the appropriate piping equipment and the process measuring and control technology. Without revenues from emissions trading, no income but only costs are generated. So this scenario is facing a strong prohibitive barrier, because the investment will not generate any revenues.
This scenario is part of the project scenario with revenues from emissions trading taken into account.

Alternative iv. Use for additional grid power generation

Generally CMM can be used for electricity generation that is delivered to the grid. Under this alternative heat is not generated. As described under Step 3, following alternatives exist:

a) Conventional steam power plant, CMM fired

Usually power generation in conventional steam power plants is economically viable for middle and large scale plants (more than 20 MWel), so in case of the project the alternatives b) to e), which are listed below are economically more attractive.
Therefore this alternative faces a prohibitive barrier and is eliminated.

b) Combined gas-steam power plant, CMM fired

A combined gas-steam power plant is a rather new technology. At present the technology is only available for natural gas, so that the CMM, which has an appreciable lower methane concentration and lower calorific value, should be first purified to an adequate quality. The additionally required purification plant makes this alternative economically not viable. This alternative would be furthermore the first combined gas steam power plant fired with CMM in Ukraine and there are no skilled and properly trained personnel for the operation and maintenance of this type of technology exist.
Therefore this alternative faces multiple prohibitive barriers and is eliminated.

c) Gas turbine, CMM fired

At present this technology is only available for gases with high caloric values, so that the CMM, which has a low calorific value, should be first purified to an adequate quality. The additionally required purification plant makes this alternative economically not viable. Further on this would be the first gas turbine fired with CMM

in Ukraine and there are no skilled and properly trained personnel for the operation and maintenance of this kind of technology.
Therefore this alternative faces multiple prohibitive barriers and is eliminated.

d) Gas engine, CMM fired

This alternative is the most suitable technology for power generation in the prospected range of performance. In this alternative only power generation for the grid and no heat generation is regarded.

This alternative is economically not viable as the high investment cost will not be recovered with the revenues from the sale of power fed into the grid. Although, the contractual specific sales price for the produced amount of electricity (in EUR/kWh) includes a yearly escalation of 3%[5], even though the set feed-in tariff is not comparable to the market prices within the Ukrainian electricity market. Therefore, this alternative is excluded from further consideration. However, the activity under this scenario is a part of the project scenario and is realistic if additional revenue from selling ERUs generated under JI mechanism is available.

e) Fuel cell, CMM fired

At present this technology is only available for gases with high caloric values, so that the CMM, which has a low calorific value due to low methane concentration, should be first purified to an adequate quality. The additionally required purifying plant makes this alternative economically not viable.
Further on this would be the first fuel cell fired with CMM in Ukraine and there are no skilled and properly trained personnel for the operation and maintenance of this kind of technology.
Therefore this alternative faces multiple prohibitive barriers and is eliminated.

Alternative v. Use for additional captive power generation

As mentioned in Step 3, this alternative is not taken into consideration due to the fact that in the baseline the consumed electricity is purchased from the local grid and no fuel combusting power plant exists. Furthermore the captured methane in the project activity will be utilised to produce electricity which will be fed into the local grid.
Therefore this alternative faces a prohibitive barrier and is eliminated.

Alternative vi. Use for additional heat generation

A conventional steam boiler produces steam, so that a steam grid is required for the transportation of the generated heat to the users. Because no such a grid is available the alternative is not realisable. A conventional hot water boiler produces hot water, which is supposed for the feed-in in a heating grid, e.g. a district heating system. The next available district heating system is too far away to make this alternative economically viable. Both alternatives face prohibitive barriers and are eliminated.

Besides both mentioned alternatives, at Sukhodolskaya-Vostochnaya an already existing JI-project with two CMM-fired steam boilers covers the yearly heat demand from the Mine so that no additional CMM-fired steam boilers are considered in the within the project activity. Furthermore no cogeneration units are designed for the project, only gensets which only generate electricity, no thermal energy.

Alternative vii. Feed into a gas pipeline (to be used as fuel vehicles or heat /power generation)

There are three possible ways to utilise the captured methane:

[5] Information was extracted from the Power Purchase Agreement, dated 16th December 2009

a) Feeding into a gas pipeline

In case of feeding the gas into a gas pipeline, a new connection to an existing pipeline has to be made. Also an additionally methane purification plant is required to fulfil the quality specification of the pipeline operator. The costs of the purification plant and the lacking piping infrastructure make this alternative economically not viable.
Therefore this alternative faces a prohibitive barrier and is eliminated.

b) Compression of the gas and usage as fuel for vehicles

This alternative requires a suitable large fleet of vehicles. All vehicles need to be upgraded with the technology in order to combust CMM in the engines. At the present stage, there are not enough such consumers available. Further on the alternative faces a barrier due to the absence of prevailing practises to utilise CMM as vehicle fuel.
Therefore this alternative faces prohibitive barriers and is eliminated.

c) Liquefaction of the gas and transportation in tanks for utilisation by external users

This alternative requires a liquefaction plant. The required investment for the plant is high. There is significant uncertainty in Ukraine on the domestic price of natural gas, and as a consequence, on the economic feasibility of such a project. There are no personnel available, which is skilled and properly trained for the operation and maintenance of such a plant. Further on the alternative faces a barrier due to the absence of prevailing practises to utilise CMM for liquefaction purposes.
Therefore this alternative faces prohibitive barriers and is eliminated.

Alternative viii. Possible combinations of options i to vii with the relative shares of gas treated under each option specified.

The project scenario alternative described in step 3, requires a relatively high investment, the operating and the maintenance costs of the new technology are relatively high, on the other hand the specific energy costs of the coal mine are relatively low. E.g. coal which is actually used for heat generation in the existing boilers is available at cost price and must not be purchased at market price. The electricity price in Ukraine is at the time too low for economically justifiable power generation in cogeneration units. As shown in the calculation of profitability, the project scenario is financially not attractive. This is proven in section B.2 of this PDD.

In addition there is significant uncertainty in Ukraine on the domestic price of natural gas, and as a consequence, on the economic feasibility of such a project, finance in Ukraine is absent as is shown in section B.2 and therefore the investment would have to be paid from the cash flow of the mine.
Thus this alternative is a realistic alternative but faces economical barriers and is eliminated.

Conclusion

There is only one realistic option for the baseline scenario, which is the continuation of the current situation:

Venting of the CMM into the atmosphere, heat generation with the existing coal fired boilers, and the full purchase of electricity from the grid. Without additional income from emissions trading, the project is economically not viable and faces prohibitive barriers.

Following key information and data were and will be used to establish the baseline:

Data/Parameter	**BEy**
Data unit	tCO2e
Description	Baseline emissions in year y
Time of determination/monitoring	Determination/Monitoring

Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied (for ex ante calculations/determinations)	An average value of 234,594 tCO2e has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The recording frequency is monthly and will be archived electronically
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**$BE_{MD,y}$**
Data unit	tCO2e
Description	Baseline emission from destruction of methane in the baseline scenario in year y
Time of determination/monitoring	Determination
Source of data (to be) used	Ex-ante estimation
Value of data applied (for ex ante calculations/determinations)	An average value of 2, 883 tCO2e has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Fuel consumption of the existing boiler-project (assuming two boilers: boiler 1 – 232.74 Nm^3/h; boiler 2 - nearly not running (only 25% of boiler 1)
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**$BE_{MR,y}$**
Data unit	tCO2e
Description	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied (for ex ante calculations/determinations)	An average value of 224,266 tCO2e has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Gas flow monitored by the Mine during the years 2008, 2009 and half year of 2010 were analysed and the values for 2009 were taken into consideration as the gas flow for the ex-ante estimation.
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**$BE_{Use,y}$**

Data unit	tCO_2e
Description	Baseline emissions from the production of power of supply to gas grid replaced by the project activity in year y
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied (for ex ante calculations/determinations)	An averaged value of 7,445 tCO_2e has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	For the ex-ante estimation of electricity generation, the operation hours of the gensets were set to 8,000 hours/annum. The installed capacity of 1.558 kWhel
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	$\mathbf{PMM_{PJ,y}}$
Data unit	tCH_4
Description	Post-mining CMM captured and destroyed in the project activity in year y
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring through flow meter
Value of data applied (for ex ante calculations/determinations)	An averaged value of 11,728 tCH_4 has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Gas flow monitored by the Mine during the years 2008, 2009 and half year of 2010 were analysed and the values for 2009 were taken as the gas flow for the ex-ante estimation.
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	$\mathbf{PMM_{BL,y}}$
Data unit	tCH_4
Description	
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied (for ex ante calculations/determinations)	An averaged value of 1,048 tCH_4 has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and	Gas flow monitored by the Boiler-project (separate registered JI-project under the project identification UA1000031 ("Utilization of Coal Mine Methane at the Coal Mine Sukhodilska-Skhidna")

procedures (to be) applied	during the years 2008, 2009 and 2010 (January – August) were analysed and the average flow over the time taken into consideration for the ex-ante estimation.
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**GENy**
Data unit	MWh
Description	Power generated during phase 2 of the project activity
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring through power meter
Value of data applied (for ex ante calculations/determinations)	As per the ex-ante estimation, 24,928 MWh will be generated within the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The electrical generation is based on the operation hours of the year multiplied with the installed capacity.
QA/QC procedures (to be) applied	The power meter is subject to a regular testing regime to ensure accuracy. If applicable, the power meter will be according to national regulations.
Any comment	

Data/Parameter	**$EF_{ELEC,y}$**
Data unit	tCO_2e/MWh
Description	CO2 emission factor from the grid
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Default value
Value of data applied (for ex ante calculations/determinations)	The default value for the crediting period is 0.896 tCO_2e/MWh
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the document „Ukraine - Assessment of new calculation of CEF“ by TÜV Süd, dated 17/08/2007; reference IS-USC-MUC and “ Electricity Emission Factors Review” by MWH S.p.A, dated November 2009 and Utilization of Coal Mine Methane at the Coal Mine named after A.F. Zasyadko, Project Design Document version 4.4 (dated 27 March 2008), Annex 2, page 69
QA/QC procedures (to be) applied	
Any comment	

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:

In accordance with the chosen methodology, additionality has to be proven by applying the "Tool for demonstration and assessment of additionality", (version 05.2), EB39 [CDM-EB], Annex 10.
The result is given below.

Step 1. Alternatives

In accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology, this step is ignored.

Step 2. Investment analysis

Sub-step 2a. Determination of the analysis method

The proposed JI project will generate additional revenue from electricity generation. Therefore, simple cost analysis (Option I) is not applicable.

Obtaining financial indicators for similar projects in Ukraine is problematic as this project is unique in its kind; therefore the investment comparison analysis (Option II) cannot be performed for the identified alternatives and the benchmark analysis (Option III) will be used to test the additionality of the proposed JI project activity.

Sub-step 2b. Application of the benchmark analysis

The core business of the Coal Mine Sukhodolskaya-Vostochnaya is to mine coal for the Ukrainian and international market. The project would secure energy supply at the site independent from third party power suppliers. Nevertheless such an investment would derivate investment capital away from the mines' core business, being the mining of coal and ensures the safety of the miners. On the other hand the project would enable the mine to improve the reliability of energy supply at more favorable tariffs. Therefore the minimum requirement for the mine was that the project should at least be profitable. Therefore the most relevant benchmark for the mine is the IRR which should at least higher than the hurdle rate.

Ukraine has a high inflation rate with high fluctuations. Corresponding to the inflation rate the banking interest is changing. For the calculations, a National Bank of Ukraine interest rate prevalent in January 2007 was taken into consideration. This interest rate was 11.5 %[6]. Therefore the most relevant benchmark for the mine is the Internal Rate of Return IRR, which should at least be higher as the inflation rate and than the customary banking interest. An average value of 11.5% has been taken into account.

Sub-step 2c. Calculation and comparison of the indicators

The economic indicators for the proposed project (alternative 8) without JI revenue has been calculated under the following assumptions:

- Expected electricity generation was based on CMM availability until 2012 that was assumed when the decision was taken to implement the project (MoU was signed on 5th March 2007).

[6] Please refer to http://bank.gov.ua/Fin_ryn/Pot_tend/2007.zip

- Degasification activities and vacuum pumps were excluded from the capital costs as they are not part of the project (the degasification activities would have to be implemented anyway irrespective of the JI project).

The project has the following economic indicators:

Table B.2.1. Economic indicators of the project, without revenues from emissions trading

Economic Parameters – "Power generation from the coal mine methane at the Sukhodolskaya-Vostochnaya Mine" – Without ERUs.		
IRR	5	%

It is obvious that the project is not feasible without JI revenues.

Sub-step 2d. Sensitivity analysis

A sensitivity analysis of the proposed project was made based on the market forecasts available at the moment of making the financial analysis of the proposed project. The revenue price for electricity based on the price in the first period of 2007, has been varied 20% downwards and 20% upwards.

Table B.2.2. Sensitivity analysis of economic indicators of the project, without and with ERU's

Change CAPEX	**IRR (without ERU's), %**	**IRR (with ERU's), %**
+20%	2.2	19.5
-20%	8.8	37.1

Change OPEX	**IRR (without ERU's), %**	**IRR (with ERU's), %**
+20%	2.1	23.4
-20%	7.8	29.7

Change CMM Production	**IRR (without ERU's), %**	**IRR (with ERU's), %**
+20%	10.5	37.9
-20%	-1.7	15.2

As shown in Figure B.2.1., the benchmark for the IRR exceeds the set value of (11.5%) in no case. The project is financially not attractive without additional income, and becomes first financially attractive with additional revenues from emissions trading.

Sensitivity analysis was carried out, where the assumed CAPEX, OPEX and gas production of the project were increased and decreased by 20%. From the graph below, it is clear that under all scenarios the project is not viable economically without carbon revenues.

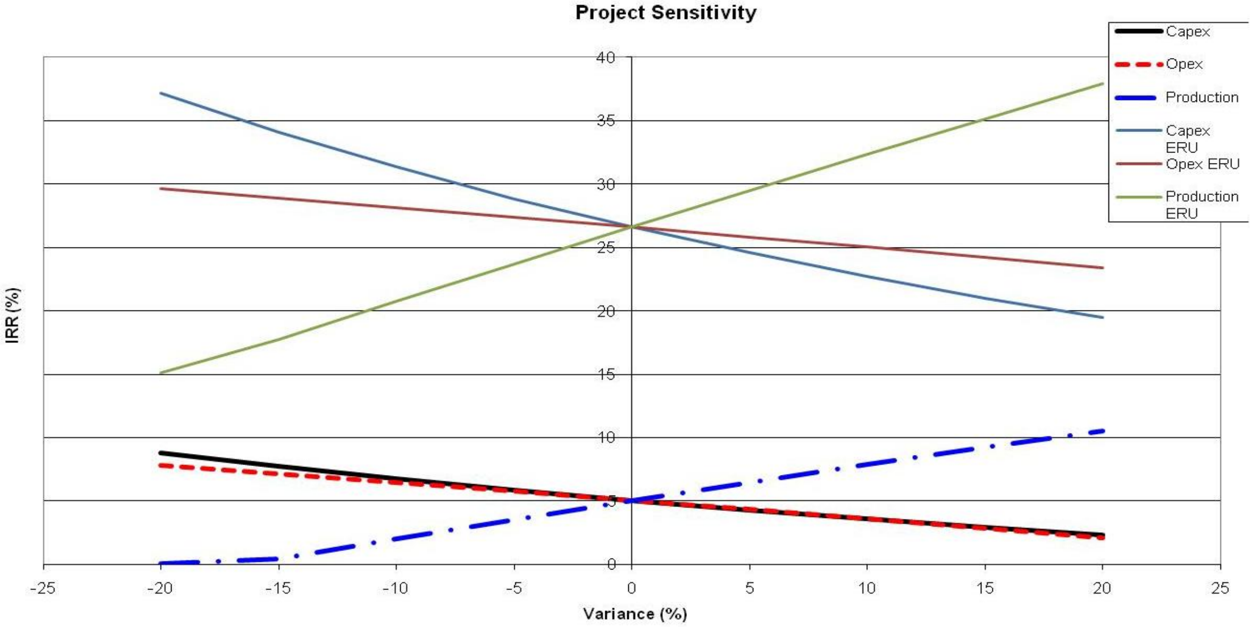

Figure B.2.1. Sensitivity Analysis

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Step 3. Barrier analysis Sub-step 3a.

Sub-step 3a. Barrier identification

The proposed JI activity faces the following barriers:

Barriers to prevailing practices

According to publicly available information about 2 billion cubic meters of CMM are actually released by Ukrainian coal mines [GGPN] with approximately 13 percent being extracted through degasification systems while the rest released into atmosphere through ventilation systems. Only 79 million cubic meters of this huge amount are actually utilised.

The situation at the Coal Sukhodolskaya-Vostochnaya Mine is similar to the national situation. Most of the CMM is released to the atmosphere together with the ventilation air. Actually there is no practice with CMM utilisation. Existing legislation is primary orientated on increasing safety of coal mine operations thus facilitating and enforcing development of degasification and ventilation systems at coal mines. Therefore current practices prevent the project from being implemented and clearly prevent the development of CMM utilisation activities.

Technology barrier

The project is unique of its kind according to the CMM Utilization projects in Ukraine. In the meantime more projects are planned to be installed as JI-projects and some CMM utilization units are already in operation. Despite that CMM utilization is not yet common practice in Ukraine and far away from business as usual. The coal mine has no skilled and properly trained personnel to operate CMM utilization units. Therefore, there is a clear technology barrier for the realisation of the proposed project.

Financial barrier

See step 2c.

Sub-step 3b. Influence of the barriers identified on the alternative baseline scenario

The only viable alternative to the proposed JI activity is the continuation of the existing situation. Since this scenario does not require any additional investment or changes in the technology, it is not affected by the barriers described above. All other alternatives face barriers and are not feasible.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed project activity

Venting the captured CMM into the atmosphere is the common practice in the coal sector of Ukraine. There are no other major examples of using the CMM for heat or power generation that have been implemented without an additional JI incentive. The Ministry of Environment and Protection of Ukraine do not provide information about projects which are viable without generation of JI-revenues.
The proposed activity is not common practice

Sub-step 4b. Discuss any similar options that are occurring:

This sub-step does not apply since no similar project activities exist. There are no other similar projects of gas collection and power generation neither in the Donetsk nor in the country, which was implemented without the ERUs incentives.
Since similar activities cannot be observed, the proposed project activity is additional.

Conclusion

The impact of approval of the proposed JI project activity will allow the crossing of the financial hurdles and other barriers that otherwise would prevent the project from being implemented. The project is additional.

B.3. Description of how the definition of the project boundary is applied to the project:

Baseline emissions

Table B.3.1. Baseline emissions

	Source	Gas		Justification / Explanation
Baseline Emissions	Emissions of methane as a result of venting	CH_4	Included	The main emission source. The amount of methane to be released depends on the amount utilised. The baseline scenario for the project activity not implemented as a JI project is taken into account.
	Emissions from destruction of methane in the baseline	CO_2	Excluded	There is neither flaring nor use for heat and power in the baseline scenario.
		CH_4	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.
		N_2O	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.
	Grid electricity generation (electricity provided to the grid)	CO_2	Included	Only CO_2 emissions associated to the same quantity of electricity than electricity generated as a result of the use of methane included as baseline emission will be counted; The "Standardized emission factors for the Ukrainian electricity grid" has been used.[7]
		CH_4	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.
		N_2O	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.
	Captive power and/or heat, and vehicle fuel used	CO_2	Excluded	The selected baseline scenario does not include the two CMM-fired steam boilers which are registered under a separate JI-project.
		CH_4	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.
		N_2O	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.

[7] According to the document „Ukraine - Assessment of new calculation of CEF" by TÜV Süd, dated 17/08/2007; reference IS-USC-MUC and " Electricity Emission Factors Review" by MWH S.p.A, dated November 2009 and Utilization of Coal Mine Methane at the Coal Mine named after A.F. Zasyadko, Project Design Document version 4.4 (dated 27 March 2008), Annex 2, page 69

Project emissions

Table B.3.2: Project emissions

	Source	Gas		Justification / Explanation
Project Emissions	Emissions of methane as a result of continued venting	CH_4	Excluded	Only the change in CMM emissions release will be taken into account, by monitoring the methane used or destroyed by the project activity.
	On-site fuel consumption due to the project activity	CO_2	Excluded Excluded Excluded Excluded	The electricity consumption of the vacuum pumps is not included in the project boundary as they are necessary for the extraction itself and is performed both in the baseline and project scenario. The own electricity consumption of the gas conditioning systems of phase 2 will not be taken into account.[8] The own electricity consumption of the cogeneration units of phase 2 will not be taken into account.[8]Ibid The own electricity consumption of the flares will not be taken into account. [8]Ibid
		CH_4	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.
		N_2O	Excluded	Excluded for simplification. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology.
	Emissions from methane destruction	CO_2	Included	From the combustion of methane in the flares and the power generators.
	Emissions from NMHC destruction	CO_2	Included	Actually NMHC accounts less than 1% by volume of the extracted coal mine gas, so NMHC has been excluded for estimating the emission reductions. However the NMHC amount will be monitored on a regular basis and the emissions will be included if the NMHC concentration will exceed 1%.
	Fugitive emissions of unburned methane	CH_4	Included	In accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology, a small amount of uncombusted methane, 0.5% for each unit, will be accounted to keep conservative.
	Fugitive methane emissions from on-site equipment	CH_4	Excluded	Excluded for simplification in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology. This emission source is assumed to be very small.

[8] The average per year over the crediting period is less than 1% of the annual average and does not exceed the amount of 2,000 tCO2e. Reference JISC “Guidance on criteria for baseline setting and monitoring, version 02

	Fugitive methane emissions from gas supply pipeline or in relation to use vehicles.	CH_4	Excluded	Excluded for simplification in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology). In addition to this JI specific approach, it is not applicable to the project.
	Accidental methane release	CH_4	Excluded	Excluded for simplification in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology. This emission source is assumed to be very small.

As described previously under A.4.2, the project activity is divided into two phases where phase 1 is only flaring and phase 2 is flaring including the generation of electrical energy.

Following drawings illustrate the project boundary as per the phase which is taken into consideration during the project activity lifecycle:

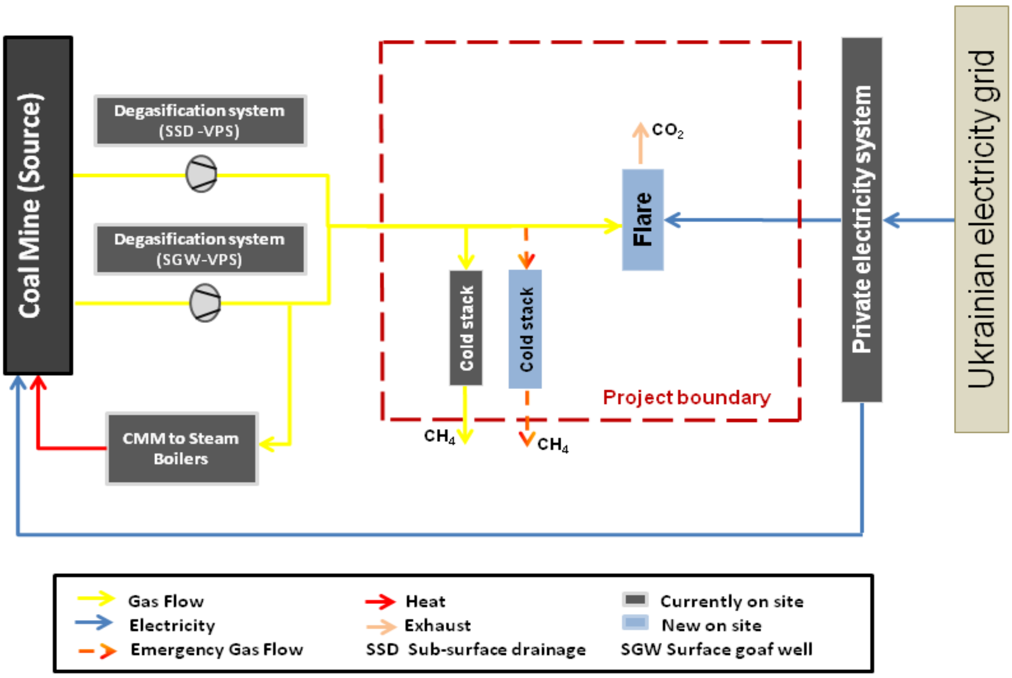

Figure B.3.1. Project boundary of phase 1

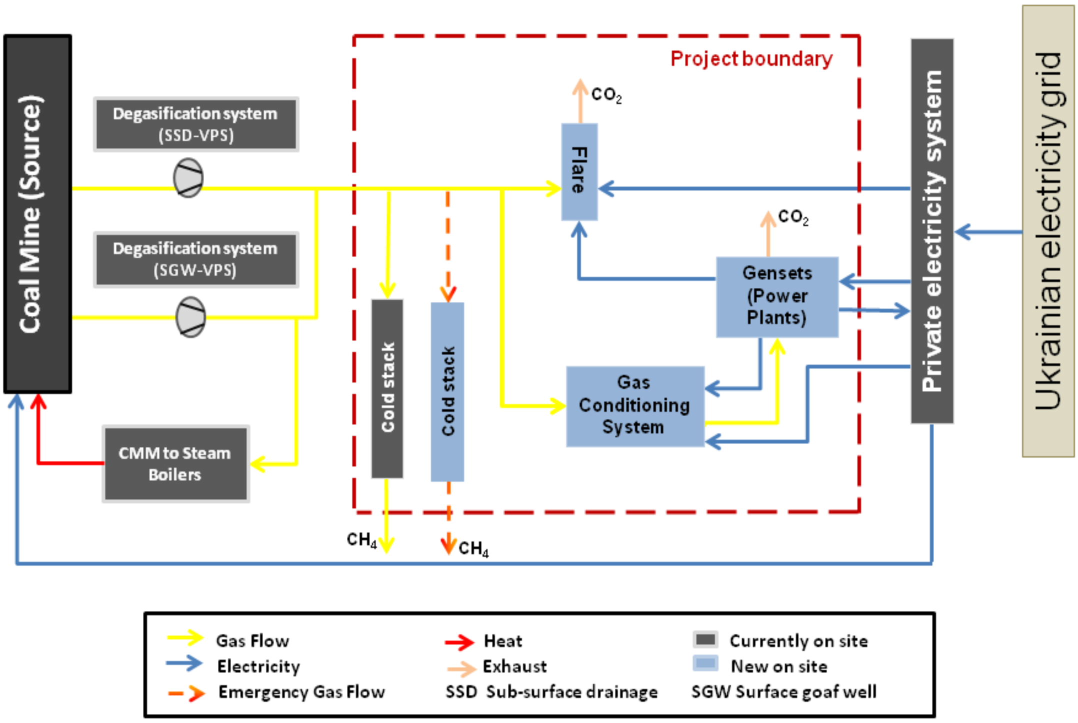

Figure B.3.2. Project boundary of phase 2

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Date of completion of the baseline study: 17/09/2010

Name of person/entity setting the baseline: Paulo Lourenco Bonanca
Green Gas Germany GmbH
Hessenstrasse 57
D-47809 Krefeld (Germany)

Green Gas Germany GmbH is not a project participant.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

05/03/2007 (date of the signed Memorandum of Understanding (MoU) between the Green Gas International B.V. and OJSC Krasnodonvuhillya (in the MoU stated as JSC Krasnodonugol)

C.2. Expected operational lifetime of the project:

The lifetime of the project is at least 10 years or 120 months, minimum until the end of the crediting period.

C.3. Length of the crediting period:

1. First stage obligation crediting under Kyoto Protocol in the years 2010-2012, 2.2 years or 26 months;
2. Late crediting in the years 2013-2020, 7.8 years or 94 months.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

A monitoring plan provided by the JI specific approach on the basis of the "Approved consolidated baseline and monitoring methodology" ACM0008 ("Consolidated methodology for coal bed methane, coal mine methane and ventilation air methane capture and use for power (electrical or motive) and heat and/or destruction through flaring or flameless oxidation") Version 7, EB 55, Sectoral Scope: 8 and 10, is applied to the project including all referring latest approved version of the following tools:

- Tool for the demonstration and assessment of additionality
  (EB39; Annex 10; Version 05.02)
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion
  (EB41; Annex 11; Version 02)
- Tool to determine project emissions from flaring gases containing methane
  (EB28; Annex 13)
- Tool to calculate the emission factor for an electricity system
  (EB50; Annex 14; Version 02)

Applicability requirements for the monitoring plan of the JI specific approach on the basis of the ACM0008 Version 7 methodology are identical to respective requirements of the baseline setting. For a detailed overview of the JI specific approach on the basis of the ACM0008 Version 7 methodology applicability please refer to section B.1 of this PDD.

General remarks to the monitoring plan:

- The monitoring plan may be updated during the first verification, if any alterations will be requested by the verifier;
- Site related information such as work reports, calibration reports, information on employed staff on site (audit and training records), etc will be available to the verifier during the on-site audit;
- Environmental indicators such as dust emissions, NOx, or SOx will be available to the verifier. These indicators are being reported to the correspondent local Supervisory Authority according to their requirements;
- CH_4 as a result from continuous venting and N_2 O emission reductions will not be claimed as mentioned in section B.3 and will therefore not be monitored. This is conservative and in accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology. Only CH_4 that is being destroyed by the project activity will be measured and therefore monitored;

- The monitoring plan shows the overall data which will be monitored by completion of the whole installation as per both phases as phase 1included only flaring and phase 2, flaring and electricity generation (please see section A.4.2. for detailed information). Parameters which will be monitored only in hase 2, are not monitored during phase 1;
- The Global Warming Potential (GWP) and the Carbon emission factor for methane (CEF_{CH4}) are set according the default values listed in the JI specific approach on the basis of the ACM0008 Version 7 methodology under "Data and parameters monitored".

This monitoring plan deviates on the following points from the methodology:

- As the project will not generate heat, no parameters according to heat generation are mentioned under Sections D.1.1.1 and D.1.1.2.
- As basis for the whole calculation, only post-mining CMM (PMM) is considered. In the accordant equations under Sections D.1.1.1 and D.1.1.2 all parameters regarding pre-mining CMM (CMM) and ventilation air methane (VAM) are excluded.
- As mentioned in Table B.3.2. under B.3, neither vehicles are used within the project activity and therefore involved neither in the baseline scenario, nor in the project activity. For this reason the parameters are excluded from the accordant equations.
- Due to the reason that neither electricity is generated for power generation, nor for the grid in the baseline scenario, equations (30) and (31) were not taken into account.
- In equation (26) the emissions factor of electricity (EF_{ELEC}) is set to 0.896 tCO2e/MWh[7] Ibid.
- In equation (2) of the project emissions calculation, the carbon emission factor of electricity used by the coal mine (CEF_{ELEC}) was set to 0.896 tCO2e/MWh[7] Ibid.
- Further comments will be inserted into the accordant paragraph when significant equation is described and equations were changed due to the project specific scenario.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

Table D.1.1.1. Monitored parameters to calculate the project emissions

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P1 PEy	Project emissions in year y	Monitored data	tCO_{2eq}	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.2, see below
P2 PE_{ME}	Project emissions from energy use to capture and use methane	Monitored data	tCO_{2eq}	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.2, see below
P3 PE_{MD}	Project emissions from methane destroyed	Monitored data	tCO_{2eq}	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.2, see below
P4 PE_{UM}	Project emissions from uncombusted methane	Monitored data	tCO_{2eq}	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.2, see below
P5 $CONS_{ELEC}$	Additional electricity consumption by project activity by power meter y	Power meter	MWh	m	continuous	100%	electronic	Cumulative value
P6 CEF_{ELEC}	Carbon emissions factor of $CONS_{ELEC}$	Official data of Ukrainian power grid	tCO_{2eq}	e	ex ante, annually	Main power generation plants	paper	Set as 0.896 tCO_2e/MWhel standard value[7] Ibid.
P7 MD_{FL}	Methane destroyed by flare	Monitored data	tCH_4	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.2, see below
P8	Project emissions of		tCO_2	c	continuously	100%	electronic	Direct emissions through

PE_{flare}	non-combusted CH_4expressed in terms of CO_2e from flaring of residual gas stream							venting in the flares
P9 MM_{FL}	Methane sent to flare	Flow meter	tCH_4	m+c	continuously	100%	electronic	Flow meters will record gas volumes, pressure and density of methane under normal conditions of temperature and pressure is 0.7168 kg/m³ [ДСТУ ISO 6976:2009] (1,013 mbar; 273.15°K)
P10 η_{flare} $\eta_{flare} = Eff_{FL}$	Flare/combustion efficiency, determined by the operation hours and the methane content in the exhaust gas	Combustion efficiency measurement temperature meter		m+c	continuously	100%	electronic	The efficiency is set to 99.5% as a conservative approach[9]. During the operation the efficiency will be verified by a continuous measurement.
P11 MD_{ELEC}	Methane destroyed by power generation	Monitored data	tCH_4	c	continuously	100%	electronic	Calculated using formulae in section D.1.1.2, see below
P12 MM_{ELEC}	Methane sent to power plant	Flow meter	tCH_4	m+c	continuously	100%	electronic	Flow meters will record gas volumes, pressure and density of methane under normal conditions of temperature and pressure is 0.7168 kg/m³ [ДСТУ ISO 6976:2009] (1,013 mbar; 273.15°K)
P13 Eff_{ELEC}	Efficiency of methane destruction / oxidation	Default value	-	e	ex ante	100%	paper	Set as 99.5% according to IPCC and the JI specific

[9] The manufacturer of the high-efficiency flare (Hofstetter Umwelttechnik AG) specifies the flare efficiency in a separate document

	in power plant							approach on the basis of the ACM0008 Version 7 methodology.
P14 CEF_{CH4}	Carbon emission factor for combusted methane	Default value	-	e	ex ante	100%	paper	Set as 2.75 tCO_{2e}/tCH_4 according to the JI specific approach on the basis of the ACM0008 Version 7 methodology.
P15 CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various)	Lab analysis	-	e	annually	100%	paper	Calculated if applicable, based on the lab analysis (see P16).
P16 PC_{CH4}	Concentration of methane in extracted gas	IR measurement	%	m	continuously	100%	electronic	Measurement
P17 PC_{NMHC}	NMHC concentration in coal mine gas	Lab analysis	%	m	annually	main components	paper	Used to check if more than 1% of emissions and to calculate r
P18 r	Relative proportion of NMHC compared to methane	Lab analysis	%	c	annually	100%	paper	Calculated if applicable, based on lab analysis.
P19 GWP_{CH4}	Global warming potential of methane	Default value	-	e	ex ante	100%	paper	Set at 21 tCO_2e/tCH_4 according to the JI specific approach on the basis of the ACM0008 Version 7 methodology.

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Project emissions are defined by the following equation:

$$PE_y = PE_{ME} + PE_{MD} + PE_{UM} \quad (1)$$

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

Combustion emissions from additional energy required

Project emissions from energy use to capture and use methane (PE_{ME}), is obtained by the equation:

$$PE_{ME} = CONS_{ELEC} \times CEF_{ELEC,PJ} \quad (2)$$

Where:
PE_{ME} = Project emissions from energy use to capture and use methane (tCO_2e)
$CONS_{ELEC}$ = Additional electricity consumption for capture and use or destruction of methane measured on site *x* and power meter *y* (MWh)
$CEF_{ELEC,PJ}$ = Carbon emissions factor of electricity used by the private power distribution system (0.896 tCO_2e/MWh)

Combustion emissions from use of captured methane

When the captured methane is burned in a flare or power plant, combustion emissions are released. In addition, if NMHC account for more than 1% by volume of the extracted CMG, combustion emission from these gases should also be included.

$$PE_{MD} = (MD_{FL} + MD_{ELEC}) \times (CEF_{CH4} + r \times CEF_{NMHC}) \quad (3)$$

with:

$r = PC_{NMHC} / PC_{CH4}$ (4)

Where:

PE_{MD}	=	Project emissions from methane destroyed (tCO_2e)
MD_{FL}	=	Methane destroyed through flaring (tCH_4)
MD_{ELEC}	=	Methane destroyed through power generation (tCH_4)
CEF_{CH4}	=	Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4)
CEF_{NMHC}	=	Carbon emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane ($tCO_2e/tNMHC$)
r	=	Relative proportion of NMHC compared to methane
PC_{CH4}	=	Concentration (in mass) of methane in extracted gas (% w/w), measured on wet basis
PC_{NMHC}	=	NMHC concentration (in mass) in extracted gas (% w/w)

If the lab analysis will result a fraction lower than 1% of NMHC in the extracted gas, following equation will be considered:

$PE_{MD} = (MD_{FL} + MD_{ELEC}) \times CEF_{CH4}$ (3a)

PE_{MD}	=	Project emissions from methane destroyed (tCO_2e)
MD_{FL}	=	Methane destroyed through flaring (tCH_4)
MD_{ELEC}	=	Methane destroyed through power generation (tCH_4)
CEF_{CH4}	=	Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4)

For the ex-ante estimation, the lab analysis[10] (ordered by the existing JI-project) was taken into consideration to choose the equation for calculating the project emissions from methane destroyed (PE_{MD}). The ex-post calculation will be based on the lab analysis for the year 2010. The report for 2010 was not available during the elaboration of this PDD.

The equation will change in cases where NMHC is not considered within the ex-post calculation for the significant year where the lab analysis proves a fraction of NMHC less than 1% of the extracted CMG.

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

[10] Yearly lab analysis executed by RESPIRATOR, Institute working for the Ministry of Coal Industry of Ukraine, dated 22/04/2009, N° 10/518

With:

MD_{FL} = Methane destroyed through flaring (tCH_4)
MM_{FL} = Methane measured sent to flare (tCH_4)
PE_{flare} = Project emissions of non-combusted CH_4 expressed in terms of CO_2e from flaring of the residual gas stream (tCO_2e)
GWP_{CH4} = Global warming potential of methane (21 tCO_2e/tCH_4)

$$MD_{ELEC} = MM_{ELEC} \text{ x } Eff_{ELEC} \quad (7)$$

Where:
MD_{ELEC} = Methane destroyed through power generation
MM_{ELEC} = Methane measured sent to power plant (tCH_4)
Eff_{ELEC} = Efficiency of methane destruction / oxidation in power plant (99.5 % according to IPCC)

Un-combusted methane from project activity

Not all of the methane sent to the flare or to power plant will be combusted, so a small amount will escape to the atmosphere. These emissions are calculated using the equation (10) of the Methodology. As the project activity does not include catalytic oxidation, the initial equation was modified as following:

$$PE_{UM} = [GWP_{CH4} \text{ x } MM_{ELEC} \text{ x } (1 - Eff_{ELEC})] + PE_{flare} \quad (10)$$

Where:
PE_{UM} = Project emissions from un-combusted methane (tCO_2e)
GWP_{CH4} = Global warming potential of methane (21 tCO_2e/tCH_4)
MM_{ELEC} = Methane measured sent to power plant (tCH_4)
Eff_{ELEC} = Efficiency of methane destruction in power plant (99.5 % according to IPCC)
PE_{flare} = Project emissions of non-combusted CH_4 expressed in terms of CO_2e from flaring of the residual gas stream (tCO_2e)

The project emissions from flaring of the residual gas stream (PE_{flare}) shall be calculated following the procedure described in the "Tool to determine project emissions from flaring gases containing methane". PE_{flare} can be calculated on an annual basis of for the required period using this tool.
Project emissions from flaring are calculated as the sum of emissions from each hour *h*, based on the methane flow rate in the residual gas ($TM_{RG,h}$) and the flare efficiency during each hour h ($\eta_{flare,h}$), as follows:

$$PE_{flare,y} = \sum TM_{RG,h} \times (1- \eta_{flare,h}) \times GWP_{CH4}/1000 \quad (15)$$

Where:

$PE_{flare,y}$ = Project emissions from flaring of the residual gas stream in year *y* (tCO_2e)
$TM_{RG,h}$ = Mass flow rate of methane in the residual gas in the hour *h* (kg/h)
$\eta_{flare,h}$ = Flare efficiency in hour *h*
GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (21 tCO_2e/tCH_4)

Table D.1.1.3. Monitored parameters to calculate the baseline emissions

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
B1 BEy	Baseline emissions in year *y*	Monitored date	tCO_2 e	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.4, see below
B2 $BE_{MD,y}$	Baseline emissions from destruction of methane in the baseline scenario in year y		tCO2 e	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.4, see below
B3 $BE_{MR,y}$	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity	Monitored date	tCO_2 e	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.4, see below

B4 $BE_{Use,y}$	Baseline emissions from the production of power or supply to gas grid replaced by the project activity in year *y*	Monitored date	tCO_2 e	c	monthly	100%	electronic	Calculated using formulae in section D.1.1.4, see below.
B5 $PMM_{PJ,y}$	Post-mining CMM captured and destroyed in the project activity in year *y*	Flow meter	tCH_4	m	continuously	100%	electronic	Post-mining methane is collected as a cumulative value, (see section B.1).
B6 $PMM_{BLi,y}$	Post -mining CMM that would have been captured, sent and destroyed by use i in the baseline scenario in the year y	Flow meter	tCH_4	m	continuously	100%	electronic	Post-mining methane is collected as a cumulative value, (see section B.1).
B7 GWP_{CH4}	Global warming potential of methane	Default value	-	e	ex ante	100%	paper	Set at 21 tCO_2e/tCH_4 according to the JI specific approach on the basis of the ACM0008 Version 7 methodology.
B8 CEF_{CH4}	Carbon emission factor for combusted methane	Default value	-	e	ex ante	100%	paper	Set as 2.75 tCO_{2e}/tCH_4 according to the JI specific approach on the basis of the ACM0008 Version 7 methodology.
B9 CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various)	Lab analysis	-	e	annually	100%	paper	Calculated if applicable, based on the lab analysis of PC_{NMHC} (P16; D.1.1.1)

B10 GEN_y	Power generated during phase 2 of the project activity	Power meter	MWh	m+c	coninuously	100%	electronic and paper	Cumulative value
B11 EF_{ELECc}	CO_2 emission factor from the grid	Official data of Ukrainian power grid	tCO_2e/MWh	e	ex ante, annually	main power generation	paper	Set as 0.896 tCO_2/MWh
B12 PC_{CH4}	Concentration of methane in extracted gas	IR measurement	%	m	continuously	100%	electronic	Measurement
B13 PC_{NMHC}	NMHC concentration in coal mine gas	Lab analysis	%	m	annually	main components	paper	Used to check if more than 1% of emissions and to calculate r
B14 r	Relative proportion of NMHC compared to methane	Lab analysis	%	c	annually	100%	paper	Calculated if applicable, based on lab analysis.

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

Baseline emissions are given by the following equation:

$$BE_y = BE_{MD,y} + BE_{MR,y} + BE_{USE,y} \quad (11)$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2e)
$BE_{MD,y}$	=	Baseline emissions from destruction of methane in the baseline scenario in year *y* (tCO_2e)
$BE_{MR,y}$	=	Baseline emissions from release of methane into the atmosphere in year *y* that is avoided by the project activity (tCO_2e)
$BE_{Use,y}$	=	Baseline emissions from the production of power, heat of supply to gas grid replaced by the project activity in year *y* (tCO_2e)

$$BE_{MD,y} = (CEF_{CH4} + r \text{ x } CEF_{NMHC}) \text{ x } \sum PMM_{BLi,y} \quad (12)$$

With:

$$r = PC_{NMHC} / PC_{CH4} \quad (13)$$

Where:

$BE_{MD,y}$	=	Baseline emissions from destruction of methane in the baseline scenario in year *y* (tCO_2e)
CEF_{CH4}	=	Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4)
CEF_{NMHC}	=	Carbon emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane (tCO_2e/tNMHC)
$PMM_{BLi,y}$	=	Post-mining CMM that would have been captured, sent and destroyed by use i in the baseline scenario in the year y (tCH4)
r	=	Relative proportion of NMHC compared to methane
PC_{CH4}	=	Concentration (in mass) of methane in extracted gas (% w/w), measured on wet basis
PC_{NMHC}	=	NMHC concentration (in mass) in extracted gas (% w/w)

If the lab analysis will result a fraction lower than 1% of NMHC in the extracted gas, following equation will be considered:

$$BE_{MD,y} = CEF_{CH4} \text{ x } (\sum PMM_{BLi,y}) \quad (12a)$$

$BE_{MD,y}$	=	Baseline emissions from destruction of methane in the baseline scenario in year *y* (tCO_2e)
CEF_{CH4}	=	Carbon emission factor for combusted methane (2.75 tCO_2e/tCH_4)
$PMM_{BLi,y}$	=	Post-mining CMM that would have been captured, sent and destroyed by use i in the baseline scenario in the year y (tCH4)

For the ex-ante estimation, the lab analysis[10] Ibid (ordered by the existing JI-project) was taken into consideration to choose the equation for calculating the baseline emissions from destruction of methane ($BE_{MD,y}$).

Furthermore the gas used by the CMM-fired steam boilers is monitored by the responsible monitoring company and is not part of the project. As per the JI specific approach on the basis of the ACM0008 Version 7 methodology the amount of methane destroyed in the baseline shall be used for the ex-ante estimation of emission reduction units. Therefore the methane destroyed by the existing CMM-fired steam boilers was taken into account for the ex-ante estimation. Later monitoring of the activities within the already registered JI-project (CMM-fired steam boilers) will not occur as the boiler-project is not within the boundary of the Project. Therefore the gas used by the existing JI-project will not be taken into account in the ex-post calculation.

$$BE_{MR,y} = GWP_{CH4} \text{ x } [\sum (PMM_{PJi,y} - PMM_{BLi,y})] \quad (16)$$

Where:

$BE_{MR,y}$	=	Baseline emissions from release of methane into the atmosphere in year *y* that is avoided by the project activity (tCO_2e)
i	=	Use of methane (flaring, power generation, supply to gas grid to various combustion end use)
$PMM_{PJ,i,y}$	=	Post-mining CMM captured, sent to and destroyed by use *i* in the project activity in year *y* (tCH_4)
$PMM_{BLi,y}$	=	Post-mining CMM that would have been captured, sent and destroyed by use i in the baseline scenario in the year y (tCH4)
GWP_{CH4}	=	Global warming potential of methane (21 tCO_2e/tCH_4)

The methane that is still vented in the project scenario is not accounted neither as project emission nor baseline emissions, since it is vented in both scenarios. As per the JI specific approach on the basis of the ACM0008 Version 7 methodology the amount of post-mining methane that would have been captured and destroyed in the baseline scenario shall be used for the ex-ante estimation of emission reduction units. Later monitoring of the activities within the already registered JI-project (CMM-fired steam boilers) will not occur as the boiler-project is not within the boundary of the Project.

Post-mining CMM extraction

As mentioned under Section D.1 only post-mining methane is directly monitored as part of the project activity ($PMM_{PJ,y}$). VAM and pre-mining methane ($CMM_{PJ,y}$) are not used in the project activity. With other words, only post-mining activity is the procedure how CMM is generated at the Mine.

$$BE_{Use,y} = ED_{CPMM,y} \quad (24)$$

Where:

$BE_{Use,y}$	=	Total baseline emissions from the production of power, heat of supply to gas grid replaced by the project activity in year *y* (tCO_2e)
$ED_{CPMM,y}$	=	Emissions from displacement of end uses by use of coal mine methane, VAM and post-mining methane (tCO_2e)

The total methane captured during year y can be described as follows:

$$CBMM_{tot,y} = PMM_{PJ,y} \quad (25)$$

Where:

$CBMM_{tot,y}$	=	Total CBM, CMM and VAM captured and utilised by the project activity (tCH_4)
$PMM_{PJ,y}$	=	Post-mining CMM captured by the project activity in year *y* (tCH_4)

The total potential emissions reductions from displacement of power generation and vehicle fuels are given by the following equation:

$$PBE_{Use,y} = GEN_y \text{ x } EF_{ELEC} \quad (26)$$

Where:

$PBE_{Use,y}$	=	Potential total baseline emissions from the production of power or heat replaced by the project activity in year *y* (tCO2e)
GEN_y	=	Electricity generated by project activity in year *y* (MWh)
EF_{ELEC}	=	Emission factor of electricity (grid, captive or a combination) replaced by the project (0.896 tCO_2/MWh)

$$ED_{CPMM,y} = [PMM_{PJ,y} / CBMM_{tot,y}] \text{ x } PBE_{Use,y} \quad (28)$$

Where:

$ED_{CPMM,y}$	=	Emissions from displacement of end uses by use of coal mine methane, VAM and post-mining methane (tCO_2e)
$PMM_{PJ,y}$	=	Post-mining CMM captured by the project activity in year *y* (tCH_4)
$CBMM_{tot,y}$	=	Total CBM, CMM and VAM captured and utilised by the project activity (tCH_4)
$PBE_{Use,y}$	=	Potential total baseline emissions from the production of power or heat replaced by the project activity in year *y* (tCO2e)

D. 1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

Table D.1.2.1. Monitored parameters

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Not applicable

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

Not applicable

D.1.3. Treatment of leakage in the monitoring plan:

Table D.1.3.1. Monitored parameters

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

In accordance with the JI specific approach on the basis of the ACM0008 Version 7 methodology, the following leakages should be considered:

1. CBM drainage from outside the de-stressed zone;
2. Impact of the JI project on coal production;
3. Impact of the JI project on coal prices;

However, there is no leakage in the project because;

1. There is no CBM involved, hence no leakage occurs from CBM drainage from outside the de-stressed zone;
2. There is no impact of the JI project on coal production as the degasification activities are independent from the JI project;
3. The impact of the JI project on coal prices is difficult to assess. The JI project as such has got no influence on coal productions, therefore, it is unlikely that the JI project will impact coal prices;

Furthermore no displacement of the extracted gas which would otherwise be used for the heat generation will occur within the project activity as only remaining amount of CMG which is not used by the already existing JI-project will be directed to the Project.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

No leakage is considered in this project.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

The emission reduction ER_y by the project activity during a given year y is the difference between the baseline emissions (BEy) and the project emissions (PEy), as follows:

$$ER_y = BE_y – PE_y \quad (40)$$

Where:

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

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

To maintain a consistent and reliable performance of the automatic controlling and monitoring system, adequate quality control and quality assurance procedures will be implemented that is regulated by the calibration standards, manufacturers' recommendations and quality norms according to national and international legislations. Under these requirements of quality control system, regular maintenance and testing regime to ensure accuracy of flow meter, gas-analysers, and electricity measuring equipments will be provided. Dependent upon the measurement equipments, the calibrations will be done internally or externally by an authorized calibration lab, respectively by the manufacturer.

A consistency check for all measured data will be carried out and reported every month. The calculation of emission reductions will be carried out weekly and reported every month.

Table D.2. Table of measurement equipment

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
P9 MM_{FL}; P12 MM_{ElEC}; B5 $PMM_{PJ,y}$ Methane amount	low	The flow meter will be subject to a regular maintenance and testing regime to ensure accuracy. The flow meter will be calibrated according manufacturers specifications. The manometer and thermometer will be subject to a regular maintenance and testing regime to ensure accuracy. In the case of lag of accuracy, this measurement equipment will be replaced to ensure the accuracy of the equipments.
P16 and B12 PC_{CH4} Methane concentration	low	The gas analyser will be subject to a regular maintenance and testing regime to ensure accuracy and will be calibrated at least every 14 days according to manufacturer's specifications.
P17 and B13PC_{NMHC} NMHC concentration	low	The determination will be provided by an accredited laboratory
P5 $CONS_{ELEC}$ B10 GEN_y Electricity measurement	low	The power meter is subject to a regular testing regime to ensure accuracy. If applicable, the power meter will be according to national regulations.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

Organisation

The project participants within this Project are the Ukrainian company OJSC Krasnodonvuhillya based in Krasnodon and the Green Gas Ukraine Holdings B.V. based in Amsterdam. Within the Green Gas Group, two subsidiaries are responsible for the management of the project. Green Gas Krasnodon LLC (GGK) will be responsible for the Plant Management and Green Gas Germany GmbH (GGG) will consult and support GGK with the daily operation and the whole JI related management. The figure below shows the whole structure of the Project.

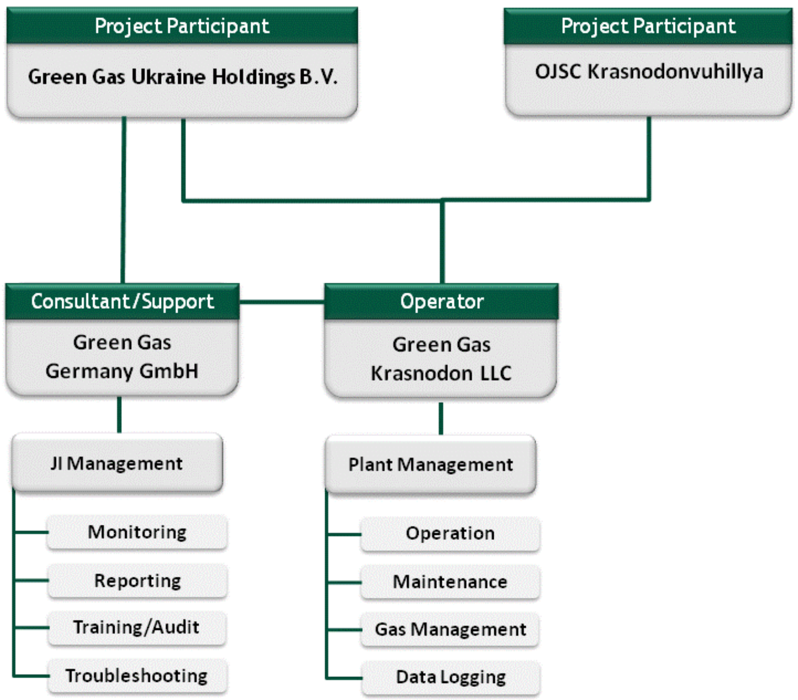

Figure D.3.1. Organisational chart - Project

The Plant Management will be executed through GGK with the support of GGG. Figure D.3.2. below shows the scope of activities between both subsidiaries including the communication lines.

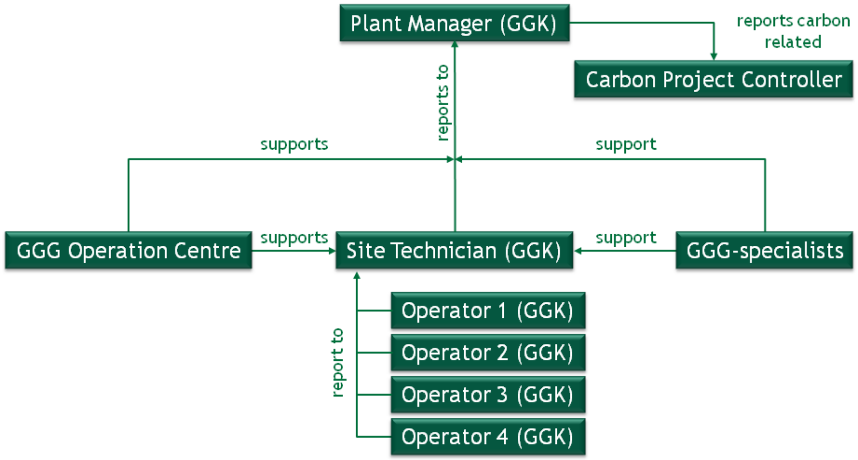

Figure D.3.2. Organisational chart – Plant Management

Roles and responsibilities

The responsible team for this project will consist of the following positions:

- Plant Manager
- Site Technicians
- Carbon Project Controller
- Site operators

The key responsibilities of the Plant Manager are, inter alia:

- Supervision of all required internal calibration procedures as well as reference measurements;
- Interface between the Field Technicians and the Carbon Project Controller;
- Identification of sufficient and efficient procedure for troubleshooting in case of failure of equipment with the support of the Carbon Project Controller;

- Ensuring accurate documentation of the Field Technician's interventions according to the requirements of the CDM Monitoring personnel;
- Preparation of site related reports according to any special events;
- Monthly and yearly reports for the Project Participants;
- Coordinating the yearly audit and training; respectively additional trainings (if required);
- Collecting and integrating utility (e.g. electricity consumption) data from external service providers.

The key responsibilities of the Field Technicians are, inter alia:

- Proceeding with scheduled and unscheduled interventions (e.g. inspection and maintenance reports according to weekly, monthly, half-yearly or yearly routine) according to the Operation and Maintenance Schedule;
- Documentation of all interventions (scheduled or unscheduled);
- Proceeding with all required internal calibrations and document the intervention in a calibration report;
- Preparation of visit reports at each site visit;
- Proceeding with reference measurements to check the accuracy of the measurement equipment;
- Storing all reference measurement certifications;
- In case of malfunction or failure of any equipment to proceed as per the troubleshooting procedures and documenting all activities.

The Carbon Project Controller will supervise the monitoring activities and is responsible for the correctness of logged data. Regular quality assurances of the electronically recorded data with the handwritten samples are conducted through checking the stored data on plausibility, errors, deviations and non-conformity. All inconsistencies will be dealt with as necessary, so the plant operation can be optimised which will result in a more accurate monitoring.

The preparation of the periodical Monitoring Reports and the analysis of the data received and stored on the central data base together with the calculations of the emission reductions are also amongst the key responsibilities of the Carbon Project Controller. The emission reductions will be calculated according to the selected methodology and its applicable tools.
For quality control, all data should be continuously checked for consistency, completeness and integrity. Therefore, the calculations of emission reductions and the Monitoring Reports will be revised and cross-checked during the internal audits by the responsible reviser.
The training of the operating personnel will occur according to a set training programme taking into consideration the requirements of the facility and Carbon Project Controller. The first training will occur after the commissioning of the flare-booster-station. Additional trainings will take place during operation.

The key responsibilities of the Carbon Project Controller are, inter alia:

- Ensuring that the calibration and/or reference measurements of measurement equipments are dealt with according to QA/QC procedures (listed in section D.2.) and to manufacturers` recommendations, if necessary, respectively whenever it is required;

- Crosschecking the reference measurements and the accordant accuracy levels;
- Crosschecking the scheduled and unscheduled inspection and maintenance reports with the raw data (if applicable);
- Ensuring that the internal calibration reports are available;
- Crosschecking internal calibration reports with the visit reports and the monitored raw data;
- Preparing the periodical Annual Reports according to the national requirements;
- Ensuring that the yearly training and audit occur on site; respectively collecting the certificates of training and audit;
- Calculating the achieved emission reductions.

The key responsibilities of the Operators are, inter alia:

- Inspection of operation;
- Keeping a logbook to register all events of the site
- Control the access (visitors, mine staff) to the site and log name of persons entering the site
- Keeping the site clean
- Reset of flare respectively engines after fault analysis and upon request of Site Technician or Plant Manager
- Control of alarms and notification of Site Technician and Plant Manager
- Inspection tours to check for noises, leakages, special events
- Notification of emergency services in case of emergency
- Supervision of control and metering equipment
- Supervision of starting equipment
- Supervision of signal devices
- Supervision of gas quality (especially methane and oxygen concentration)
- Regulation of air supply in accordance with the mode of operation and safety instructions
- Reception of delivered goods such as spare parts, tools etc.

Data logging

In order to monitor all relevant parameters within the project activity, the data processing and archiving system is based on a local system (substation) and an external data server. As the project activity is divided into two phases (phase 1 only flaring and phase 2 flaring and electricity generation), the data logging and transfer procedure will be described within this SOP separately for both phases.

The figure below shows the overall data flow including the archiving procedure which generally shows the data flow and data recipients:

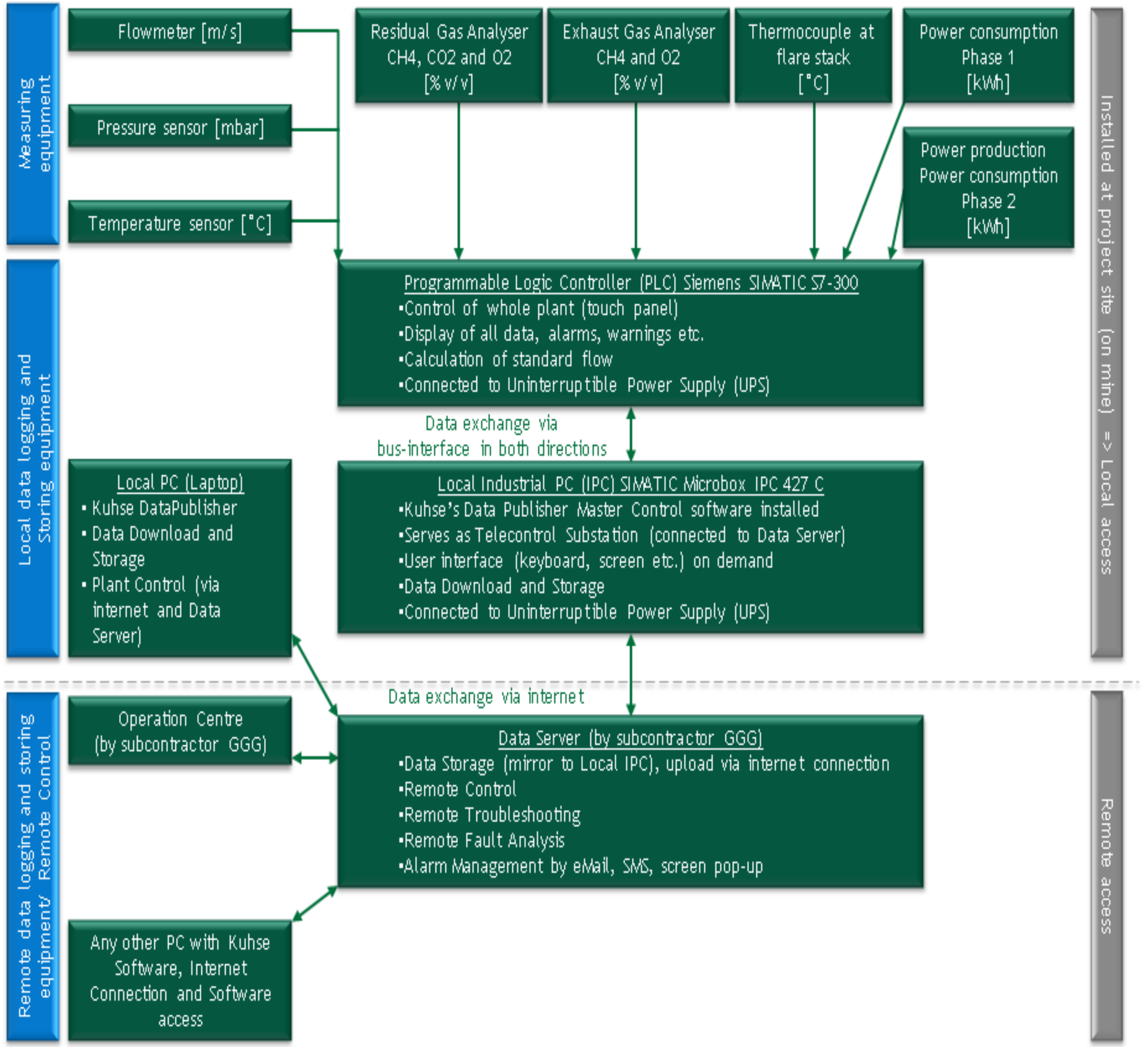

Figure D.3.3. General overview of data flow

Phase 1

As mentioned above, the data logging and transfer is divided into two phases. Phase 1 only considers flaring of coal mine gas. The whole data logging is shown in *Figure D.3.4.* below.

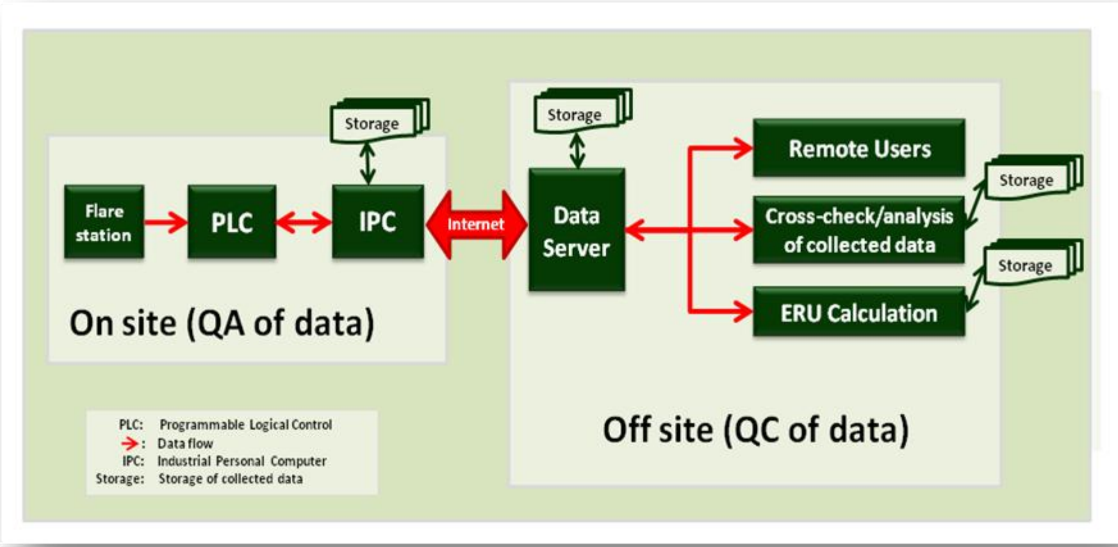

Figure D.3.4. Data transfer procedure for phase 1

All relevant measurement equipments which log values for the purpose of calculating the achieved emission reduction units (ERUs) including the quality control (QC) of all collected data within phase 1 are connected to the locally installed Programmable Logical Control (PLC). This PLC is equipped with a screen and a touch panel whereby the whole facility can be controlled and all data, alarms and warnings are shown. To ensure a stable operation, the PLC is connected to the uninterrupted power supply (UPS).

Within the PLC, the minutely logged values from the flow meter (including thermometer and manometer), the gas quality analyser (residual gas), the gas analyser (exhaust gas), the thermocouple for the exhaust gas temperature and the power meter are sent continuously to a locally implemented Industrial Personal Computer (IPC) through a parallel circuit connection (bus connection).

The software “Data-Publisher Master Control System” is installed on the IPC in order to serve as the telecontrol substation which builds the connection with the Data Server. Furthermore the IPC stores the collected raw data and is also connected with the UPS to ensure stable operation.

The collected data are stored as binary codes to avoid interferences of data storage due to higher storage capacity demand. Furthermore the storage of binary codes enables a long durability of stored data within the IPC.

A Data Server, based in Germany, downloads in a daily routine the data from the locally implemented IPC in order to use the collected data for cross-checks, analysis, for calculating the ERUs and for reporting the figures for internal purposes. All data are stored on the Data Server to avoid single-storage only at one location.

Through the wide area network, the remote user (Plant Manager, Site Technician, JI Monitoring personnel or Remote users) can visualize the data through the Data-Publisher software where, besides other functions, the quality of the logged data can be checked and analysed.

Only a restricted group of users (Senior Management of Green Gas, Plant Management personnel and personnel responsible for the JI Monitoring) have the permission to access the data (all stored raw data, documentation as calibration reports, visit reports, etc.). After analysis, cross-checks and further usage of the logged data (e.g. for calculation of ERUs), the data are stored additionally on specific drives.
The following process parameters will be sampled and stored in the data-logger of the local IPC for the calculation of ERUs:

Table D.3.1. Parameters for phase 1

Parameter	**Unit**	**Measurement Equipment**
Fraction of CH4 (residual gas)	Vol-%	Gas quality analyser (residual gas)
Fraction of CO2 (residual gas)	Vol-%	
Fraction of O2 (residual gas)	Vol-%	
Gas flow	m^3/h	Flow meter
Gas pressure	mbar	Pressure meter
Gas temperature	°C	Temperature meter
Fraction of CH4 (exhaust gas)	Vol-%	Gas analyser (exhaust gas)
Fraction of O2 (exhaust gas)	Vol-%	
Temperature (exhaust gas)	°C	Thermocouple
Electricity consumption	kWh	Power meter

Phase 2

As mentioned above, the data logging and transfer is divided into two phases. Phase 2 consists of the flaring facility (implemented in phase 1) and the electrical power generation with 2 gensets.
The whole data logging is shown in the figure below:

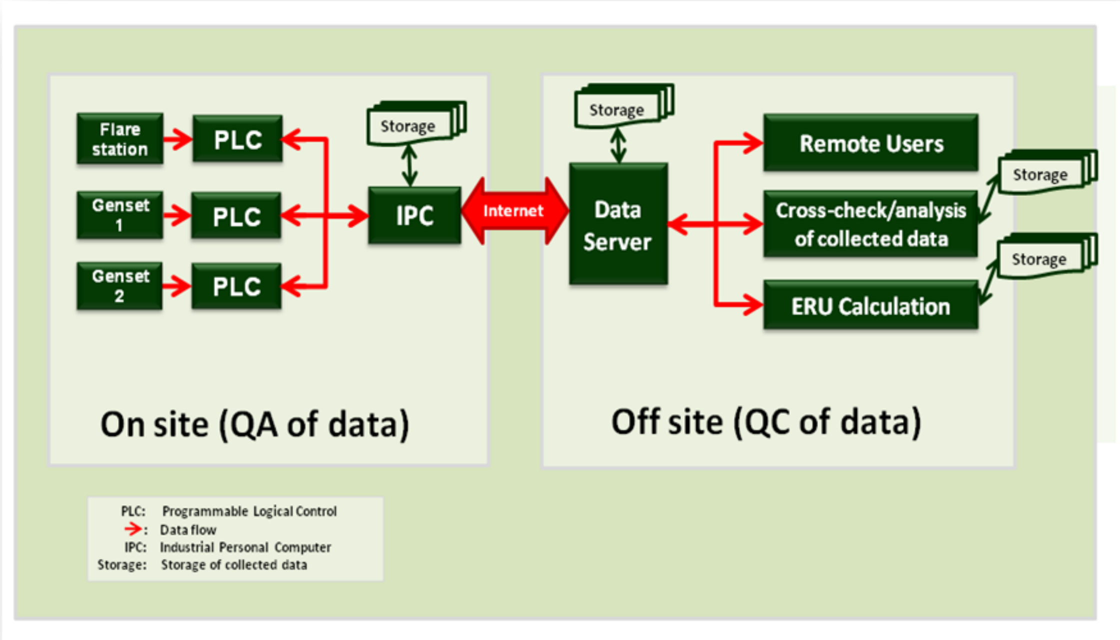

Figure D.3.5. Data transfer procedure for phase 2

All relevant measurement equipments which log values for the purpose of calculating the achieved emission reduction units (ERUs) including the quality control (QC) of all collected data within phase 2 are connected to the locally installed Programmable Logical Control (PLC).
The procedure of data logging and storage on the IPC is identical to the process described under 1.1. Additional measurement equipment will be installed within phase 2 due to the extension of the facility.

The following process parameters will be sampled and stored in the data-logger of the local IPC for the calculation of ERUs:

Table D.3.2. Parameters for phase 2

Parameter	Unit	Measurement Equipment	Location
Fraction of CH_4 (residual gas)	Vol-%	Gas quality analyser (residual gas)	After the gas buffer tank
Fraction of CO_2	Vol-%		
Fraction of O_2	Vol-%		
Gas flow (to flare)	m³/h	Flow meter	Flare
Gas pressure (to flare)	mbar	Pressure meter	
Gas temperature (to flare)	°C	Temperature meter	
Fraction of CH_4 (exhaust gas)	Vol-%	Gas analyser (exhaust gas)	Flare
Fraction of O_2 (exhaust gas)	Vol-%		
Exhaust gas temperature	°C	Thermocouple	Flare
Gas flow (to genset 1)	m³/h	Flow meter	Genset 1
Gas pressure (to genset 1)	mbar	Pressure meter	
Gas temperature (to genset 1)	°C	Temperature meter	
Gas flow (to genset 2)	m³/h	Flow meter	Genset 2
Gas pressure (to genset 2)	mbar	Pressure meter	
Gas temperature (to genset 2)	°C	Temperature meter	
Electricity consumption	kWh	Power meter	Control cabinet
Electricity produced	kWh	Power meter	

Training

The training to operate the plant is split in two parts. The first training (flare operation) is carried out after the commissioning of the flare. The second training (genset operation) will take place after commissioning of the gensets and related devices. The complete local O&M team will be trained, including Plant Manager, Site Technician and Operators.

The technical training is carried out on site by skilled and authorized Operations & Maintenance specialists of Green Gas Germany GmbH. The Carbon Training is performed by staff from the Carbon Department (Carbon Project Controller).
The training covers the operation of the complete facility (flare and gensets) including day-to-day checks and reportings (technical and carbon-reporting), scheduled and unscheduled service activities of all equipments, minor maintenance activities and troubleshootings.
The quality of operations is audited during annual quality checks and training is repeated in case of any deficits, modifications of equipment or change of local staff.

As the training is based on the installed and commissioned equipment, the documentation and manuals of this equipment and additional manuals and instructions of Operations & Maintenance personnel of Green Gas the training refers to these documents. Additionally, Green Gas Standard Operating Procedures (SOP) in their latest version is valid and must be adhered to.

Initial training

First training - day 1

- Explanation of the background and the objective of the project
- Explanation of risks related to work on coal mine sites and the work with coal mine gas.
- Introduction in general behaviour on all Green Gas sites.
- Introduction in Green Gas health and safety-policy.
- Introduction in design and layout of the whole coal mine gas project.
- Training of measuring of gas quality in the pipe system
- Training of measuring of gas pressure in the pipe system
- Training of measuring of gas flow in the pipe system
- Regular checks of the piping system (tightness, safety, functionality)

First training – day 2

- Operation of the flaring-station including residual gas analyser, exhaust gas analyser, gas flow meter, data logging system, switchgear and auxiliaries;
- Service / Maintenance of the flaring-station including residual gas analyser, exhaust gas analyser, gas flow meter, data logging system, switchgear and auxiliaries;
- Electrical Troubleshooting procedures
- Mechanical Troubleshooting procedures
- Calibration of residual gas analyser and exhaust gas analyser
- Introduction in general troubleshooting
- Training of emergency procedures
- Part Sourcing
- Specialist support possibilities

First training – day 3

- Background of Carbon-Monitoring
- Carbon Reporting procedures
- Data Troubleshooting procedures
- Documentation of works in compliance with Green Gas Standard Operating Procedures and according to Project Design Document
- Technical Reporting procedures
- Recapitulation of all trained items
- Final test of staff and certification if test has been successful

Any following updates of equipment or operation processes are forward to local personnel and trained during annual quality audits. All training activities are recorded by Operations & Maintenance and trained personnel will get a certificate.

Periodical training

Second training - day 1

- Explanation of risks related to work on coal mine sites and the work with coal mine gas.
- Regular checks of the genset system (tightness, safety, functionality, noises)
- Simple troubleshooting procedures

Second Training - Day 2

- Training of emergency procedures

- Part Sourcing
- Subcontractor support possibilities
- Recapitulation of all trained items.
- Final test of staff and certification if test has been successful.

Audit

An audit of all personnel having access to the installation will be held at least once a year. It will be distinguished between Green Gas staff and the mine's personnel (where applicable) as well between the technical audit and the reporting-Health and Safety-SOP audit.

Audit Green Gas Staff

Green Gas staff will be audited whether all Green Gas policies are respected, if all maintenance steps have been properly executed and if the SOPs are followed. In a second step, all necessary working steps will be audited. A third step includes emergency procedures, health and safety aspects and communication inside the Green Gas organisation.

Audit Mine Staff

Mine staff is audited in all procedures where this staff is entering Green Gas installations. This is mainly the case for a few valves for certain operating procedures and in case of emergency.

Certification

All audited persons will get a certificate showing following information:
- Date and place of audit
- Name of auditor
- Name of audited person
- List of audited items, tasks and procedures.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

Name of person / entity setting the baseline: Paulo Lourenco Bonanca
Green Gas Germany GmbH
Hessenstrasse 57
D- 47809 Krefeld (Germany)

Green Gas Germany GmbH is not a project participant.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Table E.1.1. Project emissions during the crediting period

Project emissions			
Year	Methane destruction through[11]		Total methane destroyed
	Flaring	Power generation	
	[tCO2e/a]	[tCO2e/a]	[tCO2e/a]
2010	6,642	0	6,642
2011	39,850	0	39,851
2012	39,850	12,435	52,286
Sum	**86,342**	**12,436**	**98,779**

Table E.1.2. Project emissions (2013 until end of operational lifetime)

Project emissions			
Year	Methane destruction through[11]Ibid		Total methane destroyed
	Flaring	Power generation	
	[tCO2e/a]	[tCO2e/a]	[tCO2e/a]
2013	39,850	12,435	52,286
2014	39,864	12,435	52,300
2015	39,849	12,435	52,284
2016	39,849	12,435	52,284
2017	39,849	12,435	52,284
2018	39,849	12,435	52,284
2019	39,849	12,435	52,284
2020	36,526	11,403	47,930
Sum	**315,483**	**98,451**	**413,936**

E.2. Estimated leakage:

There is no leakage in this project as no displacement of any CMM will occur. The existing JI-project will receive the required amount of CMM in order to provide the Mine with the amount of heat.

[11] The destruction of methane through flaring and power generation within the project activity is the avoided amount which otherwise would have been vented within the baseline.

E.3. The sum of E.1. and E.2.:

Table E.3.1. Sum of project emissions and leakage during the crediting period

Project emissions			
Year	Methane destruction through[11]Ibid		Total methane destroyed
	Flaring	Power generation	
	[tCO2e/a]	[tCO2e/a]	[tCO2e/a]
2010	6,642	0	6,642
2011	39,850	0	39,851
2012	39,850	12,435	52,286
Sum	**86,342**	**12,436**	**98,779**

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2019	39,849	12,435	52,284
2020	36,526	11,403	47,930
Sum	**315,483**	**98,451**	**413,936**

E.4. Estimated baseline emissions:

Table E.4.1. Baseline emissions during the crediting period

Baseline emissions				
Year	Methane destruction through[12]			Total methane destroyed
	Heat generation	Flaring	Power generation	
	[tCO2e/a]	[tCO2e/a]	[tCO2e/a]	[tCO2e/a]
2010	665	45,088	0	45,753
2011	3,992	270,531	0	274,523
2012	3,992	357,178	22,336	383,506
Sum	**8,649**	**672,798**	**22,336**	**703,782**

[12] The destruction of methane through flaring, heat and power generation within the baseline and venting of methane (that is avoided by the project activity) has the same meaning.

Table E.4.2. Baseline emissions (2013 until end of operational lifetime)

Baseline emissions				
Year	Methane destruction through[12]Ibid			Total methane destroyed
	Heat generation	Flaring	Power generation	
	[tCO2e/a]	[tCO2e/a]	[tCO2e/a]	[tCO2e/a]
2013	3,992	357,178	22,336	383,506
2014	3,992	357,178	22,336	383,506
2015	3,992	357,178	22,336	383,506
2016	3,992	357,178	22,336	383,506
2017	3,992	357,178	22,336	383,506
2018	3,992	357,178	22,336	383,506
2019	3,992	357,178	22,336	383,506
2020	3,659	327,414	22,336	353,409
Sum	**31,603**	**2,827,663**	**178,688**	**3,037,951**

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

See *Table E.6.1.* below

E.6. Table providing values obtained when applying formulae above:

Table E.6.1. Estimated emission reductions during the crediting period

Year	Estimated project emissions (tCO2e)	Estimated leakage (tCO2e)	Estimated baseline emissions (tCO2e)	Estimated emission reductions (tCO2e)
2010	6,642	0	45,753	39,111
2011	39,851	0	274,523	234,672
2012	52,286	0	383,506	331,220
Total (tonnes of CO2 equivalent)	**98,779**	**0**	**703,782**	**605,003**

Table E.6.2. Estimated emission reductions (2013 until end of operational lifetime)

Year	Estimated project emissions (tCO2e)	Estimated leakage (tCO2e)	Estimated baseline emissions (tCO2e)	Estimated emission reductions (tCO2e)
2013	52,286	0	383,506	331,220
2014	52,300	0	383,506	331,206
2015	52,284	0	383,506	331,222
2016	52,284	0	383,506	331,222
2017	52,284	0	383,506	331,222

2018	52,284	0	383,506	331,222
2019	52,284	0	383,506	331,222
2020	47,930	0	353,409	305,479
Total (tonnes of CO2 equivalent)	**413,936**	**0**	**3,037,951**	**2,624,015**

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including transboundary impacts, in accordance with procedures as determined by the host Party:

In the project a CMM-fired high efficiency flare will be implemented during the first phase with the purpose of destroying the extracted CMG which otherwise would have been released to the atmosphere. By releasing the CMG into the atmosphere, the harmful green house gas (GHG) methane (CH_4) would be vented into the atmosphere without being mitigated. Therefore, besides the domestic waste from the local operators, no impairment of nature and landscape is given.

The implementation of a project to recover the methane captured in mine workings by vacuum-pumping station solves following social and ecological problems:

- Lowering of emissions of methane which falls into greenhouse gases and its air emission is restricted by “Concept of implementation of a state policy on reduction of atmosphere emissions which result in oxidation of an euthrophication and generation of a ground-level ozone” approved by the Cabinet of Ministers of Ukraine No.610-r dd. 15.10.2003;
- Lowering of gas pollution of active mine workings;
- Lowering of environmental pollution level and improvement of living conditions of miners and local population, because pollution of adjoining cities by such dangerous substances as sulphur dioxide (SO2) and gasborne ash will be prevented due to use of methane as alternative fuel for a mine boiler station during implementation of the project;
- Job creation.

The high efficiency flare will combust 99.5% of the methane will be captured by the facility system. And therefore the flue gas includes much less air polluting substances then from the cold stacks where the CMG is released currently.

The Ukrainian Institute Lugansk GIPRO shakht has been contracted to proceed with the Environmental Impact Assessment (Order No. 7302, Archive No. 249/2010, and Code 9968). The whole Assessment was completed according to following requirements:

- DBN (Ukrainian national construction regulations) A.2.2-1-2003 “Structure and content of materials of environmental impact assessment (EIA) at design and construction of the enterprises, buildings and facilities” approved by the order of Gosstroy of Ukraine No.214 dd. 15.12.2003 and put into effect 01.04.2004;
- DBN A.2.2-3-2004 “Structure, order of development, agreement and approvement of the project construction documentation” approved by the order of Gosstroy of Ukraine No.8 dd. 20.01.2004 and put into effect 01.07.2004.

The flare facility causes no harmful environmental impacts as no resources as water or round are required. In fact the utilization of otherwise vented CMG reduces in an active manner the amount of CMG which is released to the atmosphere and provides significant benefits for the global climate production by converting the harmful methane into the less harmful carbon dioxide.

The project is developed according to effective standards, rules and instructions. Project solutions ensure safety operation and meet fire and explosion safety requirements. The project does not contain deviations from effective regulatory requirements.

Furthermore the operation of the flare facility reduces the uncontrolled migration of CMM to the surface in the surrounding area and reduces consequently the accident hazard by fire and explosions caused through methane which would otherwise uncontrollable discharge to the atmosphere. Beside the positive effect on the global climate protection, no transboundary impacts occur.

Under existing environmental legislation Sukhodolskaya -Vostochnaya coal mine is obliged to monitor and report annually certain contaminant emissions (nitrogen dioxide, sulfurous anhydride, carbon oxide, dust etc.). Therefore there are already well established and fully functional procedures for environmental monitoring at the Sukhodolskaya -Vostochnaya coal mine. The office of environmental engineer is responsible for relevant data monitor, collection and compilation of quarterly reports. One a year report is submitted to Ministry of Environment Protection.

Environmental performance of the project will be monitored in the framework of existing procedures and data that will be collected will be incorporated into total environmental report that Sukhodolskaya - Vostochnaya coal mine prepares annually. Environmental impact for air quality, water quality, noise, solid waste and zoology of the project activity has confirmation with local environmental authorities in Design Institute documentation.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>
There are no significant environmental impacts expected. No environmental impact assessment is needed. The plant has to fulfill the requirements of the Ukrainian Department of Ecology and Nature Conservation. The requirements should be checked by the government when the permission of the plant will be applied.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

The project has been introduced to the Ukrainian Government with a Project Idea Note (PIN). The authorities appreciated the project and finally a Letter of Endorsement, dated 03/06/2009 has been issued by the National Environmental Investments Agency of Ukraine (NEIA). It was especially noted that utilization of coal mine methane will increase the safety of the work at the coal mine and create some new working places.

Project Participant has appointed design task Institute in Lugansk to carry out stakeholder process. Part of the 'Design Task' was the preparation of an Environmental Impact Assessment. Upon completion of the EIA, advertisements were placed in the local press inviting comment from all interested parties, individuals and organisations. In total 4 advertisements were placed over a two month period. No responses nor adverse comment or request for information from individuals or interested stakeholder groups were received by the Design Institute.
The local authorities and all stakeholders of the surrounding were informed through letter of intent in the local newspaper "SLAVA KRASNODON" on 16/04/2010, 21/05/2010, 11/06/2010 and 18/06/2010. The letter of intent which was published in the newspaper has been inserted under Annex 4. As the letter of intent was always the same in all four editions, only one copy of the letter is shown under Annex 4.
Furthermore an English translation has been inserted below the letter of intent in Annex 4.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Host Project Participant

Organisation:	OJSC Krasnodonvuhillya
Street/P.O.Box:	Komsomolska Street
Building:	5
City:	Krasnodon
State/Region:	Luhanska Oblast
Postal code:	94404
Country:	Ukraine
USREOU Code	32363486
Types of works according to the SCEA:	10.10.1 Coal mining and coal washing 51.51.0 Fuel wholesale 51.39.0 Multiple product food, drinks and smokables wholesale 51.90.0 Other types of wholesale trading 92.40.0 Activity of informational agencies 45.21.5 Construction of facilities for energy, mining and manufacturing industries.
Phone:	+38 (06435) 6-23-54; +38 (06435) 6-41-22 (switch-board)
Fax:	+38 (06435) 6-51-46
E-mail:	krdu@krasnodon.lg.ua
URL:	http://krasnodoncoal.com
Represented by:	Oleksandr Oleksiyovych Potapenko
Title:	General Director
Salutation:	
Last name:	Potapenko
Middle name:	Oleksiyovych
First name:	Oleksandr
Department:	
Phone (direct):	+38 (06435) 65415
Fax (direct):	+38 (06435) 65146
Mobile:	+38 050 3262229
Personal e-mail:	Aleksandr.Potapenko@krasnodoncoal.com

Investor (Foreign) Project Participant

Organisation:	Green Gas Ukraine Holdings B.V.
Street/P.O.Box:	Jachthavenweg 109h
Building:	
City:	Amsterdam
State/Region:	Amsterdam
Postal code:	1081 KM
Country:	Netherlands
Phone:	+31 (0)20 570 2250
Fax:	+31 (0)20 570 2222
E-mail:	info@greengas.net
URL:URL:	www.greengas.net/
Represented by:	Robert Shekleton
Title:	Director
Salutation:	
Last name:	Shekleton
Middle name:	
First name:	Robert
Department:	
Phone (direct):	+49 (0) 2151 5255 140
Fax (direct):	+49 (2151) 5255 500
Mobile:	+49 (0) 1702228721
Personal e-mail:	bob.shekleton@greengas.net

Annex 2

BASELINE INFORMATION

Following key information and data were and will be used to establish the baseline:

Data/Parameter	**BEy**
Data unit	tCO2e
Description	Baseline emissions in year y
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied (for ex ante calculations/determinations)	An average value of 234,594 tCO2e has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The recording frequency is monthly and will be archived electronically
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	$BE_{MD,y}$
Data unit	tCO2e
Description	Baseline emission from destruction of methane in the baseline scenario in year y
Time of determination/monitoring	Determination
Source of data (to be) used	Ex-ante estimation
Value of data applied (for ex ante calculations/determinations)	An average value of 2,883 tCO2e has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Fuel consumption of the existing boiler-project (assuming two boilers: boiler 1 – 232.74 Nm^3/h; boiler 2 - nearly not running (only 25% of boiler 1)
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	$BE_{MR,y}$
Data unit	tCO2e
Description	Baseline emissions from release of methane into the atmosphere in year y that is avoided by the project activity
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied	An average value of 224,266 tCO2e has been calculated for the

(for ex ante calculations/determinations)	crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Gas flow monitored by the Mine during the years 2008, 2009 and half year of 2010 were analysed and the values for 2009 were taken into consideration as the gas flow for the ex-ante estimation.
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**$BE_{Use,y}$**
Data unit	tCO2e
Description	Baseline emissions from the production of power of supply to gas grid replaced by the project activity in year y
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied (for ex ante calculations/determinations)	An averaged value of 7,445 tCO2e has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	For the ex-ante estimation of electricity generation, the operation hours of the gensets were set to 8,000 hours/annum. The installed capacity of 1.558 kWhel
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**$PMM_{PJ,y}$**
Data unit	tCH_4
Description	Post-mining CMM captured and destroyed in the project activity in year y
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring through flow meter
Value of data applied (for ex ante calculations/determinations)	An averaged value of 11,728 tCH_4 has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Gas flow monitored by the Mine during the years 2008, 2009 and half year of 2010 were analysed and the values for 2009 were taken as the gas flow for the ex-ante estimation.
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**$PMM_{BL,y}$**
Data unit	tCH_4

Description	
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring
Value of data applied (for ex ante calculations/determinations)	An averaged value of 1,048 tCH_4 has been calculated for the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Gas flow monitored by the Boiler-project (separate registered JI-project under the project identification UA1000031 ("Utilization of Coal Mine Methane at the Coal Mine Sukhodilska-Skhidna") during the years 2008, 2009 and 2010 (January – August) were analysed and the average flow over the time taken into consideration for the ex-ante estimation.
QA/QC procedures (to be) applied	
Any comment	

Data/Parameter	**GENy**
Data unit	MWh
Description	Power generated during phase 2 of the project activity
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Ex-ante estimation for Determination/ monitored data for Monitoring through power meter
Value of data applied (for ex ante calculations/determinations)	As per the ex-ante estimation, 24,928 MWh will be generated within the crediting period.
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The electrical generation is based on the operation hours of the year multiplied with the installed capacity.
QA/QC procedures (to be) applied	The power meter is subject to a regular testing regime to ensure accuracy. If applicable, the power meter will be according to national regulations.
Any comment	

Data/Parameter	**$EF_{ELEC,y}$**
Data unit	tCO_2e/MWh
Description	CO2 emission factor from the grid
Time of determination/monitoring	Determination/Monitoring
Source of data (to be) used	Default value
Value of data applied (for ex ante calculations/determinations)	The default value for the crediting period is 0.896 tCO_2e/MWh
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to the document „Ukraine - Assessment of new calculation of CEF" by TÜV Süd, dated 17/08/2007; reference IS-USC-MUC and " Electricity Emission Factors Review" by MWH S.p.A, dated November 2009 and Utilization of Coal Mine Methane at the Coal Mine named after A.F. Zasyadko, Project Design

	Document version 4.4 (dated 27 March 2008), Annex 2, page 69
QA/QC procedures (to be) applied	
Any comment	

Annex 3

MONITORING PLAN

Please refer to Section D for detail Monitoring plan

Annex 4

Letter of Intent

Заявление о намерениях

1. **Заказчик**: ООО «Грин Газ Краснодон».

2. **Генпроектировщик:** ГОАО «Луганскгипрошахт», г. Луганск, ул. Пушкина, 1.

3. **Наименование объекта**: «Установка высокотемпературных факелов на центральной промплощадке шахты «Суходольская-Восточная».

4. **Местонахождение площадки**: г. Суходольск, Луганская область.

5. **Характеристика деятельности:** сжигание каптируемого шахтного метана в газоутилизационных установках тепловой мощностью 25 МВт с целью снижения антропогенного воздействия на воздушную среду и озоновый слой за счёт сокращения выбросов парниковых газов в атмосферу. Количество метана, сжигаемого в установках: от 1800 до 2000 м^3/ч.

6. **Экологические и прочие ограничения планируемой деятельности по вариантам:**

- обеспечение экологической безопасности атмосферного воздуха;
- обеспечение уровня воздействия физических факторов (шума) на состояние атмосферного воздуха и здоровья людей при строительстве и эксплуатации объекта.

7. **Возможные воздействия в период эксплуатации установки на окружающую среду:**

водную – сброс конденсата в шахтную канализацию от факельной установки;

воздушную – сжигание метана в факельной установке позволяет преобразовать метан в углекислый газ, при этом достигается снижение вредного воздействия парникового эффекта в 21 раз. Загрязнение атмосферы выбросами при сжигании метановоздушной смеси в установке с учетом природоохранных мероприятий, предусматриваемых проектом, ожидается в пределах установленных ограничений. Сокращение потребления твёрдого топлива котельной за счёт перевода одного котла на метан позволит снизить выбросы диоксида серы и взвешенных веществ;

растительный и животный мир, почвы, техногенную среду, климат и микроклимат – опосредованное воздействие, оказываемое выбросами в атмосферу;

социальную и *геологическую среды* – не ожидается.

При условии выполнения предусмотренных проектом мероприятий, проектируемое предприятие не окажет отрицательного воздействия на здоровье проживающего вблизи него населения. За пределами санитарно-защитной зоны превышения значений ПДК по приоритетным вредным веществам, выбрасываемым в атмосферу, не прогнозируется.

8. **Участие общественности** - *для подачи жалоб и предложений в течение 30 дней население может обращаться в Краснодонский городской совет*

Исполнитель ОВОС: ГОАО «Луганскгипрошахт» гл. инженер В.Н. Пономарьтел/факс (0642)59-96-02

ООО «Грин Газ Краснодон»: Глава представительства в странах СНГ Евгений Алексеев, м.тел. 0958600412

Офис менеджер Елена Островская, тел.(062) 2102718; моб. тел. 0506179903

English translation:

LETTER OF INTENT

1. The Customer: Green Gas Krasnodon LLC

2. The General Contractor: SOJSC Luhanskdiproshakht, 1, Pushkina Street, Luhansk

3. The facility name:-

"Installation of high-temperature mine gas flaring device on the Sukhodilska Skhidna Mine site"

4. The site location: Sukhodilsk, Luhansk oblast

5. Description of operations:-

Utilisation of coal mine methane by means of the Hofstetter high-temperature flaring installation, heat capacity of which is 25 MW_{th}. The objective is to mitigate anthropogenic impact on the condition of air and ozone screen by reducing greenhouse emissions released into the atmosphere.
The volume of flared methane is from 1800 to 2000 m^3.

6. Environmental and other restrictions of the projected activities (on the options):

- providing environmental safety of the air;
- providing proper level of physical (noise) factors affecting the air condition and people's health during the period of the facility construction and operation.

7. Potential environmental impact during the period of the facility operation:

- *Water environment* – drainage of condensate of the gas utilising equipment into the mine sewage system
- *Air* – flaring of methane allows converting methane into carbon dioxide what results in harmful

greenhouse effect reduction by 21 times. With due consideration of the environmental activities provided for by the project, environmental impact caused by flaring of emissions of methane-air mixture is expected to be within the limits of administrative restrictions. After one of the boilers shift to methane, consumption of solid fuel by the boiler-house will decrease. This will allow for reduction of sulphur dioxide and suspended matters emissions;

- *Flora, fauna, earth, anthropogenic environment, climate and microclimate* – indirect impact caused by emissions released into the atmosphere;
- *Social and geological spheres* – an impact is not expected.

Providing the projected measures are carried out, the project will not have a negative effect on the health of the population living close to the site.
Outside the boundaries of the sanitary protection area, excess of the ambient air standard in terms of high-priority harmful substances released into the atmosphere is not expected.

8. Public participation: *in order to submit letters of complaints and proposal, the citizens may contact the Krasnodon City Council during 30 days term.*

The Permormer of EIA: - SOJSC "Luganskdiproshakht",
Chief Engineer V.N. Monomar tel/fax (0642) 59-96-02

Green Gas Krasnodon LLC:- Head of the Representative Office in CIS Evgeny Alekseev, mobile tel. 0958600412;
Office Manager Elena Ostrovskaya, tel. (062) 2102718; mobile tel. +38 0506179903

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