



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

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**SECTION A. General description of the project****A.1. Title of the project:**

CMM utilisation on the Joint Stock Company “Coal Company Krasnoarmeyskaya Zapadnaya № 1 Mine”

Document Version: 04

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Prepared by: Emissions-Trader ET GmbH, Adam Hadulla

Title of the project in Ukrainian language:

УТИЛІЗАЦІЯ ШАХТНОГО МЕТАНУ НА ВАТ "ВУГІЛЬНА КОМПАНІЯ "ШАХТА
"КРАСНОАРМІЙСЬКА - ЗАХІДНА № 1""

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. The main contributor of methane emissions to the atmosphere is the coal industry. Methane reserves in carboniferous deposits are estimated from 12 to 25 trillion m³.

Degassing of Coal Mine Gas (CMM) is an unavoidable occurrence of hard coal mining. In addition to active coal mines there are also a lot of abandoned mines, which still emit CMM after mining. Even after shut down mining activities, the CMM escapes over many years through open shafts, cracks and existing degassing wells in the overburden directly or diffusely into the atmosphere. CMM mainly consists of the harmful greenhouse gas methane (GWP 21), so that using of CMM becomes more important particularly with regard to the world-wide consensus of reducing green-house-gas emissions.

In this project, CMM from two suction systems and from drainage wells on the surface of the coal mine “Krasnoarmeyskaya Zapadnaya № 1”, should be utilised for heat and power generation and for flaring.

The coal mine “Krasnoarmeyskaya Zapadnaya № 1” has multiple shafts, two of which are fitted with CMM suction systems, the Central Shaft and the Air Shaft № 2. Since October 2003, some quantity of CMM is utilised in a modified boiler on the Central Shaft, as a first phase of the project. The main part of CMM is not utilised and it is simply vented to the atmosphere. The main part of heat used by the coal mine facilities is generated by coal fired boilers. All power is purchased from the Ukrainian grid.

In this project new cogeneration units and new flares should be installed and should be fired with CMM.

Furthermore CMM from drainage wells on the surface should be utilised for heat and power generation and for flaring. For this purpose a new CMM pipeline should be constructed and should connect the drainage wells on the surface with the Central Shaft and the Air Shaft № 2.

The new and the modified units are supposed to displace the main part of the heat generated by the coal boilers and displace a part of the power purchased from the grid.

The hereby requested ERU's from the conversion of the methane into carbon dioxide are needed to finance the new units and the new infrastructure.



The combustion of methane in the boiler and in the flare results in a significant emissions reduction. The conversion of the harmful greenhouse gas methane with a GWP of 21 into less harmful CO₂ with a GWP of 1 reduces the global warming potential of the emissions by 87%. The displacement of conventionally generated heat (coal) gains further CO₂ emissions reduction.

A.3. Project participants:

Table A- 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)	Joint Stock Company “Coal Company Krasnoarmeyskaya Zapadnaya № 1 Mine”	no
Netherlands	Carbon-TF B.V.	no

- Joint Stock Company “Coal Company Krasnoarmeyskaya Zapadnaya № 1 Mine” (CJSC “Donetsksteel” Iron and Steel Works”), operator of the CMM plants and holder of the CMM utilisation licence
- Carbon-TF B.V.
Investor, buyer of the ERU’s; Dutch emissions trading company

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located at the coal mine “Krasnoarmeyskaya Zapadnaya № 1”, at Krasnoarmeysk (Donetsk Oblast) in the eastern Ukraine. The locations of the Donetsk region as well as location of the coal mine are shown on the maps below.

Clarification about the name of the coal mine:

The name of the coal mine has been changed some times. In this PDD usually the name:

« coal mine “Krasnoarmeyskaya Zapadnaya № 1” »

is given. In the report «**COAL MINE METHANE IN UKRAINE: OPPORTUNITIES FOR PRODUCTION AND INVESTMENT IN THE DONETSK COAL BASIN**» [CMM-UA2001] which has been prepared for the U.S. Environmental Protection Agency (EPA) in January 2001, the name of the coal mine is given as:

« Krasnoarmeyskaya Zapadnaya mine »

Originally two further coal mines, Krasnoarmeyskaya-Zapadnaya № 2 and Krasnoarmeyskaya-Zapadnaya № 3 have been planned, but have never been realised, so that the names Krasnoarmeyskaya Zapadnaya № 1 and Krasnoarmeyskaya Zapadnaya (without № 1) denominates the same coal mine.

The name Krasnoarmeyskaya Zapadnaya № 1 is the original name in Russian language, which is the most common name up to date. In official Ukrainian documents the Ukrainian transcription has to be taken. The literally transcription is:

« Krasnoarmiyska-Zakhidna No.1 »

In the approved translation of the Ukrainian LoA the Ukrainian word “Zakhidna” (Russian: Zapadnaya) has been translated correctly to English: “West”.

The latest officially registered name of the company in Ukrainian language is:

« ВАН "ВУГІЛЬНА КОМПАНІЯ "ШАХТА "КРАСНОАРМІЙСЬКА - ЗАХІДНА № 1" » »

which have been translated in the approved translation of the Ukrainian LoA to english as:

« Open Joint-Stock Company “Coal Company “Coal mine Krasnoarmiys’ka-West No.1” » »

The name given in the title of the project and for the project participant in Table A-1 and Annex-1

« Joint Stock Company “Coal Company Krasnoarmeyskaya-Zapadnaya № 1 mine” »

denominates the same coal mine as the latest officially registered name, which is used in the LoA.

A.4.1.1. Host Party(ies):



Figure A- 1: Location of the Project in the Ukraine



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

Donetsk Oblast



Figure A-2: Location of Krasnoarmeysk in the Donetsk Oblast

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

85300 Krasnoarmeysk, Donetsk Oblast



Figure A-3: Location of the Project at Krasnoarmeysk:
Central Shaft: Longitude 36°59'30", Latitude: 48°50'00"
Air Shaft №2: Longitude 37°03'46", Latitude: 48°15'20"

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

The project is located at the coal mine “Krasnoarmeyskaya Zapadnaya № 1” at Krasnoarmeysk (Donetsk Oblast).

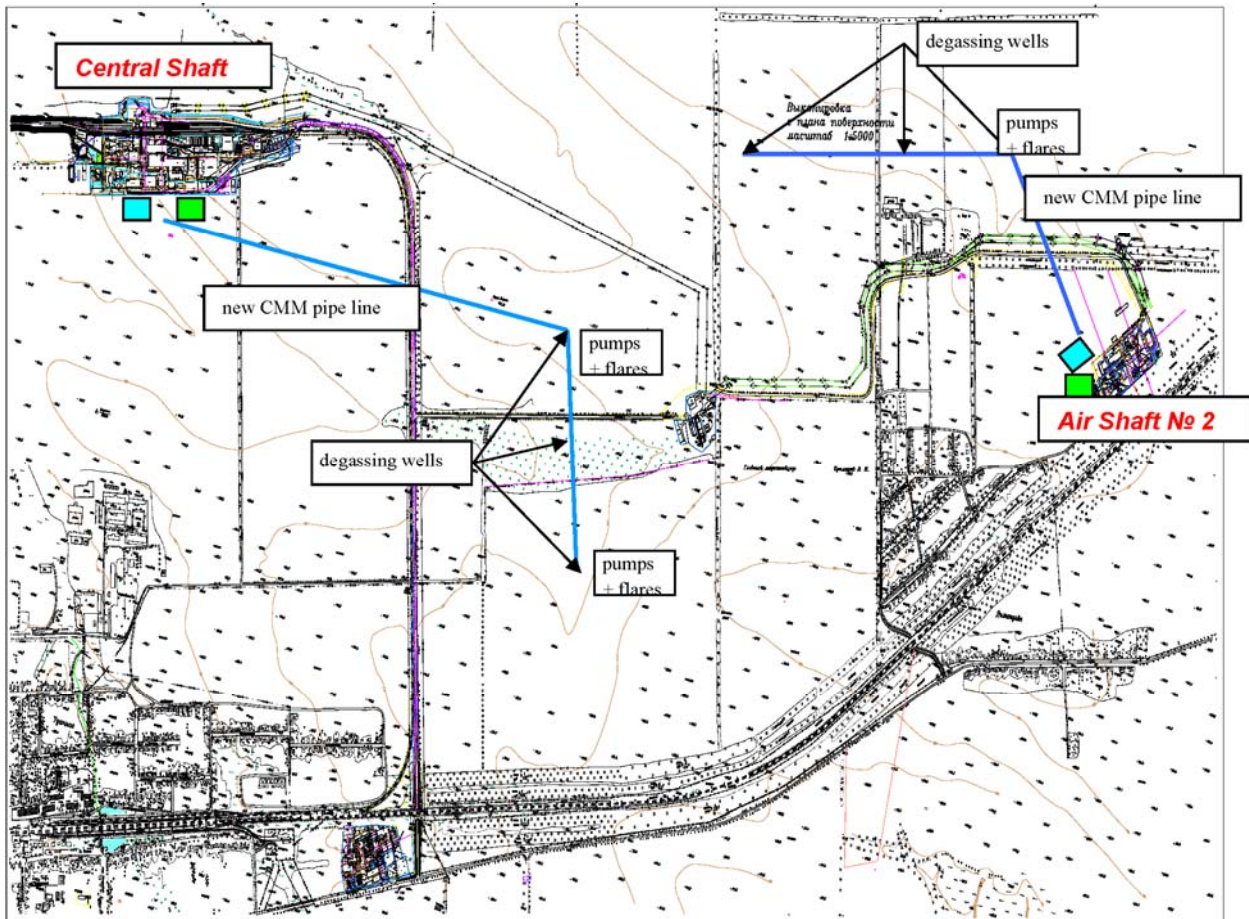


Figure A-4: Unit location plan at the coal mine “Krasnoarmeyskaya Zapadnaya № 1”

- place assigned to cogeneration units marked cyan
- place assigned to flares marked green
- degassing well = combined gas pumps / flares

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

Coal mining activity

The coal mine is producing since 1990. The actually produced amount is about 7 million tonnes per annum; a mining activity of 12 million tonnes is planned. The remaining coal reservoir is about 251 million tonnes. [KAZ].



Degasification activities

The coal mine “Krasnoarmeyskaya Zapadnaya № 1” has multiple shafts, two of which are fitted with CMM suction systems - the Central Shaft and the Air Shaft № 2. Additionally, drainage wells are drilled on the surface for safety of mining. Actually there is a small part of the CMM, which is utilised in one boiler on the Central Shaft in experimental mode as a first phase of the project. The main part of the CMM is simply vented to the atmosphere unused.

The suction system is primarily designed for operational safety in the underground and not for CMM utilisation and there are no national regulations or 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.

Additionally to the suction from the underground, CMM is captured by surface drainage wells during and post mining. The CMM is sucked out from the boreholes using mobile gas pumps. In difference to the CMM sucked from the underground, the CMM from the drainage wells starts with a very high methane concentration, which is continuously falling down (to zero). Usually a drainage well is producing gas for a period of about 3 to 12 months.

The methane flow from the suction systems and drainage wells is prospected by the ventilation engineers of the coal mine in the range from 91 to 228 m³/min for the years 2008-2012. The sucked CMM amount depends mainly on the actually mined coal seams and the coal mining progress. Detailed data has been handed over to Emissions-Trader ET GmbH and has been taken into account.

Project activities

In the case of this project CMM from both suction systems system should be utilised for heat and power generation, and flaring for methane destruction. The remaining amount of the CMM, which can not be utilised, should be further on released to the atmosphere unused.

The first contact between Emissions-Trader ET GmbH, Demeta GmbH and Donetsksteel (at that time Energo) took place in March 2003. Donetsksteel was then generally interested in CMM utilisation and in emissions trading activities. As a first step of the project activity one of the existing coal boilers has been modified and is fired with CMM since October 2003. In the following Donetsksteel considered multiple variants of CMM utilisation and also contacted other emission trading related companies, before in the autumn of 2007 Donetsksteel finally decided to install the JI-Project together with Demeta GmbH.

Utilisation of the methane captured (the project)

The utilisation of the CMM should be installed coexistent on three locations:

1. Central Shaft

- upgrade of one old coal boiler with CMM burner systems for heat production, already installed in October 2003
- installation of flares for methane destruction
- installation of cogeneration units for combined power and heat production



2. Air Shaft № 2

- installation of cogeneration units for combined power and heat production
- installation of flares for methane destruction

3. Degassing wells on the surface

- installation of mobile combined gas pumps / flare systems for:
 - a) methane destruction by flaring
 - b) methane suction and feed-in into a CMM pipeline for utilisation on the Central Shaft and the Air Shaft № 2

It is planned to utilise up to 100% of the CMM amount. The utilisation mainly depends on the heat demand of the coal mine. The units should be supplied with CMM in the following order: primary the cogeneration units, than the boiler, and at last the flares should destroy the remaining amount of CMM. The prospected utilisation plan is shown in table A-2.

Table A-2 – Installation plan of the project

unit	installation date	firing capacity	product	efficiency*
Central Shaft				
upgraded boiler	Oct 2003	25 MW	hot water	99.5%
flare No: 1	Jan 2008	5 MW	methane destruction	99.5%
flare No: 3	Mar 2008	5 MW	methane destruction	99.5%
cogeneration units	Jul 2008	total of 48.8 MW	power and hot water	99.5%
Degassing wells				
flare/pump No: 2	Jan 2008	5 MW	methane destruction	99.5%
flare/pump No: 7	Apr 2008	5 MW	methane destruction	99.5%
Air Shaft № 2				
flares No: 4-6	Apr 2008	total of 15 MW	methane destruction	99.5%
cogeneration units	Jun-Oct 2008	total of 67.5 MW	power and hot water	99.5%
cogeneration units	Jan 2009	total of 30 MW	power and hot water	99.5%

* combustion efficiency

CMM supply

All utilisation units should be connected to the local suction systems on the Central Shaft and respectively Air Shaft № 2. New connecting CMM pipelines between the drainage wells on the surface and Central Shaft and Air Shaft № 2 should be constructed. The mobile gas pumps either feed in the



CMM sucked from the drainage wells into the connecting pipeline or directly supply the flares with CMM.

The pressure generated by the vacuum pumps of the suction systems is sufficient to supply all utilisation units, so that no further compression is needed. The amount of CMM sent to each unit group (boiler, flares, etc.) will be measured by separate flow meters. Each branch will be provided with a deflagration flame arrester which prevents backfiring from the utilisation unit into the suction system of the coal mine or any another utilisation unit.

No utilisation unit will affect the central suction system in any way. This is obligatory required by the coal mine.

CMM boiler

Actually the coal mine is mainly using old coal boilers for heat generation. On the Central Shaft one of the old coal boilers has been upgraded with a CMM burner system in October 2003, after a meeting with Emissions Trader ET GmbH and Demeta GmbH in March 2003. The upgraded boiler has a firing capacity of 25 MW and is supposed to generate hot water for the central heating systems.

In 2008 the boiler should be upgraded with a new measuring and monitoring system.

The CMM will be fed into the combustion chamber of the boilers, where the methane will be burned completely at temperatures between 800 and 1000 degrees Celsius. The boilers should be operated fully automatically and all essential measured data will be collected and recorded.

CMM burner systems have been tested at various sites in Western Europe and are now approved. Proved safety-related equipment is used to minimise the risks of the plant.

Technical data – Upgraded boiler on Central Shaft

Technical data	Type KE-25-14KC hot water boiler, with a CMM burner system
Installed firing capacity	approx. 25 MW
Efficiency	86 % th, measured value
Maximum methane amount required	2,505 m ³ /h CH ₄

Cogeneration units

A major number of cogeneration units should be installed. It is planned to install several cogeneration units a firing capacity of approx. 48.8 MW at the Central Shaft and about 97.5 MW at the Air Shaft № 2. The cogeneration units are supposed to produce power and hot water for the central heating system of the coal mine.

The cogeneration units are not specified at the time. Actually two versions are considered: containerised, transportable units with a power output of approx. 1,350 kW per unit (e.g. Deutz TD 620K16), or stationary units installed fix in engine rooms (e.g. GE Jenbacher JMS-620 GS S-L).

The CMM will be fed into the gas engines, where the methane will be burned completely at temperatures about 800 degrees Celsius with low exhaust emissions. The cogeneration units should be operated fully automatically and all essential measured data will be gathered and recorded.



Cogeneration units like this have been tested at various sites in Western Europe and are now approved. Especially in the Ruhr District in Germany a large amount of units (approx. 150) is installed on active and abandoned coal mines.

Proved safety-related equipment is used to minimise the risks of the plant.

Technical data per unit	Type: containerised Deutz TD 620K16 gas engine cogeneration unit for combined heat and power generation completely build in a transportable container, including all necessary equipment, control and data collection system
Installed firing capacity	approx. 3,750 kW *
Power output	approx. 1,350 kW *
Heat output	approx. 920 kW *
Efficiency (electricity)	approx. 36 % *
Maximum methane amount required	376 m ³ /h CH ₄

*) firing capacity, efficiency and power and heat output depend on the gas quality and methane concentration

alternative

Technical data per unit	Type: JMS-620 GS S-L, GE Jenbacher gas engine, cogeneration unit for combined heat and power generation, including all necessary equipment, control and data collection system stationary unit, which has to be installed in an engine room
Installed firing capacity	approx. 8 MW *
Power output	approx. 3,044 kW *
Heat output	approx. 3,323 kW *
Efficiency (electricity)	approx. 38 % *
Maximum methane amount required	800 m ³ /h CH ₄

*) firing capacity, efficiency and power and heat output depend on the gas quality and methane concentration

Flares

A total of seven flares with a firing capacity of 5.0 MW each should be installed; three on the Central Shaft and four on the Air Shaft № 2.

Some flares are supposed to be installed on degassing wells on the surface. However within the data, which has been handed over to Emissions Trader ET GmbH, the gas amount of the degassing wells belonging to a shaft (see Figure A-4 on page 6) is included in the gas amount of the shaft. So the number of flares which should be installed on the degassing wells is included in the number of flares installed on the shafts.



The CMM will be fed into the combustion chamber of a flare, where the methane will be burned completely at a temperature of at least 850 and up to 1000 degrees Celsius. The plants should be operated fully automatically and all essential measured data will be gathered and recorded.

Flares like this have been tested at various landfill sites in Western Europe and are now approved. Proved safety-related equipment is used to minimize the risks of the plant.

The flares are supposed to destroy the remaining CMM amount, which is not used by the boilers and cogeneration units, especially in the summer, when the heat demand of the coal mine is low.

Technical data (single flare)	Type: KGUU 5/8 manufactured by Pro2 Anlagentechnik GmbH, Germany (planned) enclosed flare with a nominal capacity of 5.0 MW automatically controlled combustion process with minimum combustion temperature of 850°C for at least 2 s and combustion efficiency of at least 99.9 % (Combustion data according to German Legal Requirements for Landfill Gas Combustion) Flare, compressor and all other needed technical equipment are completely build in a container.
Installed firing capacity	5.0 MW
Maximum methane amount required	503 m ³ /h CH ₄

Electricity utilisation

Currently the electricity for the coal mine facilities is purchased from the grid. In the case of the project the electricity generated by the cogeneration units is supposed to be primarily used for the own consumption of the coal mine. The surplus is supposed to be fed-in into the Ukrainian grid. Both, the own consumption of the coal mine and the feed-in are reducing the amount of power, which is produced by the grid. This amount of conventionally generated power displaced by the project generates additional ERU's.

Heat utilisation

Currently the heat supply of the coal mine is provided by old coal boilers. In the case of the project a part of this energy will be displaced by the heat generation of the project. This amount of conventionally generated heat displaced by the project generates additional ERU's.

Training programme

The responsible personnel of the project developer Demeta GmbH has been trained on the handling with CMM-utilisation units and the applied monitoring systems, during an eight week long practical course in Germany in the autumn of 2005. In this course which has been carried out by A-TEC Anlagentechnik GmbH, a partner company of Demeta GmbH, also the basic principles of emissions trading and the background of the monitoring has been explained. A-TEC Anlagentechnik GmbH is already running several CMM utilisation plants and monitoring systems in Germany.

These trained personnel is the basis of a team of engineers, which should establish a specialised service team in the Ukraine and instruct further operating and monitoring personnel, as well for this project.



Maintenance programme

The maintenance and operation of the project equipment will be provided by the coal mine personnel. For the maintenance of the cogeneration units a contract with a local representation of the manufacturer will be awarded.

Risks of the project

Table A- 3: Risk and mitigation to the project

Risk	Mitigation
Lower CMM utilisation than expected	The amount of extracted CMM is higher than the amount of utilised CMM. The amount of CMM is expected to increase in the future, due to the extension of the coal mining activities.
Malfunctioning of the burner systems.	Training of the staff and regular maintenance of equipment.
Lower concentration of methane in extracted gas	The burner systems automatically regulate the amount of gas that is combusted in the utilisation units. Despite that a minimum concentration of 25% CH ₄ is required due to legal regulations. The cogeneration units require a minimum concentration of about 30 % for proper operation.
Lower demand for heat	The annual demand of heat at the coal mine is nearly constant. In the estimation conservative values have been taken. Seasonal heat demand has been taken into account. See figure B-1.

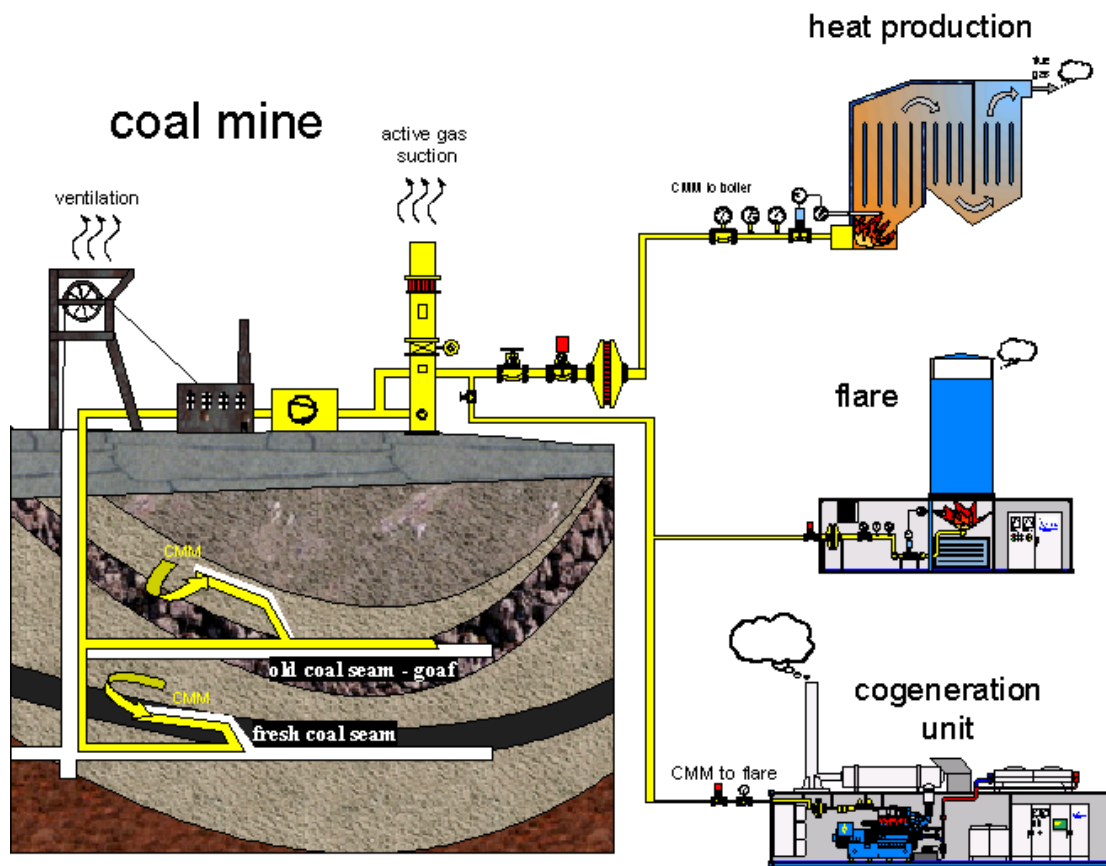


Figure A-5: General scheme of the installation with main project components

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:

The emissions reduction is based on the conversion of CMM with its main component methane (GWP 21) into CO₂ (GWP 1) in combustion processes. In absence of the project the whole CMM amount, which should be converted into CO₂ in the heat and power generation units as well as in the flares would otherwise be released unused to the atmosphere as more harmful methane.

The power generated by the project displaces conventionally generated power and reduces the greenhouse gas emissions of the Ukrainian grid.

The heat generated by the project displaces conventionally generated heat by coal combustion and reduces the greenhouse gas emissions of the coal mine.

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 envisages CMM utilisation 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.

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

Table A-4 –Emission reductions during the first crediting period (2008-2012)

	Years
Length of the period within which ERUs are to be earned	5
Length of crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO ₂
2008	886,951
2009	1,604,677
2010	1,792,123
2011	1,787,002
2012	1,781,880
Total estimated emission reductions over the crediting period (tonnes of CO ₂ equivalent)	7,852,633
Annual average of estimated emission reductions over the crediting period (tonnes of CO ₂ equivalent)	1,570,527

Table A-5 –prospective emission reductions for the years (2013-2017)

prospective emission reductions for the years 2013- 2017	
2013	1,781,880
2014	1,781,880
2015	1,781,880
2016	1,781,880
2017	1,781,880
Total estimated emission reductions over the period (tonnes of CO ₂ equivalent)	8,909,402

**A.5. Project approval by the Parties involved:**

A Letter of Endorsement Nr. 973/10/3-10 dated 2007-02-02 has been issued by the Ukrainian Ministry of Environmental Protection.

The acceptance of the project by the host party, Ukraine has been stated with a Letter of Approval, Nr. M000013, issued on 2008-02-22.

The acceptance of the project by the investor party, Kingdom of the Netherlands has been stated with a Declaration of Approval, Nr. 2008JI02, issued on 2008-04-22.

A conclusion of a Memorandum of Understanding between the Dutch and the Ukrainian Governments is signed.

**SECTION B. Baseline****B.1. Description and justification of the baseline chosen:**

The approved consolidated methodology ACM0008 / Version 03 "Consolidated baseline methodology for coal bed methane and coal mine methane capture and use for power (electrical or motive) and heat and/or destruction by flaring") has been used to identify the baseline scenario of the proposed JI project [ACM0008].

Applicability of ACM0008

The project involves the extraction of CMM from underground boreholes and gas drainage galleries to capture CMM. This extraction activity is listed as one of the applicable project activity.

The methane is captured and destroyed through utilisation to produce electricity and thermal energy, and through flaring.

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 in more detail

Hence ACM0008 is fully applicable to this JI project.

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

According to the ACM0008 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 the methane on the project site is currently released to the atmosphere together with the ventilation air – option A. Due to the low concentration of methane in the ventilation air (usually less than 1%), this methane can not be utilised. So that the ventilation air methane is not considered in the PDD.

In the case of the project pre mining CMM, during mining CMM and post mining CMM from underground boreholes is collected together in the suction systems and transported to the surface with vacuum pumps. Additionally CMM is sucked from existing surface drainage wells with separate mobile gas pumps. Further wells are planned.

In the case of the suction from underground it is impossible to determine the shares of the different sources, because numerous drainage branches are connected to the suction systems and every branch collects CMM as long as it is in operation -before, during and after mining. So that in the case of the project the option D.1 is the only option that is technically feasible for utilisation purposes. Usually the concentration of methane in the extracted gas ranges from 25-50%.

In the case of the suction from surface drainage wells option B2 is not technically feasible on the project site. So that the options B2a, C2 and D2 are possible. Usually the concentration of methane in the extracted gas ranges from 0-100 %. The CMM should be either directly utilised or it should be fed in into a CMM pipe where it be mixed together with the CMM from the underground suction system.

Step 1b. 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 the baseline scenario. In step 3 of this section some of these options will be further developed into baseline scenario alternatives. The project activity is covered by the option viii. – the combination of option iii. flaring, and option v. captive power (and heat) production.

Step 1c. Options for energy production

The options for energy production are included in the options iv. to viii. listed in step 1b.

The project activity is covered by the option viii. – the combination of option iii. flaring, and option v. captive power (and heat) production.



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 hand, 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 1b 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 1b and step 1c. 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 1a 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 the actual situation before project implementation – all of the CMM extracted by the project is released into the atmosphere.

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 coal fired on-site boilers

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

Actually there is no fully developed alternative, which is state of the art, neither the use nor the destruction, due to the low concentration of the methane in the ventilation air.

In Australia a first VAM power generation demonstration project (about MWel) has been put into operation in October 2007. This project supplies a completely new technology and should originally have been started in summer 2005. The start of operation has been moved several times due to technical problems. In addition to the unknown risks of this new technology very high capital investment (about US\$ 4,000/kW) is need, so that this technology is not financially viable.

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. 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 viable.

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 power 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 power and heat. Possible alternatives are those listed under point iv. - power generation and under point vi. - heat generation. Furthermore for the on-site heat production also a combined heat and power generation is possible and eligible:

- a) cogeneration unit, CMM fired

The captive power generation is part of the project scenario. See alternative viii.

Alternative vi. – use for additional heat generation

The captured methane could be utilised for additional heat generation, which means heat, which should be used outside the coal mine facilities. The existing boilers of the coal mine are supposed to supply only the coal mine facilities, the existing heating system is not connected to any other heating system outside the coal mine. So 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 steam boiler, CMM fired
- b) conventional hot water boiler, CMM fired

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 – in this case a new connection to an existing pipeline has to be made. Depending on the quality specification of the pipeline operator, most likely an additional methane enrichment plant could be required
- 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

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 captive heat and power generation and for flaring. All produced heat and power should be consummated by the coal mine. The remaining amount of the CMM, which can not be utilised for heat and power generation (especially in the summer), should be flared.

The project scenario consists of the following utilisation steps:

1. Cogeneration units located on both shafts will produce heat and power.
2. The remaining available CMM amount, which can not be utilised for heat or power production should be flared by flares, located on the Central Shaft, on the Air Shaft №3 and on degassing wells.
3. The deficit required power amount should be further purchased from the grid a surplus will be fed in into grid.
4. The remaining required heat amount should be further produced by the old coal boilers, especially in the winter period.

The relative shares of gas vary during a year, mainly depending on the heat demand of the coal mine (summer/winter period). In the calculation the power production is kept constant for each month. Figure B-1 shows the relative shares of CMM used for power and heat generation, and flaring relative to the total amount of the utilised CMM (100%).

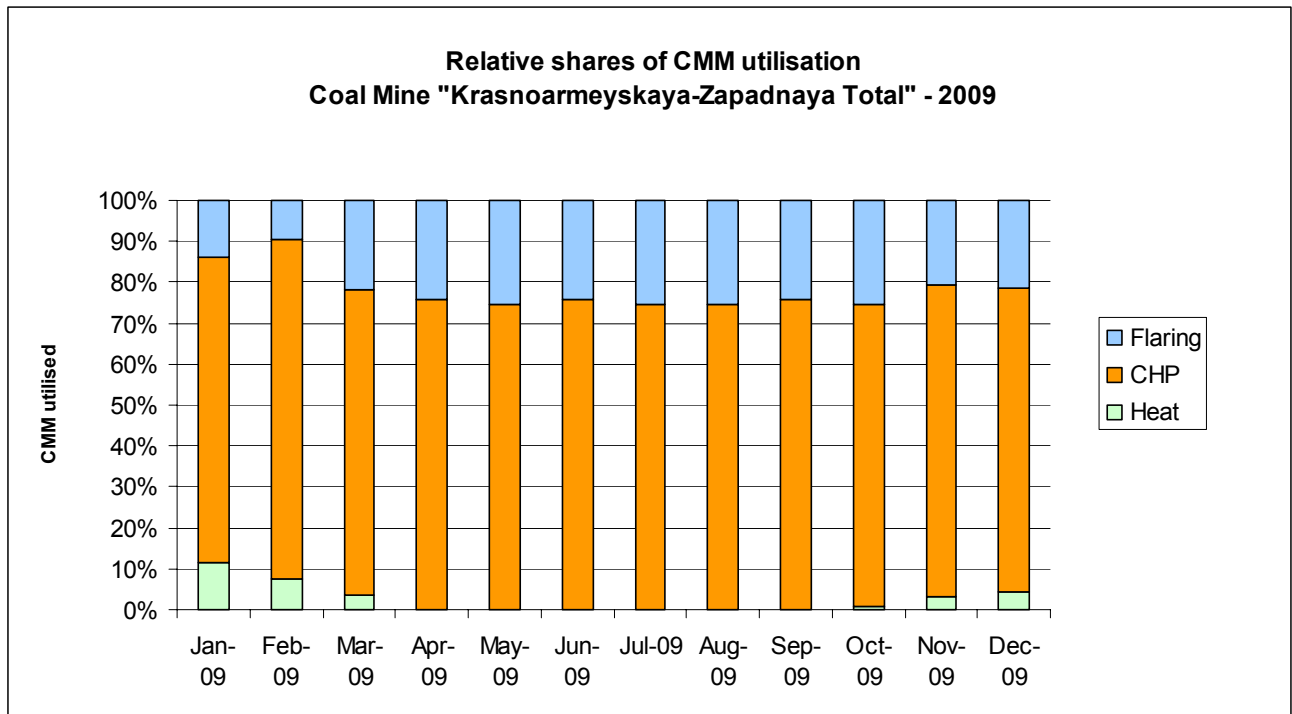


Figure B-1: Relative shares of the CMM utilisation by flaring, power and heat generation. The figure shows exemplary the values for the year 2009.

The value of 100% means 100% of the utilised CMM amount, whereas the total sucked amount is always higher than the utilised amount.



Figure B-1 exemplarily shows the relative shares prospected for the year 2009. A similar characteristic is expected for all other years too.

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, there is only one first demonstration project in Australia. This alternative is not financially viable at the time, and a high risk exists due to the implementation of a very new technology, which is not state of the art yet.

Therefore this alternative faces a prohibitive barrier.

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. 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.

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 MWe), 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 conditioned to an adequate quality. The additionally required conditioning plant makes this alternative economically not viable. Further on this alternative would be 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 kind of technology.

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 conditioned to an adequate quality. The additionally required conditioning 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.

There have been some tests with used airplane engines, which have been fired with unconditioned CMM (there is still an existing demonstration plant in China). However, due to the high maintenance costs and low thermal efficiency, this technology is financially not viable.

Therefore this alternative faces some 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 not economically viable, because the required revenues for the power feed-in into the grid are not marketable due to the business competition of the grid owners. The actually realisable sale price of power is too low.

Therefore this alternative faces a prohibitive barrier and is eliminated.

However this alternative is more suitable for captive energy generation in the project scenario, especially by the combined heat and power generation in cogeneration units, see alternatives v. and viii.

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 conditioned to an adequate quality. The additionally required conditioning 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

The captive power generation is part of the project scenario. See alternative viii.

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.

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

In this case a new connection to an existing pipeline has to be made. Also an additionally methane enrichment plant is required to fulfil the quality specification of the pipeline operator. The costs of the enrichment 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, which are upgraded with CMM compatible engines. But 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 a prohibitive barrier 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 a prohibitive barrier and is eliminated.

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

This alternative describes the project scenario not registered as JI Project

The project scenario alternative as 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. 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.

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 03), EB29 [CDM-EB]. The result is given below.

Step 1. Alternatives

In accordance with the methodology ACM0008, this step is ignored.

Step 2. Investment analysis

Sub-step 2a. Determination of the analysis method

The proposed JI project should save money, which is actually spent for power purchase and heat generation. Therefore, simple cost analysis (Option I) is not applicable.

Obtaining financial indicators for similar projects in Ukraine is problematic as this project is one of the first 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 JSC Coal Mine Krasnoarmeyskaya Zapadnaya № 1 is coal mining. The project should save money, which is actually spent for the energy supply of the site. The cost reduction should make the coal mine work more efficient; nevertheless investment capital is needed. According to business as usual rules a minimum requirement for the coal mine owner Donetsksteel is that the project should at least be profitable. Therefore the most relevant benchmark for the mine is the Net Present Value NPV, which should at least be positive.

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:

Actual prices for electricity, and coal used for heat generation were taken as of the first period of 2007 when the decision to implement the project was taken. [KAZ]

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-1: Economic indicators of the project, without revenues from emissions trading

Economic Parameters – Coal Mine Krasnoarmeyskaya Zapadnaya № 1, without ERU's		
IRR	-13,09	%
NPV (0 %)	-18.852.159	EUR
NPV (10 %)	-22.975.085	EUR

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

Sub-step 2d. Sensitivity analysis

A sensitivity analysis of the proposed project has been carried out, showing the influence of the three main factors of influence: Investment (capex), operating costs (opex) und production on the Internal Rate of Return IRR. The factors have been varied in a range of +/-20

Table B-2: Sensitivity analysis of economic indicators of the project, without ERU's

	Base case	capex -20%	opex -20%	Production +20%	
IRR	-13,09	-9,86	4,45	-9,16	%
NPV (0%)	-18.852.159	-14.950.768	11.131.014	-17.597.769	EUR
NPV (10%)	-22.975.085	-18.478.405	-8.067.006	-22.507.438	EUR

Only in the case of a significant change in opex (-20%) the IRR becomes positive the NPV (10%) of the proposed project does not become positive. The project is financially not attractive without additional income, and becomes first financially attractive with additional revenues from emissions trading.

Step 3. Barrier analysis 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 mln. cubic of this huge amount meters are actually utilised.

The situation at the Coal Mine Krasnoarmeyskaya Zapadnaya № 1 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

According to official information the project is one of the first CMM Utilisation projects in Ukraine. Therefore there is a clear technology barrier for the realisation of the proposed project. The coal mine has no skilled and properly trained personnel to operate CMM utilisation units.

Financial barrier

The revenues from selling ERU's allow the crossing of the financial barrier.

Table B-3: Sensitivity analysis of economic indicators of the project, without ERU's

Economic Parameters – Krasnoarmeyskaya-Zapadnaya with ERU's		
IRR	18.66	%
NPV (0 %)	33,829,232	EUR
NPV (10 %)	9,946,736	EUR

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.

Step 4. Common practice analysis

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 proposed activity is not common practice.

Step 5. Impact of JI revenues

Acceptance of the proposed project as a JI activity will allow crossing the financial barrier.

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:

Table B-4: Overview on emissions sources included in or excluded from the project boundary

Baseline

Source	Gas		Justification / Explanation
Emissions of methane as a result	CH ₄	Included	The main emission source. The amount of methane to be released depends on



of venting			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 no flaring and no use for heat and power in the applicable baseline scenario.
	CH ₄	Excluded	Excluded for simplification. This is conservative and in accordance with ACM0008.
	N ₂ O	Excluded	Excluded for simplification. This is conservative and in accordance with ACM0008.
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. A standardised electricity baseline factor for the Ukrainian grid, which has been determined by SenterNovem [SenterNovem] has been used.
	CH ₄	Excluded	Excluded for simplification. This is conservative and in accordance with ACM0008.
	N ₂ O	Excluded	Excluded for simplification. This is conservative and in accordance with ACM0008.
Captive power and/or heat, and vehicle fuel use	CO ₂	Included	In the baseline scenario heat would be generated by the on-site coal boilers.
	CH ₄	Excluded	Excluded for simplification. This is conservative and in accordance with ACM0008.
	N ₂ O	Excluded	Excluded for simplification. This is conservative and in accordance with ACM0008.

Table B-5: Overview on emissions sources included in or excluded from the project boundary

Project activity

Source	Gas		Justification / Explanation
Emissions of methane as a result of continued venting	CH ₄	Excluded	Only the change in CMM/CBM 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, including transport	CO ₂	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



of the gas		Included	and project scenario.
		Excluded	The own electricity consumption of the cogeneration units has been included and subtracted for the amount of electricity produced by the units.
		Excluded	The own electricity consumption of the boilers and flares is not significant ^{*)} and has been excluded.
	CH ₄	Excluded	Excluded for simplification in accordance with ACM0008. This emission source is assumed to be very small.
	N ₂ O	Excluded	Excluded for simplification in accordance with ACM0008. This emission source is assumed to be very small.
Emissions from methane destruction	CO ₂	Included	From the combustion of methane in the flares and heat and power generation.
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 ACM0008, 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 ACM0008. This emission source is assumed to be very small.
Fugitive methane emissions from gas supply pipeline or in relation to use in vehicles	CH ₄	Excluded	Excluded for simplification in accordance with ACM0008. (Besides it is not applicable to the project.)
Accidental methane release	CH ₄	Excluded	Excluded for simplification in accordance with ACM0008. This emission source is assumed to be very small.

^{*)} 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 t CO_{2eq}. Reference JISC "Guidance on Criteria for Baseline Setting and Monitoring".

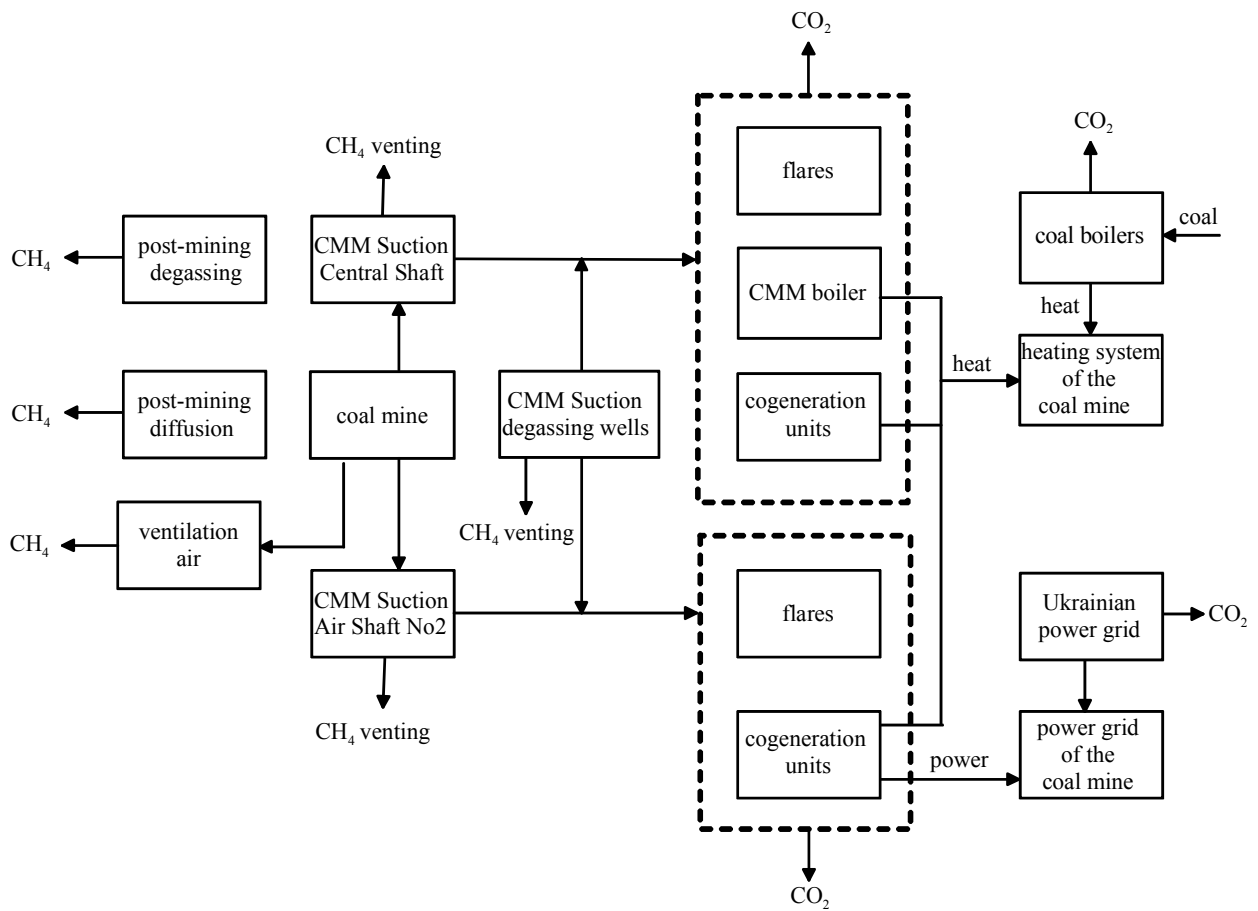


Figure B-3: Project boundary

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: 2008-05-08

Name of person / entity setting the baseline: Emissions-Trader ET GmbH



SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

2003-03-18

C.2. Expected operational lifetime of the project:

at least 10 years, minimum until the end of the crediting period

C.3. Length of the crediting period:

5 years

1st crediting period starting with 2008-01-01

**SECTION D. Monitoring plan****D.1. Description of monitoring plan chosen:**

A monitoring plan provided by the “Approved consolidated baseline methodology ACM0008”, Version 03, Sectoral Scope: 8 and 10, EB28 is applied to the project [ACM0008].

According to ACM0008 the methodological “Tool to determine project emissions from flaring gases containing methane”, EB 28 Meeting report, Annex 13, has been taken for the determination of the project emissions from flaring. In difference to the flaring tool a combustion efficiency of 99.5%, according to the IPCC guidelines [IPCC] (see also ACM0008 Version 1 and Version 2), has been taken into account instead of the default value of 90%. See justification in Annex 3.

Applicability requirements for the monitoring plan of the ACM0008 methodology are identical to respective requirements of the baseline setting. For a detailed overview of the ACM0008 applicability please refer to section B.I of this PDD.

General remarks to the Monitoring Plan:

- The monitoring plan will be updated during the first verification;
- Social indicators such as number of people employed, safety record, training records, etc, will be available to the verifier;
- Environmental indicators such as dust emissions, NO_x, or SO_x will be available to the verifier. These indicators are being reported to the Regional Supervisory Authority on an annual basis;
- The CH₄ and N₂O 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 ACM0008;
- IPCC default factors have been taken from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. [IPCC-2]
- In accordance with ACM0008 only methane that is being destroyed by the project should be measured.

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

The ID Numbers used in the tables below refer to the ID numbers as used in ACM0008; missing ID numbers refer to parameters, which are listed in the monitoring plan of the ACM0008, and which are not applicable to the project.

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 <i>(Please use numbers to ease cross-referencing to D.2.)</i>	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 PE _y	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,PJ}	Additional electricity consumption by project	electricity meter	MWh	m	continuous	100%	Electronic and paper	cumulative value
P8 CEF _{ELEC,PJ}	Carbon emission factor of CONS _{ELEC,PJ}	official data of Ukrainian power grid	tCO _{2eq}	e, c	ex ante, annually	main power generation plants	paper	calculated and published by SenterNovem [SenterNovem] Should a new officially approved standardised baseline for Ukraine be adopted, the baseline carbon emission factor will be changed accordingly.
P11 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



P12 MM _{FL}	Methane sent to flare	flow meter	tCH ₄	m	15 min. cycle	100%	electronic	Flow meters will record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure is 0.717 kg/m ³ [DIN ISO 6976 (1995)] (1013 mbar, 273.15°K)
P13 Eff _{FL}	Flare/combustion efficiency, determined by the operation hours and the methane content in the exhaust gas	combustion efficiency measurement temperature meter	-	m	annually	100%	paper	The efficiency is set to 99.5%. This will be verified by a yearly measurement. See Annex 3 for justification. The run time of the flare is monitored by continuous measurement of the flame temperature.
			°C	m	15 min. cycle	100%	electronic	



P14 MD _{ELEC}	Methane destroyed by power generation	monitored data	tCH ₄	c	monthly	100%	electronic	calculated using formulae in Section D.1.1.2, see below
P15 MM _{ELEC}	Methane sent to power plant	flow meter	tCH ₄	m	15 min. cycle	100%	electronic	Flow meters will record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure is 0.717 kg/m ³ DIN ISO 6976 (1995) (1013 mbar, 273.15°K)
P16 Eff _{ELEC}	Efficiency of methane destruction / oxidation in power plant	IPCC	-	e	ex ante	100%	paper	set at 99.5% (IPCC)
P17 MD _{HEAT}	Methane destroyed by heat generation	monitored data	t CH ₄	c	monthly	100%	electronic	calculated using formulae in Section D.1.1.2, see below



P18 MM _{HEAT}	Methane sent to boiler	flow meter	t CH ₄	m	15 min. cycle	100%	electronic	Flow meters will record gas volumes, pressure and temperature. Density of methane under normal conditions of temperature and pressure is 0.717 kg/m ³ DIN ISO 6976 (1995) (1013 mbar, 273.15°K)
P19 Eff _{HEAT}	Efficiency of methane destruction / oxidation in heat plant	IPCC	-	e	ex ante	100%	paper	set at 99.5% (IPCC)
P23 CEF _{CH4}	Carbon emission factor for combusted methane	IPCC	-	e	ex ante	100%	paper	set at 2.75 t CO _{2eq} /t CH ₄
P24 CEF _{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various)	lab analysis	-	c	annually	main components	paper	Calculated if applicable, based on the lab analysis. (See P26)
P25 PC _{CH4}	Concentration of methane in extracted gas	IR measurement	%	m	15 min. cycle	100%	electronic	measurement



P26 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
P27 r	Relative proportion of NMHC compared to methane	lab analysis	%	c	annually	100%	paper	Calculated if applicable, based on the lab analysis.
P28 GWP _{CH4}	Global warming potential of methane	IPCC	-	e	ex ante	100%	paper	set at 21

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO₂ equivalent):

Project emissions are defined by the following equation

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

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

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

All utilisation units are supplied with CMM from the CMM suction system of the coal mine. The CMM pressure provided by the suction system is sufficient for the operation of all utilisation units and no further compression is needed. The CMM suction system is always in operation for safety reasons in the underground of the coal mine. The CMM suction system would be also in operation in the absence of the project; in this case the methane would be simply blown into the atmosphere. Thus the energy use for capture of the methane is outside the project boundaries and only the part for use methane is regarded.

The flares need only very few additional electric power for operation – only for the measurement and control devices. This power consumption is negligible and is not taken into account.



The flares, which will be placed on degassing wells are equipped with own gas pumps. This combined flares / gas pumps replace old gas pumps, which are currently in operation and which would remain in operation in absence of the project. The power consumption of the new gas pumps is lower than that of the old ones. In case of the project less power will be consummated. To keep conservative $CONS_{ELEC,PJ}$ is set to zero.

The upgraded CMM fired boiler needs less electric power than the old coal fired boilers. In absence of the project the heat generation would furthermore remain in operation using the coal fired boilers. In case of the project less power will be consummated. To keep conservative $CONS_{ELEC,PJ}$ is set to zero.

The cogeneration units need additional power especially for the cooling fans. The power amount consumed by the power generation units is taken into account as $CONS_{ELEC,PJ}$.

Project emissions from methane destroyed (PE_{MD}) can be obtained by the equation:

$$PE_{MD} = (MD_{FL} + MD_{ELEC} + MD_{HEAT}) \times (CEF_{CH_4} + r \times CEF_{NMHC}) \quad (3)$$

with:

$$r = PC_{NMHC} / PC_{CH_4} \quad (4)$$

where:

PE_{MD}	Project emissions from CMM destroyed (t CO ₂ eq)
MD_{FL}	Methane destroyed through flaring (t CH ₄)
MD_{ELEC}	Methane destroyed through power generation
MD_{HEAT}	Methane destroyed through heat generation
CEF_{CH_4}	Carbon emission factor for combusted methane (2.75 t CO ₂ eq/t CH ₄)
CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various) (t CO ₂ eq/tNMHC)
r	Relative proportion of NMHC compared to methane
PC_{CH_4}	Concentration (in mass) of methane in extracted gas (%)
PC_{NMHC}	NMHC concentration (in mass) in extracted gas (%)

Uncombusted methane from flaring and end uses (PE_{UM}) can be obtained through the equation:

$$PE_{UM} = GWP_{CH_4} \times [(MM_{FL} \times (1 - Eff_{FL}) + MM_{ELEC} \times (1 - Eff_{ELEC}) + MM_{HEAT} \times (1 - Eff_{HEAT})] \quad (9)$$



D.1.1.3. Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number <i>(Please use numbers to ease cross-referencing to D.2.)</i>	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 BE _y	Baseline emissions in year y	monitored data	t CO _{2eq}	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 data	t CO _{2eq}	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, heat or supply to gas grid replaced by the project activity in year y	monitored data	t CO _{2eq}	c	monthly	100%	electronic	calculated using formulae in Section D.1.1.4, see below



B14 CMM _{PJ,y}	CMM captured and destroyed in the project activity in year y	flow meter	t CH ₄	m	15 min. cycle	100%	electronic	pre-mining + during mining + post-mining methane is collected as a cumulative value, see section B.1, Step 1a for explanation
B18 GWP _{CH4}	Global warming potential of methane	IPCC	t CO _{2eq} / t CH ₄	e	ex ante	100%	paper	21 t CO _{2eq} / t CH ₄
B19 CEF _{CH4}	Carbon emission factor for combusted methane	IPCC	t CO _{2eq} / t CH ₄	e	ex ante	100%	paper	44/16 = 2.75 tCO _{2e} /tCH ₄
B46 GEN _y	Electricity generation by project	electricity meter	MWh	m	monthly	100%	electronic and paper	cumulative value
B47 HEAT _y	Heat generation by project	heat meter	MWh	m	monthly	100%	electronic and paper	cumulative value



B49 EF _{elec}	CO ₂ emission factor of the grid	official data of Ukrainian power grid	t CO ₂ / MWh	c	ex ante, annually	main power generation plants	paper	calculated and published by SenterNovem [SenterNovem] Should a new officially approved standardised baseline for Ukraine be adopted, the baseline carbon emission factor will be changed accordingly.
B55 EF _{CO₂,Coal}	CO ₂ emission factor of fuel used for captive power or heat	IPCC	tCO ₂ /TJ	e	ex ante	100%	paper	IPCC defaults.
B57 Eff _{heat}	Energy efficiency of heat plant	manufacturer data	%	e	ex ante	100%	paper	the old coal boilers will be decommissioned, so that a continuous monitoring of Eff _{HEAT} is not possible

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO₂ equivalent):

Baseline emissions are given by the following equation:



$$BE_y = BE_{MR,y} + BE_{Use,y} \tag{10}$$

The baseline emissions from release of methane into the atmosphere in the year y ($BE_{MR,y}$) is obtained by the following equation:

$$BE_{MR,y} = CMM_{PI,y} \times GWP_{CH4} \tag{14}$$

The total emissions reductions from displacement of power/heat generation are given by the following equation:

$$BE_{Use,y} = GEN_y * EF_{ELEC} + (HEAT_y / Eff_{HEAT}) * EF_{HEAT} \tag{24}$$

Where

- $BE_{Use,y}$ Total baseline emissions from the production of power or heat replaced by the project activity in year y (tCO_{2e})
- GEN_y Electricity generated by project activity in year y (MWh)
- EF_{ELEC} Emissions factor of electricity (grid, captive or a combination) replaced by the project (tCO_2/MWh)
- $HEAT_y$ Heat generation by project activity in year y (MWh)
- EF_{HEAT} Emissions factor for heat production replaced by project activity (tCO_2/MWh)
- Eff_{HEAT} Efficiency of the former heat generation unit, which is displaced by project activity (%)

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

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 <i>(Please use numbers to ease cross-referencing to D.2.)</i>	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 CO₂ equivalent):**

not applicable

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

In accordance with ACM0008 the following leakages should be considered:

1. Displacement of baseline thermal energy uses
2. CBM drainage from outside the de-stressed zone
3. Impact of the JI project on coal production
4. Impact of the JI project on coal prices

There is no leakage in the project as:

1. There is no CMM being used for thermal demand under the baseline scenario. Hence there is no leakage for displacement of baseline thermal energy uses;
2. There is no CBM involved hence no leakage occurs from CDM drainage from outside the de-stressed zone
3. There is no impact of the JI project on coal production as degasification activities are independent from the JI project
4. The impact of the JI project on coal prices is difficult to assess. The JI project as such does not influence coal production so it is unlikely that the JI project will impact coal prices

**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

Not applicable. There are no leakages and no indirect emissions

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO₂ equivalent):

Not applicable. There are no leakages and no indirect emissions.

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 CO₂ equivalent):

The greenhouse gas emission reduction gained by the project over a period is the difference between the total baseline emissions over the period and the total project emissions over the period. This is given by the equation:

$$ER_y = BE_y - PE_y \quad (18)$$

where:

ER_y Emissions reductions of the project activity during the year y (t CO_{2eq})

BE_y Baseline emissions during the year y (t CO_{2eq})

PE_y Project emissions during the year y (t CO_{2eq})

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 an adequate quality control and assurance procedures will be implemented that is regulated by the calibration standards and quality norms of the national legislation. Under these requirements of quality control system,



regular maintenance and testing regime to ensure accuracy of flow meters, gas-analysers, electricity and heat measuring instruments will be provided. All measuring instruments will be calibrated periodically. The calibration protocols will be archived and proved by an independent entity on an annual basis. A consistency check for all measurement data and the calculation of the emission reductions will be carried out and reported monthly.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data <i>(Indicate table and ID number)</i>	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
P5 <i>Power consumption</i>	low	The calibration interval of the power meters is 2 years. Calibration procedures for power meters are implemented in compliance with the calibration methodology developed by the Ukrainian Centre for Standardisation and Metrology.
P12 P15 P18 B14 <i>Methane amount</i>	medium	<p>The flow meters consist of an orifice and a pressure difference meter. The measured volumetric flow rates are designed for a standardised gas composition and have to be corrected by the actual gas condition.</p> <p>The measured flow rates will be continuously converted from operation condition to standard state condition by use of the ideal gas law and the actual gas temperature and pressure.</p> <p>The indications of the orifice pressure difference meter and the respective temperature and pressure meters have usually hardly any fluctuations and no recalibration is needed. The meters should be initially controlled during the final inspection by the manufacturer and will be checked regularly according to the manufacturer's instructions. The indications of the measurement instruments should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.</p> <p>The quality of the determined value for the methane amount is mainly affected by the methane concentration, see P25.</p>



P13 <i>Combustion efficiency in the flare</i>	low	<p>The chosen flares are designed to fulfil the German regulations for flaring of landfill gas. In these regulations a minimum efficiency of 99.9 % is required. This efficiency is proved by a continuous measurement of the combustion temperature, which has to be above 850°C. Additionally the emissions of the flare have to be verified every three years by a measurement.</p> <p>The temperature meter should be initially controlled during the final inspection by the manufacturer and will be checked regularly according to the manufacturer's instructions. The gauge has usually hardly any fluctuations and no recalibration is needed. The gauge should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.</p> <p>According to the German Regulations a measurement of the emissions, especially the total C amount in the flue gas, which indicates the combustion efficiency of the flare, should be carried out every three years by an approved expert, laboratory, institute etc.</p> <p>See annex 3 for additional information.</p>
P25 <i>Methane concentration</i>	medium	The indication of the CH ₄ gas analyser is drifting and has to be recalibrated periodically. The recalibration will be carried out regularly according to the manufacturer's instructions.
P26 <i>NMHC Concentration</i>	low	The determination will be provided by an accredited laboratory.
B46 <i>Power production</i>	low	The calibration interval of the power meters is 2 years. Calibration procedures for power meters are implemented in compliance with the calibration methodology developed by the Ukrainian Centre for Standardization and Metrology.
B47 <i>Heat production</i>	low	<p>The indication of the measurement instrument should be initially controlled during the final inspection by the manufacturer and will be checked regularly according to the manufacturer's instructions. The gauge will be recalibrated by the manufacturer according to his own recalibration intervals.</p> <p>The indication of the measurement instrument should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.</p>

Irrespective the monitoring plan all installed aggregates and gauges should be controlled during the regular inspections, at least weakly, to assure a proper operation of the facility. Beside the monitored values any other values which are needed for the supervision of the plant should be logged.

Any gauge or apparatus which is detected as obviously out of order should be substituted.

Furthermore emissions measurement for dust, CO, NO_x etc. for all combustion units will be carried out and archived as required by the legal requirements of the Ukrainian Authorities.

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

The plants installed in the project are designed to run fully automatic, so that the operating personnel have only to supervise the correct operation of the plant and the plausibility of the collected and monitored data. In case of disturbances and emergency the plant will be shut down automatically and no unintended emissions are caused. The CMM supply will be locked by quick acting valves. Fire arresters prevent from backfiring into the CMM pipe for safety of the personnel and equipment. During the downtime of the plant the unused CMM will be vented by the coal mine as it would be without the project activity.

In case of emergency an alarm message is sent to a permanently manned place in the control room. The operating personnel, who are on duty, check the plant status and decide on further procedures as clearing the fault, eliminating danger and restarting the plant, sending a service team, informing the project manager, a fire brigade, etc.

Every emergency case is journalised.

The collected data should be stored electronically by the installed data logger and on paper by the plant manager. The data should be read out daily from the data logger and stored and archived in a central data base. The data base can provided with an internet front end by which all stored data can be visualised, controlled and analysed. The administrator of the data base is responsible for the proper work of the data base, routine backups and save storage.

The plant manager is responsible for correctness of the logged data and the administration of the data base. He should regularly verify the electronically recorded data with the handwritten data and check the stored data for plausibility, errors, deviations and non-conformity. All inconsistencies should be discussed with the service and the operation teams, at which the operational and monitoring experience is gained, the plant operation is optimised, and a more accurate monitoring should result.

All stored data will be kept during the whole operation period of the plant and furthermore for at least 5 years.

The plant manager is responsible for the preparation of the standardised weekly report. He is also in charge for the preparation of the summarised monthly and yearly reports, which should be revised by the project manager.

The plant manager is keeping an operational journal which includes the following information:

- compilation and description of all data recorded, required for the calculation of the emission reductions
- description of all records to be kept during the regular inspections, including all corrective action undertaken
- manually logged data collected during the regular inspections
- particular events



- all calibrations carried out, incl. all calibration protocols

The visualisation of the data via internet provides a prompt control of the project operation by the project manager. All data should be continuously checked for consistency, completeness and integrity by Demeta GmbH. A detailed plausibility check should be carried out at least monthly.

Based on the procedure described above a detailed annual report should be prepared by Demeta GmbH and confirmed by the verifier.

The responsible personnel of Demeta GmbH has been trained on the handling with CMM-utilisation units and the applied monitoring systems, during an eight week long practical course in Germany in the autumn of 2005. In this course which has been carried out by A-TEC Anlagentechnik GmbH, a partner company of Demeta GmbH, also the basic principles of emissions trading and the background of the monitoring has been explained. A-TEC Anlagentechnik GmbH is already running several CMM utilisation plants and monitoring systems in Germany.

These trained personnel is the basis of a team of engineers, which should establish a specialised service team in the Ukraine and instruct further operating and monitoring personnel, as well for this project. Actually there is no final training procedure established. The project management should be done by JSC Coal Mine Krasnoarmeyskaya Zapadnaya № 1. The operation of the plants should be done by the operational personnel of the coal mine together with the personnel of the CHP supplier. The service and maintenance of the boilers and flares should be done by the operational personnel of the coal mine. The service and maintenance of the cogeneration units should be done by the service personnel of the manufacturer of the CHP plants and the personnel of the Ukrainian corporate group Ukrrosmetall JSC, Sumy, Ukraine. The monitoring should be carried out by the project manager of JSC Coal Mine Krasnoarmeyskaya Zapadnaya № 1 together with Demeta GmbH and Emissions-Trader ET GmbH.

The experience of the Ukrainian personnel will be gained by training on the job together with the German service team. During this period detailed work instruction should be worked out and wrote down.

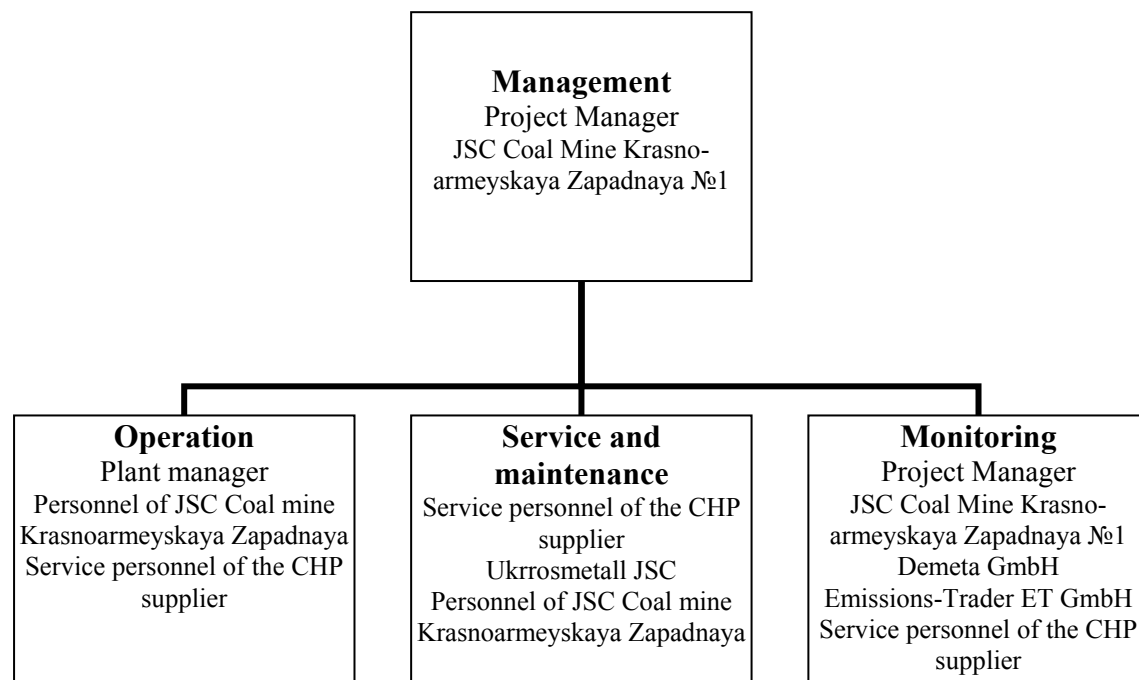


Figure D-1 - Project management structure

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

Date of completion of the monitoring plan: 2008-05-08

Name of person / entity setting the monitoring plan: Emissions-Trader ET GmbH

**SECTION E. Estimation of greenhouse gas emission reductions****E.1. Estimated project emissions:**

The following calculations are based on the baseline determined in section B. All CMM which is burned in the boilers, cogeneration units and flares is concurrently avoided CMM, which would otherwise escape to the atmosphere in absence of the project. All heat, which is generated by the project, is concurrently displaced heat, which would otherwise be generated by coal combustion. All power, which is generated by the project, is concurrently displaced power, which would otherwise be generated by conventional power generation in the Ukrainian grid.

The project emissions PE are calculated presuming that NMHC has not to be regarded ($r = 0$).

Table E-1 – Estimated project emissions

Estimated project emissions [t CO₂eq / a]						
year	2008	2009	2010	2011	2012	2011-2017
methane destruction						
flaring	38,632	44,825	25,951	25,951	25,951	25,951
heat generation	11,292	5,176	5,176	5,176	5,176	5,176
power generation	65,560	154,357	194,191	194,191	194,191	194,191
additional power consumption						
power generation	2,906	6,693	8,247	8,062	7,876	7,876
sum	118,390	211,052	233,567	233,381	233,195	233,195

E.2. Estimated leakage:

There is no leakage in this kind of project.

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

Table E-3 – Estimated project emissions and leakage

Estimated project emissions and leakage[t CO₂eq / a]						
year	2008	2009	2010	2011	2012	2011-2017
methane destruction						
flaring	38,632	44,825	25,951	25,951	25,951	25,951
heat generation	11,292	5,176	5,176	5,176	5,176	5,176
power generation	65,560	154,357	194,191	194,191	194,191	194,191
additional power consumption						
power generation	2,906	6,693	8,247	8,062	7,876	7,876
sum	118,390	211,052	233,567	233,381	233,195	233,195

**E.4. Estimated baseline emissions:***Table E-4 – Estimated baseline emissions*

Estimated baseline emissions [t CO₂eq / a]						
year	2008	2009	2010	2011	2012	2013-2017
release of methane that is avoided by the project						
flaring	295,010	342,302	198,175	198,175	198,175	198,175
heat generation	86,232	39,529	39,529	39,529	39,529	39,529
power generation	500,643	1,178,728	1,482,916	1,482,916	1,482,916	1,482,916
production of heat that is displaced by the project	40,440	63,932	69,434	69,434	69,434	69,434
production of power that is displaced by the project	83,016	191,238	235,636	230,329	225,022	225,022
sum	1,005,341	1,815,729	2,025,690	2,020,383	2,015,076	2,015,076

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

See table E-6 in section E.6.

E.6. Table providing values obtained when applying formulae above:*Table E-6 – Project emissions and emission reductions during the 1st crediting period (2008-2012)*

Year	Estimated project emissions (tonnes of CO ₂ equivalent)	Estimated leakage (tonnes of CO ₂ equivalent)	Estimated baseline emissions (tonnes of CO ₂ equivalent)	Estimated emissions reductions (tonnes of CO ₂ equivalent)
2008	118,390	-	1,005,341	886,951
2009	211,052	-	1,815,729	1,604,677
2010	233,567	-	2,025,690	1,792,123
2011	233,381	-	2,020,383	1,787,002
2012	233,195	-	2,015,076	1,781,880
Total (tonnes of CO ₂ equivalent)	1,029,585	-	8,882,218	7,852,633

Table E-7 – Prospective project emissions and emission reductions for the years (2013-2017)

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emissions reductions (tonnes of CO2 equivalent)
2013	233,195	-	2,015,076	1,781,880
2014	233,195	-	2,015,076	1,781,880
2015	233,195	-	2,015,076	1,781,880
2016	233,195	-	2,015,076	1,781,880
2017	233,195	-	2,015,076	1,781,880
Total (tonnes of CO2 equivalent)	1,165,975	-	10,075,378	8,909,402

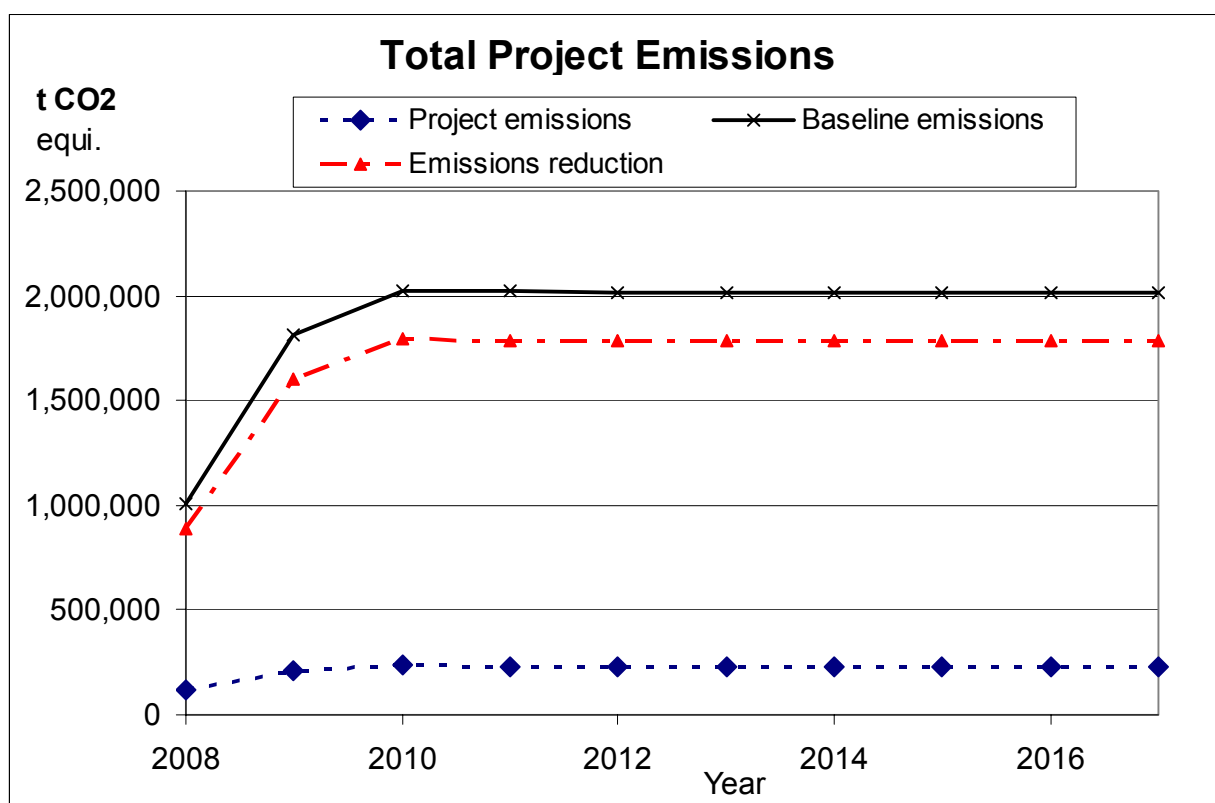


Figure E-1 - Baseline emissions, project emissions and emissions reduction; total project

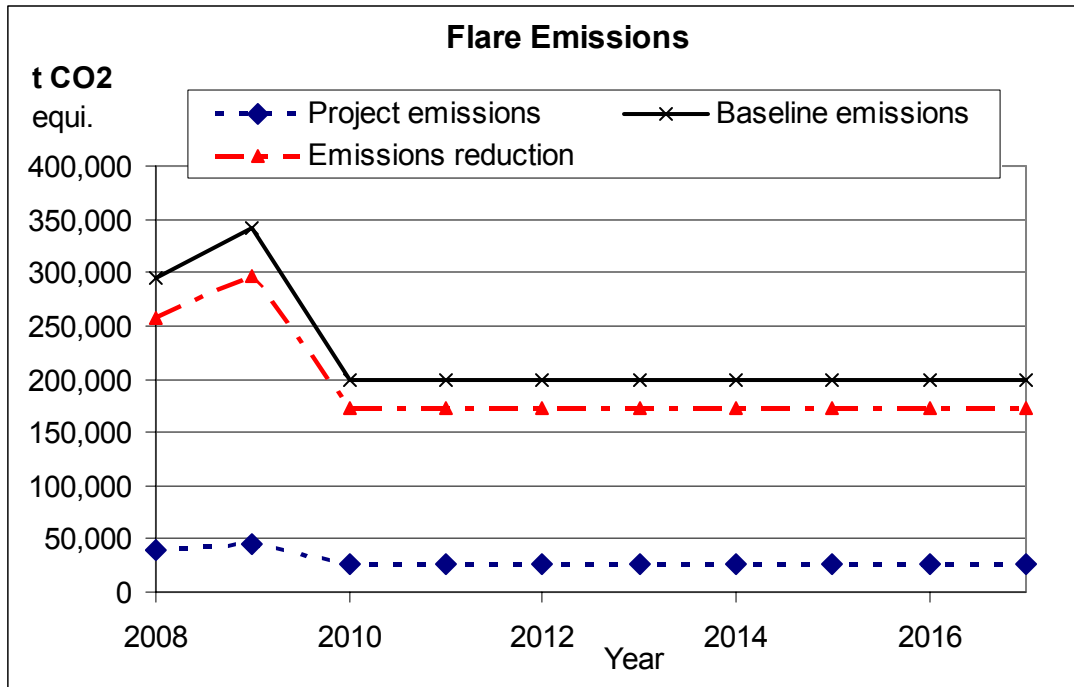


Figure E-2 - Baseline emissions, project emissions and emissions reduction; flaring

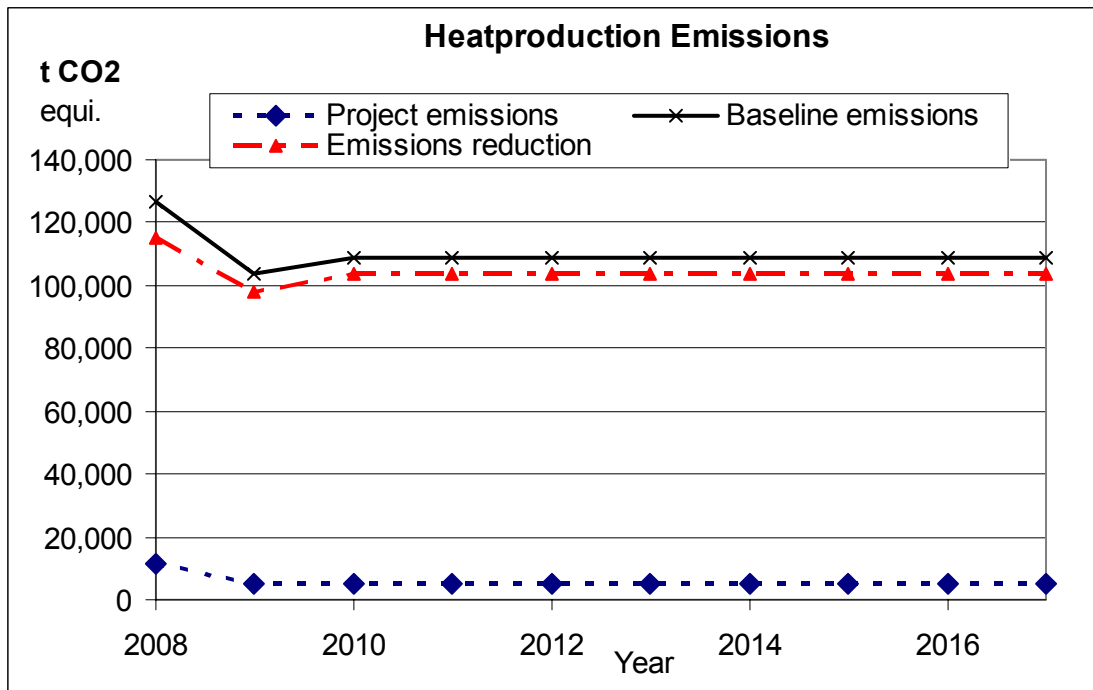


Figure E-3 - Baseline emissions, project emissions and emissions reduction; heat generation units

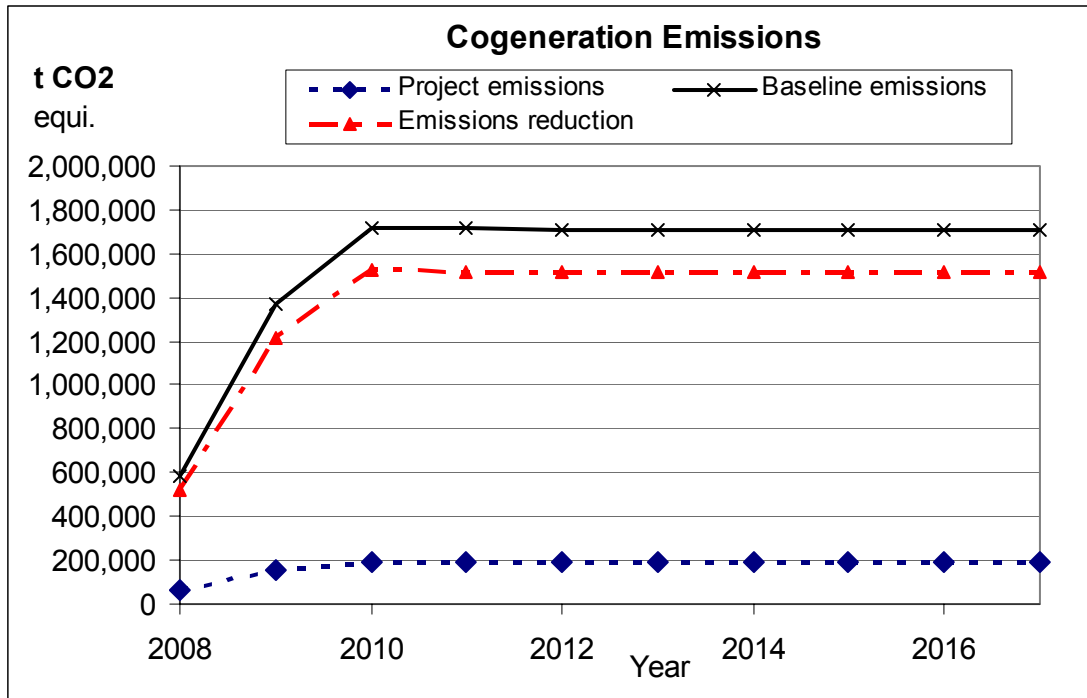


Figure E-4 - Baseline emissions, project emissions and emissions reduction; power generation units

**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:**

CHP's as well as the flares, the switchgear and all other accessories needed are built in transportable container modules. The complete facilities are built in series production at the manufacturer.

The container technology provides an easy removal of the facility after shutdown. The container has only a small footprint and is set up on four small ready-mix concrete plates, which are put under the four angles of the container. Because no groundwork is needed the complete plant can be removed fast and easy and the original state of the site can be restored in an uncomplicated way after shut down.

The facilities do not use the natural resources: water, ground and landscape, so that no impairment on nature or landscape is given. The facilities do not produce any waste, sewage or condensate. Due to the very high operational safety standards supplied a very low accident hazard is given. Due to the low intervention to the nature renaturalisation is easy.

All combustion units require an approval by the Ukrainian Mining Authorities. The combustion processes are designed to comply for the German emissions limits (German "TA-Luft") which are more rigorous, especially for NO_x, CO and C_nH_m, than the Ukrainian limits.

Both facilities cause no harmful environmental impacts. In fact the utilisation of otherwise unused CMM reduces in an active manner the amount of CMM 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.

Furthermore the operation of the plants reduces the uncontrollable 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.

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 fulfil 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 and local authorities with a PIN. The authorities appreciated the project and a Letter of Endorsement has been issued by the Ukrainian Ministry of Environmental Protection.

Donetsksteel has published information on the project in the coal mines newspaper and on the cola mines homepage <http://www.kz1.donetsk.ua>.

The project has got a lot of positive comments. All comments received by the coal mine were positive towards implementation of the project. It was especially noted that utilisation of coal mine methane will increase the safety of the work at the coal mine and create some new working places.



Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organization:	Joint Stock Company "Coal Company Krasnoarmeyskaya Zapadnaya № 1 Mine"
Street/P.O.Box:	Shibankova Square
Building:	1a
City:	Krasnoarmeysk
State/Region:	
Postal code:	85300
Country:	Ukraine
Phone:	+380 (6239) 21727
Fax:	+380 (62) 3322250
E-mail:	OFFICE@KZ1.DONETSK.UA
URL:	
Represented by:	Demchenko Anatoly
Title:	Engineering director
Salutation:	Mr
Last Name:	Demchenko
Middle Name:	
First Name:	Anatoly
Department:	
Phone(direct):	+380 (50) 3261493
Fax (direct):	
Mobile:	
Personal e-mail:	work@kmdon.com.ua

Organization:	Carbon-TF B.V.
Street/P.O.Box:	Horsterweg 217
Building:	
City:	Venlo
State/Region:	
Postal code:	5928 ND
Country:	Netherlands
Phone:	+31 (0) 77 351 7985
Fax:	+31 (0) 77 354 8687
E-mail:	info@carbon-tf.com
URL:	www.carbon-tf.com
Represented by:	Jürgen Meyer
Title:	Managing Director
Salutation:	Dr.
Last Name:	Meyer
Middle Name:	
First Name:	Jürgen
Department:	
Phone(direct):	
Fax (direct):	
Mobile:	
Personal e-mail:	jm@carbon-tf.com

Annex 2

BASELINE INFORMATION

Baseline emissions reduction from displacement of power and heat

The emissions reduction from displacement of power and heat are given by formula (24) from ACM0008, see pg. 42, Chpt. D.1.1.4.

The emissions reduction from displacement of power is calculated using the prospected power generation of the project GEN_y and the standardised carbon emission factor for the Ukrainian Grid EF_{ELEC} .

The emissions reduction from displacement of heat is calculated using the prospected heat generation of the project $HEAT_y$, the carbon emissions factor of coal EF_{HEAT} and the efficiency of the displaced old coal boilers Eff .

Baseline Carbon Emission Factor for Coal

The current fossil fuel used at the coal mine is coal from own production. The fraction used for firing of the coal boilers is not analysed in a laboratory so that no data is available. The standard carbon emission factor from the IPCC guidelines is taken instead.

The value for “Coking Coal” / “Other Bit. Coal” of 25.8 t C/TJ has been taken. This is the value with the lowest carbon emissions, thus this is conservative for coal displacement. The value of 25.8 t C/TJ is responding to 0.3406 t CO₂/ MWh generated heat.

Baseline Carbon Emission Factor for the Ukrainian power grid

A standardised carbon emission factor for the Ukrainian Grid as determined by SenterNovem, Terms of Reference, ERUPT 5 Tender, Version 1.0, 2004-03-10. This reference has already been used by Global Carbon B.V. for the Project “Switch from wet-to-dry process at Podilsky Cement, Ukraine”, which has got the final determination by JISC:

http://ji.unfccc.int/JI_Projects/DB/BPTY5S44EIX1J50RM66G4QOACHEV2G/Determination/TUEV-SUED1169913262.47/historicalDeterminationReport.html

The values for JI Projects generating electricity have been taken into account. Should a new official standardised baseline for Ukraine be published and approved by the Ukrainian Focal Point, the baseline carbon emission factor will be changed accordingly.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
CEF Ukraine	815	800	785	770	755	740	725	710	695	680	666	651	636

Table An2: *Baseline carbon emission factors for JI projects **generating electricity** in the Ukraine (in gCO₂/kWh)[SenterNovem]*

Efficiency of the old coal boilers

The efficiency of the old coal fired boilers is given by the manufacturer as 73.5%. In fact the efficiency is lower but the higher efficiency of the manufacturer is taken into account.

**Efficiency of the upgraded boiler**

The efficiency of the upgraded boiler has been measured with 86%. This value is taken into account.

Power own consumption of the cogeneration units

The power own consumption of the power generation units is estimated ex ante as of 3.5% of the generated power. This ratio is based on the experience made with more than 100 CMM cogeneration units in Germany.

Efficiency of the cogeneration units

The firing capacity, efficiency, power and heat output of the cogeneration units depend mainly on the gas quality, especially the methane concentration. Average values, based on the experience made on comparable units in Germany have been taken into account.



Annex 3

MONITORING PLAN

The monitoring plan is listed in section D. In this section additional information concerning the flaring technology used is given.

Justification of the combustion efficiency of the chosen flare

According to ACM0008 the methodological “Tool to determine project emissions from flaring gases containing methane”, EB 28 Meeting report, Annex 13, has been taken for the determination of the project emissions from flaring. In difference to the flaring tool a combustion efficiency of 99.5%, according to the IPCC guidelines (see also ACM0008 Version 1 and Version 2), has been taken into account instead of the default value of 90% as given in the flaring tool.

German regulations

The chosen flare is designed to fulfil the German regulations for flaring of landfill gas. In these regulations a minimum efficiency of 99.9 % is required. This efficiency is proved by a continuous measurement of the combustion temperature, which has to be above 1,000°C, whereas a minimum retention time of at least 0.3 s is required [TA-Luft]. Additionally the emissions of the flare have to be verified every three years by a measurement.

In case of flaring of landfill gas the German Authorities started with a required combustion temperature of 1,200°C. The temperature has been dropped to 1,000°C after first good experience in flaring of landfill gas has been made. This minimum temperature of 1,000°C is claimed for landfill gas or gas from waste utilisation plants only; in case of other gases e.g. CMM a temperature of 850°C is sufficient (there are no polycyclic aromatic hydrocarbons contained in CMM).

A combustion temperature of more than 850°C assures the complete conversion of hydro carbons contained in the fuel gas into carbon dioxide with minimum proportion of carbon monoxide and marginal, negligible fraction of other components containing carbon, so that an efficiency of minimum 99.9 % is reached. This is state of the art and has been proven in numerous combustion plants in Germany and throughout the world.

There are no legal obligatory regulations about the monitoring of flares in Germany. According to the German [TA-Luft], these regulations have to be examined in every individual case by the Authorising Authority. Normally a periodical emissions measurement of the main components CO, NO_x and total carbon, which indicates the combustion efficiency of the flare, has to be carried out every three years by an approved expert laboratory, institute etc. At this the value of 20 mg/m³ total carbon in flue gas [TA-Luft] is taken.

Description of the flare equipment

The flare, which is supposed to be used in this project, is an enclosed flare with a controlled combustion process. The flare is designed for a combustion temperature of more than 850°C and a retention time of about 0.3 sec. The flare is a further development of flares for landfill gas, which has been installed on numerous landfill sites in Germany, France, Belgium, Spain, Portugal, Hungary and Croatia.



Characteristic for landfill gas flares is the continuous operation of the flaring process and the controlled combustion process. The German Regulations require a minimum temperature of 1000°C for landfill gas flares and 850°C for CMM flares. To fulfil this legal requirement a special design of the burning system and an adequate controlling system is applied. The main difference to other flaring systems is the controlled combustion process – the combustion temperature and combustion output are controlled and regulated.

The fuel gas is fed in via a distribution system into the combustion chamber. The main pipe is split up in several distribution pipes fitted with nozzles, which are evenly distributed over the whole cross section of the combustion chamber. The uniform distribution of the fuel gas provides a smooth combustion over the whole cross section of the combustion chamber; generation of possible schlieren of uncombusted gas is minimised in that way.

The combustion air is sucked in into the combustion chamber by the natural draught of the chimney effect of the combustion pipe. The amount of the combustion air is regulated by lamellar lids in the supply air inlet, whereas the lid position is controlled by the temperature in the combustion chamber. In that way the desired value for the combustion temperature in the flare is kept constant.

The retention time of 0.3 s is achieved by the height of the flare pipe. The amount of the fuel gas is regulated by a throttle in the main fuel gas conduit. Hereby the combustion output of the flare is controlled.

The given combustion output is automatically controlled by the control system. The flare has a minimum combustion output, at which the minimum combustion temperature of 850°C can be reached and a maximum combustion output, at which the minimum retention time can be reached. Both limiting values are monitored by the control system. If the combustion temperature falls under the minimal value or the combustion output exceeds the maximal value, the system is automatically shut down.

The flare is provided with an automatic firing device and a flame detector. Both devices are standards from heating boilers section.

All process and operation data, especially the combustion temperature and the CMM amount is monitored, stored and archived.