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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

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Title:
Abandoned Coal Mine Methane Utilization at "NPK-Kontakt" Ltd

Sectoral scopes:
(8) Mining/mineral production; and
(10) Fugitive emissions from fuels (solid, oil and gas)

PDD version 1.2.2
Date of document: 14/12/2010

A.2. Description of the project:

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The proposed project aims to utilise and/or destroy the coal mine methane (CMM) currently being vented to atmosphere from the "Tomashivska South" and "Tomashivska North" mines. CMM will be used for displacing natural gas in a pipeline, and being destroyed in flares. The utilisation and destruction of methane and conversion of methane to CO2 significantly reduces greenhouse gas emissions.

The equipment will be installed by NPK-Kontakt LLC (the project developer) at two abandoned mines, where coal production was carried out from 1955 to 1972. To ensure safe working conditions in the mines of the Tomashivska fields many wells with surface decontamination were drilled during this period. The total volume of gas from the "Tomashivska South" mine between 1955 and 1964 was 61.3 million m3, and between 1965 and 1972 it was 92.2 million m3.[1] In 1978, 6 years after the mines were closed down, CMM emissions to the surface through the unsealed wells, mining workings and tectonic violation began, and continues to date.[2]

The project was first proposed after a meeting of the developer discussing experience with similar projects in Germany with experts, and the potential utilisation of methane at the licensed area of the developer. Then as a first stage, seven wells were drilled to assess the gas potentials in 2004. The second stage, to develop the project under official JI procedures stalled due to the absence of an approved methodology applicable to abandoned mines. The lack of practical experience with extraction and utilisation of CMM from of abandoned mines, and the significant costs of drilling and equipping of degassing wells, resulted in a significant reduction of the volume of CMM extracted and captured, and an inability to further implement the project without additional funding from ERUs.

The baseline scenario, therefore, is the same as the scenario existing prior to the implementation of the project activity, i.e. the release of CMM into the atmosphere.

The project scenario is the implementation of the CMM utilisation and destruction project, including displacing natural gas from a pipeline and destruction of the remaining methane in flares (2 units).

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[1] Report of Scientific Research "To develop methane recovery technology at abandoned mines and waste horizons on the anticline and dome structures" E610201020, SE "Center for Alternative Fuel Types" (SE CAFT), Kiev 2002.

[2] SE CAFT, Kiev, 2002.

It is ex-ante estimated that the project will generate average annual emission reductions of approximately 86,866 tCO_2e in the 2008-2012 period. The project will bring benefits for sustainable development, including:

- Increase safety by controlled degasification of abandoned mine workings.
- Increase the availability of gas which is less carbon intensive than coal by feeding CMM into the gas grid.
- Reduce the greenhouse gas emissions to the atmosphere through the destruction of high-GWP methane which would otherwise be released into the atmosphere and the productive use of the CMM, and displacement of coal use by grid connected power plant.

A.3. Project participants:

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Party involved	**Legal entity project participants (as applicable)**	**Party involved wishes to be considered as project participant (Yes/No)**
Ukraine (host)	Limited Liability Company "NPK-Kontakt" LLC	No
Switzerland	Carbon Resource Management S.A.	No

A.4. Technical description of the project:

A.4.1. Location of the project:

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The project is located at "Tomashivska South" and "Tomashivska North" mines.

A.4.1.1. Host Party(ies):

>>

Ukraine

See Figure 1 for the project location within the Ukraine.

Figure 1 Ukraine

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

>>
Luhansk Oblast

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

>>
93103, Lysychansk

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

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The project is located at the abandoned coal mines "Tomashivska South" and "Tomashivska North". The geographic coordinates of the mines are:

"Tomashivska South": Longitude 38°22' 05.1" East, Latitude: 48°58'23" North
"Tomashivska North": Longitude 38°19'19" East, Latitude: 48°59'40" North

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

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The CMM utilisation and destruction project includes the displacement of natural gas from a pipeline and destruction in a flare. The equipment at each of the two mines is presented below. Monitoring equipment will be adopted to measure all data required.

The following table provides an overview of the main equipment to be installed and the implementation schedule.

Table 1 Installed equipment and implementation schedule

Location	Equipment installed	Implementation schedule
"Tomashivska North"	• Degassing wells o Supply into a gas pipeline	• Implemented from 2004
"Tomashivska South"	• Degassing wells o Supply into a gas pipeline • Containerised flares* o Model KGUU-5/8 o Pro2 Anlagentechnik GmbH o 2 unit	• Implemented from 2004 • Flare #1 expected to be commissioned 2011 • Flare #2 expected to be commissioned 2012

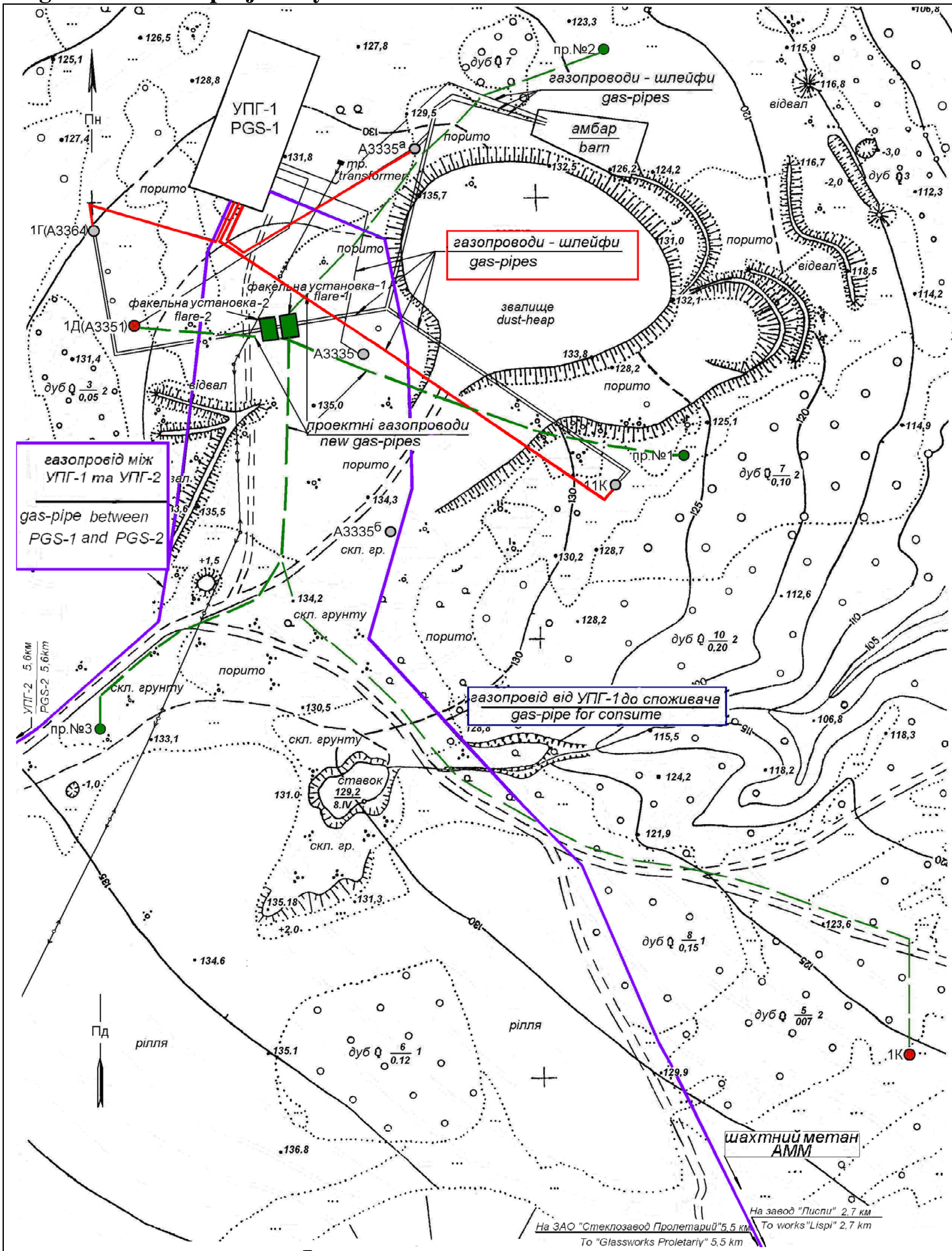
*Note: * If the methane proves to be of sufficient quality and quantity the flares could be replaced over time by electricity generating units. However, the generators are significantly more expensive than flares, and therefore are conservatively not considered in this assessment. If electricity generating units were to be installed in the future, the emission reductions from the displacement of grid electricity will conservatively be ignored, and the units treated as flares for the purpose of the emission reduction calculations so that no change to the calculations is required.*

Table 2 Technical parameters of enclosed flare

Type	KGUU 5/8
Manufacturer	Pro2 Anlagentechnik GmbH (Germany)
Methane usage	1,002 m3/h
Installed firing capacity	10 MW
Combustion temperature	At least 850 °C
Retention time	At least 0.3 sec
Expected operating time	8,400 h/y

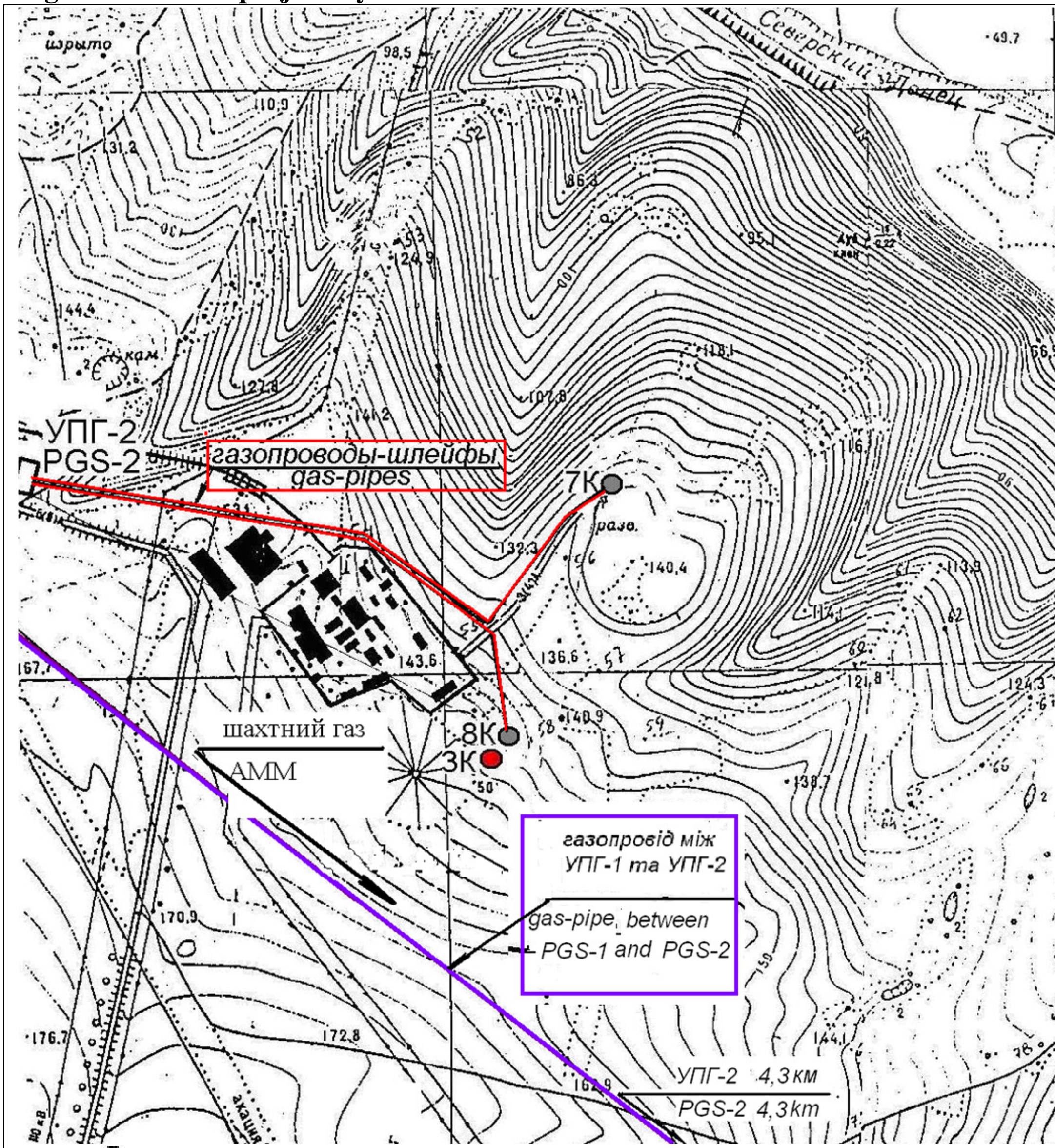
The detailed project lay-outs at the two sites are presented in Figures 2 and 3, below.

Figure 2 Detailed project lay-out of "Tomashivska South"



A3335 A3335[a] A3364 11K — Exploring wells
A3351 1K — Degassing wells
№1 №2 №3 — Degassing wells
PGS-1 — Preparation Gas Station
Flare
CMM to flare
CMM to gas- pipe

Figure 3 Detailed project lay-out of "Tomashivska North"



7K 8K (grey circle)	Exploring wells
3K (red circle)	Degassing well
PGS-2	Preparation Gas Station
(purple line)	CMM to gas-pipe

Prior to the implementation of the project activity, the CMM was released into the atmosphere, natural gas was used from the gas pipeline and electricity was generated by the plant connected to the grid. Without the implementation of the project, this scenario would have continued and is considered the baseline scenario.

Training programme

The responsible personnel of the project developer are experienced with the gas extraction and supply into the gas pipeline and will receive on the job training from Eco-Alliance once the flares are being installed.

Maintenance programme

The maintenance and operation of the general project equipment will be provided by the project developer personnel. The maintenance of the flares will be carried out by Eco-Alliance.

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:

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The emission reductions are achieved through the capture of coal mine methane which would have been released to the atmosphere in the absence of the project activity, and oxidation of the high-GWP methane through combustion in utilisation equipment or flare. In absence of the project the CMM would be released to the atmosphere, as there is no national or sectoral policy requiring the capture and destruction of CMM from closed mines[3]. In the project scenario, CO2 is emitted after combustion of the CMM in flares or combustion of the CMM from the gas pipeline.

The project is not business-as-usual and faces 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:

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Applying the proposed methodology to the project activity the project will achieve an ex-ante estimated average annual emission reduction of 86,866 tCO2e/y over the 2008-2012 period. The proposed project will operate until the year 2017 or longer. The project participants propose to use crediting periods in line with the commitment periods under the Kyoto Protocol. Therefore the first commitment period will cover 2008 to 2012, the second period will be for 2013 to 2017. Table 3,4 and 5 show the estimated reductions achieved by the project activity.

Table 3 Estimated emission reductions of the project, 2004-2007

	Years
Length of period	4
Year	Estimate of annual emission reductions in tonnes of CO2 equivalents
2004	69,821
2005	50,308
2006	32,551
2007	24,233
Total estimated emission reductions over the 2004-2007 period (tonnes of CO2 equivalent)	176,913
Annual average of estimated emission reductions over the 2004-2007 period (tonnes of CO2 equivalent)	44,228

[3] The Law of Ukraine "On gas (methane) of the coal deposits" (No. 1392-17) applies to the project. However, the law does not mandate the extraction of gas from closed coal mines, nor utilisation or destruction of the gas after extraction from the coal deposits.

Table 4 Estimated emission reductions of the project, 2008-2012

	Years
Length of crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO2 equivalents
2008	20,478
2009	19,253
2010	14,911
2011	121,208
2012	258,481
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	434,331
Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	86,866

Table 5 Estimated emission reductions of the project, 2013-2017

	Years
Length of crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO2 equivalents
2013	258,481
2014	258,481
2015	258,481
2016	258,481
2017	258,481
Total estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	1,292,405
Annual average of estimated emission reductions over the crediting period (tonnes of CO2 equivalent)	258,481

A.5. Project approval by the Parties involved:

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A letter of endorsement has been received for the proposed project, reference No. 1902/23/7, dated 16 November 2010.

Written project approval by the Parties involved will be attached.

SECTION B. Baseline

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

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In accordance with appendix B of the JI guidelines and following the guidance on criteria for baseline setting and monitoring[4], the baseline is chosen and described below, using the following step-wise approach.

Step 1 Indication and description of the approach chosen regarding baseline setting

Project participants may select either:
(a) An approach for baseline setting and monitoring developed in accordance with appendix B of the JI guidelines (JI specific approach); or
(b) A methodology for baseline setting and monitoring approved by the Executive Board of the clean development mechanism (CDM), including methodologies for small-scale project activities, as appropriate, in accordance with paragraph 4(a) of decision 10/CMP.1, as well as methodologies for afforestation/reforestation project activities.

There is no approved CDM baseline and monitoring methodology which is applicable – without revisions – to abandoned mines. Therefore, a JI specific approach (a) is applied.

JI specific approach

According to the JI guidelines:
(a) The baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would occur in the absence of the proposed project. A baseline shall cover emissions from all gases, sectors and source categories listed in Annex A of the Kyoto Protocol, and anthropogenic removals by sinks, within the project boundary;
(b) A baseline shall be established:
  (i) on a project-specific basis and/or using a multi-project emission factor;
  (ii) in a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors;
  (iii) taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector;
  (iv) in such a way that emission reduction units (ERUs) cannot be earned for decreases in activity levels outside the project activity or due to force majeure;
  (v) taking account of uncertainties and using conservative assumptions;
(c) Project participants shall justify their choice of baseline.

The project participants chose a previously approved and accepted baseline approach. This methodology was originally developed by DMT (Deutsche Montan Technologie, http://www.dmt.de)[5], which is part of the TÜV Nord group. The first two of the projects using this methodology for CMM from closed mines were submitted within the ERUPT framework of the government of the Netherlands

[4] Guidance on criteria for baseline setting and monitoring, version 02 (JISC 18).

[5] DMT (2004), Statement The contribution of the extraction of mine gas to the reduction of CH4 emissions in terms of the NRW *Klimaschutzkonzept* (climate protection concept).

(http://www.senternovem.nl/carboncredits/index.asp), contracted under this framework by the Netherlands, and received approval from the German Government.[6] Thereafter, this methodology was applied for other German projects[7] utilising CMM from closed mines, with one receiving official approval as JI project from the German Emissions Trading Authority (DEHSt) at the Federal Environment Agency[8], and many others registered as VCS projects[9]. Thus, the methodology was approved for use.

According to the methodology, methane from closed mines escapes to the atmosphere through the open shaft, degassing holes and geological fractures in the mining area. Therefore, all methane produced from closed mines and oxidised (through utilisation or destruction) should be considered as prevented emissions of methane.[10] It should be noted that the deliberate pumping of mine gas does not lead to increased production of methane, but rather to the movement of methane to the surface.[11] Such pumping is often technically required to avoid accumulation near to the surface, which can lead to formation of explosive mixtures. The pumping is required in many coal mining areas (for example, in Germany, Poland, Ukraine, Kazakhstan, etc.).[12]

Thus, the amount of CMM captured and destroyed within the project is considered as the baseline emissions, which is prevented by the project implementation. In the absence of the project the methane would be emitted into the atmosphere. The baseline scenario is selected using the approach given below.

Step 1: Identify technically feasible baseline scenario alternatives to the project activity

The baseline scenario alternatives should include all technically feasible options which are realistic and credible. These options should include the JI project activity not implemented as a JI project.

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

Step 3: Eliminate baseline alternatives that face prohibitive barriers

On the basis of the alternatives that are technically feasible and in compliance with all legal and regulatory requirements, the project participant should establish a complete list of barriers that would prevent alternatives to occur in the absence of JI. Show that the identified barriers would not prevent the implementation of at least one of the alternatives to the proposed JI project activity.

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[6] ERUPT projects ERU04/14 and ERU05/06, with JI references DE1000014 and DE1000015 respectively.

[7] For a list of projects by TÜV Nord: http://www.global-warming.de.

[8] Full list of CDM and JI projects with German approval: https://heka.uba.de/promechg/pages/project1.aspx.

[9] See http://www.v-c-s.org for projects under the Voluntary Carbon Standard (VCS).

[10] DMT (2004), Statement The contribution of the extraction of mine gas to the reduction of CH4 emissions in terms of the NRW *Klimaschutzkonzept* (climate protection concept).

[11] DMT (2004), Supplement to Statement The contribution of the extraction of mine gas to the reduction of CH4 emissions in terms of the NRW *Klimaschutzkonzept* (climate protection concept).

[12] SE CAFT, Kiev, 2002; and SRW (Scientific Research Work) "To develop a method of degassing of abandoned mines, preventing the release of methane on the Earth's surface", Report of the Makiivskiy Scientific Research Institute (MakSRI), number 17050704000, 2010.

If there are several potential baseline scenario candidates that do not face barriers: (1) either choose the most conservative (results in least emissions) alternative as the baseline scenario; or (2) choose the economically most attractive alternative (using Step 4).

Step 4: Identify the most economically attractive baseline scenario alternative (optional)

Determine which of the remaining project alternatives that are not prevented by any barrier is the most economically or financially attractive, and thus is the most plausible baseline scenario.

Step 2 Application of the approach chosen

Step 1: Identify technically feasible baseline scenario alternatives to the project activity

The baseline scenario alternatives should include all technically feasible options which are realistic and credible. These options should include the JI project activity not implemented as a JI project. The options are:

- Status quo:
  - The situation before the project was installed, without any plant for the destruction and / or utilisation of CMM.
- Destruction of CMM
  - I. Flaring
    Extracted CMM is destroyed in flares installed at the project site.
- Utilisation of CMM:
  - II. Generation of heat (e.g. in boilers)
    Extracted CMM is used for the generation of heat, for example in CMM-fired boilers onsite, and supply of the heat to an end user.
  - III. Generation of power and/or heat (e.g. in cogeneration units)
    Extracted CMM is used for the generation of power and/or heat, for example in CMM-fired cogeneration units onsite, and supply of the electricity to the grid or own use and heat to an end user.
  - IV. Feed into CMM pipeline
    Extracted CMM is (cleaned, if necessary, and) supplied to a gas pipeline for use by an end users offsite.
  - V. A combination of any of the options I to IV, for example the JI project activity not implemented as a JI project which includes feeding into a CMM pipeline and flaring. Extracted CMM is used for useful energy generation and/or destroyed in flares installed at the project site.

There are examples of each of the above options. Therefore, each of these options is technically feasible.

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

There are no state regulations mandating the capture and/or utilisation/destruction of CMM from closed mines[13]. While specific permissions and licenses may be required, each of the options above can comply

[13] The Law of Ukraine "On gas (methane) of the coal deposits" (No. 1392-17) applies to the project. However, the law does not mandate the extraction of gas from closed coal mines, nor utilisation or destruction of the gas after extraction from the coal deposits.

with legal and regulatory requirements. Therefore, each of these options is technically feasible and can comply with legal or regulatory requirements.

Step 3: Eliminate baseline alternatives that face prohibitive barriers

Sub-step 3a: On the basis of the alternatives that are technically feasible and in compliance with all legal and regulatory requirements, the project participant should establish a complete list of barriers that would prevent alternatives to occur in the absence of JI. For each of the alternatives to the situation existing prior to the implementation of the project, the barriers are listed below.

I. Flaring
   - Investment barrier: Flaring generates no income except from emission reductions. However, there are both investment costs and operational and maintenance costs. Therefore, flaring faces an investment barrier and is not economically viable.

II. Generation of heat (e.g. in boilers)
   - Technological barrier: The generation of heat (e.g. in boilers) requires that the heat can be supplied to consumers nearby. However, there is no heat demand at the project site, as the project is located away from any centre of heat demand. Therefore, generation of heat faces a technological barrier, as there is a lack of infrastructure for implementation and is thus not viable.
   - Barrier due to prevailing practice: No generation of heat currently operational at an abandoned coal mine in the Ukraine.[14] Therefore, this option would be a first-of-its-kind and faces a barrier due to prevailing practice.

III. Generation of power and/or heat (e.g. in cogeneration units)
   - Technological barrier: Skilled and/or properly trained labour to operate and maintain the technology is not available in the region, which leads to an unacceptably high risk of equipment disrepair and malfunctioning or other under performance. While there is experience in Germany and the UK, these projects are supported through feed in tariffs/premiums and/or emission reductions in those countries. For JI projects, this barrier is overcome by the active participation of technology providers and consultants, and supported from emission reductions.
   - Technological barrier: Operational risks for CMM utilisation are high. It is difficult to predict quality and quantity of the CMM. Concentrations often vary, and may be low. Volumes are variable, and in the case of abandoned mine methane are declining over time. Fouling substances like dust are included in CMM, and have a detrimental impact on the equipment. While there is experience in Germany and the UK, these projects are supported through feed in tariffs/premiums and/or emission reductions. Experience in the Ukraine has only been through JI projects with active participation of technology providers and consultants.
   - Investment barrier: Generation of power from CMM is not economic viable in the Ukraine without accounting for emission reductions. Equipment for power generation from CMM needs to be imported. Therefore, the investment and O&M cost are high, and generation of power and/or heat from CMM is not economically viable. Investment costs per megawatt of electricity capacity (MWe) for a CMM co-generation power plant (all equipment including gas conditioning) is about US $1.0 million to US $1.5 million for international standard

[14] Global Overview of CMM Opportunities, Methane to Markets Partnership, January 2009, Chapter 30: Ukraine, see http://www.globalmethane.org/documents/toolsres_coal_overview_ch30.pdf. The Methane to Markets International Coal Mine Methane (CMM) Projects Database, see http://www2.ergweb.com/cmm/index.aspx, includes 98 abandoned mine projects worldwide, but no abandoned mine methane project in Ukraine.

high-efficiency generators (2008). O&M costs (all-in) in terms of electricity produced average around US $0.02 to US $0.025/kilowatt-hour (kWh) for the entire life cycle of the co-generation plant (2008).[15] Such costs are not economic in the Ukraine.
- Barrier due to prevailing practice: No generation of power and/or heat currently operational at an abandoned coal mine in the Ukraine.[16] Therefore, this option would be a first-of-its-kind and faces a barrier due to prevailing practice.

IV. Feed into CMM pipeline
- Technological barrier: Operational risks for CMM utilisation are high. It is difficult to predict quality and quantity of the CMM. Concentrations often vary, and may be below the minimum required for feeding into a gas pipeline. Volumes are variable, and in the case of abandoned mine methane are declining over time. Fouling substances like dust are included in CMM, and need to be removed prior to feeding into a gas pipeline.
- Investment barrier: The operation and maintenance costs, in particular the cleaning of the CMM prior to feeding into a gas pipeline, result in high costs. While the supply of CMM will generate income, the value of the CMM is below the average operating costs. Therefore, the supply of CMM into a gas pipeline is not economically viable.
- Barrier due to prevailing practice: There is currently no supply of CMM from an abandoned coal mine in the Ukraine to a gas pipeline.[17] Therefore, this option would be a first-of-its-kind and faces a barrier due to prevailing practice.

V. A combination of any of the options I to IV
- Same barriers as identified for each of the individual options above. Therefore, a combination of any of the options I to IV is not viable.
- Barrier due to prevailing practice: There is currently no utilisation of CMM from an abandoned coal mine in the Ukraine.[18] Therefore, this option would be a first-of-its-kind and faces a barrier due to prevailing practice.

Sub-step 3b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives to the proposed JI project activity.

The status quo does not face any barriers. All alternatives to the status quo face realistic and credible barriers that would prevent their implementation without registration as a JI project activity.

Therefore the continuation of the status quo is the only remaining alternative and is selected as baseline scenario. As there is only one alternative to the project scenario, step 4 is not necessary.

Step 4: Identify the most economically attractive baseline scenario alternative (optional)

Not necessary, as there is only one alternative to the project scenario after step 3.

Conclusion

In conclusion, the baseline scenario is the continuation of the status quo, which is the continuation of the situation before the project was installed, without any plant for the destruction and/or utilisation of CMM.

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[15] Best Practice Guidance for Effective Methane Drainage and Use in Coal Mines, UNECE, 2010 (ECE Energy Series No. 31), see http://www.unece.org/se/pdfs/cmm/pub/BestPractGuide_MethDrain_es31.pdf.

[16] See footnote 14.

[17] See footnote 14.

[18] See footnote 14.

Calculation of the baseline

The baseline emissions are calculated from the amount of methane captured and destroyed and the global warming potential of methane, using the formula below. The baseline emissions from the supply of natural gas from the gas pipeline replaced by the project activity is conservatively ignored.

BE_y = Σi (MD_i,y – MD_BL) * GWP_CH4
With:
BE_y is the baseline emissions in year y (tCO2e)
MD_i,y is the amount of methane destroyed by use i in year y (tCH4)
i is the various uses of the methane (flare, gas pipeline)
MD_BL is the amount of methane destroyed in the baseline (tCH4)
GWP_CH4 is the 100 year global warming potential of methane (21 tCO2e/tCH4)

The amount of methane destroyed by use i is calculated using the following formula:

MD_i,y = MM_i,y * Eff_i
With:
MM_i,y is the amount of methane sent to use i in year y (tCH4)
Eff_i is the destruction efficiency of use i (set to 99.5% for the flare assuming compliance with the manufacturer's temperature specification, 98.5% for gas pipeline)

The efficiency of combustion in flare Eff_flare = 99.5%, assuming compliance with the manufacturer's temperature specifications, which is the default value for the fraction of carbon dioxide for gas combustion according to IPCC 1996.[19] This is conservative, because the chosen flare is designed to fulfil the German regulations for flaring of landfill gas, which require a minimum efficiency of 99.9 %. If the temperature is below the manufacturer's specification of 850°C, the following efficiencies are applied:

- Temperature is between 500°C and 850°C, then efficiency is 90%;
- Temperature is below 500°C, then efficiency is 0%.

The efficiency of destruction through the supply to the gas pipeline Eff_gaspipeline = 98.5%, which is the default overall efficiency of destruction/oxidation through gas grid to various combustion end uses, combing fugitive emissions from the gas grid and combustion efficiency at end use according to ACM0008 version 7.

The amount of methane destroyed in the baseline is zero, as there is no use or destruction prior to the implementation of the project activity:

MD_BL = 0

The key information and data used to establish the baseline (variables, parameters, data sources etc.) are presented below.

Data / Parameter	**GWP_CH4**
Data unit	**tCO2e/tCH4**
Description	Global warming potential of methane

[19] The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories gives a standard value for the fraction of carbon oxidised for gas combustion of 99.5% (Reference Manual, Table 1.6, page 1.29).

Time of determination/monitoring	Ex-ante
Source of data (to be) used	IPCC default value as per registered PDD
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default
QA/QC procedures (to be) applied:	Not applicable
Any comment	Baseline and project emission calculations

Data / Parameter:	**Eff_gaspipeline**
Data unit	
Description	Efficiency of destruction through the supply of gas to the gas pipeline
Time of determination/monitoring	Ex-ante
Source of data (to be) used	ACM0008 (using IPCC default values)
Value of data applied (for ex ante calculations/determinations)	98.5%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default overall efficiency of destruction/oxidation through gas grid to various combustion end uses, combing fugitive emissions from the gas grid and combustion efficiency at end use according to ACM0008 version 7
QA/QC procedures (to be) applied:	Not applicable
Any comment	Baseline and project emission calculations

Data / Parameter:	**Eff_flare**
Data unit	
Description	Efficiency of combustion in flare
Time of determination/monitoring	Ex-ante
Source of data (to be) used	The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Reference Manual, Table 1.6, page 1.29)
Value of data applied (for ex ante calculations/determinations)	99.5%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is conservative, because the chosen flare is designed to fulfil the German regulations for flaring of landfill gas, which require a minimum efficiency of 99.9 %. As stated above, if the combustion temperature is below the manufacturer's specifications, the following efficiencies are applied: • 500°C < T < 850°C, then efficiency is 90% • T < 500°C, then efficiency is 0%.
QA/QC procedures (to be) applied:	Not applicable

Any comment	Baseline and project emission calculations

Data / Parameter:	**MM_gaspipeline**
Data unit	**tCH4**
Description	Quantity of methane sent to gas pipeline
Time of determination/monitoring	Ex-post
Source of data (to be) used	Electronic monitoring equipment will be installed in 2011. For historic data source, please see description in Annex 3.
Value of data applied (for ex ante calculations/determinations)	Year_y MM_gas pipeline,y 2004 3,884 2005 2,799 2006 1,811 2007 1,348 2008 1,139 2009 1,071 2010 830 2011 670 2012 2,234 2013 2,234 2014 2,234 2015 2,234 2016 2,234 2017 2,234
Justification of the choice of data or description of measurement methods and procedures (to be) applied	MM_gaspipeline = Normalised flow * Methane concentration * Methane density The data (flow, temperature, pressure, normalised flow and concentration) are continuously recorded to memory by electronic devices.
QA/QC procedures (to be) applied:	Checked against sales receipts
Any comment	Baseline and project emission calculations

Data / Parameter:	**MD_BL**
Data unit	**tCH4**
Description	Quantity of methane destroyed in the baseline
Time of determination/monitoring	Ex-ante
Source of data (to be) used	
Value of data applied (for ex ante calculations/determinations)	0
Justification of the choice of data or description of measurement methods and procedures (to be) applied	There was no CMM capture, thus no possible destruction, prior to the implementation of the project.
QA/QC procedures (to be) applied:	

Any comment	Baseline and project emission calculations

Data / Parameter:	**MM_flare**
Data unit	**tCH4**
Description	Quantity of methane sent to flare
Time of determination/monitoring	Ex-post
Source of data (to be) used	Electronic monitoring equipment is installed as part of the flare unit.
Value of data applied (for ex ante calculations/determinations)	Year_y MM_flare,y 2004 - 2005 - 2006 - 2007 - 2008 - 2009 - 2010 - 2011 6,035 2012 12,071 2013 12,071 2014 12,071 2015 12,071 2016 12,071 2017 12,071
Justification of the choice of data or description of measurement methods and procedures (to be) applied	MM_flare = Normalised flow * Methane concentration * Methane density The data (flow, temperature, pressure, normalised flow and concentration) are continuously recorded to memory by electronic devices.
QA/QC procedures (to be) applied:	Calibrated as per manufacturer's requirements.
Any comment	Baseline and project emission calculations

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:

>>
The demonstration that the project provides reductions in emissions by sources that are additional to any that would otherwise occur uses the following step-wise approach:

Step 1. Indication and description of the approach applied

a) If a JI specific approach is used, please explicitly indicate which of the approaches to demonstrate additionality, defined in paragraph 2 of the annex I to the "Guidance on criteria for baseline setting and monitoring", is chosen, and provide a justification of its applicability, with a clear and transparent description, as well as references, as appropriate.
b) If an approved CDM baseline and monitoring methodology is used in accordance with paragraph 10 of the .Guidance on criteria for baseline setting and monitoring., please provide clear references (e.g. title of the baseline and monitoring methodology or tool, relevant version of the methodology or tool etc.) and describe why and how it is applicable.

The most recent version of the "Tool for the demonstration and assessment of additionality" is used, in accordance with the JI specific approach, defined in paragraph 2 (c) of the annex I to the "Guidance on criteria for baseline setting and monitoring".

Step 2. Application of the approach chosen

The Ukraine signed the Kyoto Protocol on 15 March 1999, and projects from 1 January 2000 are eligible under JI. The proposed project faces serious barriers as described above and is not considered the baseline scenario. The project was first developed after discussions in 2003 between the project developer and JI and CMM experts about experience with similar projects in Germany and the potential in the licensed area of NPK-Kontakt LLC.

The additionality of the project activity is demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" agreed by the CDM Executive Board. The Tool consists of steps below.

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Because of the similarity of the approaches used to determine the baseline scenario in B.1. and the Additionality Tool, in line with the practice in approved methodologies, e.g. ACM0008, Step 1 of the "Tool for the demonstration and assessment of additionality" is ignored. Therefore, as described in B.1 above, the baseline is:

The continuation of the status quo, which is the continuation of the situation before the project was installed, without any plant for the destruction and/or utilisation of CMM.

→ Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both steps 2 and 3.)

The project participants select to proceed to Step 3.

Step 3. Barrier analysis

Determine whether the proposed project activity faces barriers that:
(a) Prevent the implementation of this type of proposed project activity; and
(b) Do not prevent the implementation of at least one of the alternatives.

The identified barriers are only sufficient grounds for demonstration of additionality if they would prevent potential project proponents from carrying out the proposed project activity undertaken without being registered as a JI project activity. If JI does not alleviate the identified barriers that prevent the proposed project activity from occurring, then the project activity is not additional.

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

Establish that there are realistic and credible barriers that would prevent the implementation of the proposed project activity from being carried out if the project activity was not registered as a JI activity. Such realistic and credible barriers may include, among others:

(a) Investment barriers
(b) Technological barriers
(c) Barriers due to prevailing practice, inter alia: the project activity is the "first of its kind"
(d) Other barriers

The proposed project is the first abandoned mine methane utilisation project in Ukraine[20], therefore it faces barriers due to prevailing practice. Registration as a JI project activity generates significant additional revenues and involvement of international expertise, thus JI would alleviate the barriers due to prevailing practice.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

There is no barrier to the baseline alternative, the continuation of the situation prior to the implementation of the project activity. Therefore, the identified barrier does not affect the alternative.

→ ***"If both Sub-steps 3a – 3b are satisfied, proceed to Step 4 (Common practice analysis)".***

Therefore, the project participants select to proceed with Step 4.

Step 4. Common practice analysis

The proposed project type has been demonstrated to be first-of-its-kind (according to Sub-step 3a), therefore, it has been shown that the proposed project type (e.g. technology or practice) has not diffused in the relevant sector and region and is not common practice.

In conclusion, all the steps above are satisfied. The proposed project is not the baseline scenario and is additional.

Step 3. Provision of additionality proofs

No further additionality proofs are needed.

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

>>

Spatial boundary:

The spatial extent of the project boundary comprises:
- All equipment installed and used as part of the project activity for the extraction of CMM at the project site, and transport to an off-site user.
- Flares installed as part of the project activity.
- Ukraine National Power Grid and the connected power plants.

Emission sources:

[20] Global Overview of CMM Opportunities, Methane to Markets Partnership, January 2009, Chapter 30: Ukraine, see http://www.globalmethane.org/documents/toolsres_coal_overview_ch30.pdf. The Methane to Markets International Coal Mine Methane (CMM) Projects Database, see http://www2.ergweb.com/cmm/index.aspx, includes 98 abandoned mine projects worldwide, but no abandoned mine methane project in Ukraine.

For the purpose of determining project activity emissions, the following emission sources are included:

- CO_2 emissions from the combustion of methane in a flare;
- CO_2 emissions from the combustion of methane supplied to the gas pipeline by a user of the gas, such as engine, power plant or heat generation plant;
- CO_2 emissions from the combustion of non methane hydrocarbons (NMHCs), if they represent more than 1% by volume of the extracted coal mine gas;
- CO_2 emissions from on-site electricity or fuel consumption due to the project activity, including transport of the fuel;

For the purpose of determining baseline emissions, the following emission sources are included:

- CH_4 emissions as a result of venting gas that would be captured and destroyed in the project scenario;
- CO_2 emissions from the destruction of methane in the baseline scenario;

Fugitive emissions from unburned methane in the project scenario are the same in the baseline and project scenario. Therefore, to simplify the calculations, with no impact on the emission reductions calculated, only the change in CMM emissions release will be taken into account in the calculation.[21]

Summary of project boundary:

Table 6 Sources and gases in the project boundary

Source	**Gas**	**Included?**	**Justification / Explanation**
Baseline			
Emissions of methane as a result of venting	CH_4	Included	Main emissions source
Emissions from destruction of methane in the baseline	CO_2	Included	Considers any flaring or use for heat and power in the baseline scenario. However, there is no such use in the baseline.
	CH_4	No	Excluded for simplification. This is conservative
	N_2O	No	Excluded for simplification. This is conservative
Emissions from energy use displaced by the project	CO_2	No	Any emissions from energy use in the baseline scenario, which is displaced with CMM supplied by the project, is excluded for simplification. This is conservative.
	CH_4	No	Excluded for simplification.
	N_2O	No	Excluded for simplification.
Project activity			
Emissions of methane as a result of continued venting	CH_4	No	Only the change in CMM emissions release will be taken into account, by monitoring the methane used or destroyed by the project activity.[22]
On-site electricity and fuel consumption due to the project activity, including treatment of the gas	CO_2	Included	Energy consumption from additional equipment such as compressors should be accounted for, following *"Standardized emission factors for the Ukrainian electricity grid"*
	CH_4	No	Excluded for simplification. This emission source is assumed to be very small.

[21] This is also the approach used in ACM0008.

[22] This is also the approach used in ACM0008.

	N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
Emissions from methane destruction	CO_2	Included	From the combustion of methane in a flare.
Emissions from methane destruction	CO_2	Included	From the combustion of methane supplied to the gas pipeline.
Emissions from NMHC destruction	CO_2	Included	From the combustion of NMHC in a flare, or heat/power generation, if NMHC accounts for more than 1% by volume of extracted coal mine gas.
Fugitive methane emissions of unburned methane	CH_4	No	Excluded for simplification, as project and baseline emissions would be the same. Therefore, this simplification has no impact on the calculated emission reductions. Only the change in CMM emissions release will be taken into account, by monitoring the methane used or destroyed by the project activity.
Fugitive methane emissions from on-site equipment	CH_4	No	Excluded for simplification. This emission source is assumed to be very small.[23]
Accidental methane release	CH_4	No	Excluded for simplification. This emission source is assumed to be very small.[24]

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 baseline setting: 14/12/2010.

Contact information of the entity and persons responsible:

- The persons preparing the documentation were:
  - Mr. Christiaan Vrolijk, Carbon Resource Management Ltd, cv@carbonresource.com, Tel: +44 20 7016 1420. Carbon Resource Management Ltd is not a project participants listed in annex 1.
  - Mr Tahir Musayev, Carbon Marketing and Trading Ltd, tm@carbonresource.com, Tel: +38 044 490 6968. Carbon Marketing and Trading Ltd is not a project participants listed in annex 1.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

>>

08/09/2003

The starting date of a JI project activity is the date on which the implementation or construction or real action of the project begins. The starting date of the proposed project activity is the date of the licence for gas utilisation; the actual start of the installation of equipment was shortly after.

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[23] This is also the approach used in ACM0008.

[24] This is also the approach used in ACM0008.

C.2. Expected operational lifetime of the project:

>>
20y-0m

C.3. Length of the crediting period:

>>
4y-0m for the pre-2008 period.
5y-0m for the first crediting period.
5y-0m for the second crediting period.

The first crediting period ends in line with the first commitment period under the Kyoto Protocol. A second crediting period is proposed to cover the 2013-2017 period, which covers most of the remaining lifetime of the project activity. The period prior to the start of the first Kyoto commitment period starts with the start of operation of the project and ends with the start of the first crediting period under Kyoto.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

>>
In accordance with appendix B of the JI guidelines and following the guidance on criteria for baseline setting and monitoring[25], the monitoring plan is described below, using the following step-wise approach.

Step 1 Indication and description of the approach chosen regarding monitoring

There is no approved CDM baseline and monitoring methodology which is applicable – without revisions being applied – to abandoned mines. Therefore, a JI specific approach (a) is applied.

JI specific approach

In accordance with the guidance the monitoring plan shall provides for:

(i) The collection and archiving of all relevant data necessary for estimating or measuring anthropogenic emissions of GHGs occurring within the project boundary during the crediting period;
(ii) The collection and archiving of all relevant data necessary for determining the baseline of anthropogenic emissions of GHGs within the project boundary during the crediting period;
(iii) The identification of all potential sources of, and the collection and archiving of data on increased anthropogenic emissions of GHGs outside the project boundary that are significant and reasonably attributable to the project during the crediting period. The project boundary shall encompass all anthropogenic emissions of GHGs under the control of the project participants that are significant and reasonably attributable to the JI project;
(iv) The collection and archiving of information on environmental impacts, in accordance with procedures as required by the host Party, where applicable;
(v) Quality assurance and control procedures for the monitoring process;
(vi) Procedures for the periodic calculation of the reductions of anthropogenic emissions by the proposed JI project, and for leakage effects, if any. Leakage is defined as the net change of anthropogenic emissions of GHGs which occurs outside the project boundary, and that is measurable and attributable to the JI project;
(vii) Documentation of all steps involved in the calculations referred to above.

[25] Guidance on criteria for baseline setting and monitoring, version 02 (JISC 18).

Step 2 Application of the approach chosen

In accordance with the guidance the monitoring plan provides for:

(i) The collection and archiving of all relevant data necessary for estimating or measuring anthropogenic emissions of GHGs occurring within the project boundary during the crediting period; and

(ii) The collection and archiving of all relevant data necessary for determining the baseline of anthropogenic emissions of GHGs within the project boundary during the crediting period.

All gas flows, concentration, temperature and pressure are collected on a continuous basis, with the equipment displaying the data on a 15 minute cycle. Total gas quantities are calculated from this data. Electricity consumption is monitored continuously. Therefore, all relevant data necessary for estimating or measuring anthropogenic emissions of GHGs occurring within the project boundary during the crediting period, as well as the baseline emissions.

With regards to the emission factor of the electricity system in the Ukraine, the previously established, validated and approved approach is applied and fixed ex-ante for the crediting period.[26]

(iii) The identification of all potential sources of, and the collection and archiving of data on increased anthropogenic emissions of GHGs outside the project boundary that are significant and reasonably attributable to the project during the crediting period. The project boundary shall encompass all anthropogenic emissions of GHGs under the control of the project participants that are significant and reasonably attributable to the JI project.

The capture and destruction of the methane in flares has no impact on emissions outside the project boundary.

The capture of the methane and supply of the gas into a gas pipeline displaces natural gas in the pipeline and will not cause an increase in gas use. The emissions from the destruction of the CMM is accounted as project emissions, while the emissions from the gas displaced is not accounted for in the baseline emissions, which is very conservative.

Therefore, leakage emissions are conservatively considered zero.

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[26] http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514, *Standardized emission factors for the Ukrainian electricity grid*, Version 5, Global Carbon B.V., 2 February 2007, validated by Tuev Sued, 17/08/2007.

(iv) The collection and archiving of information on environmental impacts, in accordance with procedures as required by the host Party, where applicable.

The host Party does not require the collection and archiving of information on environmental impacts of this project activity type.

(v) Quality assurance and control procedures for the monitoring process.

All measurements are conducted with calibrated measurement equipment according to relevant industry standards. CMM supply into the gas pipeline is cross checked against sales receipts.

All monthly data is checked and signed off by the JI Project Manager.

(vi) Procedures for the periodic calculation of the reductions of anthropogenic emissions by the proposed JI project, and for leakage effects, if any. Leakage is defined as the net change of anthropogenic emissions of GHGs which occurs outside the project boundary, and that is measurable and attributable to the JI project.

The reductions of anthropogenic emissions by the proposed JI project are calculated and reported by the JI Project Management Team on a monthly basis.

Leakage is considered zero.

The description all assumptions, formulae, parameters, data sources and key factors are presented in D.1.2.2 below. Section D.1.3 states the uncertainties for each parameter. The reductions are conservatively calculated by ignoring the baseline emissions from the supply of natural gas from the gas pipeline replaced by the project activity.

(vii) Documentation of all steps involved in the calculations referred to above.

All data collected as part of the monitoring are archived electronically and kept at least for 2 years after the last transfer of ERUs for the project. 100% of the data are monitored as indicated in the table below. All measurements are conducted with calibrated measurement equipment according to relevant industry standards.

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

Option 1 is chosen.

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
Flare								
1f	CMM volume to flare	Flow measurement	m3	m	continuous	100%	electronic	Displayed at 15-minute intervals
2f	Methane concentration to flare	Infrared measurement	Vol %	m	continuous	100%	electronic	Displayed at 15-minute intervals
3f	CMM pressure to flare	Pressure pick-off	mbar	m	continuous	100%	electronic	Displayed at 15-minute intervals
4f	CMM temperature to flare	Temperature pick-off	°C	m	continuous	100%	electronic	Displayed at 15-minute intervals
5f	MM_flare Methane amount to flare	Calculation	t	c	continuous	100%	electronic	Calculated at 15-minute intervals from the parameters 1f-4f above
T	Flare combustion temperature	Meter in flare	°C	m	continuous	100%	electronic	To determine combustion efficiency of the flare
Gas pipeline*								
1g	CMM volume to gas pipeline	Flow measurement	m3	m	continuous	100%	electronic	Displayed at hourly intervals

2g	Methane concentration to gas pipeline	Infrared measurement	Vol %	m	continuous	100%	electronic	Displayed at hourly intervals
3g	CMM pressure to gas pipeline	Pressure pick-off	mbar	m	continuous	100%	electronic	Displayed at hourly intervals
4g	CMM temperature to gas pipeline	Temperature pick-off	°C	m	continuous	100%	electronic	Displayed at hourly intervals
5g	MM_gaspipeline Methane amount to gas pipeline	Calculation	t	c	continuous	100%	electronic	Calculated at hourly intervals from the parameters 1g-4g above
Other								
6	CONS_ELEC Electricity consumption	Power meter	MWh	m	continuous	100%	electronic	Monthly readings / reporting
7	PC_NMHC NMHC concentration	Gas chromatography	Vol %	m	annually	100%	electronic	Laboratory analysis

*Note: * For historic data collected, see Annex 3 for details.*

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

>>
The project emissions are calculated from the CO2 emissions from the combustion of the methane and the additional energy consumption due to the project using the formula below. The emissions of unburned methane are accounted for through the baseline emission calculations taking into consideration the destruction efficiency. When the captured methane is burned in a flare, heat or power plant, combustion emissions are released. In addition, if NMHC account for more than 1% by volume of the extracted CMM, combustion emission from these gases should also be included.

PE_y = Σi (MD_i,y – MD_BL) * (EF_CH4 + r * EF_NMHC) + CONS_ELEC,y * CEF_ELEC
With:
r = PC_CH4 / PC_NMHC

Where:
MD_i,y is the amount of methane destroyed by use i in year y (tCH4)
i is the various uses of the methane (flare, gas pipeline)
MD_BL is the amount of methane destroyed in the baseline (tCH4)
EF_CH4 is the CO2 emission factor for methane combustion (2.75 tCO2e/tCH4)
r is the relative proportion of NMHC compared to methane
EF_NMHC is the CO2 emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane) (tCO2/tNMHC)
PC_CH4 is concentration (in mass) of methane in extracted gas (%), measured on wet basis
PC_NMHC is NMHC concentration (in mass) in extracted gas (%)
CONS_ELEC,y is the additional electricity consumption due to the implementation of the project in year y (MWh)
CEF_ELEC is the grid emission factor for electricity consumption (using the Standardized emission factors for the Ukrainian electricity grid at 0.896 tCO2e/MWh electricity use)

The amount of methane destroyed by use i is calculated using the following formula:

MD_i,y = MM_i,y * Eff_i
With:
MM_i,y is the amount of methane sent to use i in year y (tCH4)
Eff_i is the destruction efficiency of use i (set to 99.5% for the flare assuming the manufacturer's combustion temperature specifications are met, 98.5% for gas pipeline)

The amount of methane destroyed in the baseline is zero, as there is no use or destruction prior to the implementation of the project activity:

MD_BL = 0

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-*	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/	Comment

referencing to D.2.)							paper)	
Flare								
1f	CMM volume to flare	Flow measurement	m3	M	continuous	100%	electronic	Displayed at 15-minute intervals
2f	Methane concentration to flare	Infrared measurement	Vol %	m	continuous	100%	electronic	Displayed at 15-minute intervals
3f	CMM pressure to flare	Pressure pick-off	mbar	m	continuous	100%	electronic	Displayed at 15-minute intervals
4f	CMM temperature to flare	Temperature pick-off	°C	m	continuous	100%	electronic	Displayed at 15-minute intervals
5f	MM_Flare Methane amount to flare	Calculation	t	c	continuous	100%	electronic	Calculated at 15-minute intervals from the parameters 1f-4f above
T	Flare combustion temperature	Meter in flare	°C	m	continuous	100%	electronic	To determine combustion efficiency of the flare
Gas pipeline*								
1g	CMM volume to gas pipeline	Flow measurement	m3	m	continuous	100%	electronic	Displayed at hourly intervals
2g	Methane concentration to gas pipeline	Infrared measurement	Vol %	m	continuous	100%	electronic	Displayed at hourly intervals
3g	CMM pressure to gas pipeline	Pressure pick-off	mbar	m	continuous	100%	electronic	Displayed at hourly intervals
4g	CMM temperature to gas pipeline	Temperature pick-off	°C	m	continuous	100%	electronic	Displayed at hourly intervals

5g	MM_gaspipeline Methane amount to gas pipeline	Calculation	t	c	continuous	100%	electronic	Calculated at hourly intervals from the parameters 1g-4g above

*Note: * For historic data collected, see Annex 3 for details.*

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

>>
The baseline emissions are calculated from the amount of methane captured and destroyed and the global warming potential of methane, using the formula below. The baseline emissions from the supply of natural gas from the gas pipeline replaced by the project activity is conservatively ignored.

BE_y = Σi (MD_i,y – MD_BL) * GWP_CH4
With:
MD_i,y is the amount of methane destroyed by use i in year y (tCH4)
i is the various uses of the methane (flare, gas pipeline)
MD_BL is the amount of methane destroyed in the baseline (tCH4)
GWP_CH4 is the 100 year global warming potential of methane (21 tCO2e/tCH4)

The amount of methane destroyed by use i is calculated using the following formula:

MD_i,y = MM_i,y * Eff_i
With:
MM_i,y is the amount of methane sent to use i in year y (tCH4)
Eff_i is the destruction efficiency of use i (set to 99.5% for the flare assuming the manufacturer's combustion temperature specifications are met, 98.5% for gas pipeline)

The amount of methane destroyed in the baseline is zero, as there is no use or destruction prior to the implementation of the project activity:

MD_BL = 0

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

This section is left blank on purpose, as option 1 is chosen.

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 I, estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

This section is left blank on purpose, as option 1 is chosen.

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):

>>
This section is left blank on purpose, as option 1 is chosen.

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

Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and is directly attributable to the JI project. Project participants must undertake an assessment of the potential leakage of the proposed JI project and explain which sources of leakage are to be calculated, and which can be neglected. All sources of leakage that are included shall be quantified and a procedure for an ex ante estimate shall be provided.

In accordance with ACM0008 the following leakages would need to be considered: displacement of baseline thermal energy uses; CBM drainage from outside the de-stressed zone; impact of the project on coal production; and impact of the project on coal prices. None of such leakages apply to the project activity: there is no CMM being used for thermal demand in the baseline scenario, there is no CBM involved, and as the project is implemented at an abandoned mine there is neither impact on coal production nor on coal prices.

The project activity displaces natural gas use from the gas grid, therefore displaces the emissions from the natural gas use as well as any upstream emissions associated with the production of natural gas. These sources of leakage would result in additional emission reductions when quantified, however the project participants chose to conservatively ignore these additional reductions.

Therefore, leakage emissions are considered zero:

LE_y = 0

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), calculatI(c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Leakage emissions are considered zero.

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

>>
Leakage emissions are considered zero.

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):

>>
Using the formulae in D.1.1.2 and D.1.1.4 above, and assuming that NMHC concentrations are less than 1%, the emission reductions can be calculated as follows:

ER_y = Σi (MM_i,y * Eff_i – MD_BL) * (GWP_CH4 – EF_CH4) – CONS_ELEC,y * CEF_ELEC = (MM_flare,y * 99.5% + MM_gaspipeline,y * 98.5%) * 18.25 – CONS_ELEC,y * 0.896

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:

>>

The host Party does not require the collection and archiving of information on environmental impacts of this project activity type.

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.
1f, 1g CMM volume	*low*	The flow meter consists 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 indication of the orifice pressure difference meter has usually hardly any fluctuations and no recalibration is needed. The meter should be initially controlled during the final inspection by the manufacturer and will be checked regularly according to the manufacturer's instructions. The indications of the measurement instruments should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.
2f, 2g Methane concentration	*medium*	The indication of the CH4 gas analyser is drifting and has to be recalibrated periodically. The recalibration will be carried out regularly according to the manufacturer's instructions.
3f, 3g CMM pressure	*low*	The indication of the pressure meter has usually hardly any fluctuations and no recalibration is needed. The meter should be initially controlled during the final inspection by the manufacturer and will be checked regularly according to the manufacturer's instructions. The indications of the measurement instruments should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.
4f, 4g CMM temperature	*low*	The indication of the temperature meter has usually hardly any fluctuations and no recalibration is needed. The meter should be initially controlled during the final inspection by the manufacturer and will be checked regularly according to the manufacturer's instructions. The indications of the measurement instruments should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.
5f, 5g Methane amount	*medium*	The quality of the determined value for the methane amount is mainly affected by the methane concentration, see 2. The formula requires no further controlling once it has been programmed and checked.

T Combustion temperature of flare	*low*	The indication of the temperature meter has usually hardly any fluctuations and no recalibration is needed. The meter should be initially controlled during the final inspection by the manufacturer and will be checked regularly according to the manufacturer's instructions. The indications of the measurement instruments should be controlled during the regular inspections while the operation time and a gauge which is obviously out of order should be substituted.
6 Power consumption	*low*	The electricity meter will be provided by the local power utility company. The company is also responsible for regular calibrations of the power meter. Cross-checked against invoices from the grid.
7 NMHC concentration	*low*	Laboratory analysis using accurate gas chromatography.

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

>>

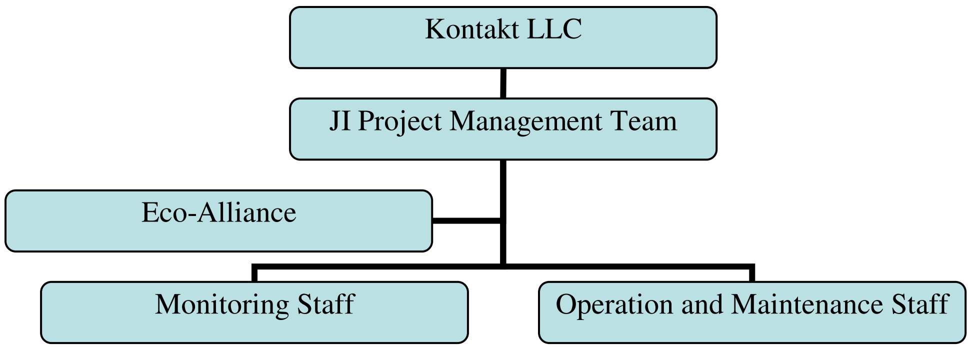
1. Introduction

The project adopts a JI specific monitoring approach. This monitoring plan describes the responsibilities of the JI Project Management Team and the methods and procedures to be adopted to implement the monitoring plan described in the Project Design Document in respect of this project activity.

2. Project Management & Responsibilities

The operational and management structure (as shown in below the figure) and the responsibilities of the principals are as follows.

Ultimate responsibility for the project rests with the JI Project Manager.



The JI Project Manager is responsible for:

- Checking and signing off all project operational-related activities
- Appointing and liaising with the accredited independent entity (AIE)
- Identifying an audit team leader to be appointed by the Chief Engineer or a delegated authority
- Appointing a JI technical team to undertake the operational activities
- Organising training and refresher courses
- Preparing and supervising a Health and Safety Plan for the JI technical team
- Supervising the work of the JI technical team
- Cross checking reported volumes and sales receipts

The monitoring staff are responsible for:

- Monitoring and recording of the relevant parameters

Historically the daily monitoring has been carried out by the team at the gas consumer, recording all parameters in log books. The cumulative monthly records taken from the electronic monitoring equipment has historically been collected by the gas supply company. This monitoring procedure will continue as back up procedure once the new electronic metering equipment is installed at the supply into the gas treatment plant.

The operation and maintenance staff are responsible for:

- Operation and maintenance of the project infrastructure
- Service and maintenance of flares by the equipment provider

Eco-Alliance assists the project where needed, in particular with regards to the flares.

3. Data to be monitored and recorded throughout the crediting period

Table 7 Parameters to be monitored and recorded

Details of monitoring parameters	**Parameters to be measured**	**Monitoring system**	**Reporting**
5f MM_flare,y Methane sent to flare	Mixture flow (1f), gas composition (2f), gas pressure (3f), and gas temperature (4f)	Electronic monitoring system, which calculates the amount of methane automatically from the separate parameters 1f-	Reporting of monthly totals

		4f	only.*
5g MM_gaspipeline,y Methane sent to gas pipeline	Mixture flow (1g), gas composition (2g), gas pressure (3g), and gas temperature (4g)	Electronic monitoring system, which calculates the amount of methane automatically from the separate parameters 1g-4g	Reporting of monthly totals only
6 CONS_ELEC,y Electricity consumption by the project	Electricity consumption	Electricity meter from the grid company	Reporting of monthly totals only
7 NMHC concentration		Laboratory analysis	If NMHC account for more than 1% by volume of the extracted CMM

*Note: * If combustion temperature is below the manufacturer's 850C, then the volumes need to be separately reported by temperature.*

4. Data and parameters used but not monitored throughout the crediting period, but are determined only once (and thus remain fixed throughout the crediting period), and that are available already at the stage of determination regarding the PDD

Conversion factors and standard variables to be used in the calculations:

- Density of methane = 0.717 kg/m3[27]
- GWP of methane GWP_CH4 = 21 tCO2e/tCH4
- CO2 emission factor for methane combustion EF_CH4 = 2.75 tCO2e/tCH4
- Grid emission factor for electricity consumption CEF_ELEC = 0.896 tCO2e/MWh[28]
- Efficiency of combustion in flare Eff_flare = 99.5%, assuming the manufacturer's combustion temperature specifications are met, which is the default value for the fraction of carbon dioxide for gas combustion according to IPCC 1996.[29] This is conservative, because the chosen flare is designed to fulfil the German regulations for flaring of landfill gas, which require a minimum efficiency of 99.9 %.

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[27] DIN ISO 6976 (1995): Density of methane under normal conditions of temperature (273.15 °K) and pressure (1013 mbar).

[28] http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514, *Standardized emission factors for the Ukrainian electricity grid*, Version 5, Global Carbon B.V., 2 February 2007, validated by Tuev Sued, 17/08/2007.

[29] The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories gives a standard value for the fraction of carbon oxidised for gas combustion of 99.5% (Reference Manual, Table 1.6, page 1.29).

- Efficiency of destruction through the supply to the gas pipeline Eff_gaspipeline = 98.5%, which is the default overall efficiency of destruction/oxidation through gas grid to various combustion end uses, combing fugitive emissions from the gas grid and combustion efficiency at end use according to ACM0008 version 7.
- Amount of methane destroyed in the baseline MD_BL = 0 tCH4

5. Monitoring System

This project will involve monitoring the volume flow of methane utilised under conditions of standard temperature and pressure, and the volume flow will be measured using international standard methods. All the equipment should be serviced, calibrated and maintained in accordance with the original manufacturer's instructions and keep complete records. Input data from the transducers should be recorded at no more than hourly intervals.

The gas flow monitoring system specification should allow for:
- Detection of emergency or inappropriate venting of gases
- Providing a certified instrument calibration record
- Backup manual monitoring at daily intervals by certified and trained operators with results signed off by a nominated supervising engineer
- Measurement of barometric pressure, gas temperature, gas pressure, gas composition and mixture flow
- Gas flows to be adjusted to normal temperature and pressure
- Additional parameters to be measured at the power generation plant: hours run on each engine

New electronic metering equipment will be installed as part of the implementation of the project, expected in 2011, at the supply point into the gas treatment plant, which will be used for the monitoring of the relevant parameters (1g-5g) for gas supply to the gas grid.

Historically, the monitoring equipment installed at the gas consumers, i.e. at the end of the gas supply pipeline, have been used by both the developer and the gas supply company for recording and invoicing purposes. This procedure also includes the monthly gas concentration analysis in the laboratory by gas chromatography.

The flares that will be installed as part of the project activity come with their own internal electronic metering equipment, which will be used for the monitoring of the relevant parameters (1f-5f) for gas consumption by the flares.

Calibrations

All measurement equipment are calibrated and checked for accuracy by a qualified third party in accordance with manufacturer's recommendations and industry standard. Calibrations will take place so that equipment have a valid calibration certificate.

A list of measurement sensors will be maintained showing the location, type, date installed and date calibration expires on a form. A list of spare sensors held in stock will also be kept showing type, date delivered and calibration expiry date.

6. Data collection and handling

Data will be transferred from each monitoring location to a centralised processing unit which can calculate the mass of methane automatically. The final result from the meter will be the accumulated mass of methane under normal temperature and pressure conditions. These readings will be checked for any anomalies before being filed for future reference.

The data collected will be kept on site and transmitted through the internet-system AERUCS to ensure proper control of the project. System AERUCS (Automatic Emission Reduction Units Calculation System) is designed to measure the number of burnt gas and evolved by burning the gas thermal energy and makes it easy to get data and view it using the Internet. Also it designed: to collect information coming from sensors, which are located within a point of consideration, the visual control of parameters, storing information for a certain amount of time and relaying information to the server automatically or on demand. Also, the system provides tracking serviceable work of all its elements with the display units and operational light signalling.

Initially 4 staff will be properly trained so as to be qualified for monitoring and recording data. The records will be double checked by the JI Project Manager who will be responsible for accuracy and frequency of the measurements. Readings of data will be recorded on paper by technicians every day.

Historically, data was collected on the site of the gas consumption on a continuous basis, with the gas supply company downloading the aggregates on a monthly basis. The monthly gas data and laboratory analysis of the concentrations was used for the purposes of invoicing by both the gas supply company and the project developer.

All data collected as part of the monitoring are archived electronically and kept at least for 2 years after the last transfer of ERUs for the project. 100% of the data are monitored as indicated in the table below. All measurements are conducted with calibrated measurement equipment according to relevant industry standards.

7. Reporting

The operator transmits copies of completed worksheets on a regular basis while maintaining originals on file.

The project operator should prepare a brief annual report which should include: information on overall project performance, emission reductions generated and verified and comparison with targets, etc. The report can be combined with the periodic verification report.

8. Training

It is the responsibility of the operator to ensure that the required capacity and internal training is made available to its technicians to enable them to undertake the tasks required by this monitoring plan. Eco-Alliance will provide on the job training when the flares are being installed.

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

>>

Contact information of the entity and persons responsible:

- The persons preparing the documentation were:
    - Mr. Christiaan Vrolijk, Carbon Resource Management Ltd, cv@carbonresource.com, Tel: +44 20 7016 1420. Carbon Resource Management Ltd is not a project participants listed in annex 1.
    - Mr Tahir Musayev, Carbon Marketing and Trading Ltd, tm@carbonresource.com, Tel: +38 044 490 6968. Carbon Marketing and Trading Ltd is not a project participants listed in annex 1.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

>>
The project emissions are calculated from the CO_2 emissions from the combustion of the methane and the additional energy consumption due to the project using the formula below. The emissions of unburned methane are accounted for by taking into consideration the destruction efficiency in the baseline emissions.

$$PE_y = \Sigma_i (MD_{i,y} – MD_{BL}) * (EF_{CH4} + r * CEF_{NMHC}) + CONS_{ELEC,y} * CEF_{ELEC}$$

With:

$$r = PC_{CH4} / PC_{NMHC}$$

Where:
PE_y is the project emissions in year y (tCO_2e)
$MD_{i,y}$ is the amount of methane destroyed by use i in year y (tCH_4)
i is the various uses of the methane (flare, gas pipeline)
MD_{BL} is the amount of methane destroyed in the baseline (tCH_4) (the amount of methane destroyed in the baseline is zero, $MD_{BL} = 0$).
EF_{CH4} is the CO_2 emission factor for methane combustion (2.75 tCO_2e/tCH_4)
r is the relative proportion of NMHC compared to methane (the amount of NMHC is below 1% according to laboratory analysis, r = 0)
EF_{NMHC} is the CO_2 emission factor for combusted non methane hydrocarbons (the concentration varies and, therefore, to be obtained through periodical analysis of captured methane) ($tCO_2/tNMHC$)
PC_{CH4} is concentration (in mass) of methane in extracted gas (%), measured on wet basis
PC_{NMHC} is NMHC concentration (in mass) in extracted gas (%)
$CONS_{ELEC,y}$ is the additional electricity consumption due to the implementation of the project in year y (MWh)
CEF_{ELEC} is the grid emission factor for electricity consumption (using the Standardized emission factors for the Ukrainian electricity grid at 0.896 tCO_2e/MWh electricity use)

The amount of methane destroyed by use i is calculated using the following formula:

$$MD_{i,y} = MM_{i,y} * Eff_i$$

With:
$MM_{i,y}$ is the amount of methane sent to use i in year y (tCH_4)
Eff_i is the destruction efficiency of use i (set to 99.5% for the flare assuming the manufacturer's combustion temperature specifications are met, 98.5% for gas pipeline)

The amount of methane destroyed in the baseline is zero, as there is no use or destruction prior to the implementation of the project activity:

$$MD_{BL} = 0$$

The methane quantities are taken from the feasibility studies, based on the test drilling. Electricity consumption is initially conservatively estimated from the capacity of the fans in the flaring equipment, and assumed to be operating full load – the actual consumption will be monitored with an electricity meter. As the gas is under pressure, no pumps are necessary for the supply to the gas pipeline.

The total project emissions from each of the three sources, flare, gas pipeline and additional electricity consumption, are presented in the table below.

Table 8 Total project emissions

Year_y	PE_y	MD_gas pipeline,y	MD_flare,y	MD_BL	EF_CH4	CONS_ELEC,y	CEF_ELEC
2004	10,522	3,826	-	0	2.75	-	0.896
2005	7,581	2,757	-	0	2.75	-	0.896
2006	4,905	1,784	-	0	2.75	-	0.896
2007	3,652	1,328	-	0	2.75	-	0.896
2008	3,086	1,122	-	0	2.75	-	0.896
2009	2,902	1,055	-	0	2.75	-	0.896
2010	2,248	817	-	0	2.75	-	0.896
2011	18,762	660	6,005	0	2.75	481.80	0.896
2012	39,943	2,200	12,011	0	2.75	963.60	0.896
2013	39,943	2,200	12,011	0	2.75	963.60	0.896
2014	39,943	2,200	12,011	0	2.75	963.60	0.896
2015	39,943	2,200	12,011	0	2.75	963.60	0.896
2016	39,943	2,200	12,011	0	2.75	963.60	0.896
2017	39,943	2,200	12,011	0	2.75	963.60	0.896

Note: Project emissions are conservatively rounded up to whole tonnes.

E.2. Estimated leakage:

>>
Not applicable. Leakage is considered zero.

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

>>
Table 9 Project emissions and leakage

Year_y	PE_y	LE_y
2004	10,522	0
2005	7,581	0
2006	4,905	0
2007	3,652	0
2008	3,086	0
2009	2,902	0
2010	2,248	0
2011	18,762	0
2012	39,943	0
2013	39,943	0
2014	39,943	0
2015	39,943	0
2016	39,943	0
2017	39,943	0

E.4. Estimated baseline emissions:

>>

The baseline emissions are calculated from the amount of methane captured and destroyed and the global warming potential of methane. The unburned methane in the project activity is excluded from the volume of methane captured and destroyed. Therefore the emissions associated with the unburned methane are neither included in the baseline emissions nor the projects emissions, which is equivalent to the treatment of emissions of methane from continued venting as only the change in CMM emissions release is taken into account.

$BE_y = \Sigma_i (MD_{i,y} – MD_{BL}) * GWP_{CH4}$
With:
BE_y is the baseline emissions in year y (tCO_2e)
$MD_{i,y}$ is the amount of methane destroyed by use i in year y (tCH_4)
i is the various uses of the methane (flare, gas pipeline)
MD_{BL} is the amount of methane destroyed in the baseline (tCH_4)
GWP_{CH4} is the 100 year global warming potential of methane (21 tCO_2e/tCH_4)

The amount of methane destroyed by use i is calculated using the following formula:

$MD_{i,y} = MM_{i,y} * Eff_i$
With:
$MM_{i,y}$ is the amount of methane sent to use i in year y (tCH_4)
Eff_i is the destruction efficiency of use i (set to 99.5% for the flare, 98.5% for gas pipeline)

The amount of methane destroyed in the baseline is zero, as there is no use or destruction prior to the implementation of the project activity:

$MD_{BL} = 0$

The total baseline emissions from each of the two sources, flare and gas pipeline, are presented in the table below.

Table 10 Emissions from methane released to the atmosphere

Year_y	BE_y	MD_gas pipeline,y	MD_flare,y	MD_BL	GWP_CH4
2004	80,343	3,826	-	0	21
2005	57,889	2,757	-	0	21
2006	37,456	1,784	-	0	21
2007	27,885	1,328	-	0	21
2008	23,564	1,122	-	0	21
2009	22,155	1,055	-	0	21
2010	17,159	817	-	0	21
2011	139,970	660	6,005	0	21
2012	298,424	2,200	12,011	0	21
2013	298,424	2,200	12,011	0	21
2014	298,424	2,200	12,011	0	21
2015	298,424	2,200	12,011	0	21
2016	298,424	2,200	12,011	0	21
2017	298,424	2,200	12,011	0	21

Note: Baseline emissions are conservatively rounded down to whole tonnes.

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

>>
Using the formulae above, the emission reductions can be calculated as follows:

ER_y = Σi (MM_i,y * Eff_i – MD_BL) * (GWP_CH4 – EF_CH4) – CONS_ELEC,y * CEF_ELEC = (MM_flare,y * 99.5% + MM_gaspipeline,y * 98.5%) * 18.25 – CONS_ELEC,y * 0.896

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

>>
Table 11 Estimated emission reductions 2004-2007

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2004	10,522	0	80,343	69,821
2005	7,581	0	57,889	50,308
2006	4,905	0	37,456	32,551
2007	3,652	0	27,885	24,233
Total (tonnes of CO2 equivalent)	26,660	0	203,573	176,913

Table 12 Estimated emission reductions 2008-2012

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2008	3,086	0	23,564	20,478
2009	2,902	0	22,155	19,253
2010	2,248	0	17,159	14,911
2011	18,762	0	139,970	121,208
2012	39,943	0	298,424	258,481
Total (tonnes of CO2 equivalent)	66,941	0	501,272	434,331

Table 13 Estimated emission reductions 2013-2017

Year	Estimated project emissions (tonnes of CO2 equivalent)	Estimated leakage (tonnes of CO2 equivalent)	Estimated baseline emissions (tonnes of CO2 equivalent)	Estimated emission reductions (tonnes of CO2 equivalent)
2013	39,943	0	298,424	258,481
2014	39,943	0	298,424	258,481
2015	39,943	0	298,424	258,481
2016	39,943	0	298,424	258,481
2017	39,943	0	298,424	258,481
Total (tonnes of CO2 equivalent)	199,715	0	1,492,120	1,292,405

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:

>>
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 project was submitted to the Ukrainian Ministry of Environmental Protection for preliminary state ecological expertise.

The flares are built in in transportable container modules. The complete facilities are built in series production at the manufacturer. The container technology provides an easy removal of the facility after shutdown. The container has only a small footprint and is set up on four small ready-mix concrete plates, which are put under the four angles of the container. Because no groundwork is needed the complete plant can be removed fast and easy and the original state of the site can be restored in an uncomplicated way after shut down. The facilities do not use the natural resources: water, ground and landscape, so that no impairment on nature or landscape is given. The facilities do not produce any waste, sewage or condensate. Due to the very high operational safety standards supplied a very low accident hazard is given.

All combustion units require an approval by the Ukrainian Mining Authorities. The combustion processes are designed to comply for the German emissions limits (German "TA-Luft") which are more rigorous, especially for NOx, CO and CnHm, than the Ukrainian limits. The 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. However, an environmental impact assessment has been prepared and was approved.[30] 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 National Environmental Investment Agency of Ukraine.

Kontakt LLC published information on the project in the coal mines newspaper and geologist magazine[31]. The project received a lot of positive comments. All comments received by the developer 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.

[30] "Assessment of Impact on the Environment / EIA / During the Construction of Exploratory Wells number 1,2,3,4,5,6,7,8,9,10,11 and 12 for Methane Gas and Degassing of Coal Deposits in the Northern and Southern Tomashevsky Domes of the Lisichansk-Tomashevska area of the Lisichansk Mine Fields of the Donbass region.", prepared by Geoindustriya NTC LLC, Chief of the Geology Department, Chief Engineer of the Project - Bobrov A. Approved by by Chief of Leninskaya GRE VO "Ukrvuglegeologiya" Vsevolodskij K. Harkiv 2003.

[31] For example "Геолог Украины" [Ukrainian Geologist], 2009, No. 3, "Osoblyvost' osnovnyh naprjam v provedennja degazacijnyh robit na Tomashivs'kij ploshhje Lysychans'kogo geologo-promyslovogo rajonu Donbasu" [Features of the main trends in carrying out degasification of Tomashivska area of the Lysychansk geological and industrial region of Donbass].

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

The key information and data used to establish the baseline (variables, parameters, data sources etc.) are presented below.

Data / Parameter	**GWP_CH4**
Data unit	**tCO2e/tCH4**
Description	Global warming potential of methane
Time of determination/monitoring	Ex-ante
Source of data (to be) used	IPCC default value as per registered PDD
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	IPCC default
QA/QC procedures (to be) applied:	Not applicable
Any comment	Baseline and project emission calculations

Data / Parameter:	**Eff_gaspipeline**
Data unit	
Description	Efficiency of destruction through the supply of gas to the gas pipeline
Time of determination/monitoring	Ex-ante
Source of data (to be) used	ACM0008 (using IPCC default values)
Value of data applied (for ex ante calculations/determinations)	98.5%
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Default overall efficiency of destruction/oxidation through gas grid to various combustion end uses, combing fugitive emissions from the gas grid and combustion efficiency at end use according to ACM0008 version 7
QA/QC procedures (to be) applied:	Not applicable
Any comment	Baseline and project emission calculations

Data / Parameter:	**Eff_flare**
Data unit	
Description	Efficiency of combustion in flare
Time of determination/monitoring	Ex-ante
Source of data (to be) used	The Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (Reference Manual, Table 1.6, page 1.29)
Value of data applied (for ex ante	99.5%

calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	This is conservative, because the chosen flare is designed to fulfil the German regulations for flaring of landfill gas, which require a minimum efficiency of 99.9 %.
QA/QC procedures (to be) applied:	Not applicable
Any comment	Baseline and project emission calculations

Data / Parameter:	**MM_gaspipeline**
Data unit	**tCH4**
Description	Quantity of methane sent to gas pipeline
Time of determination/monitoring	Ex-post
Source of data (to be) used	Electronic monitoring equipment will be installed in 2011. For historic data source, please see description in Annex 3.
Value of data applied (for ex ante calculations/determinations)	Year_y MM_gas pipeline,y 2004 3,884 2005 2,799 2006 1,811 2007 1,348 2008 1,139 2009 1,071 2010 830 2011 670 2012 2,234 2013 2,234 2014 2,234 2015 2,234 2016 2,234 2017 2,234
Justification of the choice of data or description of measurement methods and procedures (to be) applied	MM_gaspipeline = Normalised flow * Methane concentration * Methane density The data (flow, temperature, pressure, normalised flow and concentration) are continuously recorded to memory by electronic devices.
QA/QC procedures (to be) applied:	Checked against sales receipts
Any comment	Baseline and project emission calculations

Data / Parameter:	**MD_BL**
Data unit	**tCH4**
Description	Quantity of methane destroyed in the baseline
Time of determination/monitoring	Ex-ante
Source of data (to be) used	
Value of data applied (for ex ante calculations/determinations)	0

Justification of the choice of data or description of measurement methods and procedures (to be) applied	There was no CMM capture, thus no possible destruction, prior to the implementation of the project.
QA/QC procedures (to be) applied:	
Any comment	Baseline and project emission calculations

Data / Parameter:	**MM_flare**
Data unit	**tCH4**
Description	Quantity of methane sent to flare
Time of determination/monitoring	Ex-post
Source of data (to be) used	Electronic monitoring equipment is installed as part of the flare unit.
Value of data applied (for ex ante calculations/determinations)	Year_y MM_flare,y 2004 - 2005 - 2006 - 2007 - 2008 - 2009 - 2010 - 2011 6,035 2012 12,071 2013 12,071 2014 12,071 2015 12,071 2016 12,071 2017 12,071
Justification of the choice of data or description of measurement methods and procedures (to be) applied	MM_flare = Normalised flow * Methane concentration * Methane density The data (flow, temperature, pressure, normalised flow and concentration) are continuously recorded to memory by electronic devices.
QA/QC procedures (to be) applied:	Calibrated as per manufacturer's requirements.
Any comment	Baseline and project emission calculations

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, Version 5, Global Carbon B.V., 2 February 2007, validated by Tuev Sued, 17/08/2007: http://ji.unfccc.int/UserManagement/FileStorage/46JW2KL36KM0GEMI0PHDTQF6DVI514.
This reference has already been used by Global Carbon B.V. for the Project "Displacement of electricity generation with fossil fuels in the electricity grid by an electricity generation project with introduction of Steel Mill Waste Gas Firing Turbine power generation system", which has got the final determination by NEIA:
http://ji.unfccc.int/UserManagement/FileStorage/AQF0TM19HROY38IC7WXLBPK5EDZV2U.

Annex 3

MONITORING PLAN

The monitoring plan is listed in section D.

In this section additional information concerning current monitoring applied is given:

Monitoring plan applied:

The monitoring plan to be applied during the first monitoring period will provide mainly handwritten data. The monitoring and recording has initially followed the conventional processes within the industry. Although the electronic measuring equipment has been installed, no electronic storage of the data took place prior to registration. The data have been manually read from the electronic devices and hand written in journals. This method is the most common practice in Ukraine.

New electronic monitoring equipment at the point of supply to the gas treatment plant will by installed as part of the project implementation, in 2011. And an electronically data storage system will be put in operation in 2011.

So there are two monitoring procedures:

1) Manual record of the monitored data from 01/01/2004
2) Electronically record of the monitored data from 2011 (exact date will be presented in the relevant monitoring report).

Method 1 will continue to be used by the developer as backup.

Monitoring procedure 1:

The first procedure concerns the monitoring of operation data and is relevant for safety and proper operation of the wells and gas preparation unit, and thus the supply of CMM to the gas pipeline. The data (temperatures, pressures etc.) are continuously recorded to memory by electronic devices Flow Tec (ФЛОУТЕК) and Flow Nek (ФЛОИНЭК). The electronic memory can store the data for the last 6 monthly only. Paper records are available for the whole period.

The paper records of the quantity of methane, which is fed into the gas pipeline, are monthly printed sheets with the daily records, counter-signed by both the methane supplier and consumer. Two separate consumers are supplied with gas, Lisichansks Glassworks Plant “Proletary” (Пролетарий) and Lisichansk Brewery “Lispy” (ЛИСПИ). In the period January 2004 to June 2005, a third consumer was also supplied with gas, Vehicle Filling Station LLC “Alternativa”, which utilised gas through its gas station. “Proletary” and “Alternativa” use Flow Tec, “Lispy” uses Flow Nek.

Methane concentrations of the CMM supply into the pipeline are determined monthly by laboratory analysis.

The historic data collection in the monitoring procedure 1 is indicated below.

Historic data collected in order to monitor emission reductions from the project, and how these data are being archived, as per the table in Section D.1.2.1.

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
Gas pipeline								
1g-backup	CMM volume to gas pipeline	Normalised flow measurement*	Nm3	m	continuous	100%	electronic	Can be stored in memory for the last 6 month only
2g-backup	Methane concentration to gas pipeline	Gas chromatograph	Vol %	m	monthly	100%	paper	Laboratory analysis
3g-backup	CMM pressure to gas pipeline	Pressure pick-off	mbar	m	continuous	100%	electronic	Included in 1g-backup
4g-backup	CMM temperature to gas pipeline	Temperature pick-off	°C	m	continuous	100%	electronic	Included in 1g-backup
5g-backup	MM_gaspipeline Methane amount to gas pipeline	Calculation	t	c	daily	100%	paper	Manual recorded journals calculated from 1g-backup and 2g-backup above. Monthly printed sheets with daily records.

*Note: * Normalised flow calculated from flow, pressure and temperature.*

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", needs to be taken for the determination of the project emissions from flaring. In difference to the flaring tool a combustion efficiency of 99.5%, according to the IPCC guidelines (see also ACM0008 Version 1 and Version 2), has been taken into account instead of the default value of 90% as given in the flaring tool.

German regulations

The chosen flare is designed to fulfil the German regulations for flaring of landfill gas. In these regulations a minimum efficiency of 99.9 % is required. This efficiency is proved by a continuous measurement of the combustion temperature, 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, NOx 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; possible un-combusted 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.

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