JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
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Annexes

SECTION A. General description of the project

A.1. Title of the project:

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

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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 m^3.

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 the suction system of the re-activated coal mine Shcheglovskaya-Glubokaya, should be utilised for heat and power generation. Additionally flares for further methane destruction should be installed.

Actually there are four redundant existing coal fired boilers in operation with an output of 7.6 MW heat each. The boilers supply the coal mine facilities with hot water (95°C).

In this project two of the existing coal boilers should be fuel-switched. The boilers should be upgraded with a CMM burner system and henceforth be fired with CMM instead of coal. In addition a new CMM fired ventilation air heating system should be installed, which should replace the old hot water/air heat exchanger, which is supplied with heat from the coal boilers.

An existing emergency power generator, which is fired with diesel oil, and which is actually out of order, should be generally overhauled and fuel switched from diesel oil to CMM. Further on an additional cogeneration unit fired with CMM is planned.

The remaining CMM amount should be destroyed by flaring.

The hereby requested ERU's from the conversion of the methane into carbon dioxide are needed to finance the upgrade of the boilers, the new ventilation air heater, the overhaul of the emergency power generator and the installation of the new cogeneration unit and the flares.
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 CO_2 with a GWP of 1 reduces the global warming potential of the emissions by 87%. The displacement of conventionally generated heat (coal) brings further CO_2 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)	ECO-Alliance	no
Netherlands	Carbon-TF B.V.	no
Ukraine	Shakhtoupravlenye Donbass GOAO	no

- Carbon-TF B.V.
  Investor, buyer of the ERU's; dutch emissions trading company
- ECO-Alliance (JV)
  Project developer
- State-run Coal Mine Asscociation „Shakhtoupravlenye Donbass GOAO"
  Holding company of the coal mine „Shcheglovskaya-Glubokaya", operator of the CMM plants and holder of the CMM utilisation licence

A.4. Technical description of the project:

A.4.1. Location of the project:

The project is located at the coal mine "Shcheglovskaya-Glubokaya" at Makeyevka (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.

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.:

Figure A- 1: Location of Makeyevka in the Donbass Oblast

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

83059 Makeyevka

Figure A- 2: Location of the Project at Makeyevka

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 "Shcheglovskaya-Glubokaya" at Makeyevka (Donetsk Oblast).

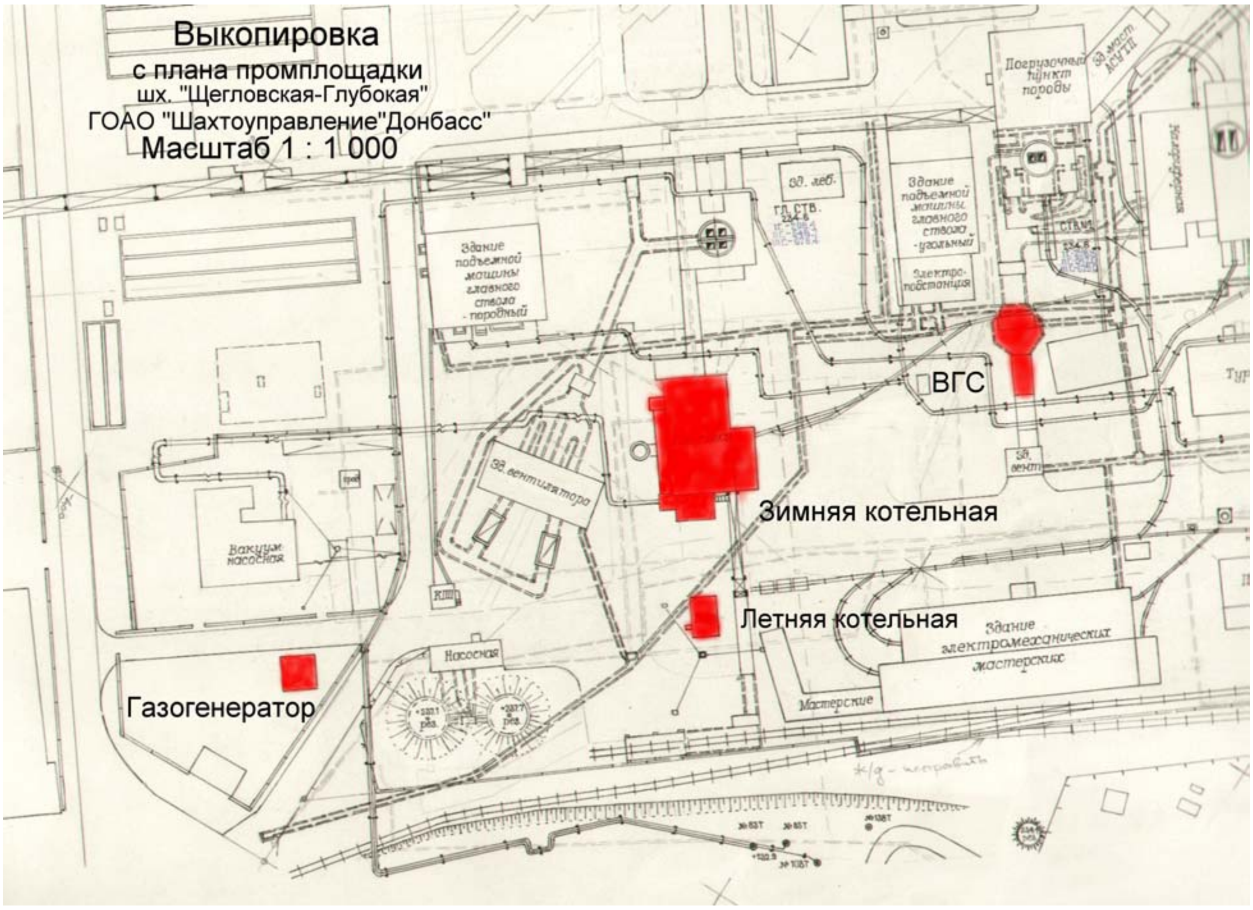

Figure A- 3: Unit location plan at the coal mine "Shcheglovskaya-Glubokaya

ВГС – *Location of the ventilation air heater*

Газогенератор - *Location of the emergency power generator unit*

Зимняя котельная - *winter boilers – four large boilers*

Летняя котельная - *summer boilers – two primary planned small boilers*

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

The coal mine "Shcheglovskaya-Glubokaya" has been decommissioned in summer 2000 and reconditioned. Coal mining started again in the winter 2003. The reconstruction process is still in progress. A modern CMM suction system is actually in construction.

The coal mine produces actually (2006) about 979.500 tonnes per year. In the future a steady mining activity of about 980.000 tonnes is planned. The coal reservoir is about 18.273.000 tonnes [SU-Donbass].

Degasification activities

Actually there is no fully existing suction system on the coal mine. Most of the CMM is simply diluted in the ventilation air. Only a part of the CMM is sucked out of underground boreholes and collected in a central suction system. The CMM from the suction system is as well as the ventilation air simply blown off into atmosphere unused. This is because 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.

The necessary technology consists of a CMM drainage and connected boreholes in the underground, and a collection and suction system, which is applied by the coal mine. The actual methane flow from the suction system is about 17-18 m³/min pure methane. Due to the higher mining amount in the future this amount shall rise up to 25 m³/min pure methane as forecasted by the ventilation engineers of the coal mine. The degasification activities at the mine are implemented independently from the JI project and do not interfere in methane extraction volumes to the surface.

Project activities - Utilisation of CMM

In the case of this project a part of the CMM from the new suction system should be utilised for heat and power generation and flaring for methane destruction. The remained amount of the CMM should further be released to the atmosphere unused.

The first contact between Eco-Alliance and the State-run Coal Mine Asscociation „Shakhtoupravlenye Donbass GOAO" took place in 2004. In the following the project idea has been developed in 2005 and finally a PIN has been applied to the Ukrainian Ministry of Environmental Protection in October 2006. Meanwhile a Letter of Endorsement № 11439/10/3-10 dated from 2006-12-22 has been issued by the Ukrainian Ministry of Environmental Protection for the project.

A first PDD has been completed in autumn 2006 and applied to TÜV Nord CERT GmbH for determination. The PDD has been redrawn from the validation process in December 2006, due to the installation of the JISC and the resulting new procedures and requirements.

Utilisation of the methane captured (the project)

The utilisation of the CMM should be provided through:

1. upgrade and fuel switch of two coal fired boilers for heat production
2. installation of a new ventilation air heater
3. general overhaul and fuel switch of an existing diesel oil fired emergency power generator for power production
4. installation of flares for methane destruction
5. installation of a cogeneration unit for power and heat production

In the calculation a mean value of 20 m³/min pure methane has been taken into account. It is planned to utilise up to 100% of this amount. The utilisation mainly depends on the heat demand of the coal mine. The units should be supplied with CMM in the order as listed above, primary the ventilation air heater, than the power production and the cogeneration unit, than the boilers, and at last the flares should destroy the remaining amount of CMM. The prospected utilisation plan for the first two years is shown in table A-2.

Table A- 2 – Installation plan of the project

unit	**installation date**	**firing capacity**	**product**	**efficiency**
step 1				
boiler No: 1	01.2007	7,600 kW	hot water 70/95°	96 %
boiler No: 2	01.2007	7,600 kW	hot water 70/95°	96 %
ventilation air heater	01.2007	3,000 kW	hot air	100 %
emergency power generation unit	01.2008	400 kW	power	36 %
step 2				
flare No: 1	1.2008	5,000 kW	methane destruction	99,9 %
flare No: 2	1.2008	5,000 kW	methane destruction	99,9 %
step 3				
cogeneration unit	6.2008	1,350 kWel 970 kWth	power heat	36 %

According to the original utilisation plan, which has been stated in 2005, all units should have been installed in the summer and autumn 2007 in sufficient time before starting of the crediting period in 2008. Due to complications in the determination process of the project and the therewith resulted uncertainty of the approval of the project, the installation of most units has been set back on the time schedule. Only the two coal boilers and the ventilation air heater have been retrofitted with simple CMM burning systems and are in trial operation since 1.2007.

CMM Supply

All utilisation units should be connected to the central suction system. The pressure generated by the vacuum pumps of the coal mine is sufficient to supply all utilisation units, so that no further compression is needed. The amount of CMM sent to each unit group (boilers, flare, 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 units.

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

CMM boilers

In the first step two of the four existing coal boilers should be fuel switched to CMM. The boilers should be upgraded with new CMM burner systems. The boilers have a firing capacity of 7,600 kW each and are supposed to generate hot water 70 / 95°C for the central heating system of the coal mine.
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 minimize the risks of the plant.

Technical data (single boiler)	hot water boiler DKWR 10/13 (rus. ДКВР 10/13), with a CMM burner system especially designed for varying methane concentrations, including all necessary technical equipment
Installed firing capacity	7,600 kW
Max. Efficiency	96 %
Heating station consisting of 2 Boilers	
Maximum methane amount required	1,528 m³/h CH_4
Expected heat production	25,507 MWh/a
Expected methane destruction	3,700,375 m³/a = = 2,653 t CH_4 per year

Ventilation air heater

In the first step a heater for the ventilation air with a firing capacity of 3,000 kW should be installed. The heater is supposed to heat up fresh and cold ventilation air, which is sucked in into the coal mine in the winter period for preventing danger through possible icicle formation in the shaft. A direct heating system should be installed. The heater should replace an old heat exchanger, which is supplied with hot water from the coal boilers. In this way the efficiency of the ventilation air heating should be improved.

Technical data	directly fired air heater WGS 1.0 (rus. ВГС I.0), 3 devices,
Installed firing capacity	3,000 kW
Efficiency	100 %
Methane amount required	302 m³/h CH4
Expected heat production	10,128 MWh/a
Expected methane destruction	1,014,931 m^3 CH_4 per year = 727 t CH_4 per year

Emergency power generator

The existing emergency power generator should be generally overhauled and fuel switched from diesel oil to CMM. The generator is actually out of order and has only few operation hours (approx. 84).

The generator is supposed to produce 400 kW_{el} power with an operation time of 6,240 hours per year.

The CMM will be fed into the gas engine, where the methane will be burned completely at temperatures about 800 degrees Celsius with low exhaust emissions. The generator should be operated fully automatically and all essential measured data will be gathered and recorded. Proved safety-related equipment is used to minimise the risks of the plant.

Comparable cogeneration units 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. In Ukraine some cogeneration units at the Zasyadko Coal Mine are already in operation.

Technical data	power generator БГЖЧН 25-34-I, consisting of gas engine, current generator and all necessary equipment, control and data collection system, manufactured by "Pervomaysk Diesel Factory"
Installed firing capacity	approx. 1,111 kW *
Power output	approx. 400 kW *
Efficiency (electricity)	approx. 36 % *
Maximum methane amount required	111 m^3/h CH4
Expected operation time	6,240 h/a
Expected power generation	2,496 MWh/a
Expected methane destruction	694,792 m^3 CH_4 per year = 498 t CH_4 per year
Expected power own consumption	87 MWh/a

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

Cogeneration unit

In the third step a cogeneration unit with a firing capacity of approx. 3,600 kW should be installed. The cogeneration unit is supposed to generate power with an output of approx. 1,350 kW, and hot water for the central heating system of the coal mine with an output of approx. 930 kW.

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 minimize the risks of the plant.

Technical data per unit	Type: Deutz TD 620K16 gas engine, packaged by Pro2 Anlagentechnik GmbH, Germany (planned) 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 m³/h CH_4
Expected operation time	6,240 h/a
Expected heat generation	5,740 MWh/a
Expected power generation	8,424 MWh/a
Expected methane destruction	2,344,924 m^3 CH_4 per year = 1,681 t CH_4 per year
Expected power own consumption	295 MWh/a

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

Flares

Two flares with a firing capacity of 5.0 MW each should be installed. 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 plant 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 flare is supposed to destroy the remaining CMM amount, which is not used by the boilers and cogeneration units.

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 per flare
Maximum methane amount required	503 m³/h CH_4
Expected operation time	6,000 h/a
Expected methane destruction (both flares)	4,309,049 m^3 CH_4 per year = 3,090 t CH_4 per year

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 power generator and the CHP is supposed to be used for the own consumption of the coal mine. The power will be fed-in into the grid of the coal mine, which is connected to the Ukrainian grid. In this way the power amount which is purchased from the grid will be reduced. This amount of conventionally generated power displaced by the project generates additional ERU's.

The cogeneration units are actually not economically viable. The installation of the cogeneration units is based on an environmentally conscious management decision.

Heat utilisation

Currently the heat supply of the coal mine is provided by four coal boilers. In the case of the project most 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 Eco-Alliance has been trained on the handling with CMM-utilisation units and the applied monitoring systems, during an eight week long practical course in Germany in the autumn of 2005. In this course which has been carried out by A-TEC Anlagentechnik GmbH, a Joint-Venture participant of Eco-Alliance, also the basic principles of emissions trading and the background of the monitoring has been explained. A-TEC Anlagentechnik GmbH is already running several CMM utilisation plants and monitoring systems in Germany.

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

Maintenance programme

The maintenance and operation of the project equipment will be provided by the coal mine personnel. For the maintenance of the CHP modules a contract with a local representation of the CHP manufacture will be awarded.

Risks of the project

The following risks could be identified:

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 usually 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.

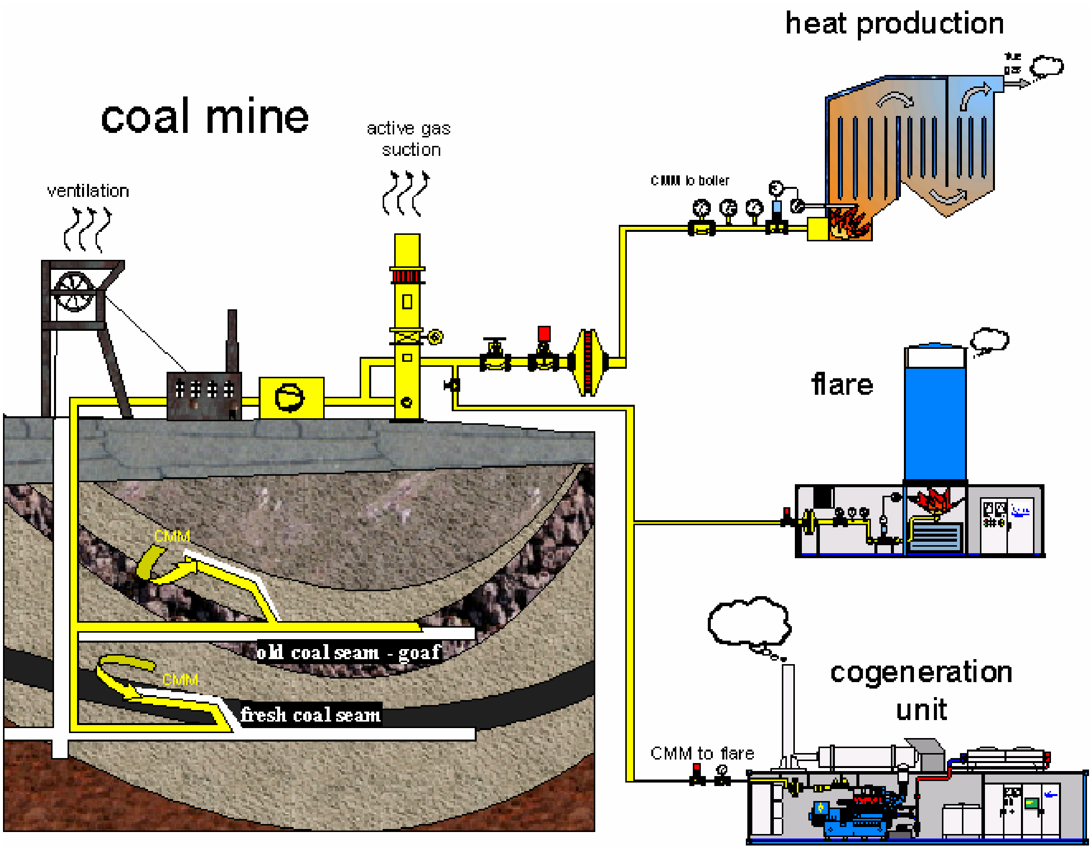

Figure A- 4: *General scheme of the installation with main project components*

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

The emissions reduction is based on the conversion of CMM with its main component methane (GWP 21) into CO_2 (GWP 1) in combustion processes. In absence of the project the whole CMM amount, which should be converted into CO_2 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 and second crediting period (2008-2012, and 2013-2017)

	Years
Length of the period within which ERUs are to be earned	10
Length of crediting period	2 x 5
Year	Estimate of annual emission reductions in tonnes of CO_2
1st Crediting Period 2008- 2012	
2008	144.374
2009	188.373
2010	177.856
2011	177.856
2012	177.856
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	866.315
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	173.263
2nd Crediting Period 2013- 2017	
2013	177.856
2014	177.856
2015	177.856
2016	177.856
2017	177.856
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	889.280
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	177.856
Total estimated emission reductions over the period within which ERUs are to be earned (tonnes of CO_2 equivalent)	1.755.596
Annual average of estimated emission reductions over the period within which ERUs are to be earned (tonnes of CO_2 equivalent)	175.560

A.5. Project approval by the Parties involved:

A Letter of Endorsement for the project has been issued by the Ukrainian Ministry of Environmental Protection.

The acceptance of the project by the host party, Ukraine with a Letter of Approval is expected.
The acceptance of the project by the investor party, Kingdom of the Netherlands with a Declaration of Approval is expected.

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 methane is provided for vehicle use.

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 Shcheglovskaya-Glubokaya 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 CO_2 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 la. 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 then 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 there are no existing surface drainage wells and no wells are planned, so that the options B2, B2a, C2 and D2 are not technically feasible.

In the case of the project pre mining CMM, during mining CMM and post mining CMM from underground boreholes is collected together in one central suction system and transported to the surface with vacuum pumps. It is impossible to determine the shares of the three sources, because numerous drainage branches are connected to the central system 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%.

Step lb. Options for extracted CBM and CMM treatment

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

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

All of these options are considered as possible alternatives for 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 production.

Step lc. 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 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 lb are in compliance with the existing regulations.

Step 3. Formulation of the baseline scenario alternatives

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

Alternative i. - Venting of CMM

Since there are no legal requirements for treatment and utilisation of the captured CMM, it is common practice at Ukrainian coal mines to release the CMM into the atmosphere. This alternative is 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

This alternative is not technical feasible, neither the use nor the destruction, due to the low concentration of the methane in the ventilation air.

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 two more alternatives are possible:

a) indirect air heater – hot air generator, CMM fired

b) direct air heater – hot air/flue gas mix generator, CMM fired

Also a combined heat and power generation is possible and eligible:

c) 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, that 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 additionally 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 in the following only the project scenario should be described.

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.

There are two heating systems planned:

1. The fresh air of the ventilation shaft should be warmed up by a CMM fired direct air heater in the winter period. The ventilation air heater should replace the existing indirect heating system - hot water/air heat exchangers. Due to the direct heating, the efficiency of the heating would be increased.

2. Hot water for the heating system of the coal mine facilities should be produced by two former coal boilers which should be fuel switched to CMM, and a cogeneration unit.
In the winter period the remaining two coal boilers should produce further required heat, which can not be delivered by the CMM heating system.

Power should be produced by a cogeneration unit (gas engine) and a former emergency power generator, which should by fuel switched to CMM. The remaining required power amount should further on be purchased from the grid.

The remaining available CMM amount, which can not be utilised for heat or power production should be flared.

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%).

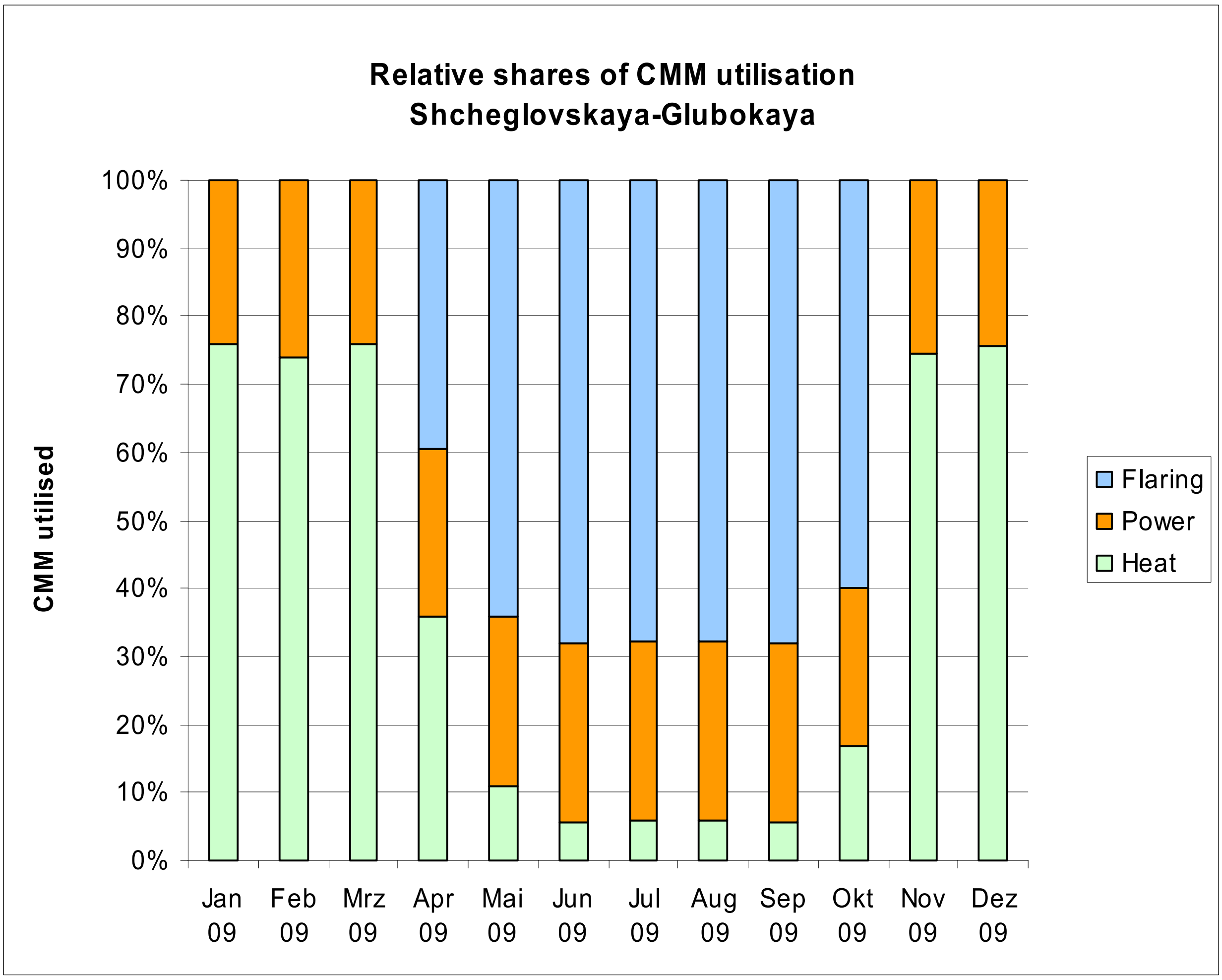

Figure B-1: Relative shares of the CMM utilisation by flaring, power and heat generation. The figure shows exemplary the values for the year 2009.
The value of 100% means 100% of the utilised *CMM amount, whereas the total sucked amount is always higher than the utilised amount.*

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, this alternative is not technical feasible, neither the use nor the destruction, due to the low concentration of the methane in the ventilation air.

Therefore this alternative faces a prohibitive barrier.

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 MWel), so in case of the project the alternatives b) to e), which are listed below, are economically more attractive.

Therefore this alternative faces a prohibitive barrier and is eliminated.

b) combined gas-steam power plant, CMM fired

A combined gas-steam power plant is a rather new technology. At present the technology is only available for natural gas, so that the CMM, which has an appreciable lower methane concentration and lower calorific value, should be first 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.

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 prohibitive barriers and is eliminated.

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

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

Therefore this alternative faces prohibitive barriers and is eliminated.

Alternative viii. 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 and in section B., 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 a prohibitive barrier.

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 Shcheglovskaya-Glubokaya coal mine 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. The coal mine is state-owned and no investment capital is available. So a bank credit or an external investor is needed. In any case the minimum requirement for the coal mine as well as for a bank or an investor 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:

Prices for electricity, and coal used for heat generation were taken as of 2005 when the decision to implement the project was taken.

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 – Shcheglovskaya-Glubokaya, without ERU's		
IRR	-1,05	%
NPV (0 %)	-262.350	EUR
NPV (10 %)	-1.439.070	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 was made based on the market forecasts available at the moment of making the financial analysis of the proposed project. The electricity price and the heat revenue in 2005 has been changed 20% downwards and 20% upwards.

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

	Base case	power+heat up 20%	power+heat down 20%	
IRR	-1,05	7,28	-11,55	%
NPV (0%)	-262.350	2.002.426	-2.527.127	EUR
NPV (10%)	-1.439.070	-385.528	-2.492.612	EUR

Thus, only in the case of a significant change in the power and heat price to higher values, the IRR of the proposed project takes reasonable values.

With expected revenues from emissions trading the project becomes financially attractive.

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 Shcheglovskaya-Glubokaya Coal Mine is similar to the national situation. 80–90% 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

See step 2c.

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

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

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 of venting	CH_4	Included	The main emission source. The amount of methane to be released depends on the amount. 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_2O	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 for the Ukrainian grid, which has been determined using the methods described in ACM0002, has been used.
	CH_4	Excluded	Excluded for simplification. This is conservative and in accordance with ACM0008.

	N_2O	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_2O	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 of the gas	CO_2	Excluded Included Excluded	The electricity consumption of the vacuum pumps is not included in the project boundary as they are necessary for the extraction itself and is performed both in the baseline and project scenario. The own electricity consumption of the CHP unit and the power generator has been included and subtracted for the amount of electricity produced by the units. The own electricity consumption of the boilers, heaters 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_2O	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".

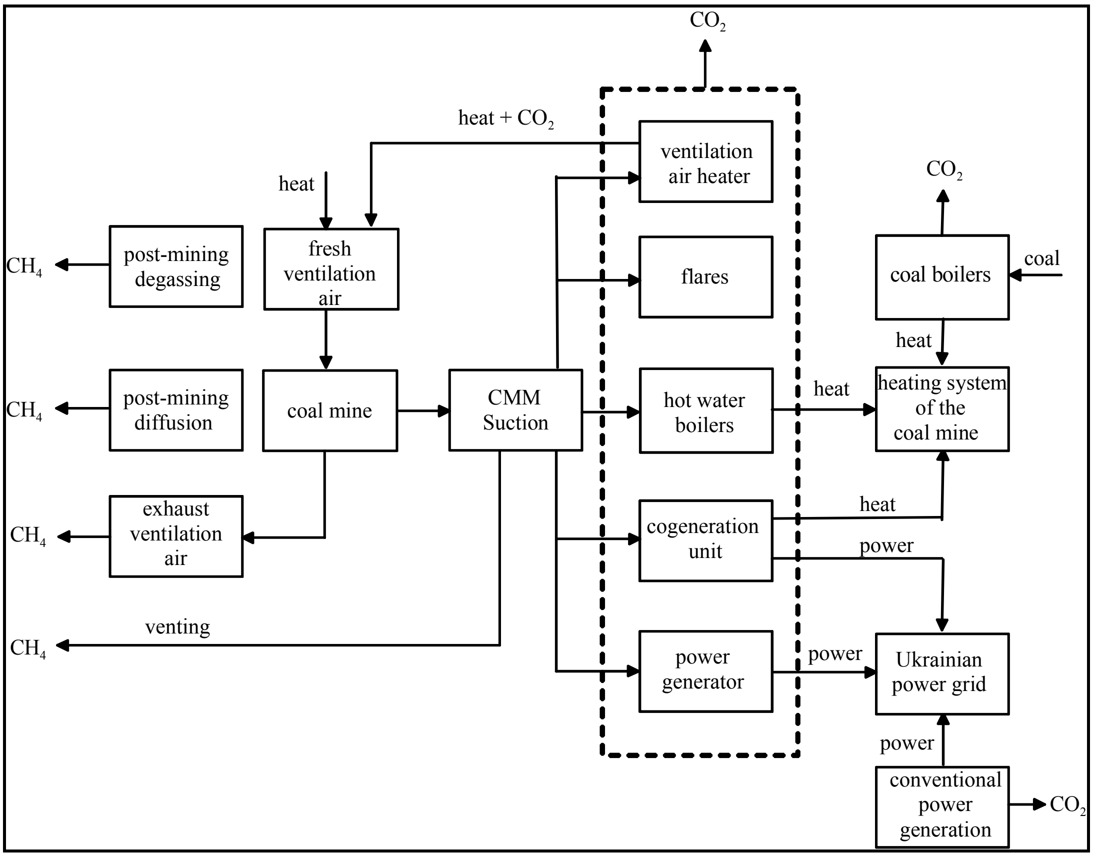

Figure B-3: Project boundary

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: 2007-09-04

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

See Annex 1 for detailed contact information.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

2007-01-01

C.2. Expected operational lifetime of the project:

at least 10 years, minimum until the end of the 2nd crediting period

C.3. Length of the crediting period:

2 x 5 years

1st crediting period starting with 2008-01-01

2nd crediting period starting with 2013-01-01

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 ACM008 methodology are identical to respective requirements of the baseline setting. For a detailed overview of the ACM008 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 CH_4 and N_2O 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 *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P1 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 using ACM0002
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/m³ [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 m	annually 15 min. cycle	100% 100%	paper electronic	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.
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	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/m³ 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/m³ 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 CO_2 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 upgraded CMM fired boilers needs less electric power than the old coal fired boilers. The air heater replaces an old heat exchanger; the energy consumption of the air heater is lower than of the heat exchanger. In absence of the project the heat generation would furthermore remain in operation using the coal fired boilers (and the heat exchanger). In case of the project less power will be consummated. To keep conservative $CONS_{ELEC,PJ}$ is set to zero.

The power generator and the cogeneration unit 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

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

with:

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

where:

PE_{MD}	Project emissions from CMM destroyed (t CO_2eq)
MD_{FL}	Methane destroyed through flaring (t CH_4)
MD_{ELEC}	Methane destroyed through power generation
MD_{HEAT}	Methane destroyed through heat generation
CEF_{CH4}	Carbon emission factor for combusted methane (2.75 t CO_2eq/t CH4)
CEF_{NMHC}	Carbon emission factor for combusted non methane hydrocarbons (various) (t CO_2eq/tNMHC)
r	Relative proportion of NMHC compared to methane
Pc_{CH4}	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:

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

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
B1 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}	CO2 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 as per ACM0002
B55 $EF_{CO2,Coal}$	CO2 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 CO_2 equivalent):

Baseline emissions are given by the following equation:

$$BE_y = BE_{MR,y} + BE_{Use,y} \quad (10)$$

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

$$BE_{MR,y} = CMM_{PJ,y} \text{ x } GWP_{CH4} \quad (14)$$

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

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

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

not applicable

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

not applicable

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

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 CO_2 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 CO_2 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:

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

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 *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
P5 *Power consumption*	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.
P12 P15 P18 B14 *Methane amount*	medium	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. 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. 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 all 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. The quality of the determined value for the methane amount is mainly affected by the methane concentration, see P25.
P13 *Combustion efficiency in the flare*	low	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 850°C. Additionally the emissions of the flare have to be verified every three years by a measurement.

		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. 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. See annex 3 for additional information.
P25 *Methane concentration*	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 *NMHC Concentration*	low	The determination will be provided by an accredited laboratory.
B46 *Power production*	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 *Heat production*	low	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. 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.

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:

All units 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. Quick acting valves lock the CMM supply; 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 Eco-Alliance. 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 Eco-Alliance and confirmed by the verifier.

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

These trained personnel is the basis of a team of engineers, which should establish a specialised service team in the Ukraine and instruct further operating and monitoring personnel, as well for this project. Actually there is no final training procedure established. The project management should be done by Eco-Alliance. The operation of the plants should be done by Eco-Alliance together with the operational personnel of the coal mine. The service and maintenance of the boilers, flares and the ventilation air heaters 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 German manufacturer Pro2 Anlagentechnik GmbH and the personnel of the Ukrainian corporate group Ukrrosmetall JSC, Sumy, Ukraine. The Monitoring should be carried out by Eco-Alliance 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.

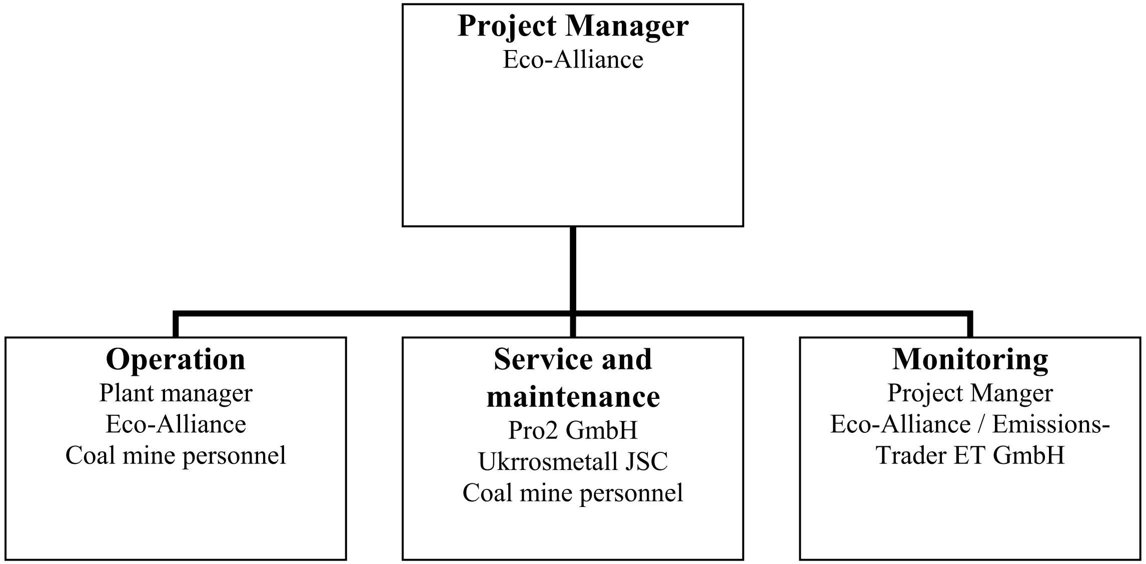

Figure D-1 - Project management structure

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

Date of completion of the monitoring plan: 2007-09-04

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

See Annex 1 for detailed contact information.

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, heaters, 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 CO_{2eq} / a]			
year	2008	2009	2010-2017
methane destruction			
flaring	7.647	8.496	6.912
heat generation	9.247	9.288	9.288
power generation	1.370	5.994	5.994
additional power consumption			
power generation	70	308	308
sum	**18.334**	**24.086**	**22.502**

E.2. Estimated leakage:

There are no leakages 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 CO_{2eq} / a]			
year	2008	2009	2010-2017
methane destruction			
flaring	7.647	8.496	6.912
heat generation	9.247	9.288	9.288
power generation	1.370	5.994	5.994
additional power consumption			
power generation	70	308	308
sum	**18.334**	**24.086**	**22.502**

E.4. Estimated baseline emissions:

Table E-4 – Estimated baseline emissions

Estimated baseline emissions [t CO_{2eq} / a]			
year	2008	2009	2010-2017
release of methane that is avoided by the project			
flaring	58.393	64.881	52.780
heat generation	70.612	70.926	70.926
power generation	10.461	45.769	45.769
production of heat that is displaced by the project	21.006	21.098	21.098
production of power that is displaced by the project	2.236	9.784	9.784
sum	**162.708**	**212.459**	**200.358**

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 lifetime of the project, 1st crediting period (2008-2012) and 2nd crediting period (2013-2017)

Year	Estimated project emissions (tonnes of CO2 equivalent)	Etimated leakage (tonnes of CO2 equivalent	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emissions reductions (tonnes of CO2 equivalent)
1st crediting Period 2008-2012				
2008	18.334	-	162.708	144.374
2009	24.086	-	212.459	188.373
2010	22.502	-	200.358	177.856
2011	22.502	-	200.358	177.856
2012	22.502	-	200.358	177.856
Total of first period (tonnes of CO2 equivalent)	109.925	-	976.240	866.315
2nd crediting Period 2013-2017				
2013	22.502	-	200.358	177.856
2014	22.502	-	200.358	177.856
2015	22.502	-	200.358	177.856
2016	22.502	-	200.358	177.856
2017	22.502	-	200.358	177.856
Total of second period (tonnes of CO2 equivalent)	112.508	-	1.001.789	889.280
Total of both periods (tonnes of CO2 equivalent)	222.433	-	1.978.029	1.755.596

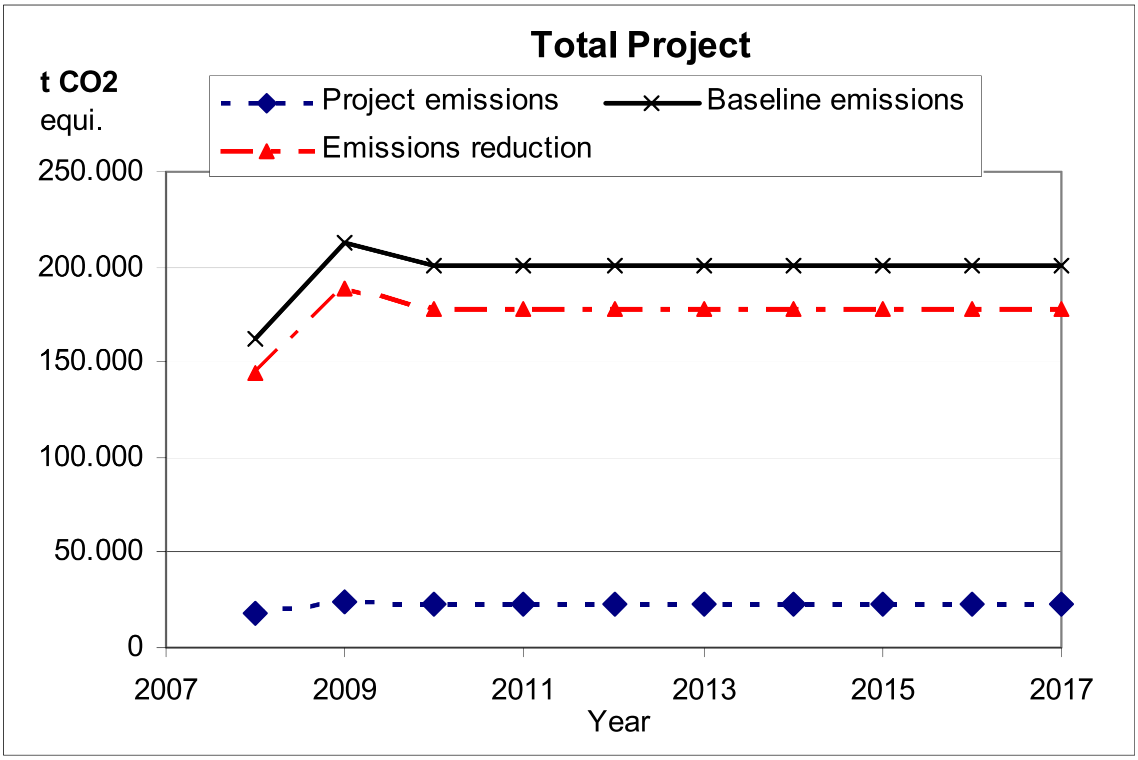

Figure E-1 - Baseline emissions, project emissions and emissions reduction; total project, both crediting periods

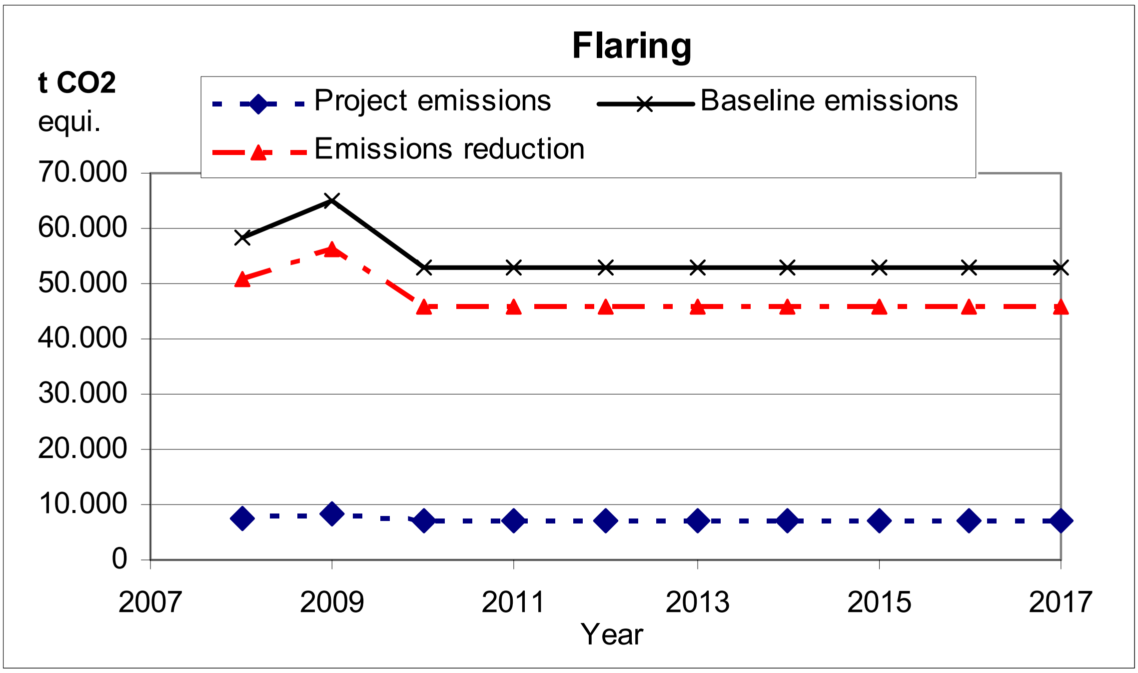

Figure E-2 - Baseline emissions, project emissions and emissions reduction; flaring, both crediting periods

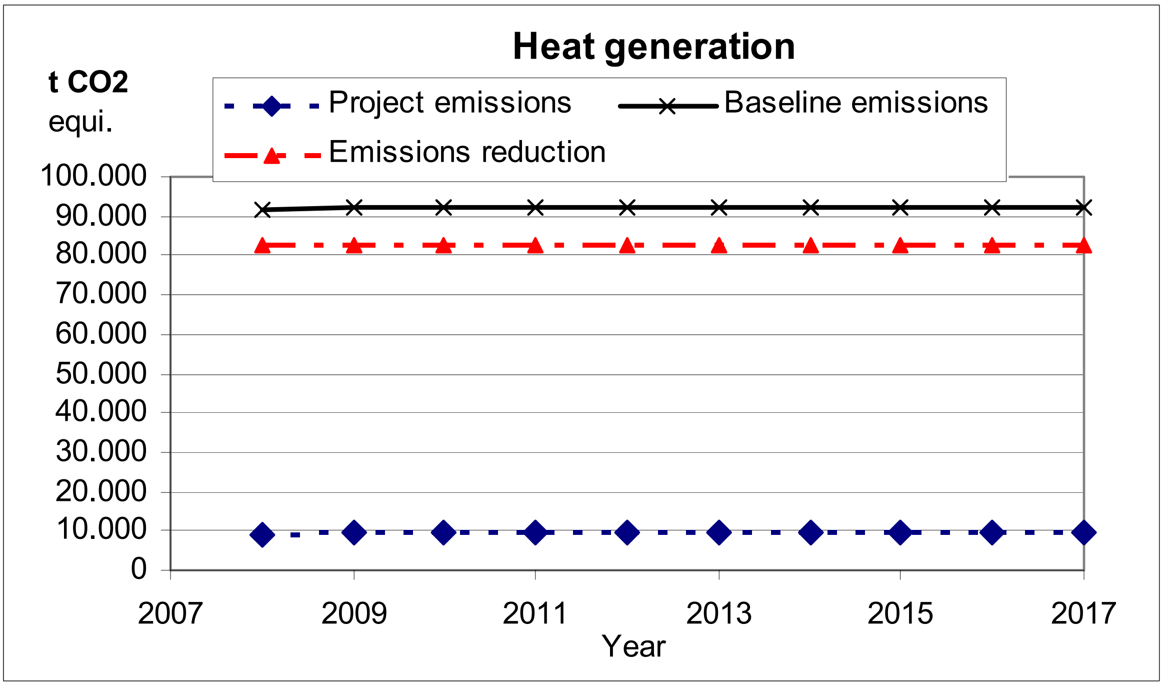

Figure E-3 - Baseline emissions, project emissions and emissions reduction; heat generation units, both crediting periods

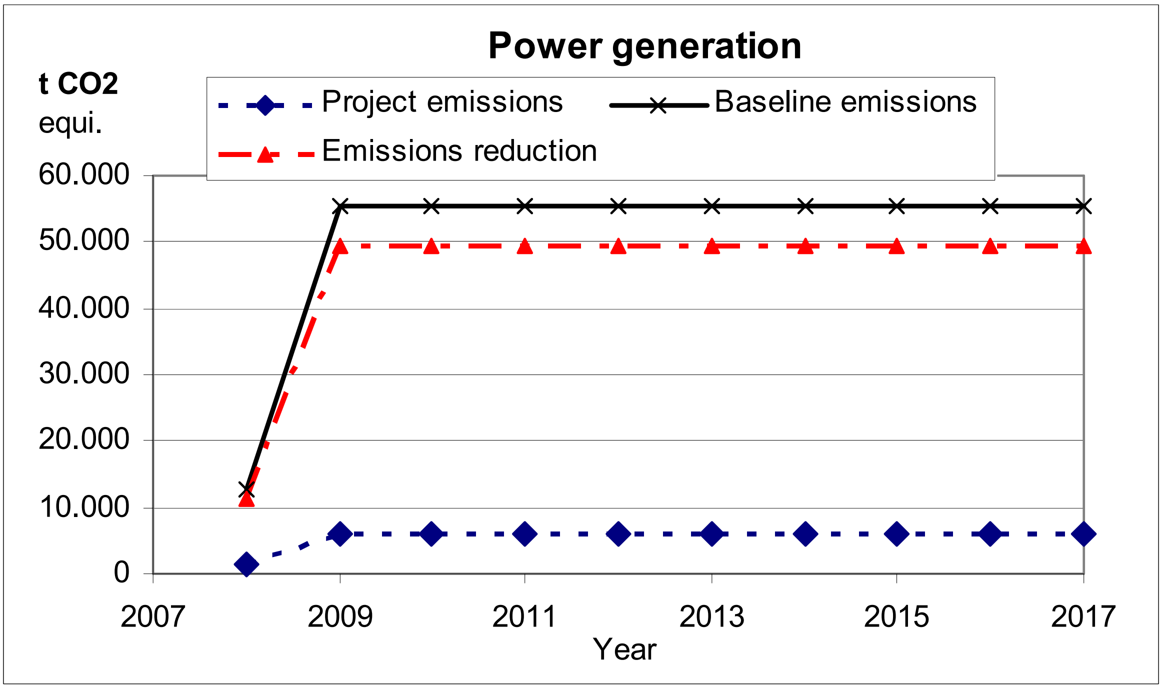

Figure E-4 - Baseline emissions, project emissions and emissions reduction; power generation units, both crediting periods

SECTION F. Environmental impacts

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

In the project an existing steam boiler, which is fired with coal should be upgraded with a CMM-Burner system. All modifications are carried out in existing buildings, so that no impairment of nature and landscape is given.

The upgrade to the CMM-burner system causes no additional sources of waste, sewage or condensate. Indeed the environmental impact is lowered, because the displacement of coal avoids former amounts of ash and slag. Furthermore the flue gas from a CMM-Burner includes less air polluting substances then that from a coal burner.

The flare, the switchgear and all other accessories needed are built in in a transportable container module. The complete facility is 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 facility does not use the natural resources: water, ground and landscape, so that no impairment on nature or landscape is given. The facility does 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 renaturisation is easy.

Both 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. 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.

A short description of the project should be published on the web-site of the Ukrainian Ministry of Environmental Protection.

The project has not been published in local press or other public media.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Proposer and project developer

Organization:	ECO–Alliance
Street/P.O.Box:	M. Grinchenka
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URL:	
Represented by:	Kasyanov Volodymyr Valentinovich
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Salutation:	Mr.
Last Name:	Kasyanov
Middle Name:	Valentinovich
First Name:	Volodymyr
Department:	
Phone(direct):	+38 (050) 380 3190
Fax (direct):	
Mobile:	
Personal e-mail:	vkasyanov@rambler.ru

Holding company of the coal mine, owner of the CMM licence

Organization:	State-run Coal Mine Asscociation „GOAO Shakhtoupravlenye Donbass"
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Represented by:	Viktor Ivanovich Orlov
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Postal code:	5928 ND
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Represented by:	Jürgen Meyer
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Salutation:	Dr.
Last Name:	Meyer
Middle Name:	
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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. 43, 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 the Ukrainian power grid

A standardised carbon emission factor for the Ukrainian Grid as determined by Global Carbon B.V., 2007-02-02 in the PDDD "Utilization of Coal Mine Methane at The Coal Mine named after A.F. Zasyadko", which has been determined using ACM0002, has been taken into account.

Type of project	**Parameter**	**EF (t CO_2 / MWh)**
JI project producing electricity	$EF_{grid,produced,y}$	0.807
JI projects reducing electricity	$EF_{grid,reduced,y}$	0.896

Table 33: Emission Factors for the Ukrainian grid 2006 – 2012 [PDD-Zasyadko]

The electricity produced by the project is completely used at the coal mine and displaces a part of the power amount purchased from the grid. Hence the project is reducing electricity.

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 [IPCC-2] 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 CO_2/ MWh generated heat.

Efficiency of the old coal boilers

There are four identical old coal fired boilers, two of which are supposed to be upgraded with a CMM burner system. The efficiency of the boilers is given by the manufacturer as 0.735. In fact the efficiency is lower but the higher efficiency of the manufacturer is taken into account.

Efficiency of the upgraded boilers

The efficiency of the CMM upgraded boilers is given as 96% by the manufacturer. Despite this value seems to be too high, it is conservative and is taken into account.

Efficiency of the ventilation air heater

The efficiency of the ventilation air heater is given as 98.5 % by the manufacturer (direct heating system). For the calculation the more conservative value of 100% is taken into account.

Power own consumption of the power generation 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 over 100 CMM CHP modules in Germany.

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 fulfill 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 1,000°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 drought 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.