JOINT IMPLEMENTATION PROJECT

"Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

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

Director, VEMA S.A. Switzerland.		**Fabian Knodel**
(position)	(signature)	(name and patronymic, last name)

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

First deputy Chairman of the Management board – chief engineer Public Joint Stock Company "State Joint Stock Company "Chornomornaftogaz"		**R. M. Ilnytskyi**
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Simferopol 2012

JOINT IMPLEMENTATION PROJECT DESIGN DOCUMENT FORM
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Annexes

SECTION A. General description of the project

A.1. Title of the project:

"Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

Sectoral scope:
Sector 1 - Energy industries (renewable/non-renewable sources)
Sector 10 - Fugitive emissions from fuels (solid, oil and gas)

PDD Version: 02.
Date: 05/04/2012.

A.2. Description of the project:

The main goals of project activity

The main purpose of the Joint Implementation Project (hereinafter - JIP) entitled "Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" is implementation of the program of technical improvement and rehabilitation of the natural gas production, storage, preparation and transportation system, the introduction of advanced technologies, the transition to a higher level of transportation, measurement and storage of natural gas.

The main cause of natural gas leaks is failure of the sealing elements of equipment as a result of temperature changes and moisture. The main component of natural gas is methane (92-95%) and it is a greenhouse gas. Natural gas leak repair will result in greenhouse gas emission reductions. To define natural gas leak the expression "methane leak" will be used further in the text since instrumental measurements of leaks are related to methane.

Thus, as a result of the project implementation natural gas leaks will be reduced, so GHG emissions will also decrease in comparison with current practice.

Historical details of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" development.

"Chornomornaftogaz" was established in 1979 as a production association for the development of hydrocarbon resources of the Black Sea and the Sea of Azov.
"Chornomornaftogaz", National Joint Stock Company for the production and transportation of oil and gas, is the legal successor of the production association "Chornomornaftogazprom", created by the order of the Ministry of Gas Industry of the USSR on October 20, 1978 № 209-org.
In 1998 the production association was reorganized into National Joint stock company "Chornomornaftogaz".

Description of conditions whereon the project will be implemented:

The technical condition of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" gas transportation systems is getting worse due to lack of necessary funds to implement modern equipment: the factor of natural aging plays an important role in this process. The problem of maintaining the reliability of the natural gas supply system at the required level is becoming more and more acute. All elements of production and technical base of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" usually work in difficult conditions of pollution, humidity, constant dynamic

and thermal overloads, and the average duration of operation of most of the main equipment of these networks is much higher than the normative terms of service.
At the start of the project Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" performed only measures aimed at maintaining the systems in working order. In most cases, these measures included repairs to correct malfunctions that arise during operation.
Most equipment that was operated at the time by Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" was already morally and physically obsolete, but because of insufficient funding and operational reserve of the existing equipment could be operated in future. In addition, the change of the existing situation was possible only in the case of not only the change of technical equipment of the network, but also on condition of improving the organizational structure of the company, which also required financial and human resources.

The baseline scenario. It is planned to further use the existing equipment and conduct routine repair and restoration works without significant investment. Leaks in compounds, pipeline fittings and shut-off and control valves would remain constant, which would lead to emissions of greenhouse gases at the pre-project level. Justification of the baseline scenario is described in Section B.

Project scenario.
The basis for the JIP is implementation of new energy efficient equipment and a set of measures aimed at reducing emissions from natural gas leaks in elements of the gas transportation system. Measures to be implemented within the framework of the project (see Section A.4.2 below), as well as application and execution of constant monitoring of potential sources of leaks and prevention of their occurrence will significantly reduce the leaks at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

Historical details of the development of the JIP "Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

06/06/2003 - the decision to launch the Joint Implementation Project *"Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"* was adopted in the meeting of the Management Board of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

05/09/2003 – commencement date of project documentation development for reconstruction and modernization of the natural gas production, storage, preparation and transportation system of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"
31/05/2005 – commencement date of the new equipment implementation according to the project documentation.
05/11/2011 – preparation and submission of the project proposal and justification of greenhouse gas anthropogenic emission reduction to the State Environmental Investment Agency.

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)	• Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"	No
Switzerland	• "VEMA 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:

JI project is implemented in the Autonomous Republic of Crimea and the Black Sea shelf and the Azov Sea shelf.

PJSC "NJSC «Chornomornaftogaz"

Figure. 1. Location of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" on the map of Ukraine.

A.4.1.1. Host Party(ies):

The project is located in Ukraine.
Ukraine is an Eastern European country that ratified the Kyoto Protocol to the UN Framework Convention on Climate Change on February 4, 2004[1]. It is listed in the Annex B of the Kyoto Protocol to the UN Framework Convention on Climate Change[2].

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

[2] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?page=1&nreg=995_801

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

The JI project is located in the Autonomous Republic of Crimea and the Black Sea shelf and the Azov Sea shelf.

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

The JI project includes all administrative and territorial units in wherein elements of the gas transportation system Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" are located.

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

The JI project is implemented in the Autonomous Republic of Crimea and the Black Sea shelf and the Azov Sea shelf (34.101989 EL, 44.952741 NL[3] - the coordinates of the main office of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"). Geographic localization of the elements to be replaced or renovated under the project is shown in Figure 2.

Place of each individual measure to avoid methane leaks is unambiguously identified by using the following data: the name of main pipelines department (hereinafter - MPD), or gas production department (the GPD) or underground gas storage department (hereinafter UGSD), the name and address of the structural department, identification name of the pipeline or inventory number of the platform, the precise location of area along the pipeline and the number of pickets, if any, the name and type of replaced or repaired armature.

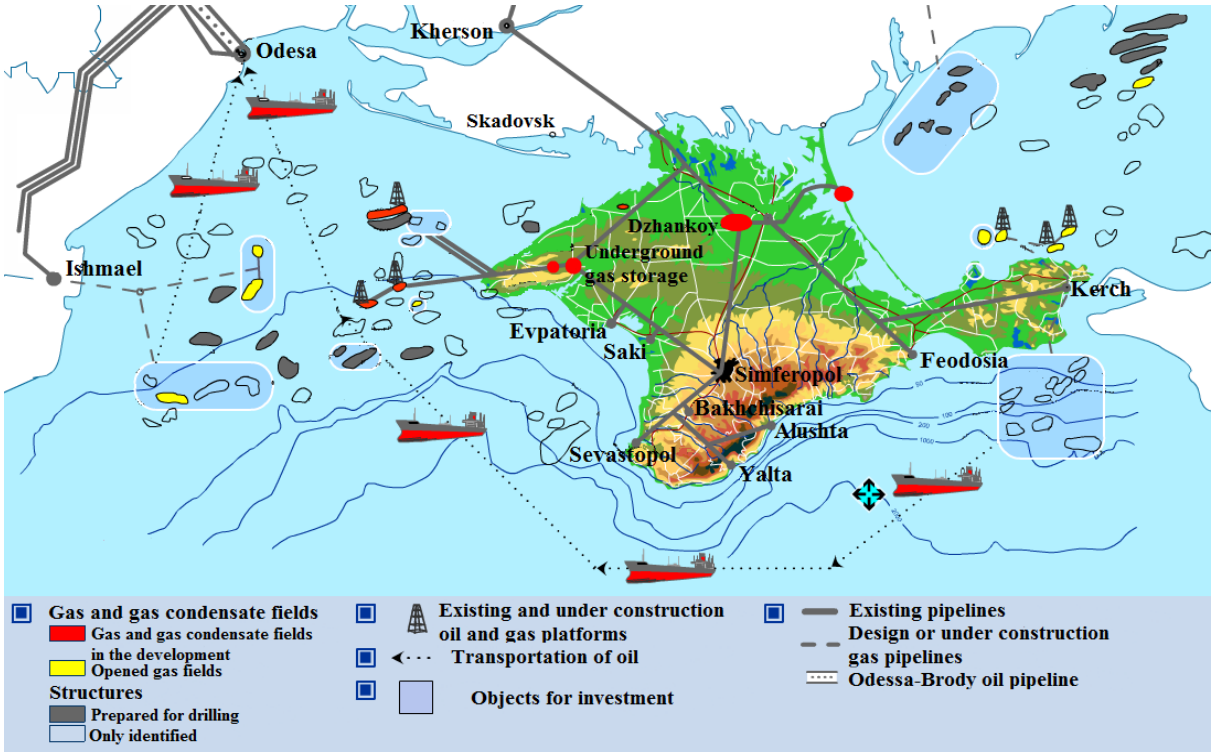

Figure. 2. Scheme of the gas transportation system of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

[3] http://api.yandex.ru/maps/tools/getlonglat/

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

Measures to reduce natural gas leaks on pipeline fittings and shut-off and control valves as well as connections of the system of natural gas production, preparation, storage and transportation.

It is expected to achieve the following goals:
▪ Creation of the system for collection and storage of data on volumes of leaks as well as the introduction of the internal audit and the system for quality assurance of methane leaks repair and measurement;
▪ Detection and measurement of leaks: leaks monitoring system, including removed leaks (repaired equipment components) will be carried out on a regular basis, by specially trained personnel. Each component will be examined according to the monitoring map, and the detected leaks will be appropriately labeled with individual numbers, volumes of gas leaks will be measured and registered in the database;
▪ Repair of all detected leaks: repair of joints of elements of the gas transportation system with leaks in the framework of this project will vary from replacement of gaskets and wedge gate valves, using new packing or sealing materials to fundamental repair and replacement of safety pressure control valves, piston rods, installation of natural gas meters with higher accuracy class. Repaired equipment components of the gas transportation system will be checked regularly as a part of standard monitoring program to ensure that they didn't become a source of leak again.
To attain these goals the following measures, which are divided into two groups, will be applied:
- measures for measurement and control of leaks (1.1);
- measures to repair leaks (1.2-1.3).
Description of key measures and technologies envisaged by the Project are listed below, details of all implemented measures to reduce methane leaks at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" will be presented on stage of monitoring of the JIP monitoring "Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz".

1.1. Implementation of the method of measuring the natural gas leaks.
For measurement of volumes of natural gas leaks, it was decided to use the method based on the Calibrated Bag Technology described in the approved baseline methodology AM0023 version 04.0.0 "Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities"[4]. One of the problems of using this method is difficult accounting of the volume of the fittings whereat measurements are done, and the initial air volume in the course of determining gas volume received in the bag. To solve these problems a special installation was made on the basis of plastic container of known volume (0.11 m^3), package, plastic hose and pressure gauge. All connections are made leakproof.

[4] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Figure 3. Photo of the installation for the quantitative measurement of methane leaks.

To determine the methane concentration in a sample a precision gas analyzer is used. A set of tools that are used with the gas analyzer is shown in Figure 4 as well as on the vendor's[5] web-site.

Figure 4. Gas analyzer set used to determine the methane concentration in the tank.

Size: 129 x 192 x 65 mm;

Weight: 500 - 1500 g;

Type of protection: IP 54;

Power supply: Nickel-cadmium battery, multicharge;

Operating temperature: from -10 to +40 ° C;

Storage temperature: from -25 to +70 ° C.

[5] http://www.enermak.com/en/urun/s/1030/EX-TEC+SR5+EX-TEC+SR4+EX-TEC+SR2+VARIOTEC+8-EX+/

After detecting and measuring the leaks appropriate repairs of leaks from connections of gas transportation system elements will be made, which will include both the use of modern packing materials and complete replacement of equipment, so that the greenhouse gas (GHG) emission reductions will be achieved.

1.2. Introduction of modern packings to repair leaks

To ensure the required packing of joints of elements of the gas transportation system to repair natural gas leaks packing materials that are produced in the form of cords, ribbons, plates or rings of uniform size and section will be used. Stretched fiber structure and various fillers ensure high performance of materials for flanged connections, valves, etc.. Specifications and description of the packings are provided below (Figure 5), as well as on vendor's[6] web-site; they correspond to standard ISO 9001[7].

Figure 5. The exterior of packing material.

Specifications of packings:

• temperature range - from -240 to +270 º C;

• chemical resistance - universal: pH from 0 to 14;

• mechanical properties - high plasticity, the ability to smooth irregularities and connections distortions, lack of cold fluidity and durability;

• adaptability - light and easy assembly and disassembly;

• non-waste use - almost complete wastelessness;

• fire safety - incombustibility.

Various modifications of packing materials allow to find technical solutions in cases where the use of traditional packings is inefficient or even difficult, particularly if there are significant irregularities, narrow surfaces that are sealed or large temperature differences. To fully protect various surfaces from corrosive environments when it is necessary to avoid slit corrosion, materials produced in the form of ribbons are applied. In the one-piece joints standardized ready rings or packing materials with multiaxially exspended structure are used. These products are manufactured in the form of plates or finished profiles of given configuration.

For shut-off and control valves (vents, gate valves, valves, flanges) and slowly rotating shaft seal that come in the form of cords with round cross section pads, are designed. Due to very low coefficient of friction of teflon and special structure of "pads" easy movement of the rod in the opening-closing of gate valves is achieved. High flexibility and plasticity of the material creates an optimal packing of gas transport equipment. By

[6] http://www.gore.com/en_xx/products/sealants/index.html

[7] http://www.iso.staratel.com/ISO9000/Doc/DSTUISO9001/DSTUISO9001.htm

increasing leakproofness due to more effective packing of joints of gas transportation system elements the leaks from these joints will decreased and this will lead to GHG emission reductions.

1.3. The introduction of shut-off and control valves

To reduce methane leaks in the course of gas transportation, the project provides for the implementation of pipeline fittings and shut-off and control valves of European manufacturers and their analogues of national production, specifications of which are given below, as well as on vendor's website[8,9,10].

1.3.1. Implementation of gate valves at all technological and transportation gas pipelines and gas equipment of various diameters, pressures and operating temperatures.

Figure 6. Exterior of gas gate valves.

Technical characteristics of gate valves:
- flanged gas valves are designed for gas pipelines with a diameter of 25 to 1500 mm;
- the body: Ductile cast iron in epoxy coatings;
- working medium: gas with a temperature from -50 ° C to +70 ° C.

1.3.2. The implementation of ball valves at all technological and transportation gas pipelines and gas equipment of various diameters, pressures and operating temperatures.

Figure 7. Exterior of a ball valve.

Specifications of ball valves:
- ball valves are designed for pipelines with diameter from 25 to 1000 mm;
- the body is of forged carbon steel;

[8] http://www.tartarini.it/

[9] http://www.fiorentini.com/

[10] http://www.actaris.ru/

- the ball is got by casting (stainless steel or carbon steel with nickel plating);
- equipped with reduction gear or electric motor;
- working medium: gas with a temperature from -50 ° C to +70 ° C.

1.3.3. The implementation of gas solenoid valves, which are used as an automatic shut-off organ in gas transportation, regulation, storage and preparation systems.

Figure 8. The exterior of the gas solenoid valve.

Specifications of solenoid valves:
- Type of gas: natural gas;
- Solenoid valves are installed at gas pipelines with diameter of 15 mm;
- Supply voltage: 230 V, 120 V, 24 V;
- Leakproofness of the valve: Class A;
- Degree of protection: IP 65;
- - Body material: Aluminum alloy;
- Operating temperature: from: - 40 to +60 ^{o}C.

1.3.4. The implementation of pressure gauges intended to measure the static pressure of gas.

Figure 9. The exterior of the gas pressure gauge.

Specifications of gas pressure gauges:

- Type of gas: natural gas;
- Accuracy class - 1.6;
- Operating temperature: from -40 to + 60 ° C;
- Temperature of measured environment: up to +100 ° C;
- Visible scale diameter: 63 mm.

Gas gauges are installed in the elements of gas supply systems, where there is a need for measuring the static pressure of the working environment: reduction systems, supply pipeline to control and technological plants (gas-distribution stations, points), transmission and distribution pipelines etc.. Old gas pressure gauges are a source of methane leaks. Their replacement reduces methane leaks.

1.3.5. The implementation of gas filters that are designed for gas treatment.

Figure 10. The exterior of the gas filter.

Specifications of gas filters:
- Type of gas: natural gas;
- Gas filter is installed at the gas pipeline with diameter of 25 mm;
- Filter element: Polypropylene non-woven fabric;
- Degree of filtration: 50 micron;
- Operating temperature: from -30 to +80 ^{o}C.

1.3.6. The implementation of gas pressure regulators, which are designed to regulate the gas pressure in the process of its production, preparation, storage and transportation.

Figure 11. Exterior of gas pressure regulators.

Specifications of gas pressure regulators:

- Type of gas: natural gas;
- Gas pressure regulators are installed at gas pipelines with a diameter of 15 mm;
- Body material: Aluminum alloy;
- Operating temperature: from - 30 to +80 ^{o}C.

Due to the JI project, which provides for the use of new technologies and the latest advances in the field of gas supply the efficiency of production, transportation and storage of gas will increase. Leakproofness of the gas transportation system as a whole will also improve due to introduction of pipeline fittings and shut-off and control valves. This in turn will lead to GHG emission reductions.

The main milestones of the project implementation

Table 1. Schedule of reconstruction and modernization of natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz".

Natural gas production, preparation, storage and transportation systems of PJSC "NJSC "Chornomornaftogaz".								
Names of measures	Implementing period							
	2005	2006	2007	2008	2009	2010	2011	2012
Measures to reduce natural gas leaks at pipeline fittings and connections of main gas pipelines as well as shut-off and control valves of gas transportation system elements.								
Measures involving the measurement and control of leaks:								
1.1.*								
Measures involving leak repair								
1.2.								
1.3:								
- 1.3.1								
- 1.3.2								
- 1.3.3								
- 1.3.4								
- 1.3.5								
- 1.3.6								
* - *see the descriptions of measures 1.1.-1.3.in A.4.2.*								

Implementation of the project activities is planned in the middle of 2005. However, the emission reductions achieved during 2005 are excluded from the calculation.

At the start of the project PJSC "NJSC "Chornomornaftogaz" performed only measures to maintain the natural gas storage, preparation and transportation system in working order. Basically, these measures included repairs to correct malfunctions that arose in the operation of gas transportation networks and replacement of the old faulty equipment, etc., because of its cheapness. The project provides for the introduction of new energy efficient equipment and reconstruction and modernization of old equipment that hasn't exceeded it's lifetime, considering the latest trends in gas production, transportation and storage.

Before implementation of the project PJSC "NJSC "Chornomornaftogaz" ensured only detection of natural gas leaks using detectors in accordance with the Gas supply systems safety rules[11] (hereinafter - GSSSR) of

[11] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=z0318-98

Ukraine to avoid accidents and explosive situations. Measurements of the leaks, their registration and calculation didn't occur and the appropriate measuring instruments were missing.

Given the complicacy of the implementation and operation the new foreign and state equipment, qualification of maintenance personnel of the systems of gas extraction, storage, preparation and transportation may be insufficient. Taking into account the circumstances, thematic training is to be organized for the personnel of PJSC "NJSC "Chornomornaftogaz".

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 is aimed at the implementation of measures to reduce natural gas leaks at the pipeline fittings and shut-off and control valves of the natural gas production, storage, preparation and transportation system of PJSC "NJSC "Chornomornaftogaz". Detailed information about the measures proposed in the project are listed in paragraph A.4.2. Due to the proposed measures natural gas leaks at the pipeline fittings and shut-off and control valves of the natural gas storage, preparation and transportation system will decrease; this will reduce GHG emissions into the atmosphere.

There are several main reasons which make the implementation of the project without the mechanism of joint implementation, which is a significant incentive, unlikely to happen:

1. No significant changes in the legislation of Ukraine in the sphere of oil and gas production and energy recourse transportation, which could force the company to give up the existing practices of operation, modernization and reconstruction of main pipelines, are expected;
2. There are no restrictions for Ukrainian enterprises regarding GHG emissions, and they are unlikely to be imposed by 2012;
3. In the absence of the project additional, very risky, investments and financial risks associated with the operation of new equipment might have been avoided;
4. According to Ukrainian legislation the company will not receive any financial benefits from reduced energy resource consumption and methane leak reductions (more details are given in Section B2).

Most equipment that was operated at that time in the natural gas production, storage, preparation and transportation system of PJSC "NJSC "Chornomornaftogaz" was already morally and physically obsolete, but because of insufficient funding and operational reserve of existing equipment, it could further be exploited. In addition, changing of the existing situation was possible on condition of not only changes of the technical provision of the network, but also improvement of organizational structure, and this also required financial and human resources.

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

Table 2. Estimated amount of emission reductions for the period preceding the first commitment period

	Years
Length of the crediting period	2
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2006	453103
2007	1359311
Total estimated emission reductions over the	1812414

period of 2006-2007 (tonnes of CO_2 equivalent)	
Annual average of estimated emission reductions over the period of 2006-2007 (tonnes of CO_2 equivalent)	906207

Table 3. Estimated amount of emission reductions over the first commitment period

	Years
Length of the crediting period	5
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2008	1449932
2009	1540553
2010	1631174
2011	1631174
2012	1631174
Total estimated emission reductions over the period of 2008-2012 (tonnes of CO_2 equivalent)	7884007
Annual average of estimated emission reductions over the period of 2008-2012 (tonnes of CO2 equivalent)	1576801

Table 4. Estimated amount of emission reductions for the period following the first commitment period

	Years
Length of the crediting period	8
Year	Estimate of annual emission reductions in tonnes of CO_2 equivalent
2013	1631174
2014	1631174
2015	1631174
2016	1631174
2017	1631174
2018	1631174
2019	1631174
2020	1631174
Total estimated emission reductions over the period of 2013-2020 (tonnes of CO_2 equivalent)	13049392
Annual average of estimated emission reductions over the period of 2013-2020 (tonnes of CO_2 equivalent)	1631174

More detailed information is provided in the Supporting Document 1.

Description of formula used for preliminary estimation of emission reductions is provided in Sections D.1.4.

A.5. Project approval by the Parties involved:

A Letter of Endorsement №867/23/7 dated 04/04/2012 of the JI project "Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" was issued by the State Environmental Investment Agency of Ukraine.

After analysis of the project, the PDD and Determination report will be submitted to the State Environmental Investment Agency of Ukraine for receiving a Letter of Approval.

SECTION B. Baseline

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

Description of baseline scenario.

There is approved CDM methodology AM0023 "Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities"[12] to measure and account natural gas leaks. The methodology AM0023 version 04.0.0 states that it can be applied to projects on reduction of natural gas leaks in natural gas compressor, gas distribution stations in the system of main gas pipelines, as well as for equipment of gas distribution systems, including the stations, which regulate gas pressure. The use of this methodology to the project stems from the following analysis.

According to the methodology AM0023 version 04.0.0 the following three conditions must be met:

1. Operators of natural gas production, transportation and storage have no current systems in place to systematically identify and repair leaks;
2. Natural gas losses (leaks) can be identified and accurately measured;
3. A monitoring system can be put in place to ensure leaks repaired remain repaired.

Hence, the JI specific approach that developed on the basis of approved CDM methodology AM0023 version 04.0.0 is used for baseline setting.

The project fully meets all these requirements subject to comments stated below.

As to *the first condition*, before the project PJSC "NJSC "Chornomornaftogaz" carried out only natural gas leak detection activities by using detectors in accordance with the gas supply systems safety rules of Ukraine to avoid accidents and explosive situations. Measurements of the leak volumes, their registration and the accounting didn't take place and appropriate metering devices were missing. But the such measures couldn't not repair the leaks in the time between the dates of regular walk-round check and didn't give understanding of the real volume of leaks caused mainly by the old packing materials. The project does not provide for more frequent walk-round checks, but it provides for the use of more modern packing materials. According to the results of international experience and data from regions where the material has been applied, the amount of leaks from the gate valves with stuffing-box packing significantly decreased.

Moreover, due to lack of modern equipment for detection and measurement of leaks, it is assumed that an effective program to identify and repair leaks could not be applied in the absence of the project. Companies that basically relied on the condition of safety, could only detect the presence of leak, but not measure its volume. In other words, we intend to emphasize that the system of leak detection and repair of PJSC "NJSC "Chornomornaftogaz" was not able to repair the leaks included in this Project.

As to *the second condition*, the purchase of modern equipment for detection and measurement of leaks and the measurement of leaks from the gate valves showed that on condition of the application of modern practices and equipment, the leaks can be detected and accurately measured.

As to *the third condition*, the introduction of step by step procedures, database creation and use of additional equipment will enable to carry out reliable monitoring of repaired gate valves and detect leaks that can occur again. On-site training of the personnel and quality control at all stages, will allow for accurate implementation of the Monitoring Plan.

[12] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Detailed analysis of baseline emissions is provided in Section D, E.

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

The following steps were used to determine the most plausible baseline scenario:
1. Identification of plausible alternatives that could be the baseline scenario.
2. Justification of exclusion from consideration of alternatives, which are unlikely to take place from a technical and / or economic point of view.
We have describe and analyzed all alternatives and selected the most plausible of them as the baseline scenario.
To set the baseline for further development of additionality justification in section B.2. we directly took into account:

- State policy and applicable law in the oil and gas sector;
- The economic situation in the oil and gas sector in Ukraine and forecast demand for products (natural gas);
- Technical aspects of management and operation of systems in the oil and gas sector;
- Availability of capital (including investment barriers), that are typical for PJSC "NJSC "Chornomornaftogaz";
- Local availability of technology / equipment;
- Price and availability of fuel.

Also to identify and set the baseline considerable attention was paid to the state of oil and gas sector. According to the International Energy Agency (Key World Statistics, IEA, 2006[13]), energy intensity of Ukraine's GDP is 0.55 kg of oil equivalent (hereinafter - OE) per 1 U.S. dollar. According to the "Energy Strategy of Ukraine till 2030"[14] it is planned to reduce energy intensity of GDP to 0.24 kg OE per 1 U.S. dollar primarily on the basis of potentials of energy efficiency and energy savings.

Today the management system in the oil and gas sector is not functioning as interdependent complex. Management and control over innovation, investment projects, financial schemes are carried out autonomously. The management structures are developed without the necessary economic interrelation with the efficient use of personnel and the production unit. Directions of production development are chosen, without consideration of the impact of market conditions. On-going centralization of financial flows at companies is not accompanied by development and implementation of appropriate economic mechanisms of distribution of consolidated financial resources that, on one hand, would ensure implementation of the goals of current operation and strategic development of enterprises, and on the other hand, industrial and economic interests and capabilities of individual components of production.

Analysis of the fuel and energy complex (hereinafter - FEC) of Ukraine in the current difficult economic conditions caused by non-payment and unjustified price and taxation policy shows that the growing profits of oil and gas sector is due to growth in paid volumes of gas supplied. Firstly, this allowed for decrease in social tension in the industry by means of overtaking arrears from wages and credit financing of artificially created debt for gas.

However, the given positive results obtained by oil and gas sector, including the results due to implementation of a number of organizational and technical measures still do not give grounds for complacency about the implementation of other programs, including manufacturing ones. Thus, an imperfect system of cost of gas and oil production formation (details are provided in B.2.) whereunder the costs of well drilling and equipping

[13] http://www.iea.org/textbase/nppdf/free/2010/key_stats_2010.pdf

[14] http://www.zakon.rada.gov.ua/signal/kr06145a.doc

of oil fields are taken from the profits, along with low gas prices for certain categories of consumers do not provide even for those costs that are necessary for maintaining outputs achieved. At the present stage of development and functioning of the domestic refining the efficiency of individual oil companies is determined by low volume of available inputs, outdated worn out equipment, inability to use the production effect. They are characterized by low financial stability, a significant level of dependence on borrowed funds, low profitability of oil production and refining. The survival of such enterprises depends on the volume of oil production and supply of crude oil. PJSC "NJSC "Chornomornaftogaz" is one of such companies.

Analysis of statistics shows that, without the development of new oil fields it will be impossible to compensate the fall in production. In fields that are currently operated, depletion of initial oil reserves is 70% and depletion of gas reserves is - 65%. Much attention was paid to management measures for intensifying the production and use of new advanced technologies. And much attention will be paid to such measures but still they can not compensate the natural decrease in production. This means that the existing proven reserves can not provide the stabilization and growth in oil and gas production, although the bowels of Ukraine, especially Prykarpattia, have hydrocarbon resources that have not been explored yet. In case of the proper development they might help to stabilize, and in the future even increase domestic production of oil and gas .

Particular attention should be paid to oil field development and modernization of the natural gas production, preparation, storage and transportation system of the Ukrainian part of the the Black Sea shelf and the Azov Sea shelf, which accounts for one third of projected gas resources of Ukraine. Recent success is associated with the opening of the East-Kazantyp and North-Kazantyp oil fields in the Sea of Azov. In 2001, geologic exploration works were launched in the area of Zmiinyi Island, which is considered to be the most promising oil and gas object in the shelf plate in the Black Sea.

Programme "Creation and organization of production of drilling, oil and gas production, oil treatment equipment and technology for the construction of oil and gas pipelines with scientific and technical part until 2010" has expired and its subsequent revision is only a project for modernization of oil and gas sector. In addition, "Energy Strategy of Ukraine till 2030", which could somehow stimulate energy efficiency measures and energy savings in oil and gas sector, hasn't been implemented yet. Hence, it is also not implemented at the PJSC "NJSC "Chornomornaftogaz".

In addition, one needs to ensure proper organization of such institutions as the energy market, accounting and information systems, but above all – an appropriate regulatory basis for the strengthening and development of the progress achieved, the creation of which in turn is impossible without a comprehensive approach to reformation of the entire regional regulatory system.

One more issue relating to the oil and gas sector that should be outlined is gas production and gas transportation systems as well as gas pumping units connected with them. The main reason why obsolete equipment is used in gas production and gas transportation systems of Ukraine (hereinafter - the GPS and GTS, respectively) is a constant lack of funding for reconstruction of compressor stations, which have been receiving only 10-15% of the necessary funds since 1992. Further operation of worn-out and obsolete equipment leads to gradual degradation of the GPS and the GTS of Ukraine and its inability to provide reliable gas transit to Europe and gas supply for domestic needs of the country.

According to experts, complete modernization of Ukraine's GTS will require from 6 to 16 billion US dollars. Most of money is needed for the reconstruction and construction of compressor stations and replacement of gas turbine drives (about $ 1.5 billion US dollars), as well as the modernization of the linear part of gas pipelines and underground gas storage facilities. After the end of modernization process, not only will reliability and economical efficiency of GPS and GTS increase, but their capacity will also increase by almost 20 billion m^3 of natural gas.

Thus, it is evident that the existing state of oil and gas sector requires significant investment to improve its current state. Oil and gas companies (including PJSC "NJSC "Chornomornaftogaz") do not have sufficient own funds for possible modernization projects. However, the practical independence of prices for gas that is supplied by the companies of oil and gas sector from specific energy costs, allows to operate the existing systems even with poor energy performance.

Step 2. Application of the approach chosen

Sub-step 2a. Identification and listing of plausible alternative baseline scenarios.

The choice of the plausible baseline scenario is based on assessment of alternative options for operation and modernization of the natural gas production, preparation, storage and transportation system at PJSC "NJSC "Chornomornaftogaz" that potentially could have taken place as of the beginning of the project. To identify all realistic and plausible alternatives all the options that meet the applicable laws and regulations were taken into account. These options are the following alternatives:
Alternative 1.1: Continuation of the current situation, without the JI project implementation.
Alternative 1.2: The proposed project activity without the use of the Joint Implementation mechanism.
Alternative 1.3: Partial project activities (to implement not all project equipment) without the use of the Joint Implementation Mechanism.

Sub-step 2b. Assessment of alternative scenarios

Alternative 1.1
Continuation of existing practice with the introduction of minimum repairs on the background of the overall deterioration in electricity supply systems.
Continuation of existing practice with the implementation of leak detection and carrying out of minimal repairs of linear part of gas pipes as well as shut-off and control valves on the background of the overall deterioration of natural gas production, storage, preparation and transportation system at PJSC "NJSC "Chornomornaftogaz".
PJSC "NJSC "Chornomornaftogaz" provides only leaks detection by using detectors in accordance with the Gas supply systems safety rules[15] (hereinafter - GSSSR) of Ukraine to avoid accidents and explosive situations. Measurements of the volumes of leaks, their registration and accounting do not occur, and appropriate metering devices are not available.
Continuation of existing practice with the implementation of leak detection and carrying out of minimal repairs of linear part of gas as well as shut-off and control valves on the background of the overall deterioration of natural gas production, storage, preparation and transportation system at PJSC "NJSC "Chornomornaftogaz", i.e. Alternative 1.1, is the most plausible baseline scenario, as :
• No investment in new technological equipment and personnel training needed to work with new devices and systems of collection, accounting and storage of leaks is needed.
• It does not affect the price of natural gas supplied by the company.
• Works that are carried out pursuant to Alternative 1.1 is consistent with GSSSR of Ukraine.
• Operational (non-emergency) leaks from the linear part of gas pipes as well as shut-off and control valves meet the requirements of sanitary and environmental regulations and legal documents.

Accordingly, *Alternative 1.1* can be viewed as the most plausible baseline.

[15] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=z0318-98

Alternative 1.2

The project activities without the use of joint implementation mechanism. In this case there are two barriers: investment barrier (see more details in Section B2) because this scenario requires additional substantial investment and has a very long payback period and high risks, so it is unattractive for investors, and also technological barrier because the new equipment for measuring, accounting and storage of data about leaks as well as the use of modern technologies planned by the project will require additional training of personnel. Implementation of devices for measuring and control of operational (non-emergency) leaks is not a common practice in Ukraine. Thus, this alternative is the least plausible baseline scenario as there is a need to invest in new technological equipment and it is characterized by lack of qualified personnel for servicing the equipment, therefore, *Alternative 2.1* can not be regarded as the plausible baseline.

Alternative 1.3

Partial project activities (to implement not all project equipment) without the use of the Joint Implementation mechanism. Alternative 1.3 provides for exclusion of any not key measures under the project, such as introduction of some types of packing, etc. from the project boundary. Thus, partial implementation of the project measures will significantly reduce the efficiency of complex of measures planned by the project. Partial implementation of the project measures will not allow for achievement of a considerable reduction in natural gas leaks at PJSC "NJSC "Chornomornaftogaz", in addition *Alternative 1.3* requires investment in new technological equipment and is characterized by lack of qualified personnel for servicing the equipment, therefore, *Alternative 1.3* may not be considered a plausible baseline.

Outcome of step 2.

Analysis of the alternatives described above shows that *Alternative 1.1* is the most plausible, and *Alternative 1.2* as well as *Alternative 1.3* are the least plausible

Demonstration of additionality.

Results of investment analysis in Section B.2 showed that the *Alternative 1.2 and Alternative 1.3* can not be considered as the most attractive alternatives from a financial point of view. These assumptions are provided in Section B.2. The results of the analysis made in accordance with the "Tool for the demonstration and assessment of additionality" (Version 06.0) in section B2 show that the project scenario is additional.

Key information for baseline setting is stated in the tables given below.

Data/Parameter	*i*
Unit of measurement	dimensionless
Description	Gas equipment sequence number of pipeline fittings and shut-off and control gas valves, flange and threaded connections, where methane leak, which was detected, repaired and then verified, was detected
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Leak measurement activity
Value of data applied (for ex ante calculations/determinations)	N/A

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[16]
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	A sequence number is assigned to a detected leak at a device. List of gas equipment is provided in the Supporting document 1. After repair verification is conducted

Data/Parameter	T_i
Unit of measurement	hour
Description	Number of operation hours of equipment where leak was detected during the year
Periodicity of determination/monitoring	Annually
Source of data (to be) used	Recordings of examination results
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 AM0023 version 04.0.0[17]
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	Number of operation hours of equipment during the year after its replacement (repair). Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	GWP_{CH4}
Unit of measurement	t CO_{2e}/ t CH_4
Description	Global warming potential
Periodicity of determination/monitoring	Annually
Source of data (to be) used	IPCC
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	Global warming potential of methane, it is determined in accordance with decision 2/CP.3 and provided in the the IPCC guidelines

[16] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[17] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

QA/QC procedures (to be) applied	The value is used for the first commitment period, and may subsequently be reviewed by a person responsible for monitoring in accordance with Article 5 of the Kyoto Protocol
Any comment	The project developer will carry out the monitoring of any changes in the global warming potential of methane published by the IPCC and approved by the COP. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	*Vbag*
Unit of measurement	m^3
Description	Volume of capacity
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Flowmeter measurement data
Value of data applied (for ex ante calculations/determinations)	0.11
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[18]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Capacity is filled with water. Volume of water that is calculated by flowmeter will be the volume of capacity. The measurement showed that the capacity volume is 0.11 m^3. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	t_i
Unit of measurement	^0C
Description	Gas temperature
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Mercury thermometer of glass type TL-4 (state standard 8.279[19])
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of	Methodology AM0023 version 04.0.0[20]

[18] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[19] http://www.gosthelp.ru/gost/gost31800.html - «Liquid operational gas thermometers. Methods and means of calibration»

[20] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

measurement methods and procedures (to be) applied	
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	P_i
Unit of measurement	MPa
Description	Gas pressure
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Barometer aneroid BAMM-1 or M-67 (TU 25-04-1797-75[21])
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 AM0023 version 04.0.0[22]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	$w_{sampleCH4,i,b}$
Unit of measurement	%
Description	Concentration of methane in the sample
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Gas analyzer EX-TEC® SR5
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 AM0023 version 04.0.0[23]

[21] http://www.gosreestr.com/files/2005/03744-73.pdf - «Control barometer aneroid. General technical conditions»

[22] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[23] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Concentration of methane in the capacity of leak *i* is the difference between the concentration of methane in the capacity at the beginning and at the end of measurement. Concentration is measured by gas analyzer EX-TEC ® SR5. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	τ_i
Unit of measurement	second
Description	Time within which the concentration of methane in the capacity reaches a certain level
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Stopwatch «SOS pr-26-2», State standard 5072-72[24]
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 AM0023 version 04.0.0[25]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Time within which the concentration of methane in the capacity reaches a certain level is determined with a stopwatch. The measurement begins with the opening tap on the tank lid and ends after the concentration of methane inside the capacity reaches a certain level. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	UR_i
Unit of measurement	%
Description	Uncertainty range for the leak measurement equipment
Periodicity of determination/monitoring	Annually
Source of data (to be) used	Manufacturer's information and/or IPCC GPG
Value of data applied (for ex ante calculations/determinations)	95

[24] http://www.complexdoc.ru/pdf/%D0%93%D0%9E%D0%A1%D0%A2%202707-75/gost_2707-75.pdf - «Mechanical stopwatches»

[25] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[26]
QA/QC procedures (to be) applied	A person responsible for monitoring check the data annually
Any comment	It is evaluated where possible; IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories[27] suggests accepting 95% confidence interval . If the manufacturer of leak measurement equipment states the uncertainty range without specifying confidence interval, it can be accepted at the level of 95%. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

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

Anthropogenic emissions of greenhouse gases in the project scenario will be decreased due to complex replacement or modernization of the elements of natural gas production, preparation, storage and transportation system at PJSC "NJSC "Chornomornaftogaz" by introduction of technologies proposed in the project activity and described above.

Additionality of the project

The additionality of the project activity is demonstrated and assessed by using the "Tool for the demonstration and assessment of additionality"[28] (Version 06.0). This manual was elaborated in original for CDM projects, but it may be also applied to JI projects.

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

Sub-step 1a. Definition of alternatives to the project activity

There are three alternatives to this project. (that were described in Section B1)

Alternative 1.1: Continuation of the current situation, without the JI project implementation.

Alternative 1.2: The proposed project activity without the use of the Joint Implementation mechanism.

Alternative 1.3: Partial project activities (to implement not all project equipment) without the use of the Joint Implementation Mechanism.

[26] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR
[27] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000: http://www.ipcc-nggip.iges.or.jp/public/gp/english/6_Uncertainty.pdf
[28] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

Outcome of sub-step 1a. Three realistic alternative scenarios to the project activity are identified

Sub-step 1b. Consistency with mandatory laws and regulations

Alternative 1.1: The current practice of detecting and repairing natural gas losses and therefore methane emissions is consistent with all applicable laws and regulations of Ukraine. The legislation allows the loss of natural gas, and accordingly, the leaks of methane in the process of natural gas transportation. The regulations set only the frequency with which companies must perform equipment checks to detect natural gas losses. GSSSR of Ukraine regulate the following standards relating to consistency of the alternatives with effective laws and regulations:

• Paragraph 4.3.3. of GSSSR. Shut-off valves and expansion joints installed at gas pipelines shall be subject to annual maintenance and, if necessary - repair. Information on replacement of gate valves, tap valves, expansion joints, and also works performed in the process of major repair must be reflected in the pipeline passport, and information on the maintenance must be written down in the logbook of state of shut-off valves and joints maintenance in accordance with the form provided in the Regulations for pipeline technical maintenance.

• Paragraph 4.3.5. of GSSSR. The technical state of outside gas pipelines and facilities shall be monitored by a set of measures (walk-round checks, a comprehensive examination by means of instruments, measurement of potential differences, etc.).

• Paragraph 4.3.6. of GSSSR. In the process of walk-round checks of overground pipelines the gas leaks, breach of barring, pipes sagging shall be detected, the condition of shut-off devices, insulating flange joints, pipelines painting etc. shall be checked.

• Paragraph 4.3.7. of GSSSR. In the process of walk-round checks of underground pipelines (including those made of polyethylene) the gas pipeline state shall be checked and gas leak shall be detected based on external evidence; the presence of gas in all wells and control tubes, chambers of other underground utility lines, basements of buildings, mines, headers, underground utilities, located at a distance of 15 m on both sides from the axis of the pipeline is to be checked by means of instruments (gas analyzer or gas deterctor)

• Paragraph 4.3.9. of GSSSR. Check of leakproofness must be made by means of appliances or soap emulsion.

• Paragraph 4.3.3.1. of GSSSR. Gas pipelines leaks are to be repaired in emergency mode. If a dangerous concentration of gas above the 1 / 5 the lower explosive limit (LEL) is detected in basements, underground buildings, headers, underground passages, galleries, pipelines are immediately disconnected. Until gas leaks are repaired, their exploitation is prohibited.

The practice of detecting the natural gas leaks established at PJSC “NJSC “Chornomornaftogaz” meets the abovementioned standards and paragraphs related to leaks. Monitoring of compliance with regulations is carried out by performing annual audits by authorized bodies. The project also meets the regulatory requirements in relation to detecting losses of natural gas and methane leaks at gas distribution facilities, and any other applicable legal norms existing at this time. Programme of PJSC “NJSC “Chornomornaftegaz” on the planned natural gas leak detection will be implemented in parallel using more modern methods of detection and measurement of natural gas leaks and, consequently, methane leaks, as well as measures for long-term repair of natural gas losses and therefore methane emissions, which are foreseen by this project.

In Ukraine, the existing system for tariff for natural gas formation does not include an investment component for the development of gas transportation networks. According to the Law "On Principles of the natural gas

market functioning"[29]. PJSC "NJSC "Chornomornaftogaz" is not obliged and motivated to build and implement new elements of gas distribution systems at its own expense.

Alternative 1.2: So far, PJSC "NJSC "Chornomornaftogaz" has not conducted any significant measures to reduce the leak of natural gas (methane). Moreover, PJSC "NJSC "Chornomornaftogaz" has neither incentive nor the means to implement the measures envisaged by the Project, in the absence of its support with the mechanisms established by Article 6 of the Kyoto Protocol to the UN Framework Convention on Climate Change. PJSC "NJSC "Chornomornaftogaz" does not have any financial incentives to cover such costs on implementation of this Project or similar measures to the ones represented in this project, except for possible proceeds that are received under the mechanism established by article 6 of the Kyoto Protocol to the UN Framework Convention On Climate Change.
Construction, reconstruction and modernization without the use of the JI mechanism are consistent with mandatory laws and regulations. Detailed analysis of consistency with the law was made for *Alternative 1.1*, and it is similar in terms of consistency with mandatory laws and regulations for *Alternative 1.2.*

Alternative 1.3: Reconstruction without the use of the JI mechanism and with the exclusion of some key project activities is in line with mandatory laws and regulations; detailed analysis of consistency with the law was made for *Alternative 1.1,* and it is similar to consistency with mandatory laws and regulations for *Alternative 1.3.*
Outcome of sub-step 1b. Under such circumstances one may say that all scenarios are consistent with current laws and regulatory acts. Therefore Step 1. is satisfied.
According to the document the "Tool for the demonstration and assessment of additionality" (Version 06.0)[30] further justification of additionality shall be performed by means of investment analysis.

Step 2 - Investment Analysis.
The main purpose of investment analysis is to determine whether the proposed project:
(a) is not the most economically or financially attractive, or
(b) is not economically or financially feasible without income from sale of emission reduction units (ERUs) related to the JI project.

Sub-step 2a - Determination of appropriate analysis method.
There are three methods used for investment analysis: a simple cost analysis, a comparative investment analysis and a benchmark analysis. If the project activities and alternatives identified in Step 1 do not receive financial or economic benefits other than income related to JI, then the simple cost analysis (Variant I) is applied. Otherwise, the comparative investment analysis (Variant II) or the benchmark analysis (variant III) are used.
Guidelines for additionality allow for performance of comparative investment analysis, which compares corresponding financial indices for the most realistic and reasonable investment alternatives (Variant II), or the benchmark analysis (Variant III). For this project it is appropriate to apply analysis using Variat III, according to the instructions of Guidelines for additionality.

Sub-step 2b–Benchmark analysis.
The proposed project "Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company

[29] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2467-17

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

"Chornomornaftogaz" will be implemented by the project participant, namely PJSC NJSC "Chornomornaftogaz". The approach recommended in paragraph 6 (a) of the Guidelines for additionality provides for using of a discount rate that is determined by considering the weighted average cost of capital (WACC). WACC is calculated as a weighted average cost of own and debt capital. The structure of capital is taken in the form of 50% of own and 50% of debt capital. In accordance with paragraph 18 of the "Guidelines on the assessment of investment analysis ver.05"[31] cost of own capital is calculated as the sum of risk-free rate (3%), the risk premium on investment in own capital (6.5%) and country risk (6.75%)[32]. Thus the cost of own capital is 16.25%. The cost of debt capital is estimated at the average cost of credit in foreign currency as of the beginning of 2003 according to the NBU, which was 12.8%[33]. And nominal discount rate (IRR benchmark) is adjusted by inflation index for the eurozone (2.1%)[34] because the calculations in financial model are carried out in euros, and is equal to 14.5%[35].
If the proposed project (not implemented as a JI project) has a less favourable rate, i.e. lower internal rate of return (IRR), than the total limit level, the project may not be considered as financially attractive.

Sub-step 2c – Calculation and comparison of financial indicators.
Financial analysis refers to the time of making investment decisions. The following assumptions were used based on information provided by the company.
The project requires investment of approximately 160 million Euros (According to the NBU's rate)[36];
1. The project duration is minimal term of the equipment operation;
2. The residual value is calculated as the result of multiplication of unused resource for initial expenses.

Analysis of cash flow takes into account the cash outflow connected with investments and operating costs[37] and cash inflow associated with the receipt of revenues from providing of services by the enterprise.
Financial Indicators of the project are given below in Table 5.

Table5. Financial indicators of the project

Revenues from gas sales without VAT (ths EUR)	Cash flow (ths EUR)	dr (discount rate)	NPV (ths EUR)	IRR (%)	Residual value (ths EUR)
67992	10677	14.5%	-50980	0.7%	101894

The source of prices for the gas transportation service provided by PJSC "NJSC "Chornomornaftogaz" is the information provided by NERC of Ukraine[38]. Taking into account the fact that "Chornomornaftogaz" is oil / gas research company, the reduction of gas leaks in pipelines leads to increased sales of the company's own

[31] http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

[32] http://pages.stern.nyu.edu/~adamodar/pc/archives/ctryprem03.xls

[33] http://bank.gov.ua/doccatalog/document?id=36547

[34] http://www.finfacts.ie/inflation.htm

[35] Supporting document 2

[36] http://www.bank.gov.ua/Statist/ses.htm

[37] Supporting document 2

[38] http://expert-ua.info/document/archiveiv/law3hguwt.htm

natural gas, so the economic effect of the project activity should be estimated in an appropriate manner, namely by multiplying the volume of saved gas (volume of leak reduction) in natural conditions on the price of gas supplies to the population.

Since it is impossible to determine operating costs of the project activities in the structure of total costs of the enterprise, it is appropriate to define the operational costs as "0", which is in line with the conservative method.

When analyzing the cash flow the IRR is 0.7 % that is below the established limit level of IRR which is 14.5%. As a result NPV is negative. Therefore the project cannot be considered as financially attractive.

Sub-step 2d: Sensitivity analysis

The sensitivity analysis is conducted to confirm whether the conclusions on the financial / economic attractiveness are enough stable at different substantiated variants of the baseline conditions change. The following two key factors were considered in sensitivity analysis: investment and operational expenses as well as tariff for natural gas transportation. According to the guidelines for additionality (paragraph 17) the sensitivity analysis should be made for key indicators in the range of variation ± 10%.

Table 6. Revenues for gas supply

	-10%	0%	10%
Operational expenses	0	0	0
Investment expenses of the company	51878.76815	51878.76815	51878.76815
Revenue of the company	61192.84575	67992.05084	74 791
Net present value (NPV)	-52923.47616	-50979.53	-49035.58616
Internal rate of return (IRR)	0.3%	0.7%	1.2%

Table 7. Investment expenses

	-10%	0%	10%
Operational expenses	0	0	0
Investment expenses of the company	57066.64497	51878.76815	46690.89134
Revenue of the company	67992.05084	67992.05084	67992.05084
Net present value (NPV)	-43937.63	-50979.53	-58021.43
Internal rate of return (IRR)	1.2%	0.7%	0.3%

Sensitivity analysis was used to assess the sensitivity of the project to changes that may occur during the project implementation and operation. Analysis of changes of revenues for natural gas transportation in the range of -10% and +10% demonstrated that the IRR varies within 0.3%-1.2%. Analysis of investment costs in the range of -10% and +10% demonstrated that the IRR varies within 0.3% - 1.2%. Expenditures that are considered in the framework of the project are high, and increase of expenditures will result in a negative NPV. Even in case of expected price of the investment and the income from the sale of ERUs the project is not viable and will not bring enough profit even in case of credit financing of the project and it will not make any profit even if the above changes in price of investment take place.

Outcome of Step 2: sensitivity analysis consistently supports (for a realistic range of assumptions) the conclusion that the project is unlikely to be financially / economically attractive.

Step 3: Barrier Analysis

According to the Guidelines of additionality the barrier analysis was not conducted.

Step 4: Common practice analysis

Sub-step 4a. Analysis of other activities similar to the proposed project activity

Consideration of activities on implementation of measures to reduce methane leaks in the system of natural gas production, preparation, storage and transportation by main gas pipelines showed no similar projects in Ukraine. Projects on introduction of measures to reduce methane leaks in the process of natural gas distribution (Reducing Methane Emissions on flange, threaded connections and switching devices of PJSC "Kyivgaz", "Reduction of natural gas emissions at OJSC "Odesagas" gate stations and gas distributing networks") are not the projects that are similar to the proposed project activity (various conditions and parameters of the system of main pipelines and distribution networks).

Outcome of Step 4: Since there is no similar project in Ukraine, there is no need to conduct analysis of similar project activity.
According to the «Tool for the demonstration and assessment of additionality» (Version 06.0) all steps are satisfied.

Conclusion
Based on the above analysis we can conclude that the project is additional.

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

Greenhouse gas sources and boundary of the baseline scenario.

There are the following emissions and leaks in the natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz" in the baseline scenario:

• GHG emissions from natural gas (methane) leaks in the linear part of the gas pipelines and shut-off and control valves of elements of the natural gas production, preparation, storage and transportation system;

Project boundary according to the specific approach is outlined by physical, geographic locations of PJSC "NJSC "Chornomornaftogaz" unified system of natural gas production, preparation, storage and transportation (wellhead, offshore fixed platform (hereinafter OFP), complex gas treatment plants (hereinafter CGTP), main gas pipelines (hereinafter MGP), gas distribution stations (hereinafter GDS), underground gas storage (hereinafter UGS), etc.) and cover all anthropogenic emissions by sources.

Table 8. An overview of all sources of emissions in the baseline scenario

Source	Gas	Included / Excluded	Substantiation / explanation
Baseline emissions			
Methane leaks	CH_4	Included	Only equivalent GHG emissions due to methane leaks in the linear part of the gas pipelines as well as shut-off and control valves of elements of the natural gas production, preparation, storage and transportation system

Figure 12 shows the boundary and GHG emission sources of the baseline scenario (outlined with green line).

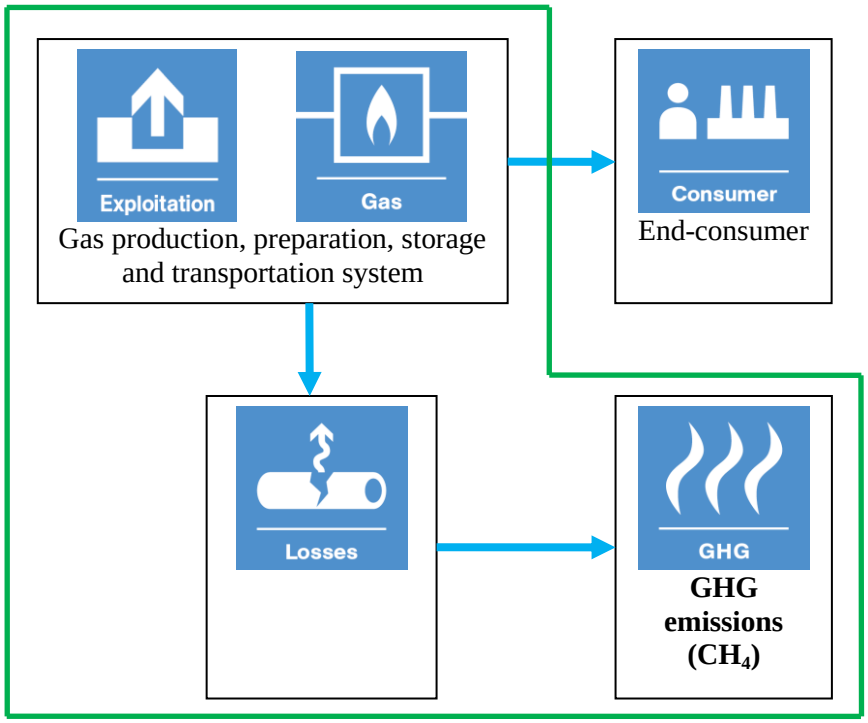

Figure 12. Boundary and GHG emissions sources in the baseline scenario

Greenhouse gas sources and boundary of the project scenario.

The sources of GHG emissions and leaks in the project scenario coincide with the emissions and leaks in the baseline scenario. Figure 13 shows boundary of the project scenario (outlined with green line).

Table 9. An overview of all sources of emissions in the project scenario

Source	Gas	Included / Excluded	Substantiation / explanation
Project emissions			
Methane leaks	CH_4	Included	Only equivalent GHG emissions due to methane leaks in the linear part of the gas pipelines as well as shut-off and control valves of elements of the natural gas production, preparation, storage and transportation system

Indirect irrelevand 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.

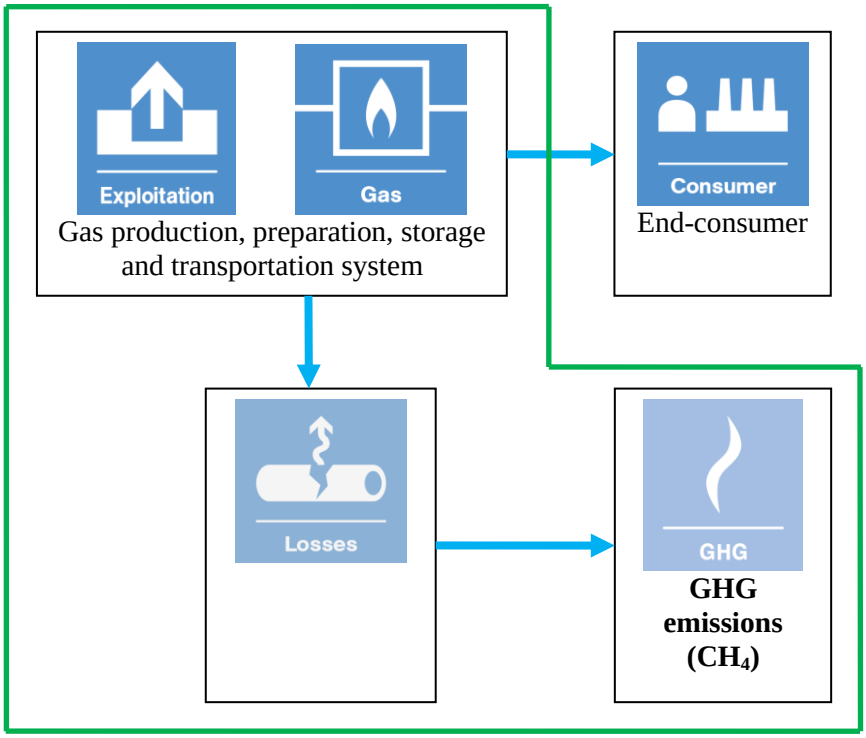

Figure 13. Boundary and GHG emissions sources in the project scenario

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Baseline formation date: 05/04/2012.
The baseline has been set by VEMA S.A., project developer, and Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"
Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"
Yasyuk Valeriy Mykhaylovych
Chairman of the management board
Telephone: +38 (0652) 52-34-58
Fax: +38 (0652) 52-34-34
e-mail: office@gas.crimea.ua
Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" is the project participant (stated in Annex 1).

VEMA S.A.:
Route de Thonon 45
Geneva, Switzerland
Fabian Knodel,
Director.
Telephone: +41 (22) 855 09 69
Fax: +41 (22) 855 09 79
e-mail: info@vemacarbon.com
VEMA S.A. is the project participant (stated in Annex 1).

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

06/06/2003 is the date of the meetings of the management board of PJSC "NJSC "Chornomornaftogaz" (Minutes of the meeting of the management board of PJSC "NJSC "Chornomornaftogaz" dated 06/06/2003) where a decision on JI project creation was made.

C.2. Expected operational lifetime of the project:

From 01/01/2006 to 31/12/2020 (15 years and 0 months, or 180 months), subject to due maintenance.

C.3. Length of the crediting period:

From 01/01/2008 to 31/12/2012 (5 years or 60 months), continuation from 01/01/2013 to 31/12/2020 (8 years or 96 months)
The starting date of the crediting period is the date when the first assigned amount units are expected to be generated, namely January 1, 2006. Generation of ERUs relates to the first commitment period of 5 years (January 1, 2008 - December 31, 2012). Prolongation of the crediting period after 2012 is subject to approval by the host Party and calculations of emission reductions are presented separately for the period before 2012 and for the period after 2012.
If after the first commitment period under the Kyoto Protocol, its effect is projonged, the crediting period for the project will also by prolonged by 8 years/96 months to December 31, 2020

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

The proposed project uses a specific approach to JI projects based on the "Guidance on criteria for baseline setting and monitoring" (Version 03) of the Joint Implementation Supervisory Committee - JISC[39], which meets the requirements specified in Regulation 9 / CMP.1., Annex 1, "Criteria for baseline setting and monitoring."

In order to quantify and prepare reports on methane emission reductions based on the baseline and project activity a specific approach based on the approved methodology AM0023 version 04.0.0 "Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities"[40] with modification (see section B. 1 above), which improves the accuracy of methane leaks measurements.

After the detection and measurement of methane leaks a monitoring program for all gas equipment of pipeline fittings as well as shut-off and control gas valves, flange and threaded joints of gas pipelines of PJSC "NJSC "Chornomornaftogaz" was developed. Implementation of this program is part of the project activities. Monitoring encompasses emissions from sources of leaks that are detected again, and control over repaired gas equipment, where methane leaks were detected earlier.

As a part of the joint implementation project PJSC "NJSC "Chornomornaftogaz" made a Register of gas fittings and compounds of the JI project Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" (Supporting documents 1 that is to be provided on request), which includes complete information about the pipeline fittings as well as shut-off and control gas valves, flange and threaded connections that are included in the project.

All relevant data related to the calculation of methane emission reductions are stored in an electronic database. Each monitoring report will include all necessary information from this database.
The table of parameters that will be included in the process of monitoring and verification for ERUs calculation, and are presented in Sections **D.1.1.1** and **D.1.1.3.**
Data and parameters not monitored throughout the whole crediting period, but determined only once, which are available at the stage of PDD development:

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

[40] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

i	Gas equipment sequence number of pipeline fittings and shut-off and control gas valves, flange and threaded connections, where methane leak, which was detected, repaired and then verified, was detected
Vbag	Volume of capacity, m^3

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 that are monitored during the whole crediting period:

T_i	Number of operation hours of equipment where leak was detected during the year, h
$w_{sampleCH4,i,p}$	Concentration of methane in the sample, %
τ_i	Time within which the concentration of methane in the capacity reaches a certain level, h
t_i	Gas temperature, ^oC
P_i	Gas pressure, Pa
UR_i	Uncertainty range for the leak measurement equipment, %
GWP_{CH4}	Global warming potential, t CO_2e/t CH_4

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

At the start of the project in Ukraine there was no single methodology of measurement and monitoring of methane. In this regard, PJSC "NJSC "Chornomornaftogaz" concluded the preliminary investment agreement relating to the joint implementation project with VEMA S.A. according to which among other things VEMA S.A. undertook to develop Methane leaks monitoring plan and program.

The monitoring plan was developed based on the methodology AM0023 version 04.0.0 "Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities"[41] with some assumptions about the method of measuring the volume of methane leaks provided in paragraph B.1 above. Also, monitoring methodology is described in details in Appendix 3.

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

[41] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Data/Parameter	*i*
Unit of measurement	dimensionless
Description	Gas equipment sequence number of pipeline fittings and shut-off and control gas valves, flange and threaded connections, where methane leak, which was detected, repaired and then verified, was detected
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Leak measurement activity
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[42]
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	A sequence number is assigned to a detected leak at a device. List of gas equipment is provided in the Supporting document 1. After repair verification is conducted

Data/Parameter	T_i
Unit of measurement	hour
Description	Number of operation hours of equipment where leak was detected during the year
Periodicity of determination/monitoring	Annually
Source of data (to be) used	Recordings of examination results

[42] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

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 AM0023 version 04.0.0[43]
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	Number of operation hours of equipment during the year after its replacement (repair). Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	GWP_{CH4}
Unit of measurement	t CO_{2e}/ t CH_4
Description	Global warming potential
Periodicity of determination/monitoring	Annually
Source of data (to be) used	IPCC
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	Global warming potential of methane, it is determined in accordance with decision 2/CP.3 and provided in the IPCC guidelines
QA/QC procedures (to be) applied	The value is used for the first commitment period, and may subsequently be reviewed by a person responsible for monitoring in accordance with Article 5 of the Kyoto Protocol

[43] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Any comment	The project developer will carry out the monitoring of any changes in the global warming potential of methane published by the IPCC and approved by the COP. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	*Vbag*
Unit of measurement	m^3
Description	Volume of capacity
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Flowmeter measurement data
Value of data applied (for ex ante calculations/determinations)	0.11
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[44]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Capacity is filled with water. Volume of water that is calculated by flowmeter will be the volume of capacity. The measurement showed that the capacity volume is 0.11 m^3. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	t_i

[44] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Unit of measurement	^{0}C
Description	Gas temperature
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Mercury thermometer of glass type TL-4 (state standard 8.279[45])
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 AM0023 version 04.0.0[46]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	P_i
Unit of measurement	MPa
Description	Gas pressure
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Barometer aneroid BAMM-1 or M-67 (TU 25-04-1797-75[47])

[45] http://www.gosthelp.ru/gost/gost31800.html - «Liquid operational gas thermometers. Methods and means of calibration»

[46] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[47] http://www.gosreestr.com/files/2005/03744-73.pdf - «Control barometer aneroid. General technical conditions»

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 AM0023 version 04.0.0[48]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	$w_{sampleCH4,i}$
Unit of measurement	%
Description	Concentration of methane in the sample
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Gas analyzer EX-TEC® SR5
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 AM0023 version 04.0.0[49]

[48] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[49] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Concentration of methane in the capacity of leak *i* is the difference between the concentration of methane in the capacity at the beginning and at the end of measurement. Concentration is measured by gas analyzer EX-TEC ® SR5. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	τ_i
Unit of measurement	second
Description	Time within which the concentration of methane in the capacity reaches a certain level
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Stopwatch «SOS pr-2б-2», State standard 5072-72[50]
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 AM0023 version 04.0.0[51]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Time within which the concentration of methane in the capacity

[50] http://www.complexdoc.ru/pdf/%D0%93%D0%9E%D0%A1%D0%A2%202707-75/gost_2707-75.pdf - «Mechanical stopwatches»

[51] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

	reaches a certain level is determined with a stopwatch. The measurement begins with the opening tap on the tank lid and ends after the concentration of methane inside the capacity reaches a certain level. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	UR_i
Unit of measurement	%
Description	Uncertainty range for the leak measurement equipment
Periodicity of determination/monitoring	Annually
Source of data (to be) used	Manufacturer's information and/or IPCC GPG
Value of data applied (for ex ante calculations/determinations)	95
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[52]
QA/QC procedures (to be) applied	A person responsible for monitoring check the data annually
Any comment	It is evaluated where possible; IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories[53] suggests accepting 95% confidence interval . If the manufacturer of leak measurement equipment states the uncertainty range without specifying confidence interval, it can be accepted at the level of 95%. Data allowing for calculation of

[52] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR
[53] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000: http://www.ipcc-nggip.iges.or.jp/public/gp/english/6_Uncertainty.pdf

	GHG emissions. Information will be archived in paper and electronic form

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

Greenhouse gas (GHG) emissions in the project scenario: GHG emissions from natural gas leaks in in the pipeline fittings as well as shut-off and control valves of elements of the natural gas production, preparation, storage and transportation system.

By using the method of measuring of leaks volume with the help of leakproof capacity, the amount of project emissions from equipment is calculated in accordance with the following formula:

$$PE_y = ConvFactor \sum_{i=1}^{n} \left[F_{CH_4,i,p}^{STP} \cdot T_i^y \cdot (1 + UR_i) \right] \cdot GWP_{CH_4} \quad \text{(D1)}$$

where:

PE_y - Methane emissions in period *y* for equipment after the repair of replacement (t CO_2e);

$ConvFactor$ - Conversion factor to convert m³ CH_4 into t CH_4 under normal temperature and pressure (0 ^{0}C, 101.3 kPa) is 0.0007168 t CH_4 /m^3 CH_4;

UR_i - The uncertainty range for the measurement method, unit fraction;

T_i^y - The time the relevant component *i* has been leaking during the given period *y*, hours;

GWP_{CH_4} - Global warming potential of methane (t CO_{2e} / t CH_4);

$F_{CH_4,i,p}^{STP}$ - methane leaks volume from one piece of equipment reduced to normal conditions (m^3/h).

[p] – index relating to the project scenario;
[i] – index relating to the sequence number of the element subject to reconstruction;
[STP] – index corresponding to the data reduced to normal conditions.

Bringing of the methane leaks rate (volume) to normal conditions:
The rate (volume) of methane leak obtained as a result of measurements is reduced to normal conditions ($P_н$ = 0.1013 MPa, $T_н$ = 0 °) in accordance with the formula:

$$F_{CH_4,i,p}^{STP} = \frac{F_{CH_4,i,p} \cdot 273 \cdot Pi}{0.1013 \cdot (273 + ti)}, \quad \text{(D2)}$$

where:

$F^{STP}_{CH_4,i,p}$ – project (after repair, replacement) methane leaks rate (volume) for equipment *i*, reduced to normal conditions (m^3/h);

$F_{CH_4,i,p}$ – project (after repair, replacement) methane leaks rate (volume) for equipment *i* (m^3/h);

P_i – gas pressure in tank, MPa;

t_i – gas temperature in tank, °C;

273 – temperature of the gas under normal conditions, corresponding to 0 °C, K;

0.1013 – gas pressure under normal conditions, corresponds to atmospheric pressure 101.3 kPa, MPa.

[p] – index relating to the project scenario;

[i] – index relating to the sequence number of the element subject to reconstruction;

[STP] – index corresponding to the data reduced to normal conditions.

By using the method of measuring of leaks volume with the help of leakproof capacity, the volume of methane leaks from one piece of equipment can be calculated by the formula:

$$F_{CH_4,i,p} = \frac{Vbag \cdot w_{sampleCH_4,i,p} \cdot 3600}{\tau_i}, \quad \text{(D3)}$$

where:

$F_{CH_4,i,p}$ - project (after repair, replacement) methane leaks rate (volume) for equipment *i* (m^3/h);

$Vbag$ - volume of leakproof tank for measurement (m^3);

$w_{sampleCH_4,i,p}$ - methane concentration in the leak sample «i», which is the difference between concentrations at the beginning and the end of the measuring (%);

τ_i - average duration of tank filling for leak «i» after reconstruction (seconds);

3600 –seconds to hours conversion factor, s per h.

[p] – index relating to the project scenario;

[i] – index relating to the sequence number of the element subject to reconstruction.

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:

Data/Parameter	*i*
Unit of measurement	dimensionless
Description	Gas equipment sequence number of pipeline fittings and shut-off and control gas valves, flange and threaded connections, where methane leak, which was detected, repaired and then verified, was detected
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Leak measurement activity
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[54]
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	A sequence number is assigned to a detected leak at a device. List of gas equipment is provided in the Supporting document 1. After repair verification is conducted. Information will be archived in paper and electronic form

Data/Parameter	T_i
Unit of measurement	hour
Description	Number of operation hours of equipment where leak was detected during the year
Periodicity of	Annually

[54] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

determination/monitoring	
Source of data (to be) used	Recordings of examination results
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 AM0023 version 04.0.0[55]
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	Number of operation hours of equipment during the year after its replacement (repair). Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	GWP_{CH4}
Unit of measurement	t CO_2e/ t CH_4
Description	Global warming potential
Periodicity of determination/monitoring	Annually
Source of data (to be) used	IPCC
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and	Global warming potential of methane, it is determined in accordance with decision 2/CP.3 and provided in the the IPCC guidelines

[55] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

procedures (to be) applied	
QA/QC procedures (to be) applied	The value is used for the first commitment period, and may subsequently be reviewed by a person responsible for monitoring in accordance with Article 5 of the Kyoto Protocol
Any comment	The project developer will carry out the monitoring of any changes in the global warming potential of methane published by the IPCC and approved by the COP. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	*Vbag*
Unit of measurement	m^3
Description	Volume of capacity
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Flowmeter measurement data
Value of data applied (for ex ante calculations/determinations)	0.11
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[56]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications

[56] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Any comment	Capacity is filled with water. Volume of water that is calculated by flowmeter will be the volume of capacity. The measurement showed that the capacity volume is 0.11 m^3. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	t_i
Unit of measurement	^0C
Description	Gas temperature
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Mercury thermometer of glass type TL-4 (state standard 8.279[57])
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 AM0023 version 04.0.0[58]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

[57] http://www.gosthelp.ru/gost/gost31800.html - «Liquid operational gas thermometers. Methods and means of calibration»

[58] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

Data/Parameter	P_i
Unit of measurement	MPa
Description	Gas pressure
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Barometer aneroid BAMM-1 or M-67 (TU 25-04-1797-75[59])
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 AM0023 version 04.0.0[60]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	$w_{sampleCH4,i,b}$
Unit of measurement	%
Description	Concentration of methane in the sample
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Gas analyzer EX-TEC® SR5

[59] http://www.gosreestr.com/files/2005/03744-73.pdf - «Control barometer aneroid. General technical conditions»

[60] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

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 AM0023 version 04.0.0[61]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Concentration of methane in the capacity of leak *i* is the difference between the concentration of methane in the capacity at the beginning and at the end of measurement. Concentration is measured by gas analyzer EX-TEC ® SR5. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	τ_i
Unit of measurement	second
Description	Time within which the concentration of methane in the capacity reaches a certain level
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Stopwatch «SOS pr-2б-2», State standard 5072-72[62]
Value of data applied (for ex ante calculations/determinations)	N/A

[61] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[62] http://www.complexdoc.ru/pdf/%D0%93%D0%9E%D0%A1%D0%A2%202707-75/gost_2707-75.pdf - «Mechanical stopwatches»

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[63]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Time within which the concentration of methane in the capacity reaches a certain level is determined with a stopwatch. The measurement begins with the opening tap on the tank lid and ends after the concentration of methane inside the capacity reaches a certain level. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	UR_i
Unit of measurement	%
Description	Uncertainty range for the leak measurement equipment
Periodicity of determination/monitoring	Annually
Source of data (to be) used	Manufacturer's information and/or IPCC GPG
Value of data applied (for ex ante calculations/determinations)	95
Justification of the choice of data or description of measurement methods and	Methodology AM0023 version 04.0.0[64]

[63] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[64] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

procedures (to be) applied	
QA/QC procedures (to be) applied	A person responsible for monitoring check the data annually
Any comment	It is evaluated where possible; IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories[65] suggests accepting 95% confidence interval . If the manufacturer of leak measurement equipment states the uncertainty range without specifying confidence interval, it can be accepted at the level of 95%. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

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 (GHG) emissions in the baseline scenario: GHG emissions from natural gas leaks in in the pipeline fittings as well as shut-off and control valves of elements of the natural gas production, preparation, storage and transportation system.

By using the method of measuring of leaks volume with the help of leak-proof capacity, the amount of baseline emissions from equipment is calculated in accordance with the following formula:

$$BE_y = ConvFactor \sum_{i=1}^{n} \left[F_{CH_4,i,b}^{STP} \cdot T_i^y \cdot (1 - UR_i) \right] \cdot GWP_{CH_4} \quad \text{(D4)}$$

where:

BE_y - Methane emissions in period *y* for equipment before the repair of replacement (t CO_2e);

$ConvFactor$ - Conversion factor to convert m^3 CH_4 into t CH_4 under normal temperature and pressure (0 ^{0}C, 101.3 kPa) is 0.0007168 t CH_4 /m^3 CH_4;

UR_i - The uncertainty range for the measurement method, unit fraction;

[65] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000: http://www.ipcc-nggip.iges.or.jp/public/gp/english/6_Uncertainty.pdf

T_i^y - The time the relevant component *i* has been leaking during the given period *y*, hours;

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

$F_{CH_4,i,b}^{STP}$ - methane leaks volume from one piece of equipment reduced to normal conditions (m^3/h).

[b] – index relating to the baseline scenario;
[i] – index relating to the sequence number of the element subject to reconstruction;
[STP] – index corresponding to the data reduced to normal conditions.

Bringing of the methane leaks rate (volume) to normal conditions:
The rate (volume) of methane leak obtained as a result of measurements is reduced to normal conditions ($P_н$ = 0.1013 MPa, $T_н$ = 0 °) in accordance with the formula:

$$F_{CH_4,i,b}^{STP} = \frac{F_{CH_4,i,b} \cdot 273 \cdot Pi}{0.1013 \cdot (273 + ti)}, \quad \text{(D5)}$$

where:

$F_{CH_4,i,b}^{STP}$ – baseline (before repair, replacement) methane leaks rate (volume) for equipment *i*, reduced to normal conditions (m^3/h);

$F_{CH_4,i,b}$ – baseline (before repair, replacement) methane leaks rate (volume) for equipment *i* , (m^3/h);

P_i – gas pressure in tank, MPa;
t_i – gas temperature in tank, °C;
273 – temperature of the gas under normal conditions, corresponding to 0 °C, K;
0.1013 – gas pressure under normal conditions, corresponds to atmospheric pressure 101.3 kPa, MPa.
[b] – index relating to the baseline scenario;
[i] – index relating to the sequence number of the element subject to reconstruction;
[STP] – index corresponding to the data reduced to normal conditions.

By using the method of measuring of leaks volume with the help of leakproof capacity, the volume of methane leaks from one piece of equipment can be calculated by the formula:

$$F_{CH_4,i,b} = \frac{Vbag \cdot w_{sampleCH_4,i,b} \cdot 3600}{\tau_i}, \quad \text{(D6)}$$

where:

$F_{CH_4,i,b}$ - baseline (before repair, replacement) methane leaks rate (volume) for equipment i, (m^3/h);

$Vbag$ - volume of leakproof tank for measurement (m^3);

$w_{sampleCH_4,i,b}$ - methane concentration in the leak sample «i», which is the difference between concentrations at the beginning and the end of the measuring (%);

τ_i - average duration of tank filling for leak «i» after reconstruction (seconds);

3600 – seconds to hours conversion factor, s per h.

[b] – index relating to the baseline scenario;

[i] – index relating to the sequence number of the element subject to reconstruction.

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

N/A

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):

N/A

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

Increase in GHG emissions outside the project boundary which might be caused by the project are not expected..

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

N/A

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

N/A

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):

Calculation of emission reductions achieved as a result of the project activity (calculated in accordance with a specific approach to JI projects):

$ERU_y = BE_y - PE_y$, where: (D.7)

BE_y - total methane emissions from equipment before the repair or replacement, in period «*y*», (t CO_2e);

PE_y - total methane emissions from equipment after the repair or replacement, in period «*y*», (t CO_2e);

$[y]$ - index that corresponds to monitoring period.

The Supporting document 1 contains the calculation of baseline and project emissions as well as emission reductions of the project during the 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:

The main legislative acts of Ukraine relating to the monitoring of the environmental impact of business entities are:

- Law of Ukraine № 1264-XII «On environmental protection"[66] dated 25/06/1991
- Law of Ukraine № 2707-XII «On atmospheric air protection»[67] dated 16/10/1992.
- Current rules on emission limitation: «Norms of maximum permissible emissions of pollutants from permanent sources» – approved by the Ministry of Environmental Protection of Ukraine dated 27/06/2006, №309 and registered in the Ministry of Justice of Ukraine dated 01/09/2006, №912/12786.

The main areas of environmental protection activities of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" are:

• Conservation and sustainable use of water resources.

• Protection of air basin.

• Land protection and waste management.

Preliminary, exploratory and production drilling for hydrocarbons, arrangement and exploitation of deposits in the Black Sea and the Sea of Azov are performed only on the basis of developed and approved design documents. EIA is an integral part of the projects and it is submitted together with the design documents to the authorized state agencies for peer review.

The right to development of design documentation is provided to businesses and individuals – agents of economic activity regardless of ownership (design engineers) who are licensed to this activity under the law. Design works are performed on the basis of agreements concluded between Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" and design engineers.

Given the specificity of facilities and works design in the Black Sea and the Sea of Azov, the design engineer performs the collection, processing and systematization of retrospective, literature and their own materials on ecological state of geological, air and marine environment, analises research materials for the identification of current (baseline) state of the plankton community and bottom biocenosis, provides characteristics of fishin inf the area of the projected facilities or works, carries out ecological shooting (if necessary) and evaluates the damages to water living resources.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:		
Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.

[66] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1264-12

[67] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2707-12

i	Low	A number must be assigned to every coil and after repair monitoring must be carried out to identify additional leaks
T_i	Low	A logbook must be arranged where possible for equipment that is often shut down with the purpose to measure operational hours. Staff will have appropriate qualifications for fixation of the results. Equipment is regularly calibrated and verified according to quality control procedure and the law of Ukraine «On metrology and metrological activity»[68]. Maintenance is carried out according to technical specifications
GWP_{CH4}	Low	Global warming potential of methane is determined in accordance with decision 2/CP.3 and provided in the the IPCC guidelines. The project participants will keep records of any new values for greenhouse gases approved by the COP
t_i	Low	Records of data about equipment that is calibrated and verified are made on a regular basis. Staff will have appropriate qualifications for fixation of the results. Equipment is regularly calibrated and verified according to quality control procedure and the law of Ukraine «On metrology and metrological activity»
P_i	Low	Records of data about equipment that is calibrated and verified are made on a regular basis. Staff will have appropriate qualifications for fixation of the results. Equipment is regularly calibrated and verified according to quality control procedure and the law of Ukraine «On metrology and metrological activity»
UR_i	Low	Uncertainty range for the leak measurement equipment is taken under chapter 6 of «IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories»[69]
$Vbag$	Low	Volume of leakproof tank does not change with time, so constant monitoring of its volume is not required
$w_{sampleCH4,i}$	Low	Gas analyzers EX-TEC® SR5. Equipment is regularly calibrated and verified according to quality control procedure and the law of Ukraine «On metrology and metrological activity»
τ_i	Low	Stopwatch is a simple device and it is not included in the list of devices that must undergo an annual calibration. A stopwatch SOS pr-2b-2, which meets te requirements of State standards 5072-72 will be used. Staff will have appropriate qualifications for fixation of the results. Equipment is regularly calibrated and verified according to quality control procedure and the law of Ukraine «On metrology and metrological activity». Maintenance is carried out according to technical specifications.

[68] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15
[69] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000: http://www.ipcc-nggip.iges.or.jp/public/gp/english/6_Uncertainty.pdf

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 their predecessors will be used.

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

An individual operational and management structures will be applied for each sub-project.

Sub-project 1. Coordination of work of all departments and services of PJSC "NJSC "Chornomornaftogaz" relating to the JI project implementation is done by a Working team. The structure of the Working team is shown in the Figure 14.

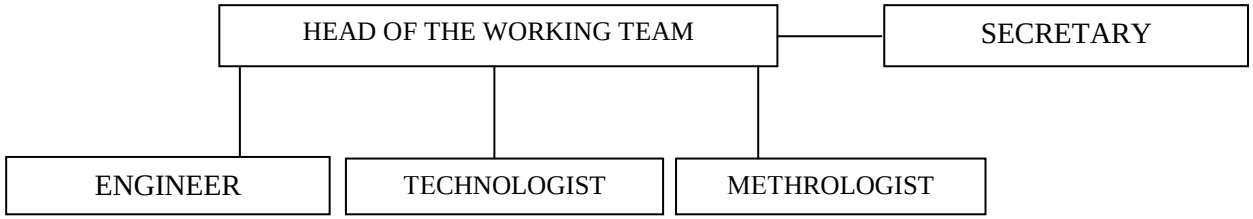

Figure 14 Structure of the Working team

The engineer of the working team is responsible for collection of all information envisaged in the monitoring plan and making all necessary calculations. The secretary of the working team is responsible for storage and archiving of all information obtained as a result of the measurements and calculations. On the basis of the obtained information the head of the working team, determines the plan of measures under the Project and the volume of necessary resources. The technologist and methrologist of the working team who are responsible for conducting monitoring measurements of leaks and repair thereof, ensure that calibrated measuring equipment and technical support are in place.

The initial data to calculate the reduction of the GHG emissions and the results of the calculations will be archived by PJSC "NJSC "Chornomornaftogaz" during the crediting period and at least two years after the last transfer of ERUs for the project.

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

The monitoring plan and the baseline are set by VEMA S.A., project developer, and Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz".

Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"
Yasyuk Valeriy Mykhaylovych
Chairman of the management board
Telephone: +38 (0652) 52-34-58
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e-mail: office@gas.crimea.ua
Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" is the project participant (stated in Annex 1).

VEMA S.A.

Route de Thonon 45
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VEMA S.A. is the project participant (stated in Annex 1).

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

Project emissions were estimated in accordance with the formulae given in Section D.1.1.2. To estimate emissions for the period of 2006-2010 existing data of PJSC "NJSC "Chornomornaftogaz" relating to the actual monitoring parameters values for an appropriate period were used, for the period of 2011-2020 predicted data according to the company development plan were used.

Implementation of the project activities began in the middle of 2005. However, the emission reductions achieved during 2005 are excluded from the calculation.

Results of calculation are provided in the tables below. The calculations are stated in Supporting document 1 annexed to the PDD.

Table 10. Estimated project emissions for the period January 1, 2006– December 31, 2007

Year	Project emissions (tons of CO_2 equivalent)
2006	39400
2007	118199
Total project emissions over the period from 2006 to 2007 (tons of CO_2 equivalent)	**157599**

Table 11. Estimated project emissions for the period January 1, 2008 – December 31, 2012

Year	Project emissions (tons of CO_2 equivalent)
2008	126079
2009	133959
2010	141838
2011	141838
2012	141838
Total project emissions over the period from 2008 to 2012 (tons of CO_2 equivalent)	**685552**

Table 12. Estimated project emissions for the period January 1, 2013 - December 31, 2020

Year	Project emissions (tons of CO_2 equivalent)
2013	141838
2014	141838
2015	141838
2016	141838
2017	141838
2018	141838
2019	141838
2020	141838
Total project emissions over the period from 2013 to 2020 (tons of CO_2 equivalent)	**1134704**

E.2. Estimated leakage:

Leakages don't take place.

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

Since no leakages are expected the sum of emissions from leakages and from the project activity is equal to the emissions from the project activity. The results are provided in tables below.

Table 13. Table containing sum of emissions from leakages and project activities before the first commitment period.

Year	Estimated project emissions (tons of CO_2 equivalent)	Estimated leakages (tons of CO_2 equivalent)	Total emissions and leakage (tons of CO_2 equivalent)
2006	39400	0	39400
2007	118199	0	118199
Total emissions (tons of CO_2 equivalent)	**157599**	**0**	**157599**

Table 14. Table containing sum of emissions from leakages and project activities during the first commitment period.

Year	Estimated project emissions (tons of CO_2 equivalent)	Estimated leakages (tons of CO_2 equivalent)	Total emissions and leakage (tons of CO_2 equivalent)
2008	126079	0	126079
2009	133959	0	133959
2010	141838	0	141838
2011	141838	0	141838
2012	141838	0	141838
Total emissions (tons of CO_2 equivalent)	**685552**	**0**	**685552**

Table 15. Table containing sum of emissions from leakages and project activities after the first commitment period.

Year	Estimated project emissions (tons of CO_2 equivalent)	Estimated leakages (tons of CO_2 equivalent)	Total emissions and leakage (tons of CO_2 equivalent)
2013	141838	0	141838
2014	141838	0	141838
2015	141838	0	141838
2016	141838	0	141838
2017	141838	0	141838
2018	141838	0	141838
2019	141838	0	141838
2020	141838	0	141838
Total emissions (tons of CO_2 equivalent)	**1134704**	**0**	**1134704**

E.4. Estimated baseline emissions:

Estimated baseline emissions were calculated in accordance with the formulae specified in section D.1.1.4.

Results are provided in the tables below. Calculations are provided in the Supporting document 1, attached to the PDD.

To estimate emissions for the period of 2006-2010 existing data of PJSC "NJSC "Chornomornaftogaz" relating to the actual monitoring parameters values for an appropriate period were used, for the period of 2011-2020 predicted data according to the company development plan were used. Results of calculation are provided in the tables below.

Table 16. Estimated baseline emissions for the period January 1, 2006– December 31, 2007

Year	Estimated baseline emissions (tons of CO_2 equivalent)
2006	492503
2007	1477510
Total baseline emissions over the period from 2006 to 2007 (tons of CO_2 equivalent)	**1970013**

Table 17. Estimated baseline emissions for the period January 1, 2008 – December 31, 2012

Year	Estimated baseline emissions (tons of CO_2 equivalent)
2008	1576011
2009	1674512
2010	1773012
2011	1773012
2012	1773012
Total baseline emissions over the period from 2008 to 2012 (tons of CO_2 equivalent)	**8569559**

Table 18. Estimated baseline emissions for the period January 1, 2013 - December 31, 2020

Year	Estimated baseline emissions (tons of CO_2 equivalent)
2013	1773012
2014	1773012
2015	1773012
2016	1773012
2017	1773012
2018	1773012
2019	1773012
2020	1773012
Total baseline emissions over the period from 2013 to 2020 (tons of CO_2 equivalent)	**14184096**

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

Emission reductions are calculated according to formula described in section D.1.4. Results are provided in the tables below. Calculations are provided in the Supporting document 1, attached to the PDD.

Table 19. Estimated emission reduction for the period from January 1, 2006– December 31, 2007

Year	Estimated emission reduction (tones of CO_2 equivalent)
2006	453103
2007	1359311
Total estimated emission reduction over the period from 2006 to 2007 (tons of CO_2 equivalent)	**1812414**

Table 20. Estimated emission reduction for the period from January 1, 2008 – December 31, 2012

Year	Estimated emission reduction (tones of CO_2 equivalent)
2008	1449932
2009	1540553
2010	1631174
2011	1631174
2012	1631174
Total estimated emission reduction over the period from 2008 to 2012 (tons of CO_2 equivalent)	**7884007**

Table 21. Estimated emission reduction for the period January 1, 2013 - December 31, 2020

Year	Estimated emission reduction (tones of CO_2 equivalent)
2013	1631174
2014	1631174
2015	1631174
2016	1631174
2017	1631174
2018	1631174
2019	1631174
2020	1631174
Total estimated emission reduction over the period from 2013 to 2020 (tons of CO_2 equivalent)	**13049392**

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

Table 22. Table containing results of estimation of emission reduction for the period from January 1, 2006 to December 31, 2007.

Year	Estimated project emissions (tones of CO_2 equivalent)	Estimated leakages (tones of CO_2 equivalent)	Estimated baseline emissions (tones of CO_2 equivalent)	Estimated emission reduction (tones of CO_2 equivalent)
2006	39400	0	492503	453103
2007	118199	0	1477510	1359311
Total (tones of CO_2 equivalent)	**157599**	**0**	**1970013**	**1812414**

Table 23. Table containing results of estimation of emission reduction for the period from January 1, 2008 to December 31, 2012

Year	Estimated project emissions (tones of CO_2 equivalent)	Estimated leakages (tones of CO_2 equivalent)	Estimated baseline emissions (tones of CO_2 equivalent)	Estimated emission reduction (tones of CO_2 equivalent)
2008	126079	0	1576011	1449932
2009	133959	0	1674512	1540553
2010	141838	0	1773012	1631174
2011	141838	0	1773012	1631174
2012	141838	0	1773012	1631174
Total (tones of CO_2 equivalent)	**685552**	**0**	**8569559**	**7884007**

Table 24. Table containing results of estimation of emission reduction for the period from January 1, 2013 to December 31, 2020

Year	Estimated project emissions (tones of CO_2 equivalent)	Estimated leakages (tones of CO_2 equivalent)	Estimated baseline emissions (tones of CO_2 equivalent)	Estimated emission reduction (tones of CO_2 equivalent)
2013	141838	0	1773012	1631174
2014	141838	0	1773012	1631174
2015	141838	0	1773012	1631174
2016	141838	0	1773012	1631174
2017	141838	0	1773012	1631174
2018	141838	0	1773012	1631174
2019	141838	0	1773012	1631174
2020	141838	0	1773012	1631174
Total (tones of CO_2 equivalent)	**1134704**	**0**	**14184096**	**13049392**

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 environmental regulations of Ukraine gas emissions into the atmosphere are not considered contaminative. Therefore, no environmental permits for the transportation and supply of natural gas are required.

The only environmental impact is a reduction of natural gas emissions into the atmosphere. Implementation of this project will improve the safety of operation of gas distribution networks, which in turn will reduce the likelihood of explosions or fires.

Transboundary impacts of project activities according to their definitions in the text ratified by Ukraine "Convention on transboundary pollution at a great distance," will not take place. Project implementation does not bring any harmful effects on the environment.

PJSC "NJSC "Chornomornaftogaz" independently performs complex of exploration and drilling operations on Azov-Black Sea shelf, industrial construction, arrangement of offshore deposits, production, transportation and storage of natural gas and liquid hydrocarbons. These production activities and production facilities whereat such activities take place, represent environmental hazard, so ensurance of environmental safety and compliance with environmental legislation is an integral part of all directions of these activities.

The main procedures of environmental protection are:

• Planning and monitoring of environmental measures.
• Organization of the EIA development for projects of new construction of wells and other production facilities.
• Departmental environmental expertise and organization of the state examination of the EIA.
• Obtaining permissible environmental documentation necessary for the implementation of production activities that require such documentation.
• Monitoring of compliance with standards of environmental impact set out in relevant resolutions of environmental agencies.
• Organization of monitoring over the ecological state of the environment in the areas of production activities of the Company.
• Accounting for emissions of harmful substances into the air, discharges into water bodies, waste formation and disposal.
• Calculation of charges of environmental pollution and the relevant statistical reporting.
• Preparation of contracts on environmental works and services provision.
• Implementation of departmental inspections of production facilities to comply with environmental requirements.

Protection and rational use of water resources.

The company's subdivisions carried out water intake from the company's own artesian wells (special water use), utility waterpipe and partly from the sea (for sanitary and industrial needs). Permits for special water use meet the requirements of applicable law.

The volume of water consumption does not exceed established limits. Stratal waters of operational marine stationary platforms were pumped into absorbing wells in accordance with the deposit development projects.

Drill water from SEFDR is repetitively used for technological purposes (cooling mechanisms and fire extinguishing water storage).

Domestic wastewater of SMEs, according to the norms of maximum permissible discharges of contaminative substances, were discharged into the Black Sea through special release with spreaders according to permit state inspection of the Black Sea protection. Standard maximum allowable discharges of wastewater from SMEs into the Sea were developed by Research Institute of the Navy (Odesa). Allowed volume of discharge is 2225 m^3 of wastewater per year.

Table 25. Information about contaminative substance discharges into water objects with wastewater of PJSC "NJSC "Chornomornaftogaz" in 2010.

Water object name	Name of contaminative substances, which enter water object alongside with wastewater	Actual concentration of contaminative substances which enter water object (mg/litre)	Actual discharge of wastewater (cu.m / year)	Actual discharge of contaminative substances (ton per year)
Black Sea	BOD 5	2,5	2225	$5,56 \times 10^{-3}$
	Suspended substances	3,00	2225	$6,66 \times 10^{-3}$
	Oil products	0,05	2225	$0,11 \times 10^{-3}$
	Iron ions	0,05	2225	$0,11 \times 10^{-3}$

On land, economic and domestic wastewater was drained to municipal drainage networks.

Oil-containing bilge water on ships and platforms was collected in special ship collecting tanks, this process is followed by cleaning of this water to the level stipulated by regulatory standard in the ship's bilge water separators and then in is discharged into the sea beyond 12 mile zone at a spead of at least 4 knots (as required by MARPOL73 / 78). Separators are provided with TBS "Don," BZ "Centaurus", P / k "Neptun-3", TBS "Naftogaz-68".

In the shelf area of the Black Sea and the Sea of Azov Holitsynske, Shtormove, Arhhangelske, Strilkove, Shidno-Kazantypske, Pivnichno-Bulganakske deposits are developed subject to the following requirements:

• Since the process of gas production at offshore shelf is of high environmental hazard (Resolution of CMU dated 27/05/1995 № 554), exploitation of deposits must be accompanied by environmental monitoring of the marine environment (in accordance with Article 22 of the Law of Ukraine "On Environmental Protection");

• Compliance with the law relating to the development of EIA of the projects on well construction;

• Provision of SMEs and floating crafts, used for their service, with equipment necessary for the prevention of marine pollution.

Under these conditions, the Company carries out departmental monitoring of the marine environment in waters of operating SMEs by means of quarterly test of the surface layer to determine the content of pollutants. Analysis of samples is performed in the laboratories of the Crimean basin Sanitary &

Epidemiological Service[70] and Reskomekoresursiv of ARC. Results of analysis of all samples meet the standards MAC for contaminants of territorial waters of Ukraine.

Complex monitoring study of the ecological state of marine ecosystems are made periodically in the waters of existing deposits of the Sea of Azov and waters of Subotine oil deposi (Prykerchenska part of the Black Sea) and the northwestern Black Sea shelf. Research is conducted by: marine expeditionary hydrological, hydrochemical tests of surface and bottom seawater and sediment (to determine the content of all fractions of petroleum products, heavy metals, organochlorine compounds, pesticides, BOD), hydrobiological tests (to determine species composition, biomass, phyto and zooplankton and benthos, with the assessment of their environmental condition). Expeditionary works are performed in the network of stations located in the waters of SMEs, underwater pipelines and background areas of the seas.

Research results indicate a satisfactory condition of the marine environment in the areas of industrial production of hydrocarbons, its stabilization comparing to previous years. Cases of exceeding the standards for some compounds of certain medium components, identified in some stations, are not associated with the influence of industrial facilities of PJSC "NJSC "Chornomornaftogaz" by scientists.

Furthermore, as noted above, the study of ecological state of the marine environment is also carried out in the process of ecological shootings in the process of EIA elaboration for projects on construction of new sea wells.

Monitoring studies are conducted with involvement of leading scientific institutions - research institutes in the field of hydrology and oceanography (Research Institute Pivden NIRO, Kerch, Institute of Mineral Resources of the Ministry of Ecology of Ukraine).

State control over compliance with requirements of environmental regulations at offshore facilities of the company is carried out by: The State of the Azov-Black Sea Ecological Inspectorate, the State Environmental Inspection of the Sea of Azov[71], Crimean Basin Sanitary & Epidemiological Service on water transport.

Operation of pipeline systems on land and offshore waters was carried out in normal mode in compliance with regulations. Routine inspections of underwater pipelines are performed in accordance with the approved schedule.

Accidents and pollution of the water environment or the coastline due to industrial activity were not recorded.

Treatment facilities operate at the off-shore and onshore facilities of the Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" to treat wastewaters.

Wastewater treatment facilities DVZ - SKA 50 «Biomaster», productivity of 9.2 m^3 / day, as well as facilities for disinfection of sewage and bilge water separator function at SEFDR "Sivash". SEFDR "Tavryda" has similar equipment.

Facilities of Underground gas storage (UGGSS) department have on land treatment equipment (installation BIO-50), complex gas preparation installation (CGPI) "Baherovo" and the base of production and technological support and package (PTS and P) - (installation "Biotal-5").

Electrochemical station for cleaning of associated stratal waters operates in East-Crimean Oil and Gas Production Administration (EC OGPA). In 2008, the station "Biotal-5" in the reservoir park was installed.

A plan for primary and long-term measures for construction and reconstruction of treatment facilities at the Company's facilities was elaborated and will be implemented in stages.

[70] http://krimses.com.ua/

[71] http://azovseaeco.com.ua/

Land protection and waste management.

To prevent pollution of lands, which are exposed to industrial activity of the Company's facilities, with waste, the following activities were carried out:

All the bore sludge from drilling platforms is transported to the company's own warehouse of bore waste. Lease term of land for the warehouse (sludge tank) is prolonged by 49 years. Sludge tank fully complies with applicable regulations.

Landfill for storage of bored waste was taken into operation by the working committee of the acceptance of the completed construction on 20 October 1989. The project was designed by "VNDPI SHELF".

Place waste removal (PWR) is located within the Novosilsk village council of the Black Sea district, 3.8 km. away from Kalynivka village, 6 km. away from town Chornomorske, 200 m west of the highway Chornomorske-Olenivka. Distance from artesian wells - drinking water source – is 7 km; from water courses and water bodies - 10 km. Total area of the sludge tank is 0.87 hectares, the project area is 10000 m^2.

Landfill for bore waste is the place of abandoned clay quarry. The site has a slight slope. To protect the environment from pollution ground insulation screen is provided; it is a clay screen with film coating, side insulation screens are clay screens with film coating and a ferroconcrete plate. Along the perimeter of the landfill a ditch was dug with depth of 1 m to collect rain without drainage to the the terrain. Aeration zone is 60 m, installed sanitary-protection zone of 1000 m is maintained.

Stored wastes relate to up to 3 hazard class (in terms of the chemical composition 78% is rock SiO_2, S, CaO, MgO, FeO, Al_2O_3, 1% is organic matter, 3-6 % is $CaSO_4$, $MgSO_4$MgCe $Fe(SO_4)$, 5% is barytes $BaSO_4$, 10% is water H_2O) - hazardous stored wastes are absent, the emissions of gas are absent.

At EC OGPA facilities where soil contamination by oil is possible, visual control of pollution with recording in logbooks is always performed. Monitoring of soil with involvement of leading scientific institutions is conducted.

Table 26. Existance and handling of waste.

Name of waste type	Class of hazard	Waste movement
Fluorescent lamps and waste that contains mercury, damaged or used-up	1	Transferred to specialized organisation for utilisation according to agreement
Used-up mercury thermoments	1	Transferred to specialized organisation for utilisation according to agreement
Spoilt or used-up batteries, lead batteries	2	Transferred to specialized organisation according to agreement
Tyres used-up, damaged or rubbished while exploitation	3	Transferred to specialized organisation for utilisation according to agreement
Spoilt or used-up oil, motor oil, transmission oils and greases	3	Transferred to specialized organisation according to agreement
Spoiled, polluted (oily) quartz sand	3	Transferred to specialized organisation for utilisation according to agreement
Bore sludge and wastes containing baryte	3	Placed on their own specialized landfill
Defective zinc electrodes	4	Transferred to specialized organisation for utilisation according to agreement
Municipal Waste other	4	Transferred to specialized organisation for

		utilisation according to agreement
Used-up abrasive material	4	Transferred to specialized organisation for utilisation according to agreement
Methanol water	3	Transferred to specialized organisation for utilisation according to agreement
Scrap metal	4	Transferred to specialized organisation according to agreement

Used-up fuel and lubricating materials, fluorescent lamps, tires, batteries, oil sludge, oiled soil, treatment facilities sediment, metanol water and waste from the production units are transferred to a specialized recycling companies (that have received appropriate permissions of the Ministry of Ecoresources of Ukraine).

According to the order of Ministry of Nature of Ukraine dated 07/07/2008 № 342 a typical primary accounting form № 1-VT "Accounting for packaging materials and packaging" was introduced and corresponding instruction was developed at the company. All subdivisions are provided with the permission and limits on waste formation and disposal.

Protection of air pool.

According to Article 11 of the Law of Ukraine "On Air Protection" and the Decree of the Cabinet of Ministers of Ukraine dated 13/03/2002 № 302 "On approval of the procedure for conduction and payment of work associated with the provision of permits for emissions of pollutants into the atmosphere from stationary sources, and accounting of firms, institutions, organizations and individuals - entrepreneurs who have received such permits", and instructions approved by the Ministry of Environment of Ukraine dated 09/03/2006, № 10, in a precsribed terms works on inventory of sources of pollutants and document development that substantiate their volumes from each production unit of the Company are carried out; permits for emissions of pollutants into the air for all units are received.

Emissions of pollutants in the air by all departments of the Public Joint Stock Company “National Joint Stock Company “Chornomornaftogaz”" were carried out in accordance with the said permits of Reskomekoresursiv of the ARC and did not exceed the maximum allowable emissions (MAE).

Calculations of emissions of pollutants from stationary sources and calculations of environmental tax for air pollution are composed according to the data about actual spending of raw materials during operation of the equipment.

Service of the Department of special work of the Company in accordance with the approved schedule implements internal control over emissions from equipment that consumes fuel. In cases of exceeding the standards content of certain hazardous substances adjustment of equipment (boilers) is done.

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:

As noted above, in the environmental impact assessment, it is clear that the project does not create any significant adverse environmental impact, but rather has a positive impact on the environment.

SECTION G. Stakeholders' comments

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

Since the project activities do not imply any negative environmental impact and negative social effect, special public discussions were not necessary. Consultations with stakeholders were held at meetings with local authorities.

PJSC "NJSC "Chornomornaftogaz" program of methane leaks reduction is regularly covered in press media and on television.

There have been numerous publications of PJSC "NJSC "Chornomornaftogaz" employees in specialized and high profile national magazines. Information about work on methane leaks reduction at pipeline fittings as well as shut-off and control valves, flange and threaded connections of elements of natural gas production, preparation, storage and transportation system at PJSC "NJSC "Chornomornaftogaz" is covered on the official website www.blackseagas.com, as well as on the sites of information agencies: http://www.uaenergy.com.ua/, http://chaspik.pp.ua/, http://angi.ru/, http://energyland.info/, http://www.ngbi.com.ua/, http://www.oil-gas.com.ua/, http://www.naftogaz.kiev.ua/.

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

Organisation:	PJSC "NJSC "Chornomornaftogaz"
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Salution	Mr
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Annex 2

BASELINE INFORMATION

Calculation of the dynamic baseline was carried out according to a specific approach to Joint Implementation (JI) projects, relying on the "Criteria for baseline setting and monitoring".

When choosing the baseline for the JI project a specific approach that meets the requirements specified in Regulation 9/CMP.1. was used.

Key information for baseline setting is stated in the tables given below.

Data/Parameter	*i*
Unit of measurement	dimensionless
Description	Gas equipment sequence number of pipeline fittings and shut-off and control gas valves, flange and threaded connections, where methane leak, which was detected, repaired and then verified, was detected
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Leak measurement activity
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[72]
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	A sequence number is assigned to a detected leak at a device. List of gas equipment is provided in the Supporting document 1. After repair verification is conducted. Information will be archived in paper and electronic form

Data/Parameter	T_i
Unit of measurement	hour
Description	Number of operation hours of equipment where leak was detected during the year
Periodicity of determination/monitoring	Annually
Source of data (to be) used	Recordings of examination results
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of	Methodology AM0023 version 04.0.0[73]

[72] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[73] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

measurement methods and procedures (to be) applied	
QA/QC procedures (to be) applied	Staff will have appropriate qualifications for fixation of the results
Any comment	Number of operation hours of equipment during the year after its replacement (repair). Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	GWP_{CH4}
Unit of measurement	t CO_2/ t CH_4
Description	Global warming potential
Periodicity of determination/monitoring	Annually
Source of data (to be) used	IPCC
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	Global warming potential of methane, it is determined in accordance with decision 2/CP.3 and provided in the IPCC guidelines
QA/QC procedures (to be) applied	The value is used for the first commitment period, and may subsequently be reviewed by a person responsible for monitoring in accordance with Article 5 of the Kyoto Protocol
Any comment	The project developer will carry out the monitoring of any changes in the global warming potential of methane published by the IPCC and approved by the COP. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	*Vbag*
Unit of measurement	m^3
Description	Volume of capacity
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Flowmeter measurement data
Value of data applied (for ex ante calculations/determinations)	0.11
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[74]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to

[74] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

	technical specifications
Any comment	Capacity is filled with water. Volume of water that is calculated by flowmeter will be the volume of capacity. The measurement showed that the capacity volume is 0.11 m^3. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	t_i
Unit of measurement	^0C
Description	Gas temperature
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Mercury thermometer of glass type TL-4 (state standard 8.279[75])
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 AM0023 version 04.0.0[76]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	P_i
Unit of measurement	MPa
Description	Gas pressure
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Barometer aneroid BAMM-1 or M-67 (TU 25-04-1797-75[77])
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and	Methodology AM0023 version 04.0.0[78]

[75] http://www.gosthelp.ru/gost/gost31800.html - «Liquid operational gas thermometers. Methods and means of calibration»

[76] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[77] http://www.gosreestr.com/files/2005/03744-73.pdf - «Control barometer aneroid. General technical conditions»

[78] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

procedures (to be) applied	
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	It is measured to identify the density of CH_4 to bring the leakage rate to normal conditions. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	$w_{sampleCH4,i,b}$
Unit of measurement	%
Description	Concentration of methane in the sample
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Gas analyzer EX-TEC® SR5
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 AM0023 version 04.0.0[79]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Concentration of methane in the capacity of leak *i* is the difference between the concentration of methane in the capacity at the beginning and at the end of measurement. Concentration is measured by gas analyzer EX-TEC ® SR5. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	τ_i
Unit of measurement	second
Description	Time within which the concentration of methane in the capacity reaches a certain level
Periodicity of determination/monitoring	Every time when measurements are performed in accordance with the monitoring plan
Source of data (to be) used	Stopwatch «SOS pr-26-2», State standard 5072-72[80]
Value of data applied (for ex ante calculations/determinations)	N/A

[79] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[80] http://www.complexdoc.ru/pdf/%D0%93%D0%9E%D0%A1%D0%A2%202707-75/gost_2707-75.pdf - «Mechanical stopwatches»

Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[81]
QA/QC procedures (to be) applied	Equipment is calibrated in accordance with the quality control procedures. Current maintenance is conducted according to technical specifications
Any comment	Time within which the concentration of methane in the capacity reaches a certain level is determined with a stopwatch. The measurement begins with the opening tap on the tank lid and ends after the concentration of methane inside the capacity reaches a certain level. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Data/Parameter	UR_i
Unit of measurement	%
Description	Uncertainty range for the leak measurement equipment
Periodicity of determination/monitoring	Annually
Source of data (to be) used	Manufacturer's information and/or IPCC GPG
Value of data applied (for ex ante calculations/determinations)	95
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Methodology AM0023 version 04.0.0[82]
QA/QC procedures (to be) applied	A person responsible for monitoring check the data annually
Any comment	It is evaluated where possible; IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories[83] suggests accepting 95% confidence interval . If the manufacturer of leak measurement equipment states the uncertainty range without specifying confidence interval, it can be accepted at the level of 95%. Data allowing for calculation of GHG emissions. Information will be archived in paper and electronic form

Detailed information about the baseline is provided in section B.1.

[81] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[82] http://cdm.unfccc.int/methodologies/DB/PZN9ZCTGF3KHFH0W21NY0NYL6X5CIR

[83] IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories, 2000: http://www.ipcc-nggip.iges.or.jp/public/gp/english/6_Uncertainty.pdf

Annex 3

MONITORING PLAN

The proposed project uses a specific approach to JI projects based on "Guidance on criteria for baseline setting and monitoring" (Version 03) of the Joint Implementation Supervisory Committee - JISC, which meets the requirements specified in Regulation 9 / CMP.1.

Monitoring plan provides for the following measures:
1. Identification of all potential sources of emissions within the project.
2. Collection of information on greenhouse gas emissions within the project during the crediting period.
3. Assessment of the project implementation schedule.
4. Collection of the information on measurement equipment, its calibration.
5. Collection and archiving information on the impact of project activities on the environment.
6. Data archiving.
7. Determination of the structure of responsibility for project monitoring.
8. Analysis of organization of personnel training.

The monitoring plan includes the following sections:
1. Program of initial monitoring measurements of methane leaks at gas fittings, flange and threaded connection of natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz".
2. Map of monitoring methane leaks in the gas valves at threaded and flanged connections of natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz".
3. Methodology for measuring methane leaks.
4. Guidelines for collection and storage of monitoring measurements.

I. PROGRAM
of initial monitoring measurements of methane leaks at gas fittings, flange and threaded connection of natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz"

The purpose of the initial monitoring measurements of methane leaks is:
1. Obtaining more accurate estimation of methane leaks from gas transportation system (except for leakage associated with the operation, maintenance or emergency situations).
2. Estimation of methane emission reduction units from the JI project.
3. Determination of potential income from the JI project, and therefore needed repairs / replacement of gas equipment as may be necessary, providing an attractive payback period of investment.
4. Setting priorities regarding work to be done at the gas equipment.
5. Accumulation of initial experience in the process of using measuring equipment, identifying issues to be resolved or improved (such as additional measuring equipment, accuracy level of instruments, the need for training of workers) before the beginning of the project to ensure its proper operation.
JI project has the following stages:
• a list of facilities where methane leaks occur;
• measurements of methane leak volume at the facilities;
• repair of methane leaks at the facilities by repairing of gas equipment or replacement of sealing material, or complete replacement of equipment;
• monitoring of leaks at already repaired (replaced) equipment.

In the initial stages the most important issue is to obtain illustrative example of methane leaks at the gas valves, threaded and flanged connections of natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz". If a comprehensive examination of all elements is impractical, it is necessary to choose the most illustrative and typical elements. Some issues should be systematically determined during the initial measurements:

• where leaks take place and what the order of their magnitude is;
• where the leaks are relatively small;
• areas where there are opportunities for repair and / or replacement of equipment that require low expenses;
• where there are larger leaks, the repair of which does not require large expenditures.

Qualitative information (such as difficulty in measuring the specific dimensions at the specific vents due to limited access to them, etc.) should also be recorded, where possible, to facilitate planning and execution of the project. System of names / numbering of gas equipment must be agreed upon PRIOR TO measurements. The tables below should be descriptive and factual, not prescriptive and normative.

Table 1 MP. The protocol for measuring the leak of methane at gas fittings

Date of measurement: _____
The atmospheric pressure during the measurement: _____ (MPa)
The temperature during the measurement: _____(^{0}C)
Airtight tank volume: _____ (m^3)

№ c/o	The code under register	Address	Measurement of the sample air stream		Airtight tank filling time, sec	Methane leak, m^3/h.	Annual leak, tCO_2/year
			Backgrou nd methane concentrat ion, %	Concentra tion in the sample %			
1	2	3	4	5	6	7	8

Measurements were carried out: _____
_____

Legend to Table 3.
(1) Serial number of the gas valves.
(2) Code of the gas valve under the register.
(3) Address of the location of the gas valves.
(4) Background concentration - the concentration of methane in the leakproof tank before measurement (volume percent).
(5) The concentration of the sample - the concentration of methane in an airtight tank at the end of measurement (volume percent).
(6) The time of filling of the tank with methane to said concentration Paragraph (6) (seconds).
(7) Hourly leaks of methane are calculated in accordance of the formulae (D2) and (D3).
(8) Annual methane leaks are calculated in accordance with the formula (D1).

II. MONITORING MAP

of methane leaks at gas fittings, flange and threaded connection of natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz"

The monitoring map identifies the general annual monitoring measurement procedure for methane leaks at gas fittings, flange and threaded connection of natural gas production, preparation, and storage and transportation system of PJSC "NJSC "Chornomornaftogaz" included in the boundary of the JI project.

According to the project activity (Section A.2 of the project design document), each detected methane leak in gas valves, flange and threaded connection of natural gas production, preparation, storage and transportation system of PJSC "NJSC "Chornomornaftogaz" must be marked with individual number.

To mark individual number of each detected methane leak PJSC "NJSC "Chornomornaftogaz" makes a register of the gas valves of the JI project "Methane leaks reduction and implementation of energy efficiency measures at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" (hereinafter - Register) in which each object is assigned a unique number (code) and the following data is specified:

• Equipment location (address);

• Type of equipment:

• Type of connection to gas system (for switching devices);

• Number of flanged connections;

• Number of threaded connections;

• Nominal diameter;

• Gas pressure, which the equipment is designed for;

• Year of commissioning;

• Place of installation (underground, above ground) (for the gas valves of gas distribution networks).

Between 2005 and 2007 measurements of methane leaks at the gas equipment were held annually only at the equipment, where in that year repair works, sealing or replacement of equipment were carried out in accordance with the project implementation schedule (paragraph 4 of Section A.4.2 Project design document).

Measurements of methane leak volume at the gas equipment during the first repair (replacement) of equipment according to project implementation schedule are held twice: the first time - before repair (replacement) of equipment, the second time - after the repair (replacement).

Since 2008 measurements of methane leak volume have been held at least once a year for each gas equipment of PJSC "NJSC "Chornomornaftogaz" which is in the Register, to ensure that gas appliances did not became a source of methane leak again.

Maintenance of gas equipment, which is in the Register is held not less frequently than once every six months. Current repair of gas equipment, which is in the Register, is held once a year.

If the monitoring measurement of methane leak from gas equipment shows the presence of leak the volume of which exceeds the volume of leak after the first equipment repair (replacement), such equipment must be repaired (replaced) on a priority basis.

Types of data and parameters used in the annual monitoring measurements of methane leaks are presented in sections D.1.1.1 and D.1.1.3.

III. METHOD OF METHANE LEAKS MEASUREMENTS

Required materials, tools and appliances:

1) Keys, tools;

2) High-sensitivity gas analyzer EX-TEC ® SR5 - 1 pc.;

3) Sealed tank, sealed bag, hose, sealant, adhesive tape (scotch);

4) gauge;

5) thermometer;

6) Barometer;

7) The stopwatch;

8) Fire extinguisher.

Scheme of installation for measuring methane leaks (Figure 15).

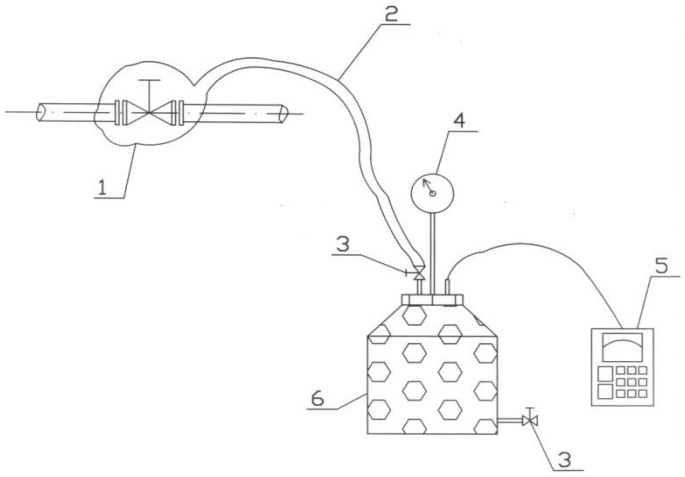

Figure 15. Scheme of installation for methane leaks measurements.

Notation:

1. Sealed bag.

2. Hose.

3. Tap valve.

4. Manometer.

5. Gas analyzer EX-TEC ® SR5.

6. Sealed tank (capacity).

Procedure for measuring methane leaks on gas pipelines fittings:

1. Set tank (6). Put a bag (1) on the element, where measuring of methane leaks will be carried out.

2. Connect bag (1) and tank (6) by hose (2).

3. Tighten the hose connection (2) and bag (1) with adhesive tape to seal the connection.

4. Measure by the gas analyzer (5) background concentration of methane in the tank (6) and record its value in protocol of measurement.

5. Open the tap valve (3) in the place of connection of the hose (2) with the tank (6) and start the stopwatch.

6. Close the tap valve (3) in the place of connection of the hose with the tank after 180 seconds, turn off the stopwatch.

7. With gas analyzer (5) determine the concentration of methane in the tank and record its value in protocol of measurement.

8. Control of gas pressure in the tank (6) is exercised by using manometer (4).

9. Determine the temperature with a thermometer of TL4 type and record its value in protocol of measurement.

10. Determine the atmospheric pressure with barometer and record its value in protocol of measurement.

11. After measuring disconnect the hose (2) from the tank (6).

12. Open the tap valve (3) to ventilate the tank (6).

The data recorded during the measurement of methane leaks in the protocol of measurement:

1. Name and code of the gas pipeline valves, where measurement of methane leaks took place.

2. Address of location of the gas valves, where measurement of methane leaks took place.

3. Date of measurement

4. Temperature of air (° C).

5. Atmospheric pressure (kPa).

6. Background concentrations of methane gas in the tank (%)

7. The concentration of methane in the tank at the end of measurement (%)

8. Duration of measurement (180 s).

9. Surnames, names and patronymic names of people who conducted the measurement.

IV. GUIDLINE

on collection and storage of monitoring measurements

JI project implementation includes:

1. Initial and subsequent regular monitoring checks of each unit of gas equipment that is in the Register, and measurements of methane leaks.

2. Repair (replacement) of worn gas equipment.

All data collected in the process of JI project implementation must be recorded and entered into a database. The database must be constantly updated throughout the term of the JI project, with inter alia information about new leaks, detected and repaired during the term of the project. In monitoring reports of the JI project data from the database must be included.

It is recommend to create a special working team for the JI project and allocate the responsibility for collecting all the information on JI project, storing and archiving documents for JI project between individual members of the Working team.

The main sources of information for the calculation of methane emission reduction units are documents whose characteristics are listed in Table 2MP:

Table 2. A list of initial documents, which are executed during JI project implementation.

№	Name of document	Source of document data	Document format	Who forms document	What is document formed for	Where it is stored
1	Register of gas valves, threaded and flanged connections	Technical documentation	Spreadsheet	Technical personnel and accounting department of the company	To mark methane leak places	At a secretary of a working team of the JI project
2	Protocols of methane leak measurements	Initial and monitoring measurements	Data filled in paper forms, signed by those who performed the measurements	Specialist of Operation Service	To form a register of initial and monitoring measurements	At a secretary of a working team of the JI project
3	Register of initial and monitoring measurements of methane leaks	Protocols of methane leak measurements with Gas analyzer EX-TEC® SR5, stopwatch «SOS pr-2б-2», barometer aneroid BAMM-1 or M-67, mercury thermometer of glass type TL-4	Spreadsheet	Authorized member of the working team	To calculate the volume of methane leak	At a secretary of a working team of the JI project

№	Name of document	Source of document data	Document format	Who forms document	What is document formed for	Where it is stored
4	Methane leak volume calculation	PDD and records of monitoring measurement of methane leaks with Gas analyzer EX-TEC® SR5, stopwatch «SOS pr-2б-2», barometer aneroid BAMM-1 or M-67, mercury thermometer of glass type TL-4	Spreadsheet	Authorized member of the working team	To form monitoring reports	At a secretary of a working team of the JI project
5	Journals of reports on leak detection	Reports of specialists who carry out walk-round checks; Service of gas pipelines operation	Data filled in paper forms, about detected leaks during the walk-round check once per four days	Specialist of Operation Service	To repair leaks	At departments of the Service of gas pipelines operation
6	Journals of maintenance of gas armature	Observation of specialists who carry out walk-round checks; Service of gas pipelines operation	Filled paper forms	Walk-round check Services of operation	To control the technical condition of equipment	At departments of the Service of gas pipelines operation