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 «Chernigivgas»

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

Director of

CEP Carbon Emissions Partners S.A. _____ **Fabian Knodel**

(position) (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

the Head of the Management Board

PJSC «Chernigivgas» _____ **A.A. Yarova**

(position) (signature) (name and patronymic, last name)

PS

Chernigiv - 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 methane leak
EPNGL – excess physical methane 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 "Chernigivgas"

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

Project Design Document Version: 04

Date: 14/08/2012.

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 "Chernigivgas" is reduction of methane leaks at gas transportation and gas distribution infrastructure of PJSC "Chernigivgas". These leaks are the result of leaking gas equipment and gas fittings. The basic leak sources are gas distribution network (GDN) components, included into the Project boundary, as follows:

- gas equipment (pressure control valves, valves, filters, break switches, etc.) located at gas distribution points (GDPs) and cabinet-type gas distribution points (CGDPs) of PJSC "Chernigivgas";
- gas fittings (faucets, valve gates, screw valves, etc.) located at gas pipelines of PJSC "Chernigivgas".

The project boundary encompasses 437 GDPs, 1174 CGDPs and 3121 gas fitting units at gas pipelines.

The main reason of methane leaks is failure of sealing elements of equipment caused by temperature fluctuations and moisture. Basic component of natural gas is methane, which is greenhouse gas. Methane content in natural gasis 92-95%. Repair of methane leaks will result in a reduction of greenhouse gas emissions. Hereinafter, to refer to methane leaks the term "methane leaks" is used, since leak measurements refer to methane.

Situation existing prior to the start of the project

PJSC "Chernigivgas" is an enterprise that provides transportation and supply of natural gas to industrial enterprises (146), public-service facilities (4 334), and population (452 184 apartments and individual accomodation units) in Chernihiv city and the territories adherent to the city.

The main activities of the company are:
- Transportation of natural gas and oil 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 existing tariffs for gas transportation regulated by the state does not take into account the amortization and investment needs of gas distribution enterprises. This leads to a lack of financing for repair works and modernization of gas networks, purchase of proper technological equipment and components, and, as a result, contributes to the increase of methane leaks at PJSC "Chernigivgas" facilities.

Before the launch of this project, an application of Joint Implementation Mechanism provided for by the Kyoto Protocol was planned.

Baseline scenario
Prior to the start of the Project (2005) PJSC "Chernigivgas" 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 (UGSSR)[1]. The company detected methane leaks with the purpose of avoidance of emergency and explosive situations. Measurings of methane leak volumes, 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 "Chernigivgas" gas pipelines showed about 70 million m^3 per year methane leaks.

Project scenario
Project activities provide for the reduction of methane leaks that occur as a result of faulty sealing of GDN components (GDP and CGDP equipment and gas fittings of PJSC "Chernigivgas" 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 but also estimation of leak volume (i.e., potential gas leak reductions) and assess the quality of repairs conducted. This key information is required for substantiation of efficiency of repair works and priority choice of its objects, which is important under short financing for repair of all leaks. 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 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). Monitoring will be carried out on a regular basis by

[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.

specially trained staff. Detected leak points will be duly marked with individual numbers and registered in the database.

- 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. The repaired GDP (CGDP) gas equipment and gas fittings will be inspected regularly, as a part of standard monitoring activity, to make sure that they did not become the source of leaks again.

The project was initiated in September 2005:

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

September 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 "Chernigivgas".

31/09/2005 – PJSC "Chernigivgas" approves the PDD (version 01), which included the leak monitoring programme.

13/12/2010 – CEP Carbon Emissions Partners S.A. and PJSC "Chrenigivgas" signed an Emission Reductions Purchase Agreement relating to the JI project.

18/07/2012 – a Working Team was created to ensure performance of the JI Monitoring Plan.

14/08/2012 –Letter of Endorsement No.2220/23/7 was obtained from 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 "Chernigivgas"	No
Switzerland	• CEP Carbon Emissions Partners S.A.	No
*Please indicate if the Party involved is a host Party		

A.4. Technical description of the project:

A.4.1. Location of the project:

The Project is located in the territory of Ukraine's Chernihiv (Chernihiv region) and the territories adherent to the city (Figure 1).

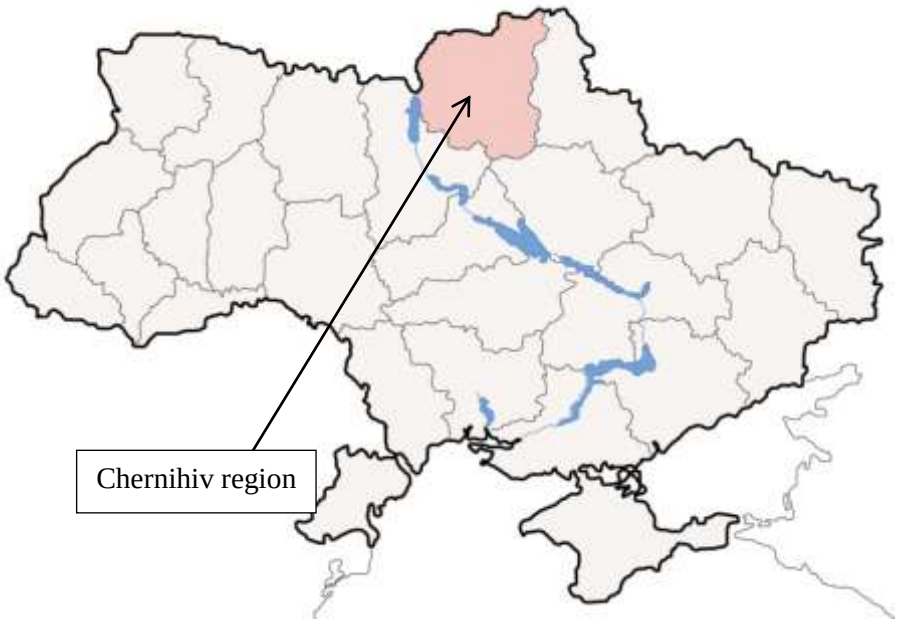

Figure 1. The map of Ukraine with indication of Chernihiv region

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. 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 Ukraine's Chernihiv (Chernihiv region) and the territories adherent to the city.

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

Chernihiv (Chernihiv region) and the territories adherent to the city.

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

The geographical coordinates of Chernihiv are:
51°30' 00" N; 31°18'00" E
Time zone: GMT +2:00

Chernihiv is the administrative capital of Chernihiv region.

The area is 31 865 sq. km. The population is 1 084 000 people. The region is divided into 22 districts. Chernihiv region is located in the north-eastern part of Ukraine, on the left bank of the Dnipro River, on Dnipro and Polissia lowlands. 20% of the total territory is covered with forests. There are 1200 rivers in the region having the total length of 8 500 km, the largest are the Dnipro River and Desna River with

affluents Seim, Oster, Snov, Ubid and Udai in the south. The climate is moderately continental. The average temperatures are: -7°C in January, +19°C in July. The annual precipitation average is 550-660 mm.

A complete list and addresses of gas distribution points (437 units), cabinet-type gas-distribution points (1174 units) and gas fittings (3121 units), that are included in the project boundary, is provided in Supporting Document 1 - "Registry of gas distribution points, cabinet-type gas distribution points, 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 "Chernigivgas"[2].

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

1. Development and introduction of methane leak calculation method

To measure methane leaks the proposed project applies a JI-specific approach based on the 2012 "Methodology of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks", registry No. UkrNTI 0112U00A816, 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 conservativeness 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 "Chernigivgas".
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 "Chernigivgas" will be provided at the JI project monitoring stage.

FT-02V1 leak detector. In order to detect methane leaks in a sample FT-02V1 leak detector, shown in Figure 2, is used.

Figure 2. A photo of FT-02V1 leak detector.

Specifications of FT-02V1 leak detector are provided in Table 1.

[2]Supporting document 1 to the PDD 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 "Chernigivgas", "Registry of gas distribution points, cabinet-type gas distribution points, gas fittings of gas distribution networks of the Joint Implementation Project" is executed in an electronic form and submitted to the State Environmental Investment Agency of Ukraine and Bureau Veritas Certification Holding SAS – a company that verifies the project.

Table 1. FT-02V1 leak detector specifications

Parameter	Value
Dimensions, mm	max 190x33x18
Weight, g	max 200
Supply voltage, V	from 3.05 to 4.5
Sensitivity limit, volume ratio, % - for methane - for propane	 0.01 0.03
Alarm threshold, volume ratio, % - for methane - for propane	 1.00±0.4 0.4±0.16
Ramp-up period, s	max
Alarm actuation period, s	max 3
Maximum power	1.5
Battery life, h	min 5
Battery voltage at idle, V	max 4.5
Battery short-circuit current, A	max 0.6
Explosion protection mark	1ExibdIICT5
Electric shock protection	3 class
Protection rating - electronic module shell - battery	 IP20 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[3], GOST 5152-84[4] or GOST 10330-76[5]).

More details on the measurement methods used in leak monitoring is provided in the Annex 3.

2. Introduction of modern sealants for leak repair.

Sealants (sealing agents) GOST 7338-90 are oil-and-petrol-resistant plates used 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 armature chambers, centrifugal and piston pumps, and also different 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, different devices. This stuffing is used to complete more than 80% of armature. They differentiate both in materials they are made of and methods of making (by structure). Both factors substantially influence operating properties of stuffing. The important

[3] "Rubber and Rubber-fabric Planes"
[4] "Sealing Stuffing"
[5] "Dishevelled flax. Specifications"

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 and control valves. Within the framework of the Project it is also planned to replace old GDP (CGDP) gas equipment as well as gas fitting of the USSR production with the equipment and shut-off and control valves of European producers and their analogues of national production.

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

4. Installation of centralized methane leak accounting 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;
- registration of the results and determination of priority in repair of leaks, which ensures the highest efficiency of this work upon scarcity of means for repair.
- data analysis and evaluation of reduction of natural gas losses and volumes of emission reduction.
- 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 maintaining of leakproofness of GDN components of PJSC "Chernigivgas" 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 the Working Team. Development of the Monitoring Plan, the PDD of the project, version 01 (October-December 2005).
2. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment: 80 GDPs (CGDPs) and 126 fittings (October-December 2005).
3. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment: 322 GDPs (CGDPs) and 504 fittings (January - December 2006).
4. Implementation of the PETM programme, repair (replacement) of gas equipment: 243 GDPs (CGDPs) and 504 fittings (January - December 2007).
5. Implementation of the PETM programme, repair (replacement) of gas equipment: 243 GDPs (CGDPs) and 504 fittings (January - December 2008)
6. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment: 241 GDPs (CGDPs) and 504 fittings (January - December 2009).
7. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment: 241 GDPs (CGDPs) and 499 fittings (January - December 2010).

8. Introduction and implementation of the PETM programme, repair (replacement) of gas equipment: 227 GDPs (CGDPs) and 480 fittings (January - December 2011).
9. 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 2012 - December 2017)

Upon proper maintenance no replacement of equipment implemented in the framework of the project is expected during the project period, since it meets all criteria of the existing modern common practice. Training of employees and specialists of PJSC "Chernigivgas" will take place in accordance with practice that existed prior to the project, and in case of necessity, such as lack of skills for working with equipment that is implemented in the framework of the project activities, equipment manufacturers will conduct briefings and training, as stipulated in contracts for the purchase of equipment.

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 includes:
- repair (replacement) of GDP (CGDP) gas equipment and gas fittings of PJSC "Chernigivgas" gas pipelines with the use of modern sealing materials and modern equipment of the European producers and their analogues of national 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 "Chernigivgas".

Reduction of methane 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:

The following emission reductions will be achieved during the Project implementation at each stage of the Project:

Table 2. Estimated amount of emission reductions in the period before the first commitment period (2005-2007)

	Years
Period before the crediting period	2 years and 3 months
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2005	48 820
2006	244 101
2007	390 562
Total estimated emission reductions before the crediting period (tonnes of CO_2 equivalent)	**683 483**
Annual average of estimated emission reductions before the crediting period	**227 827**

(tonnes of CO_2 equivalent)	

Table 3. Estimated amount of emission reductions in the first commitment period (2008-2012)

	Years
Duration of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	515 185
2009	683 482
2010	829 943
2011	976 403
2012	976 403
Total estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**3 981 416**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2 equivalent)	**796 283**

Table 4. Estimated amount of emission reductions in the period after the first commitment period (2013-2017)

	Years
Period after the crediting period	5
Years	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	976 403
2014	976 403
2015	976 403
2016	976 403
2017	976 403
Total estimated emission reductions after the crediting period (tonnes of CO_2 equivalent)	**4 882 015**
Annual average of estimated emission reductions after the crediting period (tonnes of CO_2 equivalent)	976 403

For more details see Supporting Document 2[6].
A description of formula used for calculation of emission reductions is provided in Section D.1.4.

A.5. Project approval by the Parties involved:

[6] Supporting Document 2 – Calculation of GHG emission reductions 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 "Chernigivgas" is executed in an electronic form and submitted to the State Environmental Investment Agency of Ukraine and Bureau Veritas Certification Holding SAS – a company that verifies the project.

The Project has been already supported by the Government of Ukraine, namely by the State Environmental Investment Agency of Ukraine, which issued a Letter of Endorsement for the JI Project (No. 2220/23/7 as of 14/08/2012).
Therefore, organizational risk for the JI Project is minimized.

Upon the receipt of the Determination Report from the Accredited Independent Entity the Project Design Documents and the Determination Report will be submitted to the State Environmental Investment Agency of Ukraine and accredited body of the country where another Project participant is registered to receive Letters of Approval for the JI project.

SECTION B. Baseline

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

A 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[7]. 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 selected approach for the baseline setting.

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 by eliminating above-standard methane leaks at gas distribution networks", registry No. UkrNTI 0112U00A816 dated 2012 that was 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 calculation method for estimation of GHG emission reductions.

The Methodology is based on approved Clean Development Mechanism methodology AM0023 version 04.0 "Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities"[8] 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.
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 "Chernigivgas" 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 "Chernigivgas" prior to the Proect.

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

1. Natural gas pipeline operators had no current Leak Detection and Repair Program as of the beginning of the project, i.e. GDN operator had no PETM or analogous programmes before the project started.

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

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

2. As of the start of the Project implementation, the project boundary is clearly identified, and GDN components (gas equipment of GDP, CGDP, gas fittings) included into the project boundary are identified and used by GDN operator on a lawful basis.
3. GDN operator may implement a monitoring system to monitor the condition of all GDN components included into the project boundary, including those already repaired or replaced.

The Project fully complies with the three conditions.

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

1. As of the moment of project implementation, natural gas pipeline operators do not use an expanded LDRP, providing 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 "Chernigivgas" 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 9.5 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 "Chernigivgas" 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 conducting the reliable monitoring of the repaired GDP (CGDP) gas equipment and gas fittings of gas pipelines and detecting 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

Initial conditions

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: Implementation of this Project without the application of JI mechanism.

Detailed analysis of each alternative is provided below.

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 "Chernigivgas". 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: Implementation of this Project without the application of 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 "Chernigivgas" is not obliged and motivated to conduct modernization of the equipment that will 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 on condition of theabsence of the Project.

Therefore, this scenario can be viewed as the Baseline.

Emission Reductions

The computational method used in the "Methodology of calculation of methane leaks in gas distribution networks" implies detection of excess physical methane leaks in GDN components and after their repairs, i.e. bringing them to conditional leak-proofness, 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.
3. Data on leaks is collected during project implementation.
4. The functioning of leak repair is checked during monitoring.
5. 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 of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks", registry No. Ukr NTI 0112U00A816 dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine.

Prior to the beginning of the Project PJSC "Chernigivgas" 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 "Chernigivgas" 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. Replacement schedules for equipment

Starting September 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

Full 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 "Chernigivgas" (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 monitoring plan. All data are kept in a database. Every report on fulfillment of the monitoring plan will include complete information from such database (Annex 3 to this PDD).

4. Monitoring requirements

In the process of the Project implementation supervision of the facilities of the Project 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 collected data will be included into the regular reports on fulfillment of the monitoring plan. All data are kept in a database. Each report on fulfillment of the monitoring plan will include complete information from such 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 baseline and justification of its choice are presented in the section B.2. below.

Key information for determination of the baseline is presented below.

Formulae for calculation of baseline GHG emissions are described below:

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

$$BE_y = GWP_{CH_4} \cdot ConvFactor \cdot W_y \cdot B_y \quad \text{(B1)}$$

where:

BE_y - GHG emissions in period *y* of the baseline scenario (t CO_2e)

GWP_{CH_4} - global warming potential of methane (t CO_2e/t CH_4)

W_y - average methane weight fraction in natural gas in period *y* of the project scenario (%)

B_y - methane leaks into the atmosphere in period *y* of the baseline scenario (m^3)

$ConvFactor$ - conversion factor to convert methane leaks from volume units to weight units (t CH_4 / m^3 CH_4). Under normal conditions defined as 0 degree Celsius and 0.1013 MPa, $ConvFactor$ = 0.0007168 t/m^3.

[*y*] - index corresponding to monitoring period

[CH_4] – - index that corresponds to methane.

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

$$B_y = \sum_{h \in H_i} \left(\sum_{i' \in I'} K^g_{i'h} \cdot H^g_{i'hy} + \sum_{i'' \in I''} K^n_{i''} \cdot H^n_{i''hy} \right); \quad \text{(B2)}$$

$K^g_{i',h,y}$ – natural gas leakage factor for GDN component i' that is in CLP (i.e. corresponds to SPNGL) in period *y* of the baseline scenario (m^3/h);

$K^n_{i''}$ – natural gas leakage factor for GDN component i'' that corresponds to EPNGL in period *y* of the baseline scenario (m^3/h);

$H^g_{i',h,y}$ - time of operation of GDN component in CLP under pressure in period *y* of the baseline scenario (h)

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

[*y*] - index corresponding to monitoring period

[*i'*] - index corresponding to 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 corresponding to 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 that corresponds to SPNGL

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

Data/Parameter	*i*
Data unit	Dimensionless
Description	Sequence number of GDN component (GDP (CGDP), gas fittings of gas pipeline) included in the project boundary
Time of determination/monitoring	Once at the beginning of Project
Source of data (to be) used	Activity on leak measurements

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 by eliminating above-standard methane leaks at gas distribution networks" registry No. Ukr NTI 0112U00A816 dated 2012 that was 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 for fixing of 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	tCO_2e / tCH_4
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 COP. GWP of methane is provided at the UNFCCC website[9]
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	In case CO_2 emission factors for methane change baseline and project scenario will be recalculated according to 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	Dimensionless
Description	Number of activity (replacement/repair) at GDN component after an EPNGL was detected at such component
Time of determination/monitoring	Every time after the activity carried out at corresponding 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 by eliminating above-standard methane leaks at gas distribution networks" registry No. Ukr NTI 0112U00A816 dated 2012 that was developed by the Institute

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

	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 "Chernigivgas" are entered in equipment repair logs. Personnel will have corresponding qualification for fixing of results.
Any comment	Data that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

Data/Parameter	W_y
Data unit	%
Description	Average mass fraction of methane in the natural gas in period *y* in the project scenario
Time of determination/monitoring	Annually
Source of data (to be) used	Calculation
Value of data applied (for ex ante calculations/determinations)	-
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 "Chernigivgas" calibrated and verified in accordance with the procedures for quality control
Any comment	Data that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

Data/Parameter	$K_{i,h}^{g}$
Data unit	m^3/h
Description	Natural gas leak factor from GDN component in CLP
Time of determination/monitoring	After every activity carried out at GDN component
Source of data (to be) used	Standard values or data from "Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard methane leaks at gas distribution networks" registry No. Ukr NTI 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.2 in Annex A to "Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard methane leaks at gas distribution networks" registry No. Ukr NTI 0112U00A816 dated 2012 developed by the Institute of Gas of the National Academy of Sciences of Ukraine are used

QA/QC procedures (to be) applied	N/A
Any comment	Data that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

Data/Parameter	K_i^n
Data unit	m^3/h
Description	Natural gas leak factor that corresponds to EPNGL for GDN component
Time of determination/monitoring	Once at the beginning of the project for each type of component
Source of data (to be) used	"Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard methane leaks at gas distribution networks" registry No. Ukr NTI 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 in Annex A to "Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard methane leaks at gas distribution networks" registry No. Ukr NTI 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 that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

Data/Parameter	$H_{i',h,y}^g$
Data unit	h
Description	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 EPNGL repair at such component
Time of determination/monitoring	Annualy
Source of data (to be) used	Data of the company received during GDN operation and activities aimed at leak repair
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 that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

Data/Parameter	$H^{n}_{i",h,y}$
Data unit	h
Description	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*
Time of determination/monitoring	Annually
Source of data (to be) used	Data of the company received during GDN operation and activities aimed at leak repair
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 that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

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 of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in 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[10], 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 selected approach. Proofs of the Project additionality

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:

[10] "Tool for the demonstration and assessment of additionality" (Version 06.0.0):http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

Alternative 1.1: The continuation of the existing system of leak detection and repair;

Alternative 1.2: Implementation of this project without the use of 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 "Chernigivgas".

PJSC "Chernigivgas" 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 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 "Chernigivgas" 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 "Chernigivgas" 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 "Chernigivgas" 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 Step 1a: One plausible alternative was identified. It's *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"[11]
2. Law of Ukraine "On Pipeline Transport"[12]

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

3. Order 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[13].

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 natural gas loss detection at PJSC "Chernigivgas" 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 "Chernigivgas" 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 "Chernigivgas", and in this connection a few types of barriers arose at the beginning of the Project implementation. PJSC "Chernigivgas" 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 "Chernigivgas" 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.

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

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

- 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 on the Project implementation include the costs on:

- purchase and use of modern measuring devices for methane emission detection (gas detectors AZ 7291, SENSIT Trak-It III CGI, or FT-02V1, 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 "Chernigivgas" does not gain any additional benefits in case of reduction of methane leaks. Thus, there are no incentives for PJSC "Chernigivgas" 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 "Chernigivgas". 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 "Chernigivgas" 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 "Chernigivgas" in connection with methane leaks at gas pipelines and PJSC "Chernigivgas" 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 "Chernigivgas"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*: The continuation of the existing 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 "Chernigivgas", 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 "Chernigivgas" 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:

But for 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.

Outcome: 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 "Chernigivgas" 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.04/01-869 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 "Chernigivgas".

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 "Chernigivgas".

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 "Chernigivgas" 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).

The JI Project boundary for the baseline and project scenarios is outlined by the dotted line in Figure 3.

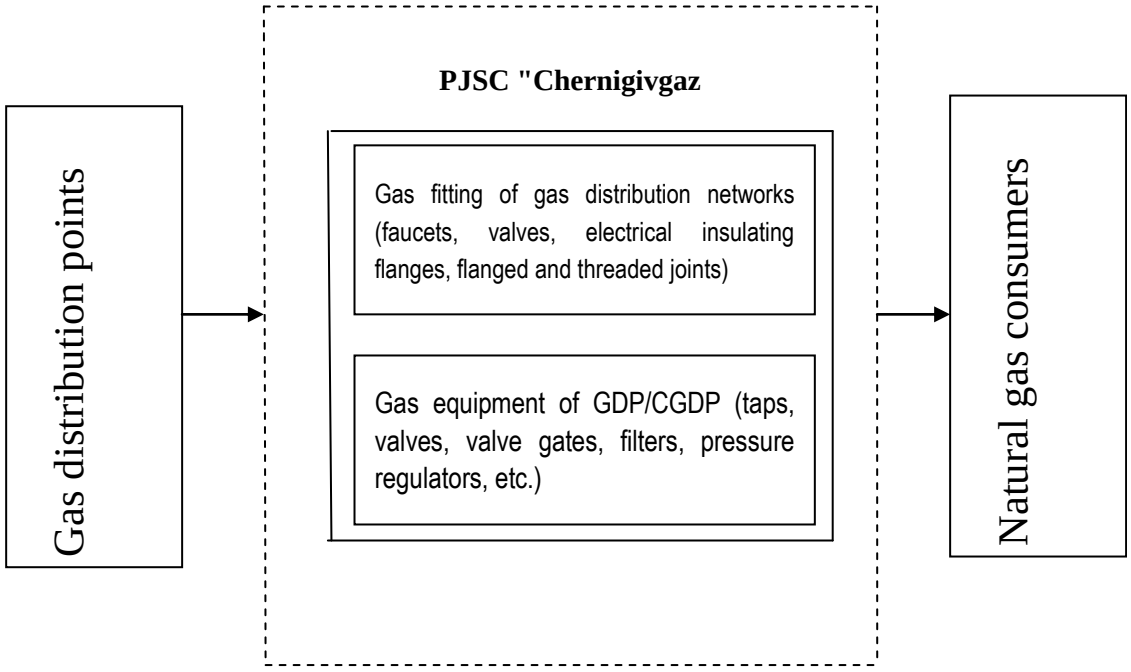

Figure 3. Project boundary

Table B.3.1. 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 on the gas equipment of gas-distribution points and the gas armature of the gas-distribution pipelines of PJSC Chernigivgas"

Indirect irrelevant leaks of CO_2, CH_4, N_2O were excluded. The leaks are not under the control of the project developer (it is impossible to estimate the volume of leaks), that is why they were excluded.

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

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: 31/09/2005
Baseline was determined by and PJSC "Chernigivgas" (Ukraine)

PJSC “Chernigivgas”
Address: 68 Liubetska St., 14021 Chernihiv, Ukraine.
Telephone: +380 (0462) 644-044
Fax: +380 (0462) 644-090
E-mail: post@gas.cn.ua
Web-site: http://gazcn.at.ua/
Contact person: Alla Yarova
PJSC “Chernigivgas” is a Project participant (stated in Annex1).

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the Project: 31/09/2005 – a completion certificate for September.

C.2. Expected operational lifetime of the project:

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 in years and months is 12 years and 3 months / 147 months, from 31/09/2005 to 31/12/2017 if the Kyoto Protocol is prolonged.

C.3. Length of the crediting period:

The JI Project refers to the first commitment period and makes 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 "Chernigivgas" were carried out and when the first GHG emission reductions were generated, namely 31/09/2005. The end of the crediting period is 31/12/2012. The crediting period lasts for 7 years and 3 months / 87 months.

If after the first commitment period according to the Kyoto Protocol it will be prolonged, the crediting period of the Project will be prolonged till December 31, 2017. The prolongation of the crediting periof after 2012 is subject to the Host party's approval. The total crediting period (before the crediting period, the crediting period and after the crediting period) will last for 12 years and 3 months / 147 months.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The proposed project uses a JI-specific approach in accordance with the JISC "Guidance on criteria for baseline setting and monitoring", Version 03[14].
The monitoring plan is designed for accurate and clear measurement and calculation of greenhouse gas emissions and preparation of reports on reduction of methane emissions on the basis of the baseline and the project activity. The JI-specific approach is based on the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks", registry No. UkrNTI 0112U00A816 of 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 meeting the project requirements towards accuracy and transparency of leak detection and repair, as well as conservativeness of calculation 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 "Chernigivgas" 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 methane 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 methane leak (SPNGL) standard values are used, if available, and otherwise NGLF are applied, obtained by statistical processing of the results of ex-post methane leak measurement before and after the repair, see Table A.2 of Appendix A. NGLF values listed in Appendix A to the Methodology, obtained by statistical processing of the results of ex-post methane leak measurement before and after the repair1516:
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 NGLF, 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

[14] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[15] Report on the scientific and engineering research "Development of methodological basics for the calculation of greenhouse gases emission reduction by repair of methane leaks in gas distribution networks", NASU Institute of Gas, 2012

[16] Report on the scientific and engineering research "Assessment of methane leaks in gas distribution networks in Ukraine", NASU Institute of General Energy, 2011

replacement of component i and/or sealant replacement in component i. This reduction is calculated as the difference between the EPNGL NGLF and SPNGL NGLF 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 natural gas emission 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 leakage reduction can be calculated in the corresponding component.Thus, applying the computational method of the Methodology to calculate methane leakage 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 "Chernigivgas" drew up the following registries:

1. 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 "Chernigivgas" (see Supporting Document 1), which includes full information about all GDPs (CGDPs), shut-off and control valves, flanged and threaded joints included into the Project boundary.
2. Registry of EPNGL repairs in GDN components
3. Registry of GDN component operational mode monitoring – under the pressure and depressurized, i.e. with NGLF=0
4. Registry of GDN components condition monitoring where EPNGL were repaired.

All relevant data associated with calculation of methane emission reductions are stored in an electronic database (DB). Each Monitoring Report will contain all necessary information from this 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 pipeline 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 was detected	Dimensionless

W_y	Average mass fraction of methane in natural gas in period *y* of the project scenario	%
$K^g_{i,h}$	Natural gas leakage factor of GDN component in CLP	m^3/h
$K^n_{i"}$	Natural gas leakage factor corresponding to EPNGL of GDN component:	m^3/h
$H^g_{i',h,y}$	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
$H^n_{i",h,y}$	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	tCO_2eq/tCH_4

[*y*] - index corresponding to monitoring period
[*i*] - index corresponding to GDN component number
[*i'*] - index corresponding to 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 corresponding to 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 corresponding to SPNGL
[*n*] - index corresponding to 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 GDN component (GDP (CGDP), gas pipeline fittings) included into the project boundary	Activity on leak measurements	Dimensionless	m	Once at the beginning of the project	100%	Electronic and paper	All GDPs, CGDPs and gas fittings included into the project boundary, are listed in the Registry and numbered correspondingly.
2. GWP_{CH_4}	Global Warming Potential for methane	IPCC Second Assessment Report: Climate Change 1995(SAR)) and approved COP. GWP of methane is provided at the UNFCCC website [17]	tCO_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 was detected	Leak measurement activity	Dimensionless	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

[17] 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
4. W_y	Average mass ratio of methane in natural gas	Calculated based on the official company data on the average net calorific value of gas in monitoring period	%	c	Annually	100%	Electronic and paper	Company data
5. $K_{i,h}^{g}$	Natural gas leakage factor of GDN component in CLP	Standard values or data of the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks"	m^3/h	e	After each activity with GDN component	100%	Electronic and paper	Company data or calculated based on company data
6. *ConvFact* or	Volume to weight conversion factor for methane leaks	Calculated using the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks"	t CH4/m3 CH4	e	Throughout the crediting period	100%	Electronic and paper	If CO_2 emission factors for methane change, the baseline shall be recalculated

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
7. $H^{g}_{i',h,y}$	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	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
8. $H^{n}_{i'',h,y}$	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 CO_2 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:

$$PE_y = GWP_{CH_4} \cdot ConvFactor \cdot W_y \cdot P_y \quad (1)$$

where:

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

GWP_{CH_4} - global warming potential for methane (tCO_2eq/tCH_4)

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

P_y – methane leaks to the atmosphere in period *y* of the project scenario (m^3)

$ConvFactor$ - 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 corresponding to monitoring period

$[CH_4]$ - index corresponding to methane

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

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

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

$K^{g}_{i"h}$ - natural gas leakage factor corresponding to EPNGL of GDN component $i"$ in period *y* 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 corresponding to monitoring period

$[i']$ - index corresponding to 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 corresponding to 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 corresponding to SPNGL

$[n]$ - index corresponding to EPNGL

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

ID number *(Please, use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	Comment
i	Sequence number of the GDN component	Leak measurement activity	Dimensionless	m	Once at the beginning of the	100%	Electronic and paper	All GDN components included into the project boundary are listed in the Registry and numbered correspondingly

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
	(GDP (CGDP), gas fitting) included into the project boundary				project			
GWP_{CH_4}	Global warming potential of methane	IPCC Second Assessment Report: Climate Change 1995(SAR)) and approved COP. GWP of methane is provided 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
h	No. of activity (replacement/repair) in GDN component after EPNGL was detected	Leak measurement activity	Dimensionless	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
W_y	Average mass ratio of methane in natural gas in period *y* of the project scenario	Calculated based on the official company data on the average net calorific value of gas in	%	c	Annually	100%	Electronic and paper	Company data

[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
		monitoring period						
$K_{i'h}^{g}$	Natural gas leakage factor of GDN component in CLP	Standard values for equipment or calculated using the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks"	m^3/h	e	After each activity with GDN component	100%	Electronic and paper	Company data or calculated based on company data
$K_{i"}^{n}$	Natural gas leakage factor corresponding to EPNGL of GDN component	Calculated using the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess methane leaks in gas distribution networks"	m^3/h	e	Once at the beginning of the project for each GDN component	100%	Electronic and paper	Calculated based on company data
$H_{i'hy}^{g}$	Time of GDN component operation under the pressure from the	Company data obtained in the course of GDN operation and leak repair	h	c	Annually	100%	Electronic and paper	Company data Calculated for each GDN component for monitoring period

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
	beginning of monitoring period *y* to the implementation of the project activity (repair/replacement) that caused EPNGL removal	activities						
$H^{n}_{i"hy}$	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*	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
ConvFactor	Volume to weight conversion factor for methane leaks	Calculated using the "Methodology of calculation of greenhouse gas emission reduction by eliminating	t CH4/m3 CH4	e	Through out the crediting period	100%	Electronic and paper	If CO2 emission factors for methane change, the baseline shall be recalculated

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
		excess methane leaks in gas distribution networks"						

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

$$BE_y = GWP_{CH_4} \cdot ConvFactor \cdot W_y \cdot B_y \quad (3)$$

where:

BE_y - GHG emissions in period *y* of the baseline scenario (t CO_2e)

GWP_{CH_4} - global warming potential of methane (t CO_2e/t CH_4)

W_y - average methane weight fraction in natural gas in period *y* of the project scenario (%)

B_y - methane leaks into the atmosphere in period *y* of the baseline scenario (m^3)

$ConvFactor$ - conversion factor to convert methane leaks from volume units to weight units (t CH_4/m^3 CH_4). Under normal conditions defined as 0 degree Celsius and 0.1013 MPa, $ConvFactor$ = 0.0007168 t/m^3.

[*y*] - index corresponding to monitoring period

[CH_4] – - index that corresponds to methane.

Emissions of natural gas in the atmosphere caused by leaks from gas transportation networks are calculated according to the formula:

$$B_y = \sum_{h \in H_i} \left(\sum_{i' \in I'} K^g_{i'h} \cdot H^g_{i'hy} + \sum_{i'' \in I''} K^n_{i''} \cdot H^n_{i''hy} \right) \quad (4)$$

$K^{g}_{i'hy}$ – natural gas leakage factor for GDN component i' that is in CLP (i.e. corresponds to SPNGL) in period *y* of the baseline scenario (m^3/h);

$K^{n}_{i''}$ – natural gas leakage factor for GDN component i'' that corresponds to EPNGL in period *y* of the baseline scenario (m^3/h);

$H^{g}_{i'hy}$ - time of operation of GDN component in CLP under pressure in period *y* of the baseline scenario (h)

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

[*y*] - index corresponding to monitoring period

[*i'*] - index corresponding to 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 corresponding to 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 that corresponds to SPNGL

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

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

D.1.2.1 Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
-	-	-	-	-	-	-	-	-

Direct monitoring of emission reduction is not applied.

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

Direct monitoring of emission reduction is not applied.

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

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 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, the "Methodology of calculation of greenhouse gas emission reductions achieved by eliminating above-standard methane leaks at gas distribution networks", registry No. UkrNTI 0112U00A816 dated 30/04/2012 developed by the Institute of Gas of the National Academy of Sciences of Ukraine and on the basis of elements of approved CDM methodology AM0023 version 4.0 no leakage is expected.

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

No leakage is 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 CO_2 equivalent):

Greenhouse gases emission reductions are calculated by the following formula:

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

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 the 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 "Chernigivgas" under individual sequence number.
2. GWP_{CH_4}	Low	IPCC Second Assessment Report: Climate Change 1995(SAR)) and approved COP. GWP of methane is provided at the UNFCCC website. 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_{ih}^{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 methane leaks in gas distribution networks", registry No. UkrNTI 0112U00A816 dated 30/04/2012 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 methane leaks in gas distribution networks", registry No. UkrNTI 0112U00A816 dated 30/04/2012 developed by the Institute of Gas of the National Academy of Sciences of Ukraine are used.

7. $H^{g}_{i'hy}$	Low	Company's official data that are entered in GDN component operation logs and duplicated in electronic database are used
8. $H^{n}_{i''hy}$	Low	Company's official data that are entered in GDN component operation logs and duplicated in electronic database are used

To ensure conservativeness of the parameters of medium and high level of uncertainty will be carry out permanent regular calibration of metering equipment and use the latest editions of the normative and technical documentation. In the absence of recent editions of the normative and technical documentation, historical data and the latest approved values will be 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 "Chernigivgas" relating to the JI project implementation is done by the Working Team created pursuant to Decree No.157 dated 18/07/2012. The structure of the Working Team is shown in Figure 4.

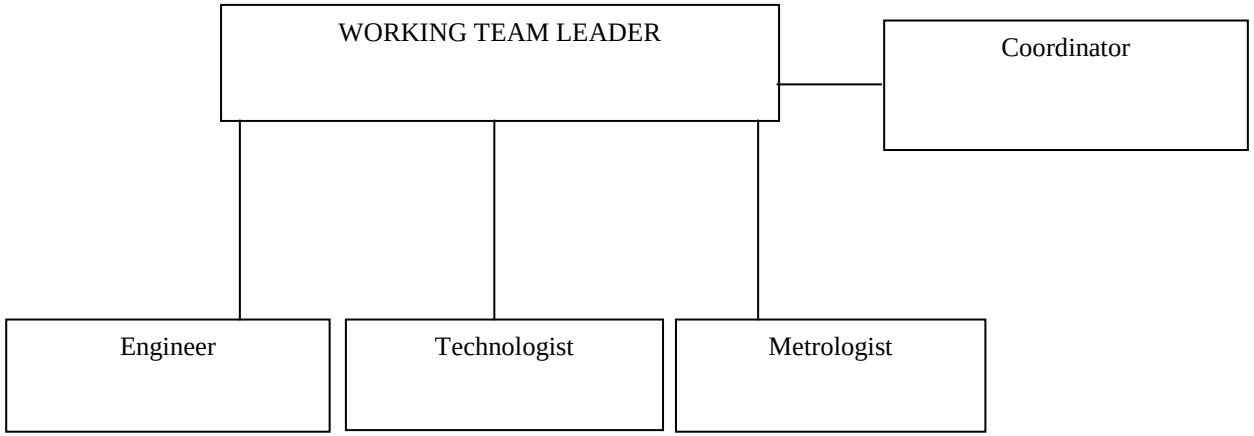

Figure 4. Structure of the Working team

The technologist of PJSC "Chernigivgas" is responsible for collection of all information under the monitoring plan and conduction of all necessary calculations. The engineer is responsible for organization of monitoring measurements of leaks and their repair. On the basis of the information received, Head of the Working Team shall determine the plan of project activities and the amount of resources required. The metrologist shall ensure the availability of verified metering devices and technical support. The coordinator is responsible for storage, archiving and backuping of project information.

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

PJSC "Chernigivgas"
Address: 68 Liubetska St., 14021 Chernihiv, Ukraine.
Telephone: +380 (0462) 644-044
Fax: +380 (0462) 644-090
E-mail: post@gas.cn.ua
Web-site: http://gazcn.at.ua/
Contact person: Alla Yarova
PJSC "Chernigivgas" is a Project participant (stated in Annex1).

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

The estimation of project emissions was performed on the basis of the data received according to the monitoring plan presented in Section D.1.1.2 and Annex 3. The results of measurements and calculations done by PJSC "Chernigivgas" (see Supporting Document 2)[19] are provided in Table 5.

Table 5. Estimated Project Emissions

Year	Estimated project emissions (tonnes CO_2 equivalent)
2005	218 373
2006	218 373
2007	218 373
Total 2005 - 2007	**665 119**
2008	218 373
2009	218 373
2010	218 373
2011	218 373
2012	218 373
Total 2008 - 2012	**1 091 865**
2013	218 373
2014	218 373
2015	218 373
2016	218 373
2017	218 373
Total 2013 - 2017	**1 091 865**
Total (tonnes of CO_2 equivalent)	**2 838 849**

E.2. Estimated leakage:

No leakage is expected.

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

As there is no leakage, the sum of E.1. and E.2. will be equal to E.1. (see Table 5)

E.4. Estimated baseline emissions:

Baseline emissions provided in the Table 6 were estimated by using the formulae provided in Section D.1.1.4.

[19] 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 "Chernigivgas" 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 6. Estimated baseline emissions

Year	Estimated baseline emissions (tonnes of CO_2 equivalent)
2005	267 193
2006	462 474
2007	608 935
Total 2005 - 2007	**1 338 602**
2008	733 558
2009	901 855
2010	1 048 316
2011	1 194 776
2012	1 194 776
Total 2008 - 2012	**5 073 281**
2013	1 194 776
2014	1 194 776
2015	1 194 776
2016	1 194 776
2017	1 194 776
Total 2013 - 2017	**5 973 880**
Total (tonnes of CO_2 equivalent)	**12 385 763**

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

Estimated annual reduction of greenhouse gas emissions in the project is calculated according to the formula:

Emission reductions = Baseline emissions – Project emissions

All results of estimation of emission reductions in the project are provided in the Table 7 below.

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

Table 7. Estimated emission reductions under the Project

Year	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated leakage (tones of CO_2 equivalent)	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2005	218 373	0	267 193	48 820
2006	218 373	0	462 474	244 101
2007	218 373	0	608 935	390 562
Total 2006 – 2007 (tonnes of CO_2 equivalent)	**665 119**	**0**	**1 338 602**	**683 483**
2008	218 373	0	733 558	515 185
2009	218 373	0	901 855	683 482
2010	218 373	0	1 048 316	829 943
2011	218 373	0	1 194 776	976 403
2012	218 373	0	1 194 776	976 403
Total 2008 – 2012 (tonnes of CO_2 equivalent)	**1 091 865**	**0**	**5 073 281**	**3 981 416**
2013	218 373	0	1 194 776	976 403
2014	218 373	0	1 194 776	976 403
2015	218 373	0	1 194 776	976 403
2016	218 373	0	1 194 776	976 403
2017	218 373	0	1 194 776	976 403
Total 2013 – 2017 (tonnes of CO_2 equivalent)	**1 091 865**	**0**	**5 973 880**	**4 882 015**
Total (tonnes of CO_2 equivalent)	**2 838 849**	**0**	**12 385 763**	**9 546 914**

SECTION F. Environmental impacts

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

According to the 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" [20]). 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.
Implementation of this project will increase the safety of operation of gas distribution networks, which, in turn, will reduce the probability of explosions or fires.

No transboundary impacts from the project activity, according to their definition in the text of the "Convention on long-range transboundary pollution" ratified by Ukraine, will take place.

The Project implementation does not provide for any harmful impacts on the environment.

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

The Project implementation does not provide for any harmful impacts on the environment.

[20] 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 provides for neither negative impact on the environment nor negative social effect.

Annex1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

To determine the baseline 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 CLP	m^3/h
6	$K_{i"}^{n}$	Natural gas leakage factor corresponding to EPNGL of 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 baseline is presented in tables of section B.1.

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

Annex 3

MONITORING PLAN

The monitoring plan 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 "Chernigivgas" gas distribution networks.
2. Monitoring map of methane leaks at the gas equipment of GDPs (CGDPs), gas fittings of PJSC "Chernigivgas" 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 "Chernigivgas" 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 Project implementation.
3. Determination of the potential income of the project 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 project, to provide for the proper implementation.

The JI Project 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 Project.
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 "Chernigivgas" 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 "Chernigivgas" 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 "Chernigivgas" 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	
$K^{g}_{i,h}$	Natural gas leak factor from GDN component in CLS	m^3/h
$K^{n}_{i"}$	Natural gas leak factor that corresponds to EPNGL for GDN component	m^3/h
$H^{g}_{i'hy}$	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
$H^{n}_{i"hy}$	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	tCO_2e / tCH_4

[*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 FT-02V1- 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 FT-02V1.

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 Project 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 project, must be collected and entered in one database. The database must be constantly filled in during the JI Project lifetime.Data about the new leaks detected and repaired during the project lifetime must also be included. In monitoring reports on JI Project the data must be included from a database.

It is recommended to create a Working team on the JI Project at the enterprise, and to define responsibility for collection of all information on the JI Project, storage and archiving of documents on the JI Project 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 Project 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 uncheduled repairs	Filled paper forms	Workers of working brigades	To form the Registry of EPNGL eliminated in GDN components	The coordinator of JI Project 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 Project 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 Project 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