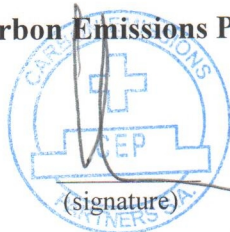# JOINT IMPLEMENTATION PROJECT

«Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC «Kharkivgaz»

Position of the head of the organization, institution, body, which prepared the document

Director of CEP Carbon Emissions Partners S.A.

_____   _____   **Fabian Knodel**
(date)   (signature)   (name and patronymic, last name)

PS

Position of the economic entity – owner of the source, where the Joint Implementation Project is planned to be carried out

Chairman of the Management Board of PJSC «Kharkivgaz»

_____   _____   **V.V.Zlenko**
(date)   (signature)   (surname, name and patronymic of the person)

PS

Kharkiv 2012

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

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ABBREVIATIONS

GDN – gas distribution network
CLP – conditional leak-proofness
SPNGL – standard physical natural gas leak
EPNGL – excess physical natural gas leak
PETM – Purposeful Examination and Technical Maintenance
NGLF – natural gas leak factors
GHG – greenhouse gas
UGSSR – Ukrainian Gas Supply System Safety Rules
GDP – gas distribution point
CGDP – cabinet-type gas distribution point
CDM – Clean Development Mechanism
NERC – National Electricity Regulatory Commission
PJSC – Public Joint-Stock Company
PDD – Project Design Document
JI – Joint Implementation

SECTION A.   General description of the project

A.1.   Title of the project:

Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz"

Sectoral scope 10. Fugitive emissions from fuel (solid fuel, oil and gas)

PDD Version: 02.

Date: 08/10/2012.

A.2.   Description of the project:

The purpose of the project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz" is reduction of natural gas leaks at gas transportation and gas distribution infrastructure of PJSC "Kharkivgaz". These leaks are the result of leaking gas equipment and gas fittings.
 The main sources of leaks are gas distribution networks (GDN) components included in the project boundary, namely:
- gas equipment (pressure regulators, valves, filters, switching devices) located at gas distribution points (GDP) and cabinet gas distribution points (CGDP) of PJSC "Kharkivgaz";
- gas fittings (taps, valves, vents, etc.), located at the gas pipelines of PJSC "Kharkivgaz".

The project boundary includes 1034 GDPs, 674 CGDPs, and 3751 gas fitting units.

The main cause of natural gas leaks is failure of sealing elements of equipment caused by temperature fluctuations and moisture. Natural gas consists mainly of methane, which is greenhouse gas. Methane makes up 92-95% of natural gas. Methane leak repair will lead to the reduction of greenhouse gas emissions. Hereinafter, natural gas leaks will also be referred to as "methane leaks", since methane is the gas instrumental leak measurements deal with.

Situation prior to the project.

PJSC "Kharkivgaz" is a company, which provides transportation and supply of natural gas in Kharkiv city and territories adherent to the city. At the moment, the company supplies natural gas to industrial enterprises (181), budget-funded and public utility entities (5 221), population (520 458 apartments and individual households).

The main activities of the company are:
- Transportation of natural gas by distribution pipelines;
- Supply of natural gas at regulated tariffs;
- Installation of domestic gas meters;
- Design, installation of gas supply systems;
- Maintenance, repair works.

The structure of the existing tariffs for gas transportation, regulated by the state, do not take into account the depreciation and investment needs of gas distribution enterprises. This causes a lack of funds for repair and modernization of gas networks, purchase of adequate technological equipment and components and, as a result, pushes up natural gas leaks at PJSC "Kharkivgaz" facilities.
Prior to the implementation of this project, JI mechanism provided for by the Kyoto Protocol was planned to be applied.

Baseline scenario.

Prior to the start of the Project, PJSC "Kharkivgaz" carried out detection of methane leaks from gas fittings of gas distribution networks using organoleptic methods, methane leaks detection at GDP and CGDP using gas detectors in accordance with Ukrainian Gas Supply System Safety Rules[1] (UGSSR) in order to avoid emergency and explosion-hazardous situations. Measurement of methane leaks, their registration and accounting were not conducted, and the proper measuring devices were absent. Fixing the leaks detected by gas detectors and organoleptic methods usually implied a mere routine repairs of GDP (CGDP) equipment and gas fittings using cotton fiber stuffing with oil tightening and asbestos-graphite compound. This technology of repairs ensured only short-term leak-proofness of the equipment and gas fittings and avoidance of explosion hazards. Meanwhile, theoretical calculations of methane leaks as a result of leakage of GDP and CGDP equipment, gas fittings of PJSC "Kharkivgaz" gas pipelines showed about 5 million m^3 per year methane leaks.

Project scenario.
Project activities consist of the reduction of methane leaks that occur as a result of faulty sealing of GDN components of PJSC "Kharkivgaz" (gas equipment of GDPs (CGDPs) and gas fittings of gas pipelines).

Within the framework of the JI project in order to repair methane leaks at gas equipment and gas fittings two types of repairs are applied:
1. Complete replacement of old gas equipment and gas fittings with new units.
2. Replacement of pressure-sealing elements with the use of modern sealing materials, changing the common practice of servicing and repair on the basis of paronite gaskets and cotton fiber stuffing with oil tightening and asbestos-graphite compound.

The existing practice of servicing and repair on the basis of paronite gaskets and sealing stuffing of cotton fibre with fatty impregnation and asbestos-graphite filler does not give a long-lasting effect of methane leak reductions.
As a result of JI project activities, in addition to methane leak reductions, technical losses of natural gas will decrease, a contribution will be made to the improvement of environmental situation, and the risk of accidents and explosions will be reduced.

Project activities will include:
- Implementation of Purposeful Examination and Technical Maintenance (PETM) of GDN components (GDP and CGDP equipment and gas fittings). This is a modern and the most economically effective practice, which provides possibilities of detection of leak points, estimation of leak volume (i.e., potential gas leak reductions) and assessment of the quality of repairs conducted. This is key information for justification of repair efficiency and priority objects to be repaired, which is important taking into account the lack of financing for leak repairs. The PETM programme will include organizational measures such as creation of working team for the project, training of employees, implementation of relevant monitoring procedures for all GDP (CGDP) gas equipment and fittings, creation of data collection and storage for data on repairs and methane leaks, and implementation of internal audit and quality assurance system for the repair of methane leaks.
- Detection of methane leaks: leak monitoring system at all GDN components (GDP and CGDP equipment and gas fittings), included into the project boundary including methane leaks (GDN repaired within the project activity). Leaks monitoring will be conducted on a regular basis by specially trained personnel. The leaks revealed will be correspondingly assigned individual numbers and registered in the data base.

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[1]Decree No. 254 of 01/10/1997 of the State Labour Safety Supervisory Committee of Ukraine, registered in the Ministry of Justice of Ukraine No. 318/2758 on 15/05/1998

- Repair of all leaks detected: repairs of GDN comonents under this project will include replacement of sealing elements using new materials and/or replacement of gas equipment and gas fittings by new modern equipment. Repaired GDP (CGDP) components and gas fittings will be regularly inspected as part of the standard monitoring programme to make sure they don't turn into leak sources again.

The project was initiated in February, 2005:

In February 2005, an inspection of PJSC "Kharkivgaz" GDP (CGDP) gas equipment, fittings, flanged and threaded joints; primary leak measurements were made.

February 2005 – the start of inspection and repair works at GDP (CGDP) gas equipment and gas fittings, flanged and threaded joints of gas distribution networks of PJSC "Kharkivgaz".

09/02/2005 – PJSC "Kharkivgaz" approves the PDD (version 01), which included the leak monitoring programme.

17/02/2012 – a Working Team was created to ensure performance of the JI Monitoring Plan.

04/10/2012 - Letter of Endorsement No.2896/23/7 was issued for the JI project by the State Environmental Investment Agency of Ukraine.

A.3.	**Project participants:**

Party involved*	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Ukraine (Host Party)	• PJSC "Kharkivgaz"	No
Switzerland	• CEP Carbon Emissions Partners S.A.	No
*Please indicate if the Party involved is a host Party		

PJSC "Kharkivmiskgaz" - an organization that implements the project (Applicant). EDRPOU code 03359500. Name the type of economic activity CTEA 40.22.0 Distribution and supply of Pipe 45.33.3 45.21.4 Building local pipelines, communication lines and power supply. PJSC "Kharkivmiskgaz" is responsible for the design, construction and installation work performed by its own personnel or by contractors. Enterprise finance the project and do not receive any money.

CEP Carbon Emissions Partners S.A. is a research and engineering organisation. It is responsible for the development of project design documents for the joint implementation project. Besides, it will participate in determination, monitoring and verification of the project.

A.4.	**Technical description of the project:**

	A.4.1. Location of the project:

The project is located in the territory of Kharkiv, Ukraine and territories adherent to the city (Figure 1).
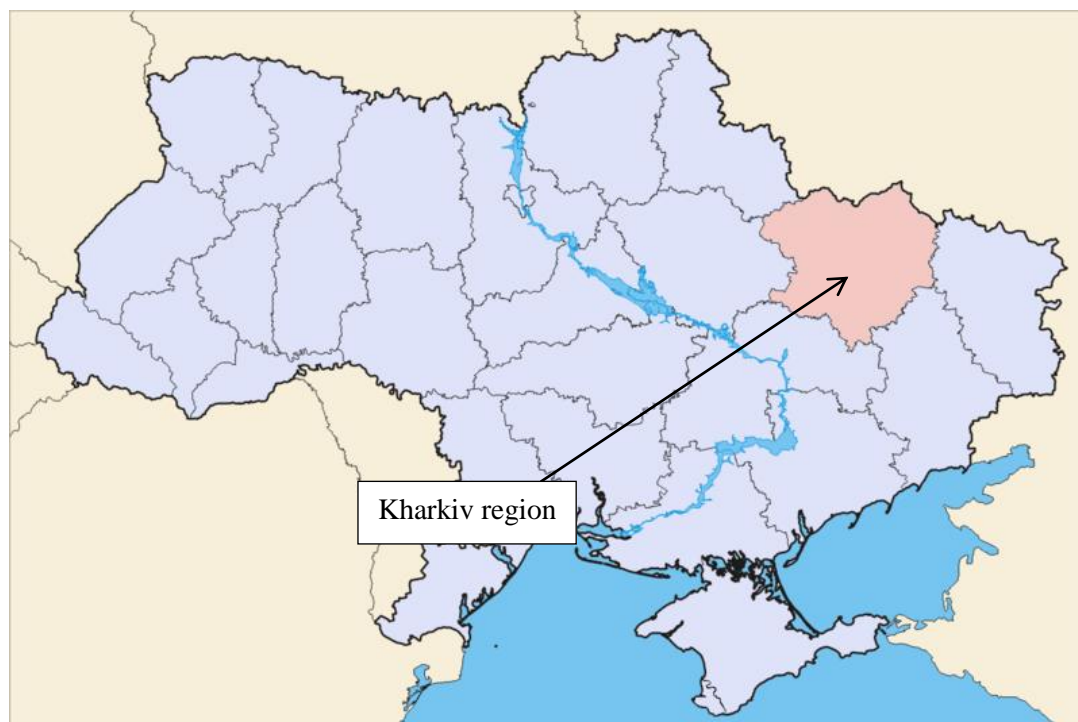
Figure 1. Map of Ukraine with the indication of Kharkiv region.

A.4.1.1. Host Party(-ies):

The project is located in the territory of Ukraine.

Ukraine is an Eastern European country that ratified the Kyoto Protocol to the UN Framework Convention on Climate Change on February 4, 2004[2]. It is listed in Annex 1 and meets the requirements of participation in Joint Implementation projects.

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

The project is located in the territory of Kharkiv region, Ukraine.

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

Kharkiv region

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

Coordinates:
Latitude: 50°00′21″ N
Longitude: 36°13   ′45″ E
Time zone: GMT +2:00

Regional centre of Kharkiv region is Kharkiv city.

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[2] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1430-15

The territory is 31 400 sq.m. Population is 2 760 000 people. The number of administrative units: 27 districts.

The region is located in easern Ukraine. The oblast borders Russia to the north, Luhansk Oblast to the east, Donetsk Oblast to the south-east, Dnipropetrovsk Oblast to the south-west, Poltava Oblast to the west and Sumy Oblast to the north-west. The largest cities in the regions are Balakliia, Bohodukhiv, Izium, Krasnohrad, Kupiansk, Lozova, Kharkiv, Chuhuiv. The gasification level in the region (as of the middle of 2009) was 68.8%, including 80.8% in cities and towns, 51.9% in villages.

A complete list and addresses of gas distribution points (1034 units), cabinet-type gas-distribution points (674 units) and gas fittings (3751 units), that are included in the project boundary, is provided in Supporting Document 1 - "Registry of gas distribution points and gas fittings of the Joint Implementation Project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz"[3].

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

1. Development and implementation of methane leak detection method

To measure methane leaks the proposed project applies a JI-specific approach based on the 2012 "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks of Ukraine", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine (hereinafter – the "Methodology"). In line with the Methodology, project participants selected the computational method as the method meeting the project requirements towards accuracy and transparency of methane leak detection and repair, as well as conservatveness of calculation approach. On the other hand, taking into account limited financing and the absence of a long-term development plan for the industry, it can be stated that the measurement method is not applicable in the specified circumstances at PJSC "Kharkivgaz".

The description of main activities and technologies under the project is provided below.More details on measures taken to detect and eliminate leaks in GDN components of PJSC "Kharkivgaz" will be provided at the JI project monitoring stage:

MI-11 interferometer mine. In order to detect methane leaks in a sample MI-11 leak detector, shown in Figure 2, is used.

Figure 2. MI-11 interferometer mine.

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[3]Supporting Document 1 - "Registry of gas distribution points, cabinet-type gas distribution points and gas fittings of gas distribution networks of the Joint Implementation Project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz" is drawn up in electronic form and submitted to the State Environmental Investment Agency of Ukraine and project verifier - BureauVeritas Certification Holding SAS.

Specifications of MI-11 leak detector are provided in Table 1.

Table 1. Specifications of MI-11 interferometer mine.

Parameter	Value
Size, mm	max 115x54x186
Weight, g	max 1500
Supply voltage, V	from 3.05 to 4.5
Sensitivity threshold, volume ratio, %	
- for methane	6
- for propane	6
Alarm threshold, volume ratio, %	
- for methane	1.00±0.4
- for propane	0.4±0.16
Ramp-up time, s	max 45
Alarm actuation period, s	max 3
Max power	1.5
Battery life, h	min 5
Battery voltage at idle, V	max 4.5
Battery short-circuit current, A	max 0.6
The gas detector has an explosion safety mark	1ExibdIICT5
Indicator of electric shock protection method	class 3
Protection level	
- electronic unit shell	IP20
- accumulator unit	IP54

After methane leak detection in a corresponding GDN component (GDP (CGDP) gas equipment and gas pipeline fittings), the unit is repaired or replaced with the use of modern sealing materials (GOST 7338-90, [4]GOST 5152-84 [5]or GOST 10330-76).[6]).

For more information on metering devices used in leak monitoring see Annex 3.

2. Implementation of state-of-the-art sealants for leak repair.

Sealants GOST 7338-90. Oil-and-petrol-resistant plates are designed for making of rubber-technical wares, that serve for the compression of immobile connections, prevention of friction between metallic surfaces, single shock load accommodation; the sealants are also used for making gaskets, flooring and other sealing wares.

The project activity provides for greasing of locking devices and compression of the threaded connections with flax fibres GOST 10330-76 and Plitol-M oil (TU U 25404313.004-2201)

Sealing stuffing GOST 5152-84. Asbestine wattled sealing stuffing is used for the compression of sealing of stuffing fitting chambers, centrifugal and piston pumps, and also various devices at working temperatures from -70 to 300˚C.

Wattled sealing stuffing is the most widespread type of sealing materials, used to seal stuffing armature chambers, centrifugal and piston pumps, various devices. This stuffing is used to complete more than 80%

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[4]"Rubber and Rubber-fabric Planes"
[5]"Sealing Gland"
[6]"Dishevelled flax. Specifications"

of fittings. They differentiate both in materials they are made of and methods of manufacturing (structure). Both factors substantially influence operating properties of stuffing. The important components of stuffing are different types of impregnations and fillers that give necessary properties to stuffing.

3. Replacement of shut-off and control valves.

Shut-off valves. The project provides for replacement of outdated and worn-out GDP (CGDP) gas equipment and gas fittings of USSR manufacture with valves from European manufacturers and their domestic analogues.

During implementation of the Project producers of gas equipment that is used for prevention of methane leaks can be changed upon the creation of more modern and perfect technologies and equipment in the market.

4. Implementation of centralized methane leak monitoring system.

The choice of equipment and materials will depend on the size, source of leaks and operating schedule of system component where this leak was detected during PETM of gas distribution networks, including:

•   studying of basic conditions – when using measuring devices described above;
•   registering the results and determination of priority in repair of leaks, which ensures the highest efficiency of this work upon limited funds for repair;
•   data analysis and estimation of reduction of natural gas losses and amount of emission reductions;
•   development of plan of future inspections, and further monitoring of GDN components included into the project boundary, including those where leaks had already been repaired within the project framework.

Implementation of the PETM program aimed at leak detection and repair, further maintainance of leakproofness of GDN components of PJSC "Kharkivgaz" is not time limited. Even after the end of the crediting period, the Project will generate methane emission reductions.

Implementation schedule.

1. Drawing up the primary registry of GDP (CGDP) gas equipment, gas fittings, threaded and flanged connections of gas pipelines. Inspection of GDP (CGDP) gas equipment, gas fittings, threaded and flanged connections of gas pipelines and primary monitoring measurements. Signing of the Memorandum of Understanding relating to the Joint Implementation Project. Creation of a Working Team. Development of the Monitoring Plan, the PDD of the project, version 01 (February-December 2005).
2. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment: 341 GDPs (CGDPs) and 751 fittings (February-December 2005).
3. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment:342 GDPs (CGDPs) and 750 fittings (January-December 2006).
4. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment:342 GDPs (CGDPs) and 750 fittings (January-December 2007).
5. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment:342 GDPs (CGDPs) and 750 fittings (January-December 2008).
6. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment:341 GDPs (CGDPs) and 750 fittings (January-December 2009).
7. Continuation of implementation of the PETM programme, implementation of regular monitoring inspections and measurements at already repaired gas equipment of GDPs (CGDPs) and fittings of

gas pipelines, leak repair at already repaired equipment, if such leaks take place (January 2010 - December 2017).

If the equipment introduced under the project is serviced properly, it is not expected to need replacement before the project period runs out, as the technologies employed are in line with the present-day global practice. Workers and specialists of PJSC "Ternopilmiskgaz" will be trained the same way they used to before the project was launched. If needed, which means if their skill level is not high enough to work with the equipment introduced under the project, equipment producers will give instructions and training, which is mentioned in the contracts for equipment purchase.

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

The project activity encompasses:
-        repair (replacement) of GDP (CGDP) gas equipment and gas fittings of PJSC "Kharkivgaz" gas pipelines with the use of modern sealing materials and modern equipment of the European producers and their analogues of domestic production;
-        monitoring of methane leaks aimed at the detection of methane leaks caused by sealing failures;
-        further renewal of sealing of GDN components of PJSC "Kharkivgaz".
Reduction of natural gas leaks will result in reduction of emissions of methane that is greenhouse gas.

Absence of the Project activity means that all equipment, including old units, that are still capable of working, and equipment characterized by worse leak-proofness than the one planned in the project activity, will be operated for a long time in the ordinary mode. This makes it impossible to reduce methane emissions.

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

In the course of Project implementation the following emission reductions will be achieved at each Project stage:

Table 2. Estimated emission reductions for the period preceding the first commitment period (2005-2007)

	Years
Duration of the crediting period	3
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2005	169 069
2006	338 138
2007	507 207
Total estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**1 014 414**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**347 799**

Table 3. Estimated emission reductions for the first commitment period (2008-2012)

	Years
Duration of the crediting period	5
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2008	676 277

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2009	845 346
2010	845 346
2011	845 346
2012	845 346
Total estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**4 057 661**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**811 532**

Table 4. Estimated emission reductions for the period following the first commitment period (2013-2017)

	Years
Length of the crediting period	5
Years	Estimated annual GHG emission reductions in tonnes of CO_2 equivalent
2013	845 346
2014	845 346
2015	845 346
2016	845 346
2017	845 346
Total estimated GHG emission reductions over the crediting period (tonnes of CO_2 equivalent)	**4 226 730**
Annual average of estimated GHG emission reductions over the crediting period (tonnes of CO_2equivalent)	845 346

For more details refer to Supporting Document 1[7].

For the description of the formula used for calculation of emission reductions see Section D.1.4.

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

The project has been supported by a Ukrainian Government representative, namely the State Environmental Investment Agency of Ukraine that issued Letter of Endorsement No.2896/23/7 dated 04/10/2012 for the Joint Implementation project. Thus, organizational risks are minimal.

Upon receiving of the Determination Report from an Accredited Independent Entity, the project design document (PDD) and the Determination Report will be submitted to the State Environmental Investment Agency of Ukraine and to an authorized entity of the country where another project participant is registered to obtain Letters of Approval.

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[7]Supporting Document 2 - "Calculation of GHG emission reductions for the Project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz" is drawn up in electronic form and submitted to the State Environmental Investment Agency of Ukraine and project verifier - BureauVeritas Certification Holding SAS.

SECTION B. Baseline

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

Baseline is the scenario that reasonably represents the anthropogenic emissions by sources of GHGs that would occur in the absence of the proposed project. The baseline should be established in accordance with the requirements of the "Guidance on criteria for baseline setting and monitoring," Version 03[8]. In line with the "Guidelines for users of the joint implementation project design document form," Version 04, a stepwise approach is used for baseline description and justification:

Step 1. Identification and description of the approach chosen to establish the baseline.

The proposed project applies a JI specific approach based on the Joint Implementation requirements in accordance with paragraph 9 (a) of the JI Guidance on criteria for baseline setting and monitoring, Version 03 and the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks of Ukraine", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine to set the baseline (measurement and calculation of methane leaks). Project participants selected the computational method for estimation of GHG emission reductions.

The Methodology is based on approved Clean Development Mechanism methodology AM0023 version 04.0.0 "Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities"[9] and takes into account the specifics of methane leak detection and repair activity in Ukraine.

This Methodology is designed for development of projects aimed at methane leak reduction in technological equipment of gas distribution networks and is applicable to project activities that reduce physical methane leaks by implementing investment activities, which would not be implemented under the existing company practice, i.e. methane leaks would not be repaired.

This Methodology is applicable to project activities that eliminate the excess physical methane leaks in gas distribution network components by establishing advanced leak detection and repair practices, being the supplement to conventional Leak Detection and Repair Program, envisaged by the Ukrainian Gas Supply System Safety Rules (UGSSR), referred to as PETM in this project design document.
The conventional leak detection and repair practices, which existed at PJSC "Kharkivgaz" prior to the project, based on the UGSSR included leak detection and repair only to prevent emergencies and explosion hazards. Conventional activity within the UGSSR does not provide for mandatory replacement of worn-out equipment still capable of operation and neither requires application of new modern although more expensive sealing materials to repair leaks. This practice does not cause major reduction of methane leaks in GDN components during its transportation.
In the course of the Project implementation PETM program of GDP (CGDP) gas equipment and gas fittings of PJSC "Kharkivgaz" gas distribution networks, as described in paragraph "Project scenario" in Section A.2 of the PDD, essentially, is the implementation of advanced Leak Detection and Repair Program which existed at PJSC "Kharkivgaz" prior to the Proect.

To use the proposed JI Specific Approach for baseline setting the following three conditions shall be satisfied:

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[8] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[9] http://cdm.unfccc.int/UserManagement/FileStorage/LV8NU1GYWTK06COJPDIXQ35FR2MA47

1. As of the moment of project implementation, natural gas pipeline operators do not use an expanded LDRP, which would provide a possibility of systematic detection and repair of methane leaks.
2. Methane losses (leaks) can be detected and measured accurately.
3. GDN operator may implement a monitoring system to make sure that the leaks repaired do not reoccur.

The project fully complies with the second and the third condition; the first condition is met with the account of remarks that follow.

Information relating to the *first condition*: before the beginning of the project PJSC "Kharkivgaz" provided only the detection of leaks by means of gas detectors in accordance with Ukrainian Gas Supply System Safety Rules in order to avoid emergency and explosive situations. The measurements of the volumes of leaks, their registration and accounting were not carried out. The theoretical calculations of leak volume show the rate of about 75 million m^3 per year before the Project started.

However, the aforementioned measures do not reflect the actual scale of leaks mainly due to the use of old equipment and worn-out sealants. The Project does not provide for more frequent checks of gas equipment, but provides for the use of modern sealing material, replacement of old gas equipment with new up-to-date units of European production or their analogues of domestic manufacture, as well as monitoring measurement of methane leaks.

According to international experience and the data received from the regions, where new sealing materials and gas equipment were used, it can be concluded that their use considerably reduced the volumes of methane leaks.

In addition, due to the fact that the national legislation doesn't provide any mechanisms for encouragement of operators to reduce natural gas losses, effective program for detection and repair of methane leaks could not be applied without the project activities. Operators, mainly aiming to solve safety issues, only fixed that a leak is present, not measuring the amount thereof.

In other words, we want to emphasize that the practice that existed at PJSC "Kharkivgaz" before the beginning of the Project implementation didn't repair the leaks included into this Project.

Information relating to the *second condition*. The purchase of modern equipment for methane leak detection and measurement as well as direct measurement of leak amount at GDP (CGDP) gas equipment and gas fittings showed that when up-to-date practice and gas equipment are applied, it is possible not only to detect and repair leaks but also to measure them accurately.

Information relating to the *third condition*. Introduction of step-by-step procedures, creation of the comprehensive database and application of a system approach will allow the company to conduct reliable monitoring of the repaired GDP (CGDP) gas equipment and gas fittings of gas pipelines and detect leaks that occurred again after being repaired, if any (see Annex 3). The training of personnel at sites and introduction of quality control at all stages of the project activity will allow implementing the Monitoring Plan.

Step 2. Application of the approach chosen.

Input data

Only two options of baseline conditions can be considered as possible and reliable alternatives to the Project:

Alternative 1.1: Continuation of the current system of leak detection and repair;
Alternative 1.2: Proposed project activity without the use of the JI mechanism.

The detailed analysis of each alternative follows.

Alternative 1.1: Continuation of the current system of leak detection and repair is the most plausible and realistic alternative to the Project implementation because it requires no additional costs for PJSC "Kharkivgaz". Methane leaks are a component of natural gas transportation process, i.e. continuation of the current situation is a common practice that suits the financial and organizational situation of the enterprise. According to this alternative only routine repairs are provided; this allows of keeping methane leaks at a stable level, that is reduction of leaks in this case is impossible.

Alternative 1.2: Proposed project activity without the use of the JI mechanism. This alternative questions the use of new technologies aimed at repair of methane leaks in the process of natural gas transportation as it requires considerable resources and organizational programs (staff training). PJSC "Kharkivgaz" is neither obliged nor motivated to conduct modernization of the equipment that would reduce greenhouse gas leaks, as improvement of ecological situation in the region is not an economically viable business without the JI mechanism.

Arguments that are presented in this PDD (see section B.2) prove that continuation of the existing practice of leak detection and repair is the most plausible scenario in the absence of the Project.

Therefore, this scenario can be viewed as the Baseline.

Emission reductions

The computational method used in the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks of Ukraine" implies detection of excess physical methane leaks in GDN components and after their repairs, i.e. bringing them to conditional leak-proofness (CLP), identification of leak size using leak factors obtained by statistical processing of the results of ex-post methane leak measurement in Ukraine's gas distribution networks before and after repairs.

In accordance with the Methodology the level of emission reductions is determined in the following order:

1. The current practice of natural gas loss detection and repair activities is assessed and described.
2. Clear and transparent criteria are established to identify whether the detection and repair of a leak would also have occurred in the absence of the project activity.
3. The time schedules for replacement of equipment in the absence of the project activity are determined.
4. Data on leaks is collected during project implementation.
5. The functioning of leak repair is checked during monitoring.
6. Emission reductions are calculated ex-post based on data collected in the previous steps.

These steps for this Project are described below.

1. Assessment and description of the current leak detection and repair practices

The Methodology stipulates that for the calculation of emission reductions only those emissions, which are not detected and repaired in accordance with the current practice, are taken into account. The Project used a JI-specific approach based on the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks of Ukraine", registry No. Ukr NTI 0812U005362 dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine.

Prior to the beginning of the Project, PJSC "Kharkivgaz" provided only the detection of leaks accordance with Ukrainian Gas Supply System Safety Rules in order to avoid emergency and explosive situations. The measurements of the volumes of leaks, their registration and accounting were not carried out.

Before the Project implementation PJSC "Kharkivgaz" didn't take any measures on direct inspection and maintenance beyond the scope of requirements established by the safety rules. Traditional material used in the course of repair works provided only for temporary repair of methane leaks, while approach provided by the Project ensures reliable long-term repair of methane leaks.

Gas equipment of GDPs (CGDPs), gas fittings of gas pipelines included in the project boundary will be examined, repaired or replaced, not regarding the fact that they are regularly inspected and repaired within the existing maintenance system. Repair and replacement under the Project will be performed with the use of modern equipment of the European production, their analogues of national production, and new sealing materials, without regard to whether the leak has been detected or not, in order to prevent leaks in the future.

2. Equipment replacement schedule

Starting February 2005, when methane leaks were detected repair or replacement of GDP (CGDP) gas equipment, gas fittings of gas pipelines were carried out with the use of modern equipment and materials, in accordance with the project activity.

Inclusion into calculation of methane emission reductions of any similar cases of replacement of components with application of materials and equipment that were used before the project practice is not appropriate, since they will not cause any substantial influence on the result of the Project, i.e. on the level of reduction of methane emissions.

It is also noteworthy that under this Project all GDN components (GDP (CGDP) gas equipment, gas fittings of gas pipelines) included into the project boundary will be repaired or replaced, even if leaks are detected only on part of them.

3. Data collection during project implementation

Complete information on all GDN components (GDP, CGDP gas equipment, shut-down and control valves of pipelines) included into the project boundary is provided in the Registry of gas distribution points and gas fittings of the JI project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz" (Supporting Document 1). Excess physical methane leaks are detected using individual leak indicators which register changes in resistance of a semiconductor sensor when contacting with gas. Repairs (replacement of equipment) are held after methane leaks were detected in the GDN component. Collection of data to calculate emissions of methane (which is the component of natural gas) is carried out along with repairs (replacement) of GDN components included into the Project boundary. The calculations are made in line with the Methodology, using the computational method of methane leaks reduction calculation. The Methodology is based on the use of natural gas leak factors (NGLF) for each GDN component obtained by statistical processing of the results of ex-post methane leak measurement in Ukraine's gas distribution networks before and after repairs. The project provides for the collection of data on pressure in GDN components, as the absence of such pressure indicates there are no leaks in the corresponding GDN component.

After repair (replacements) of gas equipment the new measuring is carried out, to make sure that methane leaks are repaired.

The data collected are included into the reports on fulfillment of the <u>monitoring plan</u>. All data are stored in a database. Every report on fulfillment of the <u>monitoring plan</u> will include complete information from such database (Annex 3 to this PDD).

4. Monitoring requirements.

In the process of the <u>Project</u> implementation supervision of the facilities of the <u>Project</u> is carried out to verify whether methane leaks repaired remain repaired. The Monitoring Plan for this Project refers to all repaired (replaced) gas equipment of GDPs (CGDPs), gas fittings of gas pipelines. Frequency of leak detection and measuring activity at sites where leaks were already repaired is specified in the Monitoring Plan.

For the GDN component already repaired (replaced) in the previous monitoring period, and no excess physical leaks were detected again in this monitoring period, methane leaks will be equal to the volume of leaks, measured after the first repair (replacement) for the entire period since the last inspection/monitoring.

If EPNGL were detected again, such equipment will be excluded from the calculations of reduction of methane emissions for corresponding monitoring period. It will be considered that at this equipment there was no reduction of methane emissions during the period from the date of the last monitoring of methane emissions measuring. Such equipment will be repaired (or replaced) repeatedly. Then measuring of methane leaks will be carried out once again.

The data collected will be included into the regular reports on fulfillment of the monitoring plan. All the data are stored in a database. Every report on fulfillment of the monitoring plan will include complete information from the corresponding database.

5. Calculation of methane leak reductions.

The reduction of methane leaks in a GDN component takes place only after the excess physical leak was repaired (related to replacement and/or replacement of the component sealing) and only for the time when the GDN component was under the pressure and is defined as the difference between the factors corresponding to EPNGL and SPNGL in m^3 per hour.

Description of the <u>baseline</u> and justification of its choice are presented in Section B.2. below.

Key information to determine the <u>baseline</u> is presented below.

Description of formulae to calculate <u>GHG emissions</u> in the baseline scenario is provided below:

Greenhouse gas emissions in the baseline scenario according to a JI specific approach (which is calculated by using the tabular method of the Methodology) are calculated according to the formula:

$$BE_y = GWP_{CH_4} \cdot ConvFactor \cdot W_y \cdot B_y$$

(B1)

where:

BE_y - greenhouse gas emissions in period y of the baseline scenario, t CO$_2$eq;

GWP_{CH_4} - global warming potential of methane, tCO$_2$eq/tCH$_4$;

W_y - average mass ratio of methane in natural gas in period y of the project scenario, %;

B_y – natural gas leaks to the atmosphere in period y of the baseline scenario, m^3;

ConvFactor - volume to weight conversion factor for methane leaks, t CH_4/m^3 CH_4. Under normal conditions - zero degrees Celsius and 0.1013 MPa, *ConvFactor* $=0.0007168$ t/m^3.
[*y*] - index for monitoring period;
[CH_4] - index for methane.

Methane leaks to the atmosphere caused by leaks from gas transportation networks are calculated by the following formula:

$$B_y = \sum_{h \in H_i} (\sum_{i' \in I'} K_{i',h}^g \cdot H_{i',h,y}^g + \sum_{i'' \in I''} K_{i''}^n \cdot H_{i'',h,y}^n); \text{ (B2)}$$

$K_{i',h}^g$– natural gas leak factor of i' GDN component in CLP (i.e. corresponding to SPNGL) in period *y* of the baseline scenario, m^3/h;

$K_{i''}^n$ - natural gas leakage factor corresponding to EPNGL of i" GDN component in period *y* of the baseline scenario, m^3/h;

$H_{i',h,y}^g$– time of GDN component operation in CLP under the pressure in period *y* of the baseline scenario, h;

$H_{i'',h,y}^n$ - time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period y, h;
[*y*] - index for monitoring period;
[*i'*] - index for GDN component number that belongs to the set of elements I' (I'+I'') = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated no emission reductions (no component replacement/repair took place) in the reporting monitoring period;
[*i''*] - index for GDN component number that belongs to the set of elements I'' (I'+I'') = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated emission reductions (component replacement/repair took place) in the reporting monitoring period;
[*h*] - index corresponding to the number of project activity in GDN component, if more than one activity was carried out at this component in monitoring period (where *H* is a set embracing all activities in the project scenario at the GDN component in monitoring period)
[*g*] - index for SPNGL;
[*n*] - index for EPNGL.

Data/Parameter	i
Data unit	None
Description	Sequence number of the GDN component (GDP (CGDP), gas fitting) included into the project boundary
Time of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Leak measurement activity
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	"Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
QA/QC procedures (to be) applied	Personnel will have corresponding qualification to record the results.

Any comment	List of GDN component (GDP (CGDP) gas equipment, gas fittings of gas pipeline) included in the project boundary is presented in the Supporting Document 1

Data/Parameter	GWP_{CH_4}
Data unit	t CO₂eq/tCH₄
Description	Global Warming Potential of methane
Time of determination/monitoring	Throughout the crediting period
Source of data (to be) used	IPCC Second Assessment Report: Climate Change 1995 (SAR) and approved by COP. GWP of methane is available at the UNFCCC website [10]
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	N/A
QA/QC procedures (to be) applied	If global warming potential for methane change, the baseline and the project scenario will be recalculated based on the new values
Any comment	Project developer will monitor any changes in Global Warming Potential of methane published by IPCC and Approved by COP

Data/Parameter	h
Data unit	None
Description	No. of activity (replacement/repair) in GDN component after EPNGL detection
Time of determination/monitoring	After each activity with GDN component
Source of data (to be) used	Leak measurement activity
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	"Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
QA/QC procedures (to be) applied	According to the procedures of operation data on all work at GDN components of PJSC "Kharkivgaz" are entered in equipment repair logs. Personnel will have corresponding qualification to record the results.
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

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[10] http://unfccc.int/ghg_data/items/3825.phphttp://unfccc.int/ghg_data/items/3825.php

Data/Parameter	W_y
Data unit	%
Description	Average mass ratio of methane in natural gas in period y of the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Calculation
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	The value is calculated on the basis of company's official data in monitoring period
QA/QC procedures (to be) applied	Equipment for measuring calorific value of natural gas transported by GDNs of PJSC "Kharkivgaz" calibrated and verified in accordance with the procedures for quality control
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data/Parameter	$K_{i',h}^{g}$
Data unit	m^3/h
Description	Natural gas leak factor of i' GDN component in CLP
Time of determination/monitoring	After each activity with GDN component
Source of data (to be) used	Standard values or data of the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Standard values or data from Table A.1 of Appendix A of the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
QA/QC procedures (to be) applied	N/A
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data/Parameter	$K_{i''}^{n}$
Data unit	m^3/h
Description	Natural gas leakage factor corresponding to EPNGL of i'' GDN component

Time of determination/monitoring	Once at the beginning of the project for each GDN component
Source of data (to be) used	"Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data from Table A.1 of Appendix A of the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
QA/QC procedures (to be) applied	N/A
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data/Parameter	$H_{i',h,y}^{g}$
Data unit	h
Description	Time of GDN component operation under the pressure from the beginning of monitoring period y to the implementation of the project activity (repair/replacement) that caused EPNGL removal
Time of determination/monitoring	Annually
Source of data (to be) used	Company data obtained in the course of GDN operation and leak repair activities
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Company's official data that are entered in GDN component operation logs are used
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

Data/Parameter	$H_{i'',h,y}^{n}$
Data unit	h
Description	Time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period y
Time of	Annually

determination/monitoring	
Source of data (to be) used	Company data obtained in the course of GDN operation and leak repair activities
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Company's official data that are entered in GDN component operation logs are used
Any comment	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

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

1. Approach to demonstration of the fact that the Project generates reduction of emissions by sources which are additional to those that would have occurred in the absence of the JI project

The proposed JI project applies a JI-specific approach based on the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks" registry No. Ukr NTI 0112U00A816 of 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine (hereinafter – the Methodology) and the latest version of the "Tool for the demonstration and assessment of additionality" ver. 06.0.0[11], approved by the CDM Executive Board, were used to justify the additionality of this Project.

This approach can be applied to this Project on methane leak reduction, because it was developed exactly for the projects of such type. The consideration of local terms and legislation will allow estimating its additionality objectively.

2. Application of the approach chosen. Justification of additionality of the Project.

Step 1 - Identification of alternatives to the Project implementation consistent with current Ukrainian laws and regulations.

Sub-step 1a. Identification of alternatives to the Project implementation.

Only two baseline alternatives can be considered as acceptable for the Project:

Alternative 1.1: Continuation of the current system of leak detection and repair.
Alternative 1.2: Proposed project activity without the use of the JI mechanism.

Alternative 1.1: Continuation of the current situation of methane leak (and thus natural gas losses) detection and repair is the most plausible alternative to the Project implementation, because it does not require any additional investment from PJSC "Kharkivgaz".

PJSC "Kharkivgaz" does not receive any financial profit from methane emission reductions. The existing Ukrainian system of natural gas tariff formation stipulates the lowering of tariff on natural gas

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[11] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

in case of reduction of its losses. The payment that is now set for the methane emissions within the fixed limits is difficult to charge because of the absence of measuring technologies and big amount of insignificant emissions spread in large territory.

Alternative 1.2: According to the Methodology, to determine the probable baseline alternative it is necessary to determine if measures aimed at reduction of methane leaks from equipment have been implemented or are expected to be implemented, by using leak detection and measurement technology similar to the technology described in this methodology.

Before the beginning of the Project implementation PJSC "Kharkivgaz" did not carry out any measures aimed at direct inspection and technical maintenance that would go beyond the scope of the requirements set forth by safe practice regulations.

The type and volumes of technological losses in the Ukrainian gas distribution networks were mainly unknown to the moment of the first direct inspections and prophylactic overviews, carried out for the evaluation of possibilities of project implementation within the framework of the mechanisms set by article 6 of the Kyoto protocol to the UN Framework Convention on Climate Change. Estimations of net volume of gas consumption and its losses were approximate, because most end-consumers (60 % of households) have no gas-meters, and the invoicing is executed on the basis of normative standards.

In case of the absence of the support of the Project by the mechanisms set by article 6 of the Kyoto protocol to the UN Framework Convention on Climate Change PJSC "Kharkivgaz" had neither incentives nor resources for implementation of the measures planned in the framework of the Project. The Project stipulates additional costs on measuring devices (gas analyzers, barometers, manometers, thermometers, stop-watches), new gas equipment of European producers and their analogues of national production, modern sealing materials and personnel training.

PJSC "Kharkivgaz" has no financial incentives to cover such costs on the implementation of the Project measures or measures similar to the project measures, but for possible income, that can be obtained within the framework of the mechanism set by article 6 of the Kyoto protocol to the UN Framework Convention on Climate Change.

Outcome of Sub-step 1a. One realistic alternative scenario to the project activity was identified - *Alternative 1.1*.

Sub-Step 1b: Consistency with mandatory Ukrainian laws and regulations

Alternative 1.1: The current practice of natural gas loss (and accordingly, methane emissions) detection and repair conforms to the current legislation of Ukraine, namely:
1. Law of Ukraine "On the basis of the natural gas market functioning" [12].
2. Law of Ukraine "On Pipeline Transport" [13].
3. Decree of the Ministry of Fuel and Energy Industry of Ukraine "On approval of methods for detection of specific losses, technological and production losses of natural gas during gas transportation in gas distribution networks" [14].

The legislation admits and doesn't forbid natural gas losses, and, accordingly, methane leaks in the process of natural gas transportation. The regulations set periodicity of equipment verifications to be carried out by gas distribution organizations with the aim of natural gas loss detection. Practice of

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[12] http://search.ligazakon.ua/l_doc2.nsf/link1/JD33S02A.html

[13] http://zakon2.rada.gov.ua/laws/show/192/96-вр/ed20120408

[14] http://zakon1.rada.gov.ua/laws/show/z0570-03

natural gas loss detection at PJSC "Kharkivgaz" corresponds to the indicated standards. Control over compliance with standards is performed by implementation of annual revisions by authorized bodies.

The Project also conforms to the existing legislative requirements in Ukraine relating to detection of methane leaks and methane emissions at gas distribution facilities, and to any other current applicable legislative regulations.

The program of PJSC "Kharkivgaz" for regular detection of methane leaks will be implemented together with application of more up-to-date methods of detection and measurement of methane leaks, and therefore, methane emissions, as well as the activities for long-term natural gas losses, and therefore, methane leaks, repair planned under the Project.

Outcome of Sub-step 1b. The selected plausible, credible and conservative alternative (*Alternative 1.1*) fully correspondents to mandatory requirements and standards of the Ukrainian legislation. *Alternative 1.2* also doesn't contradict national legislation of Ukraine.

Step 2 – Investment analysis.

Since the "Tool for the demonstration and assessment of additionality" version 06.0.0 provides the choice to carry out either investment analysis or barrier analysis, the barrier analysis was chosen to demonstrate additionality.

Step 3 – Barrier Analysis.

Sub-step 3a – Identification of barriers that would prevent the implementation of the proposed JI Project activity.

The Project is the first project of such type for PJSC "Kharkivgaz", and in this connection a few types of barriers arose at the beginning of the Project implementation. PJSC "Kharkivgaz" faced serious financial barriers, and the problem of insufficient experience of personnel in data collection, calculations, or the use of new approaches and measuring devices for gas leak detection and repair at its facilities under the Project, including:

- Organizational barrier.

Insufficient potential of labor and technical resources of PJSC "Kharkivgaz" for implementation and carrying out of purposeful examination and technical maintenance of gas equipment. It is connected with the absence of qualified personnel: the company has faced significant outflow of qualified personnel in the last several years, and newly recruited employees do not have enough experience and knowledge.

- Absence of special technical knowledge.

At the beginning of the Project available qualified personnel did not have experience in operation and repair of more innovative equipment provided by the Project. Therefore, the Project implementation requires time to gain practical experience in installation, commissioning and further operation of the equipment included into the project boundary.

- Financial barrier.

Additional costs of the Project implementation include those of:

- purchase and use of modern metering devices for methane emission detection (gas detectors AZ 7291, SENSIT Trak-It III CGI, or MI-11, EX-TEC or Variotec type gas analyzers);

- purchase of modern, more expensive sealing materials of different types;
- replacement of old types of GDN components with new equipment of European producers;
- personnel training, realization of direct prophylactic overview and technical maintenance;
- systematic collection of data and data management;
- systematic and long-term control of efficiency of detected methane leak repairs.

During the project implementation modern sealing material is used. In accordance with the previous results of research, the sealing materials that comply with GOST 7338-90, GOST 10330-76 and GOST 5152-84 and are far more effective, but at the same time more expensive than sealing materials that are used in the current practice. In the current practice PJSC "Kharkivgaz" does not gain any additional benefits in case of reduction of methane leaks. Thus, there are no incentives for PJSC "Kharkivgaz" to purchase and use more expensive sealing material.

At the beginning of the Project old GDP (CGDP) gas equipment and shut-off and control valves of the USSR production were mostly used at networks of PJSC "Kharkivgaz". They are much worse than the new gas equipment and shut-off and control valves of European producers in terms of leak-proofness, but at the same time they are considerably cheaper. Thus, installation of new gas equipment of European producers and their analogues of national production at the gas pipelines could not prevail because of the shortage of funds.

Application of the JI mechanisms to this Project does these measures economically attractive and is the only way of their introduction.

Outcome of Sub-Step 3a: We may conclude that this Project is economically not attractive without registration of the Project as a JI Project. This proves additionality of this Project.

Sub-step 3b: Demonstrate that the identified barriers would not prevent the implementation of at least one of the alternatives (but for the proposed Project activity):

Financial barriers are also connected with the structure of the existing tariffs for gas transportation and distribution. The tariffs are regulated by the state and do not take into account the depreciation and investment needs of gas distribution enterprises. Such situation results in the constant shortage of money and impossibility of timely implementation of major repairs, investing in modernization and development of gas distribution infrastructure.

PJSC "Kharkivgaz" will get no direct economic benefits from reduction of methane emissions that will be achieved during the Project implementation but for revenues from the sale of emission reduction units, as lower gas losses will lead to tariff reduction for consumers under the existing tariff system.

Also, it should be taken into account that in Ukraine methane is not included in the list of ecologically harmful gases and methane emissions are not punished by means of ecological fines. Thus, no sanctions are imposed on PJSC "Kharkivgaz" in connection with methane leaks at gas pipelines and PJSC "Kharkivgaz" gets no financial benefits for reduction of methane leaks.

Outcome of Sub-Step 3b: As reduction of methane emissions does not bring any economic benefits to PJSC "Kharkivgaz" and implementation of this Project does not bring any economic benefits to other Project participants, including the applicant of the Project, but for the benefits within the framework of JI Project, we may conclude that implementation of the Project without the receipt of revenues within the framework of the JI Project, faces the investment barrier.

At the same time, based on the barrier analysis provided above, we may conclude the barriers listed above would not prevent the implementation of only one of two alternatives, namely –

Alternative 1.1: Continuation of the current system of leak detection and repair.

Step 4: Common practice analysis
Sub-step 4a: Analysis of other activities similar to the proposed Project activity:

The absence of financial incentives described in Step 3 are typical not only for PJSC "Kharkivgaz", but also for other companies operating gas distribution networks in Ukraine. Therefore existing practice for detection and repair of methane emissions represented in the baseline scenario selected for this Project is the common one for Ukraine.

In general, the gas distribution companies in Ukraine use the same methods of methane leak detection as the ones used at gas pipelines of PJSC "Kharkivgaz" before the beginning of the Project. Sealing materials that are used for reduction of losses are also very similar in the regions of Ukraine. Programs of methane leak detection and repair that are used in Ukraine, in most cases are aimed at meeting safety requirements and prevention of accidents.

Sub-step 4b: Discussion of any similar Options that are occurring.

Apart from this Project and other projects implemented within the framework of the mechanism set by article 6 of the Kyoto protocol to the UNFCCC (United Nations Framework Convention on Climate Change), no programs of direct detection and repair of natural gas losses at gas distribution networks are implemented in Ukraine. The Project provides for the use of modern technologies and methodologies for methane leak detection and estimation.

The prospects of obtaining financing of the Project within the framework of the mechanism set by article 6 of the Kyoto protocol to the UNFCCC allowed its developer to prepare this Project. Thus, it can be concluded that any actions, similar to those which are planned under this Project, are developed and implemented in Ukraine, expecting the receipt of benefits in accordance with the mechanisms set by article 6 of the Kyoto protocol to the UNFCCC.

Conclusion: Measures similar to the project measures, can be currently implemented only on condition of receipt of expected revenue from realization of the mechanism set by article 6 of the Kyoto protocol to the UNFCCC. Thus, this Project is considered to satisfy the criteria of additionality.

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

PJSC "Kharkivgaz" is the legal user of all gas supply facilities included in the JI project boundary on the basis of Agreements on the use of state property that is not subject to privatization No.04/01-823 of 28/12/2001.

There are three types of methane emission sources in the JI Project:

(i) Under the control of the Project participants, such as: technological natural gas losses during scheduled repair of gas pipelines;
(ii) Reasonably attributable to the Project, such as: methane leaks at gas fittings of house distribution networks;
(iii)   Significant leaks:
  • leaks at gas equipment (pressure controllers, valves, filters, etc.) of gas distribution points (cabinet-type gas distribution points);
  • methane leaks in gas armature (faucets, valves, etc.), located in gas distribution networks of PJSC "Kharkivgaz".

Only methane leaks of type (iii) are included in the JI Project boundary:
  • leaks at gas equipment (pressure controllers, valves, filters, etc.) of gas distribution points (cabinet-type gas distribution points);

- methane leaks in gas armature (faucets, valves, etc.), located in gas distribution networks of PJSC "Kharkivgaz".

A complete list of gas distribution points (94 units) / cabinet-type gas distribution points (193 units) and gas fittings (1163 units), that are including into the JI Project boundary, are provided in the Supporting Document 1.

Sources of leaks of type (i) - technological methane leaks during scheduled repair of gas pipelines - are not included in the project boundary as PJSC "Kharkivgaz" does not apply the technologies which allow avoiding such leaks.

Sources of leaks of type (ii) - methane leaks at gas fittings of house distribution networks - are not included in the JI Project boundary because such leaks are much lower than leaks of type (iii), and sources of these leaks, as a rule, are in private houses (apartments).

Project boundary for the baseline scenario is outlined by dotted lines in Figure 3.
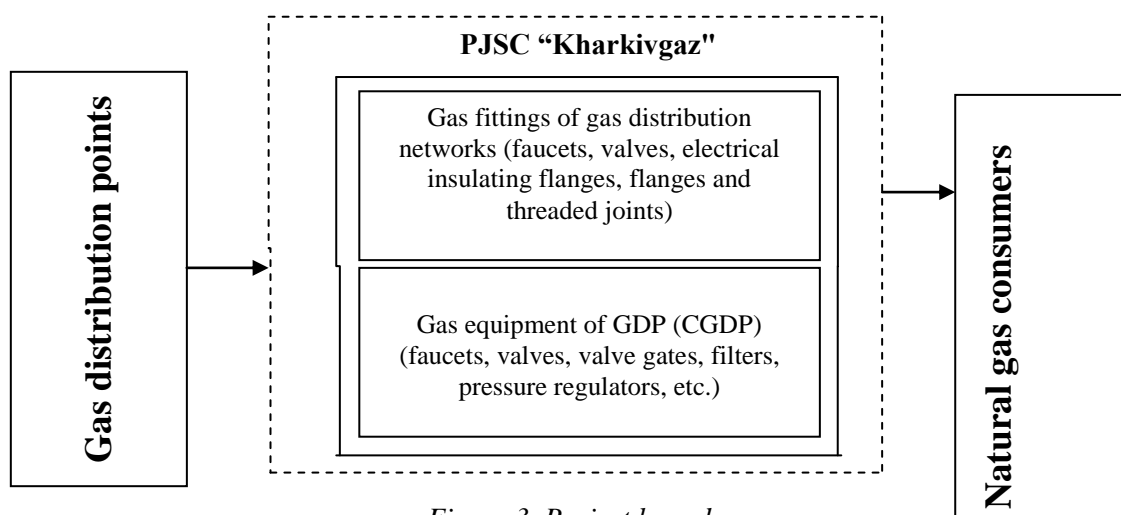
Figure 3. Project boundary

Table 5. An overview of all sources of emissions in the project scenario.

Source	Gas	Included / excluded	Substantiation / Explanation
Project emissions			
Methane leaks	CH_4	Included	Only equivalent GHG emissions due to methane leaks in gas equipment of gas distribution points and gas fittings of gas distribution pipelines of PJSC "Kharkivgaz"

Indirect CO_2, CH_4, N_2O leakage is excluded. Leakage is beyond the control of the project developer (leakage cannot be measured) and therefore have been excluded.

Geographically GDPs (CGDPs) and gas pipelines of PJSC "Kharkivgaz" are located in Kharkiv region, Ukraine, and territories adherent to it.

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 baseline setting: 09/02/2005
Baseline was determined by CEP Carbon Emissions Partners S.A. and PJSC "Kharkivgaz" (Ukraine)

PJSC "Kharkivgaz"
Address: 1 Bezliudivska St., 61492 Kharkiv
Phone: +38 (057) 719-85-56+
Fax: +38 (057) 719-85-56
E-mail: office@oblgaz.kharkov.ua
Web-page: http://kharkivgaz.com.ua/
Client ref.: Volodymyr Volodymyrovych Zlenko (Chairman of the Board)
PJSC "Kharkivgaz" is a project participant (stated in Annex 1).

Company CEP Carbon Emissions Partners S.A.
Address: 52 Route of de of Thonon, Geneva, CH-1222, Switzerland
Telephone: +41 (76) 346 11 57
Fax: +41 (76) 346 11 57
E-mail: 0709bp@gmail.com
web Page: -
Contact person: Fabian Knodel (Director)
Company CEP Carbon Emissions Partners S.A. is a project participant (stated in Annex 1).

SECTION C.   Duration of the <u>project</u> / <u>crediting period</u>

C.1.   **<u>Starting date of the project</u>:**

Starting date of the project activity: 09/02/2005 – a completion certificate for February.

C.2.   **Expected <u>operational lifetime of the project</u>:**

Functioning of the system of leak detection and repair, and also further maintaining of leak-proofness of gas equipment that was created within the framework of the Project, are not limited in time, as periodic repair (replacement) of GDP (CGDP) gas equipment and gas fittings of gas pipelines will be performed constantly. Expected operational lifetime of the project is 12 years and 11 months / 155 months, from 09/02/2005 to 31/12/2017 if the Kyoto Protocol is prolonged.

C.3.   **Length of the <u>crediting period</u>:**

ERU generation belongs to the first commitment period of 5 years / 60 months (January 1, 2008 – December 31, 2012).

The starting date of the crediting period is the date when the first project measures at gas pipelines of PJSC "Kharkivgaz" were carried out and when the first GHG emission reductions were generated, namely 09/02/2005. The end of the crediting period is 31/12/2012. Thus, the length of the crediting period is 7 years and 11 months, or 95 months.

If after the first commitment period under the Kyoto protocol it is prolonged, the crediting period under the project will be prolonged until 31/12/2017. Prolongation of the crediting period beyond 2012 i subject to approval by the Host Party. The total crediting period (pre-crediting period, crediting period and post-crediting period) will make 12 years and 11 months, or 155 months.

SECTION D.   Monitoring plan

D.1.   Description of monitoring plan chosen:

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03.[15]

The monitoring plan was developed for reliable and clear calculation of greenhouse gases emissions and for preparation of reports on methane emissions reduction based on the baseline and project activity. The JI-specific approach is based on the 2012 "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine (hereinafter – the "Methodology").

The Methodology provides for the use of two equal and independent methods of methane leaks in gas distribution networks, namely:
- the computational method as the method based on data on methane leaks from GDN components formed from standard values on natural gas emissions for each GDN component as well as data obtained by statistical processing of the results of ex-post methane leak measurement before and after the repairs.
- the measurement method based on the results of ex-post methane leak measurement for each GDN component before and after the repairs.

Due to the large quantity of potentially explosive components in gas distribution networks, their complicated accessibility for leak measurement, as well as unavailability of necessary measurement equipment as of the beginning of the Project, PJSC "Kharkivgaz" applies the computational method for emission reduction calculation while implementing the expanded leak detection and repair program.

While the computational method is used according to the Methodology to calculate excess physical natural gas leak (EPNGL) in a GDN component, natural gas leakage factors (NGLF) listed in Table A.1 of Appendix A to the Methodology, attached as a Supporting Document, are applied; to calculate standard physical natural gas leak (SPNGL) standard values are used, if available, and otherwise LDAF are applied, obtained by statistical processing of the results of ex-post methane leak measurement before and after the repair, see Table A.1 of Appendix A. LDAF values listed in Appendix A to the Methodology, obtained by statistical processing of the results of ex-post natural gas leak measurement before and after the repair:[16],[17]:

Assessment of GDN component condition - whether it has conditional leak-proofness or not - is made using audio, visual and olfactory responses, detection with individual dosimeters during leak detection activities under the project.

Each GDN component has LDAF, which may be either standard, i.e. typical of equipment under conditional leak-proofness, or excess, i.e. typical of equipment not in its conditional leak-proofness state, so that physical methane leak exceeds the limit of normal operational mode of any GDN component. Equipment where EPNGL was detected but not repaired in the corresponding monitoring period is deemed conditionally leak-proof, i.e. its leaks are deemed equal to SPNGL over the corresponding monitoring period. Methane leak reduction in GDN component i in the monitoring period takes place only after the excess leak has been repaired by

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[15]http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

[16]Report on the scientific and engineering research "Development of methodological basics for the calculation of greenhouse gases emission reduction by repair of natural gas leaks in gas distribution networks", NASU Institute of Gas, 2012

[17]Report on the scientific and engineering research "Assessment of methane leaks in gas distribution networks in Ukraine", NASU Institute of General Energy, 2012

replacement of component i and/or sealant replacement in component i. This reduction is calculated as the difference between the EPNGL LDAF and SPNGL LDAF for the time under the pressure.

The dates of leak repair and removal of gas pressure from the relevant GDN component are the days preceding the actual carrying out of works on component replacement and/or sealant replacement in component; the dates of natural gas pressure feed to the GDN component are the days following the actual carrying out of the activity. Gas equipment where the repeated methane leak will be detected, should be excluded from the calculations of greenhouse gases emission reduction in the corresponding monitoring period. Thus, it will be deemed that no methane leak reduction took place in this equipment (in the corresponding GDN component) in the period from the date of the latest monitoring measurement of methane leak to the date of repeated leak detection and repair. Such equipment should be repaired (replaced) again, following which methane leak reduction can be calculated in the corresponding component. Thus, applying the computational method of the Methodology to calculate methane leak reduction in gas distribution networks actually yields lowered results by applying the aforementioned calculation mechanisms, which confirms the conservative approach.

According to the Methodology, the Working Team of PJSC "Kharkivgaz" will draw up the following registries:
1. The registry of gas distribution points and the gas armature of JI project «Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz", which includes all the information on GDP (CGDP), valves gas armature, flanges and threaded connections that are included in the project.
2. Registry of EPNGL repairs at GDN components. Registry of monitoring of operation of GDN components under the pressure or unpressurized, i.e. when NGLF equals zero.
3. Registry of monitoring of operation of GDN components under the pressure or unpressurized, i.e. when NGLF equals zero.
4. Registry of GDN components monitoring after EPNGL repair.

All data associated with the calculation of the methane emission reductions are stored in an electronic database (DB). Each Monitoring report will include all necessary information from the database.

Project data and documents subject to monitoring and required for verification, will be stored throughout the crediting period and 2 years after the transfer of the last ERUs under the project.

Data and parameters that are not monitored throughout the crediting period, but are determined only once and that are available already at the stage of PDD development:

Index	Parameter	Data unit
i	Sequence number of the GDN component (GDP (CGDP), gas fitting) included into the project boundary	dimensionless
ConvFactor	volume to weight conversion factor for methane leaks, t CH_4/m^3 CH_4	0,0007168 t/m^3.

…

Data and parameters that are not monitored throughout the crediting period, but are determined only once but that are not available already at the stage of PDD development: none

Data and parameters that are monitored throughout the crediting period:

Index	Parameter	Data unit
h	No. of activity (replacement/repair) in GDN component after EPNGL detection	dimensionless
W_y	Average mass ratio of methane in natural gas in period y of the project scenario,	%
$K_{i',h}^g$	Natural gas leakage factor of i' GDN component in CLP:	m^3/h
$K_{i''}^n$	Natural gas leakage factor corresponding to EPNGL of i'' GDN component	m^3/h
$H_{i',h,y}^g$	Time of GDN component operation under the pressure from the beginning of monitoring period y to the implementation of the project activity (repair/replacement) that caused EPNGL removal	h
$H_{i'',h,y}^n$	Time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period y	h
GWP_{CH_4}	Global Warming Potential of methane	t CO$_2$eq/tCH$_4$

[y] - index for monitoring period;

[i] - index corresponding to GDN component number

[i'] - index for GDN component number that belongs to the set of elements I' (I'+I") = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated no emission reductions (no component replacement/repair took place) in the reporting monitoring period;

[i''] - index for GDN component number that belongs to the set of elements I" (I'+I") = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated emission reductions (component replacement/repair took place) in the reporting monitoring period;

[h] - index corresponding to the number of project activity in GDN component, if more than one activity was carried out at this component in monitoring period (where H is a set embracing all activities in the project scenario at the GDN component in monitoring period)

[g] - index for SPNGL;

[n] - index for EPNGL.

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

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

ID number *(Please, use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
1. i	Sequence number of the GDN component (GDP (CGDP), gas fitting) included into the project boundary	Leak measurement activity	None	m	Once at the beginning of the project	100%	Electronic and paper	All GDN components included into the project boundary are listed in the Registry and numbered correspondingly
2. GWP_{CH}	Global Warming Potential of methane	IPCC Second Assessment Report: Climate Change 1995 (SAR) and approved by COP. GWP of methane is available at the UNFCCC website [18]	t CO_2eq/tCH_4	e	Throughout the crediting period	100%	Electronic and paper	Project developer will monitor any changes in Global Warming Potential of methane published by IPCC and Approved by COP
3. h	No. of activity (replacement/repair) in GDN component after EPNGL detection	Leak measurement activity	None	m	After each activity with GDN component	100%	Electronic and paper	Every activity conducted at a GDN component included into the project boundary is assigned a sequence number
4. W_y	Average mass ratio of methane in natural gas in period y of the project scenario	The value is calculated on the basis of company's official data on gas	%	c	Annually	100%	Electronic and paper	Company data

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[18] http://unfccc.int/ghg_data/items/3825.phphttp://unfccc.int/ghg_data/items/3825.php

ID number *(Please, use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
		net calorific value in monitoring period						
5. $K_{i',h}^{g}$	Natural gas leakage factor of i' GDN component in CLP:	Standard values or data of the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks"	m³/h	e	After each activity with GDN component	100%	Electronic and paper	Company data or calculated based on company data
6. $K_{i'',h}^{g}$	Natural gas leakage factor corresponding to EPNGL of i'' GDN component	Calculated using the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks"	m³/h	e	Once at the beginning of the project for each GDN component	100%	Electronic and paper	Calculated based on company data
7. $H_{i',h,y}^{g}$	Time of GDN component operation under the pressure from the beginning of monitoring period *y* to the implementation of the project activity	Company data obtained in the course of GDN operation and leak repair activities	h	c	Annually	100%	Electronic and paper	Company data Calculated for each GDN component for monitoring period

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

ID number *(Please, use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
	(repair/replacement) that caused EPNGL removal							
8. $H_{i'',h,y}^n$	Time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period *y*	Company data obtained in the course of GDN operation and leak repair activities	h	c	Annually	100%	Electronic and paper	Company data Calculated for each GDN component where leak repair activities were carried out for monitoring period

Pursuant to the current legislation, all metering equipment in Ukraine shall compl with the fixed standards and is subject to periodical verification.

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

Greenhouse gas emissions in the project scenario according to the JI-specific approach (calculated using the tabular method of the Methodology) are calculated by the following formulae:

$$PE_y = GWP_{CH_4} \cdot ConvFactor \cdot W_y \cdot P_y$$

(1)

where:

PE_y - greenhouse gas emissions in period *y* of the project scenario, t CO₂eq;

GWP_{CH_4} - global warming potential of methane, tCO₂eq/tCH₄;

W_y - average mass ratio of methane in natural gas in period *y* of the project scenario, %;

P_y – natural gas leaks to the atmosphere in period y of the project scenario, m³;

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ConvFactor - volume to weight conversion factor for methane leaks, t CH_4/m^3 CH_4. Under normal conditions - zero degrees Celsium and 0.1013 MPa, *ConvFactor*=0.0007168 t/m^3.

$[y]$ - index for monitoring period;

$[CH_4]$ - index for methane.

Natural gas emissions to the atmosphere caused by leaks from gas transportation networks are calculated by the following formula:

$$P_y = \sum_{h \in H_{i'}} \sum_{i' \in I'} K^g_{i'h} \cdot H^g_{i'hy} + \sum_{h \in H_{i''}} \sum_{i'' \in I''} K^g_{i''h} \cdot H^n_{i''hy} \tag{2}$$

$K^g_{i'h}$ - natural gas leak factor of i' GDN component in CLP (i.e. corresponding to SPNGL) in period y of the project scenario, m^3/h;

$K^g_{i''h}$ - natural gas leak factor corresponding to EPNGL of GDN component in period y i'' of the project scenario, m^3/h;

$H^g_{i'hy}$ - time of GDN component operation from the beginning of monitoring period y to the implementation of the project activity (repair/replacement) that caused EPNGL removal, h;

$H^n_{i''hy}$ - time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period y, h;

$[y]$ - index for monitoring period;

$[i']$ – index for GDN component number that belongs to the set of elements I' (I'+I") = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated no emission reductions (no component replacement/repair took place) in the reporting monitoring period;

$[i'']$ – index for GDN component number that belongs to the set of elements I" (I'+I") = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated emission reductions (component replacement/repair took place) in the reporting monitoring period;

$[h]$ - index for the number of project activity in GDN component, if more than one activity was carried out at this component in monitoring period (where H is a set embracing all activities in the project scenario at the GDN component in monitoring period);

$[g]$ - index for SPNGL;

$[n]$ - index for EPNGL.

D.1.1.3. Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions of greenhouse gases by sources within the <u>project boundary</u>, and how such data will be collected and archived:

ID number *(Please, use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
1. i	Sequence number of the GDN component (GDP (CGDP), gas fitting) included into the project boundary	Leak measurement activity	None	m	Once at the beginning of the project	100%	Electronic and paper	All GDN components included into the project boundary are listed in the Registry and numbered correspondingly
2. GWP_{CH_4}	Global Warming Potential of methane	IPCC Second Assessment Report: Climate Change 1995 (SAR) and approved by COP. GWP of methane is available at the UNFCCC website [19]	t CO₂eq/tCH₄	e	Throughout the crediting period	100%	Electronic and paper	Project developer will monitor any changes in Global Warming Potential of methane published by IPCC and Approved by COP
3. h	No. of activity (replacement/repair) in GDN component after EPNGL detection	Leak measurement activity	None	m	After each activity with GDN component	100%	Electronic and paper	Every activity conducted at a GDN component included into the project boundary is assigned a sequence number
4. W_y	Average mass ratio of methane in natural gas in period y of the project scenario	The value is calculated on the basis of company's official data on gas net calorific value in monitoring period	%	c	Annually	100%	Electronic and paper	Company data

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[19] http://unfccc.int/ghg_data/items/3825.phphttp://unfccc.int/ghg_data/items/3825.php

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

ID number *(Please, use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
5. $K_{i'h}^g$	Natural gas leakage factor of i' GDN component in CLP:	Standard values for equipment or calculated using the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks"	m³/h	e	After each activity with GDN component	100%	Electronic and paper	Company data or calculated based on company data
6. $K_{i''}^n$	Natural gas leakage factor corresponding to EPNGL of i'' GDN component	Calculated using the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks"	m³/h	e	Once at the beginning of the project for each GDN component	100%	Electronic and hard copy	Calculated based on company data
7. $H_{i'hy}^g$	Time of GDN component operation under the pressure from the beginning of monitoring period *y* to the implementation of the project activity (repair/replacement) that caused EPNGL	Company data obtained in the course of GDN operation and leak repair activities	h	c	Annually	100%	Electronic and paper	Company data Calculated for each GDN component for monitoring period

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

ID number *(Please, use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
	removal							
8. $H_{i"hy}^{n}$	Time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period *y*	Company data obtained in the course of GDN operation and leak repair activities	h	c	Annually	100%	Electronic and paper	Company data Calculated for each GDN component where leak repair activities were carried out for monitoring period

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

Greenhouse gas emissions in the baseline scenario according to a JI specific approach (which is calculated by using the tabular method of the Methodology) are calculated according to the formula:

$$BE_y = GWP_{CH_4} \cdot ConvFactor \cdot W_y \cdot B_y$$

(3)

where:

BE_y - greenhouse gas emissions in period *y* of the baseline scenario, t CO₂eq;

GWP_{CH_4} - global warming potential of methane, tCO₂eq/tCH₄;

W_y - average mass ratio of methane in natural gas in period *y* of the project scenario, %;

B_y – natural gas leaks to the atmosphere in period *y* of the baseline scenario, m³;

$ConvFactor$ - volume to weight conversion factor for methane leaks, t CH₄/m³ CH₄. Under normal conditions - zero degrees Celsium and 0.1013 MPa, $ConvFactor$=0.0007168 t/m³.

$[y]$ - index for monitoring period;

$[CH_4]$ - index for methane.

Natural gas emissions to the atmosphere caused by leaks from gas transportation networks are calculated by the following formula:

$$B_y = \sum_{h \in H_i} (\sum_{i' \in I'} K_{i'h}^{g} \cdot H_{i'hy}^{g} + \sum_{i'' \in I''} K_{i''}^{n} \cdot H_{i''hy}^{n})$$

(4)

$K_{i'h}^{g}$ - natural gas leak factor of i' GDN component in CLP (i.e. corresponding to SPNGL) in period y of the baseline scenario, m³/h;

$K_{i''}^{n}$ - natural gas leakage factor corresponding to EPNGL of i'' GDN component in period y of the baseline scenario, m³/h;

$H_{i'hy}^{g}$ – time of GDN component operation in CLP under the pressure in period y of the baseline scenario, h;

$H_{i''hy}^{n}$ - time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period y, h;

$[y]$ - index for monitoring period;

$[i']$ – index for GDN component number that belongs to the set of elements I' (I'+I") = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated no emission reductions (no component replacement/repair took place) in the reporting monitoring period;

$[i'']$ - index for GDN component number that belongs to the set of elements I" (I'+I") = I, where I is a set embracing all the GDN components included into the project boundary) where project activity generated emission reductions (component replacement/repair took place) in the reporting monitoring period;

$[h]$ - index corresponding to the number of project activity in GDN component, if more than one activity was carried out at this component in monitoring period (where H is a set embracing all activities in the project scenario at the GDN component in monitoring period)

$[g]$ - index for SPNGL;

$[n]$ - index for EPNGL.

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

D.1.2.1 Data to be collected in order to monitor emission reductions from the <u>project</u>, 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
-	-	-	-	-	-	-	-	-

Direct monitoring of emission reduction is not applied.

> **D.1.2.2 Description of formulae used to calculate emission reductions from the <u>project</u> (for each gas, source etc.; emissions/emission reductions in units of CO₂ equivalent):**

Direct monitoring of emission reduction is not applied.

> **D.1.3. Determination of <u>leakage</u> in the <u>monitoring plan</u>:**

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

According to the selected JI specific approach based on the Joint Implementation requirements in accordance with paragraph 9 (a) of the JI Guidance on criteria for baseline setting and monitoring, Version 03[20] and the "Methodology for calculation of greenhouse gas emission reductions achieved through above-standard natural gas leak repair at the gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine to set the baseline (measurement and calculation of methane leaks) and elements of the Approved Clean Development Mechanism Methodology AM0023 Version 04.0.0, no leakage is expected.

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

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[20] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

No leakage is expected.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO₂ equivalent):

Greenhouse gases emission reductions are calculated by the following formula:

$$ER_y = BE_y - PE_y;$$ (5)

where

ER_y – greenhouse gas emission reductions in period y (t CO_2eq)

BE_y – greenhouse gas emissions in period y of the baseline scenario (t CO_2eq)

PE_y – greenhouse gas emissions in period y of the project scenario (t CO_2eq)

[y] – index corresponding to monitoring period.

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:

Implementation of this Project does not provide for any negative environmental impact (See Section F below). Therefore data collection on environmental impacts of the Project is not required. There are no laws or regulations in Ukraine requiring collection of such information.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	UNERCtainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1. *i*	Low	Every GDN component included into the project boundary should be listed in Supporting Dociment 1: Registry of gas distribution points, cabinet gas distribution points, gas fittings, gas distribution networks of JI project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Kharkivgaz" under individual sequence number.

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

2. GWP_{CH_4}	Low	IPCC Second Assessment Report: Climate Change 1995 (SAR) and approved by COP. GWP of methane is available at the UNFCCC website [21], Project developer will monitor any changes in Global Warming Potential of methane published by IPCC and Approved by COP.
3. h	Low	According to GDN operation procedure and leak measurement activity, each implementation (replacement/repair) at a GDN component should be fixed in repair logs and inserted into the electronic DB provided for by the project.
4. W_y	Low	According to GDN operation procedure, the company should conduct measurement of average weight fraction of methane in natural gas on a monthly basis; the results are fixed in official reports of the company and affect the price of gas transportation through GDN.
5. $K_{i'h}^g$	Low	Standard values for each GDN component or in case of their absence factors provided in Table A.2 in Annex A to the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks" developed by the Institute of Gas of the National Academy of Sciences of Ukraine are used.
6. K_i^n	Low	Factors provided in Table A.2 in Annex A to the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks" developed by the Institute of Gas of the National Academy of Sciences of Ukraine are used.
7. $H_{i'hy}^g$	Low	Company's official data that are entered in GDN component operation logs and duplicated in electronic database are used
8. $H_{i''hy}^n$	Low	Company's official data that are entered in GDN component operation logs and duplicated in electronic database are used

For the sake of conservativeness of parameters with medium and high level of indefinitness, metering equipment is subject to regular calibration and the latest versions of regulations and specifications are used. If the latest versions are unavailable, the previous versions are used.

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

Coordination of activities of all departments and services of PJSC "Kharkivgaz" relating to the JI project implementation is carried out by the Working Team created pursuant to Decree No.153 of PJSC "Kharkivgaz" management board as of 17/02/2012. The structure of the Working Team is shown in Figure 4.

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[21] http://unfccc.int/ghg_data/items/3825.phphttp://unfccc.int/ghg_data/items/3825.php
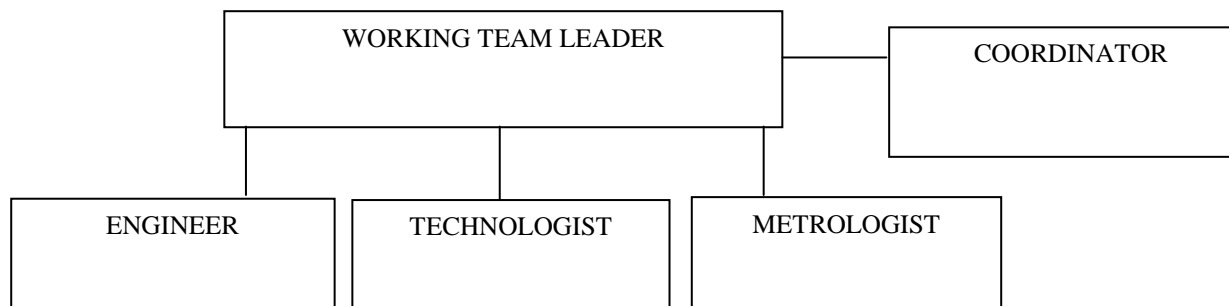
Figure 4. Working Team structure

Technologist is responsible for collection of information and performance of all the necessary calculations as provided in the monitoring plan of the JI project. Engineer is responsible for organization of measurements and repair of leaks. Working Team Leader is responsible for the Project schedule development and determination of the necessary resources based on the data received. Metrologist ensures the availability of the calibrated metering devices and technical maintenance of the JI project. Coordinator is responsible for storage, archiving and backuping of data relating to the JI project.

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

PJSC "Kharkivgaz"
Address: 1 Bezliudivska St., 61492 Kharkiv
Phone: +38 (057) 719-85-56
Fax: +38 (057) 719-85-56
E-mail: office@oblgaz.kharkov.ua
Web-page: http://kharkivgaz.com.ua/
Client ref.: Volodymyr Volodymyrovych Zlenko (Chairman of the Board)
PJSC "Kharkivgaz" is a project participant (stated in Annex 1).

SECTION E.   Estimation of greenhouse gas emission reductions

E.1.   Estimated project emissions:

Project emissions were estimated based on data from the monitoring plan presented in Section D.1.1.2 and Annex 3. The results of measurements and calculations done by PJSC "Kharkivgaz" (see Supporting Document 2)[22] are provided in Table 6:

Table 6. Estimated project emissions:

Year	Estimated project emissions (t CO_2eq)
2005	203 414
2006	203 414
2007	203 414
Total 2005-2007	**610 239**
2008	203 414
2009	203 414
2010	203 414
2011	203 414
2012	203 414
Total 2008-2012	**1 017 065**
2013	203 414
2014	203 414
2015	203 414
2016	203 414
2017	203 414
Total 2013-2017	**1 017 065**
Total (t CO_2 equivalent)	**2 644 369**

E.2.   Estimated leakage:

No leakage is expected.

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

Since no leakage is expected, the sum of E.1 and E.2 equals E.1 (see Table 6).

E.4.   Estimated baseline emissions:

Similar to project emissions, baseline emissions were estimated using formule in Section D.1.1.4. The results are provided in Table 7.

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[22] Supporting document 2 – "Calculation of methane emission reductions on gas equipment of GDPs (CGDPs), gas fittings, flanged and threaded connections of gas distribution networks of PJSC "Kharkivgaz" on the basis of initial monitoring measurements", is executed in an electronic form and submitted to the State Environmental Investment Agency of Ukraine and BureauVeritas Certification Holding SAS – the company that verifies the project.

Table 7. Estimated baseline emissions.

Year	Estimated baseline emissions (t CO$_2$ equivalent)
2005	372 482
2006	541 551
2007	710 620
Total 2005-2007	**1 624 653**
2008	879 690
2009	1 048 759
2010	1 048 759
2011	1 048 759
2012	1 048 759
Total 2008-2012	**5 074 726**
2013	1 048 759
2014	1 048 759
2015	1 048 759
2016	1 048 759
2017	1 048 759
Total 2013-2017	**5 243 795**
Total (t CO$_2$ equivalent)	**11 943 174**

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

Annual GHG emission reductions in the project are calculated under the formula that follows:

Emission reductions = Baseline emissions - Project emissions

The results of emission reductions calculation are provided in Table 8 below.

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

Table 8. Estimated CO$_2$ emission reductions under the project

Year	Estimated project emissions (t CO$_2$ equivalent)	Estimated leakage (t CO$_2$ equivalent)	Estimated baseline emissions (t CO$_2$ equivalent)	Estimated emission reductions (t CO$_2$ equivalent)
2005	203 414	0	372 482	169 069
2006	203 414	0	541 551	338 138
2007	203 414	0	710 620	507 207
Total 2005-2007 (t CO$_2$ equivalent)	**610 239**	**0**	**1 624 653**	**1 014 414**
2008	203 414	0	879 690	676 277
2009	203 414	0	1 048 759	845 346
2010	203 414	0	1 048 759	845 346
2011	203 414	0	1 048 759	845 346
2012	203 414	0	1 048 759	845 346
Total 2008-2012 (t CO$_2$ equivalent)	**1 017 065**	**0**	**5 074 726**	**4 057 661**
2013	203 414	0	1 048 759	845 346
2014	203 414	0	1 048 759	845 346
2015	203 414	0	1 048 759	845 346
2016	203 414	0	1 048 759	845 346
2017	203 414	0	1 048 759	845 346
Total 2013-2017 (t CO$_2$ equivalent)	**1 017 065**	**0**	**5 243 795**	**4 226 730**
Total (t CO$_2$ equivalent)	**2 644 369**	**0**	**11 943 174**	**9 298 805**

SECTION F.   Environmental impacts

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

According to the environmental standards of Ukraine, natural gas emissions into the air are not considered polluting. (The Decree of the Cabinet of Ministers of Ukraine №1598 dated 29/11/2001 "About approval of the list of the most widespread and dangerous polluting substances which emissions are subject to regulation"[23]). Therefore no environmental permissions are required for natural gas transportation and supply. The only environmental impact is reduction of natural gas emissions into the atmosphere.

In addition, implementation of this <u>Project</u> will improve the gas distribution network operation safety, which, in turn, will lower the possibility of explosions or fires.

Transboundary impacts from the <u>project</u> activity, according to their definition in the text of "Convention on long-range transboundary pollution" ratified by Ukraine, will not take place.

No negative impact is expected as a result of the <u>Project</u> implementation.

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

No negative impact is expected as a result of the <u>Project</u> implementation.

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[23]http://search.ligazakon.ua/l_doc2.nsf/link1/ed_2001_11_29/an/16/KP011598.html

SECTION G. Stakeholders' comments

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

Consultations were conducted with the specialists of the Institute of General Energy of NAS of Ukraine. No comments from stakeholders were received. The project activity does not provide for any negative environmental or social impact.

Annex1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Supplier:

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Annex 2

BASELINE INFORMATION

To determine the <u>baseline</u> the following parameters are used:

#	Parameter reference	Name to the parameter	Data unit
1.	i	Sequence number of the GDN component (GDP (CGDP), gas fitting) included into the project boundary	Dimensionless
2.	GWP_{CH_4}	Global warming potential of methane	tCO_2e / tCH_4
3.	h	No. of activity (replacement/repair) in GDN component after EPNGL was detected	Dimensionless
4.	W_y	Average mass fraction of methane in natural gas	%
5.	K_{ih}^g	Natural gas leakage factor of GDN component in i' CLP	m^3/h
6	$K_{i''}^n$	Natural gas leakage factor corresponding to EPNGL of i'' GDN component	m^3/h
7	$H_{i'hy}^g$	Time of GDN component operation under the pressure from the beginning of monitoring period y to the implementation of the project activity (repair/replacement) that caused EPNGL removal	h
8.	$H_{i''hy}^n$	Time of GDN component operation under the pressure from the implementation of the project activity (repair/replacement) that caused EPNGL removal to the end of monitoring period y	h

The detailed description of parameters for determination of the <u>baseline</u> is presented in tables of section B.1.

Calculation of the <u>baseline</u> is performed as per formulae (3) and (4) (Section of D.1.1.4).

<u>Annex 3</u>

<u>MONITORING PLAN</u>

The <u>monitoring plan</u> includes the following sections:

1. The program of the initial monitoring measurements of methane leaks at the gas equipment of GDPs (CGDPs), gas fittings of PJSC "Kharkivgaz" gas distribution networks.
2. Monitoring map of methane leaks at the gas equipment of GDPs (CGDPs), gas fittings of PJSC "Kharkivgaz" gas distribution networks.
3. Methodology of methane leak detection.
4. Guidance on monitoring measurement data collection and storage.

I. PROGRAM

of the initial monitoring measurements of methane leaks at the gas equipment of GDPs (CGDPs), gas fittings of PJSC "Kharkivgaz" gas distribution networks.

The aim of the initial monitoring measurements of methane leaks is:
  1. Receipt of a more reliable estimation of methane leak volumes from the gas transportation system (exept for the leaks, related to operation, technical maintenance or emergency situations).
  2. Methane ERUs calculation during the JI <u>Project</u> implementation.
  3. Determination of the potential income of the <u>project</u> and amount of repair work / replacement which is necessary under condition of an attractive payback period for investment.
  4. Determination of priorities in relation to works that must be executed at gas equipment.
  5. Obtaining of initial experience in JI project implementation, identification of questions, that must be solved or improved (such as additional measuring equipment, accuracy class of devices, necessity of training of corresponding workers) before the beginning of the <u>project</u>, to provide for the proper implementation.

The JI <u>Project</u> has the following stages:
  - determination of the list of facilities where methane leaks occur;
  - repair of methane leaks by replacement of sealing materials with more modern and reliable ones or complete replacement of equipment;
  - calculation of methane leaks at facilities;
  - monitoring of leaks at equipment that was already repaired (replaced).

Certain issues have to be determined systematically during preliminary measurements:

- where leaks take place and calculation of their volumes (at the initial stages an approximate calculation is possible to have an understanding of the size of leak volumes);
- where leaks are relatively small;
- where there are possibilities for repair or/and replacements of equipment, that require small funds;
- where significant leaks are detected and their repair will not require significant financing.

Quality information (for example, difficulties in measuring at certain components because of the limited access to them etc) also must be recorded, where possible to facilitate planning and implementation of the <u>Project</u>.
The system of the name/ numeration of gas equipment units must be agreed upon before the beginning of measurements.
The table provided below has explanatory and actual, not directing and normative character.

Table 1MP. Information about facilities located at GDPs (CGDPs)

A logger of technical verification of gas equipment of GDPs (CGDPs) is maintained (a maintenance log that is kept by inspectors) - one time per four days, it is performed by the corresponding authorized worker. Leaks are specified in the logger of reports (Table 1MP). Availability of EPNGL is determined by using gas detector and / or by organoleptic method.

Current repair is conducted one time per year, technical maintenance - one time per half-year.

Table 1MP. Information on GDP (CGDP) facility

Name of GDP (CGDP) (code according to the Register)/ Name of GDP (CGDP) component	Gas pressure at entrance /exit, (MPa)	Average volume of the transported gas, m^3/h.	% CH_4	Availability of above-standard leak, yes/no
1	2	3	4	5

Date of measurement: _____

Table 2MP. Information on facilities at gas distribution pipelines

A logger of technical verification of gas fittings is maintained (a maintenance log that is kept by inspectors) - one time per month, it is performed by the corresponding authorized worker. Leaks are specified in the logger of reports (Table 2MP). Availability of EPNGL is determined by using gas detector and / or by organoleptic method.

Current repair is conducted one time per year, technical maintenance - one time per half-year.

Table 1MP. Information on GDP (CGDP) facility

No. z/p (registry code) valve type	Gas pressure, (MPa)		Average volume of the transported gas, m^3/h.	% CH_4	Availability of above-standard leak, yes/no
1	2	3	4	5	6

Date of measurement: _____

II. MONITORING MAP

of methane leaks at the GDN components (gas equipment of GDPs (CGDPs), gas fittings of PJSC "Kharkivgaz" gas distribution networks) included in the project boundary

The monitoring map determines the general procedure for realization of the annual measurement of methane leaks at GDP (CGDP) gas equipment, gas fittings of PJSC "Kharkivgaz" gas distribution networks, that are included in the JI project boundary.

In accordance with the Project activity (Section A.2 of the PDD), each project activity at GDP (CGDP) gas equipment unit and gas fittings of PJSC "Kharkivgaz" gas distribution networks must be tagged with an individual number.
With the aim of tagging of each project activity at GDN component included in the project boundary a Registry "Repair of EPNGL at GDN components" of the project is drawn. In this Registry each activity at GDN component is tagged with individual number.

Since the beginning of the project activity, inspections aimed at determination of methane leaks are held at GDP (CGDP) gas equipment once every four days, and at gas fittings - once a month, so that one could make sure that gas equipment didn't become the source of methane leaks again. Inspections are recorded in the report of the service of gas pipelines and GDPs (CGDPs) operation and Registries planned under the project.

Methane leak detection at gas equipment during the first repair (replacements) of equipment in accordance with Project Implementation schedule is conducted twice: the first time -before repair (replacement) of equipment, the second time - after repair (replacement).
Current repair is conducted one time per year, technical maintenance - one time per half-year.

Technical maintenance of gas equipment that is in the Registry is conducted not rarer than one time per half of a year.
Current repair of gas equipment that is in the Registry is conducted one time per year.

If EPNGL is identified during the reporting monitoring period at GDN component that was repaired (replaced) in the previous monitoring period, this GDN component is excluded from the calculation of leak reduction in the reporting monitoring period and the GDN component shall be repaired (replaced) on a priority basis.

Data and parameters not monitored throughout the whole crediting period, but determined only once, which are available at the stage of PDD development:

Table 3MP. Data and parameters not monitored throughout the whole crediting period, but determined only once, which are available at the stage of PDD development.

Parameter reference	Name to the parameter	Data unit
i	Sequence number of GDN component (GDP (CGDP), gas fittings of gas pipeline) included in the project boundary	Dimensionless

Data and parameters that are not monitored during the crediting period but are identified only once and are not available at the PDD development stage: none

Data and parameters monitored during the whole crediting period are provided in table 4 MP:

Parameter reference	Name to the parameter	Data unit
h	Number of activity (replacement/repair) at GDN component after EPNGL was detected such component	Dimensionless
W_y	Average mass fraction of methane in the natural gas in period	%

	y of the project scenario	
$K_{i,h}^{g}$	Natural gas leak factor from GDN component in CLS	m³/h
$K_{i''}^{n}$	Natural gas leak factor that corresponds to EPNGL for GDN component	m³/h
$H_{i'hy}^{g}$	Time of operation of GDN component under pressure from the beginning of monitoring period "y" to implementation of project activities (repair / replacement) that resulted in the repair of EPNGL at such component	h
$H_{i''hy}^{n}$	Time of operation of GDN component under pressure from the moment of implementation of project activities (repair / replacement) that resulted in the repair of EPNGL at such component to the end of the monitoring period "y"	h
GWP_{CH_4}	Global Warming Potential of methane	tCO₂e / tCH₄

[*y*] – index that corresponds to monitoring period;

[*i'*] – index that corresponds to a number of GDN component, which is in a set of elements *I' ((I' + I'') = I*, where I is a set that includes all GDN components that are in the project boundary) where the project activities did not result in any emission reductions (there was no replacement / repair of components) in the reporting monitoring period;

[*i''*] – index that corresponds to a number of GDN component, which is in a set of elements *I'' ((I' + I'') = I*, where I is a set that includes all GDN components that are in the project boundary) where the project activities resulted in emission reductions (there was replacement / repair of components) in the reporting monitoring period;

[*h*] – index that corresponds to a number of activity under the project at GDN component, if more than one activity was carried out at reporting component in the monitoring period (where H is a set, which includes all activities in the project scenario at GDN component in the monitoring period);

[*g*] – index that corresponds to SPNGL;

[*n*] – index that corresponds to EPNGL.

III. METHODOLOGY OF METHANE LEAK MEASUREMENTS

Line-up of team for conduction of measurement:

Specialist of the service for operation of street gas pipelines and court introductions (SESG and CI);

A locksmith on exploitation and repair of gas equipment of GDP - 1 person;

A locksmith SESG and CI - 1 person.

Necessary materials, instruments and devices:

1) Keys, instruments;

2) Highly sensitive gas analyzer AZ 7291 or SENSIT Trak-It III CGI or MI-11- 1 unit;

3) Fire-extinguisher.

The procedure of methane leak measurement at gas equipment of GDPs (CGDPs) and gas fittings of gas pipelines:

1. Check whether GDP (CGDP, well) where gas equipment and gas fittings, where measuring will be conducted, are located are gas contaminated or not. Conduct measuring of gas contamination of GDP (CGDP, well) with the gas analyzer AZ 7291 or SENSIT Trak-It III CGI or MI-11.

Data recorded during measuring of methane leak in protocol of measuring:

1. Name, code of GDP (CGDP) gas equipment or gas fittings of gas pipeline where methane leak is measured.

2. Address of location of GDP (CGDP) or gas fittings where measuring of methane leaks is conducted.

3. Date of measurement.

4. Recording whether leak was detected or not.

5. Names of persons who conducted measurement.

IV. GUIDANCE
on monitoring measurement data collection and storage

Realization of JI <u>Project</u> provides for:

1. Initial and further regular monitoring inspections of each gas equipment unit that is in the register and realizations of measuring of methane leaks.
2. Repair (replacement) of old gas equipment.
All data, collected in the process of realization of the JI <u>project</u>, must be collected and entered in one database. The database must be constantly filled in during the JI <u>Project</u> lifetime. Data about the new leaks detected and repaired during the <u>project</u> lifetime must also be included. In monitoring reports on JI <u>Project</u> the data must be included from a database.
It is recommended to create a Working team on the JI <u>Project</u> at the enterprise, and to define responsibility for collection of all information on the JI <u>Project</u>, storage and archiving of documents on the JI <u>Project</u> between the members of the Working team.
Basic information sources for the calculation of methane emission reduction units are documents, the qualities of which are given in Table 5 below:

Table 5MP. List of preliminary documents formed during JI <u>Project</u> implementation

#	Document title	Document data source	Document format	Person who draws up the document	Document purpose	Document storage location
1	Logs of reports on the detection of leaks	Reports of inspectors of exploitation service of gas pipelines and GDPs (CGDPs)	Paper forms filled with data on leaks detected during walk-around once per four days	Masters of exploitation service of pipelines and GDPs (CGDPs)	To form Monitoring reports, calculate leak reductions, schedule of extracurriculumm repairs	At departments of exploitation service of pipelines and GDP (CGDP)
2	Logs of unscheduled repairs of GDN components (replacement of GDN components	Schedule of unscheduled repairs	Filled paper forms	Workers of working brigades	To form the Registry of EPNGL eliminated in GDN components	The coordinator of JI <u>Project</u> Working team
3	Registry of EPNGL eliminated in GDN components	Logs of unscheduled repairs of GDN components (replacement of GDN components	Electronic table	Authorized Working Team member	To form Monitoring reports, calculate leak reductions	The coordinator of JI <u>Project</u> Working team
4	Registry of the "Monitoring of pressurized component"	Logs of GDN component operation services	Electronic table	Authorized Working Team member	To form Monitoring reports, calculate leak reductions	The coordinator of JI <u>Project</u> Working team

#	Document title	Document data source	Document format	Person who draws up the document	Document purpose	Document storage location
4	Calculation of methane leaks	Registry of EPNGL eliminated, Registry of the "Monitoring of pressurized component", the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks" registry No. UkrNTI 0112U00A816 of 2012	Electronic table	Authorized member of Working team	To form Monitoring reports	The coordinator of JI Project Working team