JOINT IMPLEMENTATION PROJECT

«Reduction of direct methane emissions by implementation of innovative repair methods 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)

PS

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

Acting First Deputy
Chairman - Chief Engineer
Public Joint Stock Company
"National Joint Stock Company
"Chornomornaftogas" _____ **Gryn O.V.**

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

PS

Simferopol - 2012

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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

Reduction of direct methane emissions by implementation of innovative repair methods at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

Sectoral scope:
Sector 10 - Fugitive emissions from fuels (solid, oil and gas)

PDD Version: 02.
Date: 21/09/2012.

A.2. Description of the project:

The main goals of project activity

The main purpose of the Joint Implementation Project (hereinafter - JIP) entitled "Reduction of direct methane emissions by implementation of innovative repair methods at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" (NJSC "Chornomornaftogaz") is reduction of direct methane emissions by implementation of innovative gas pipeline repair methods of the natural gas production, storage, preparation and transportation system.

Historical details of NJSC "Chornomornaftogaz" development and description.

"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".

Code in the Unified State Register of Enterprises and Organizations of Ukraine – 00153117

Name of activities under the Foreign-Economic Activities Code:

11.10.2	- Extraction of natural gas
11.10.1	- Extraction of oil
51.39.0	- Non-specialized wholesale of food, beverages and tobacco
52.11.0	- Retail sale in non-specialized stores with advantage in the product range
60.30.2	- Transportation of natural gas by pipelines
61.10.2	- Activity of marine freight transport

The situation existing prior to the project activity

For the last 20 years the company NJSC "Chornomornaftogaz" has lack of investment to ensure a radical reconstruction of the gas pipeline system. The current funding is sufficient only to keep safe operation and for emergency needs for the operation and regular service of gas pipeline system.

The baseline scenario.

The baseline scenario provides for the further implementation of current instructions and regulations in the repair of gas pipelines which requires to stop the operation of gas pipeline separating it by tap group at the ends, and gas discharge into the atmosphere. Only after the discharge of natural gas into the atmosphere it is allowed to perform any repair work on the gas pipeline, which involves removing part of the pipeline containing defects and welding the new part. Justification of the baseline scenario is described in Section B.

Project scenario.

The project provides for the implementation of innovative repair methods that allow repair of gas pipelines with identified defects by using of detachable sleeves and rings between the gas pipeline, which is under repair and the sleeve and the further introduction of a special high-pressure self-hardening composition (sealant) in the space formed between the outer pipeline surface and inner surface of the sleeve.

Historical details of the development of the JIP "Reduction of direct methane emissions by implementation of innovative repair methods at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz"

14/05/2004 – commencement date when NJSC "Chornomornaftogaz" started implementation project measures in introducing innovative methods of gas pipelines repair with identified defects.
09/02/2004 – Project design document development for the project activities.
12/09/2012 – The State Environmental Investment Agency of Ukraine issued a Letter of Endorsement № 2554/23/7.

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)	• NJSC "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.

NJSC "Chornomornaftogaz"

Figure. 1. Location of NJSC "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].

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 pipelines NJSC "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°6′15″ EL, 44°56′53″ NL[3] - the coordinates of the main office of NJSC "Chornomornaftogaz"). Geographic localization of the gas pipelines to be replaced or renovated under the project is shown below.

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

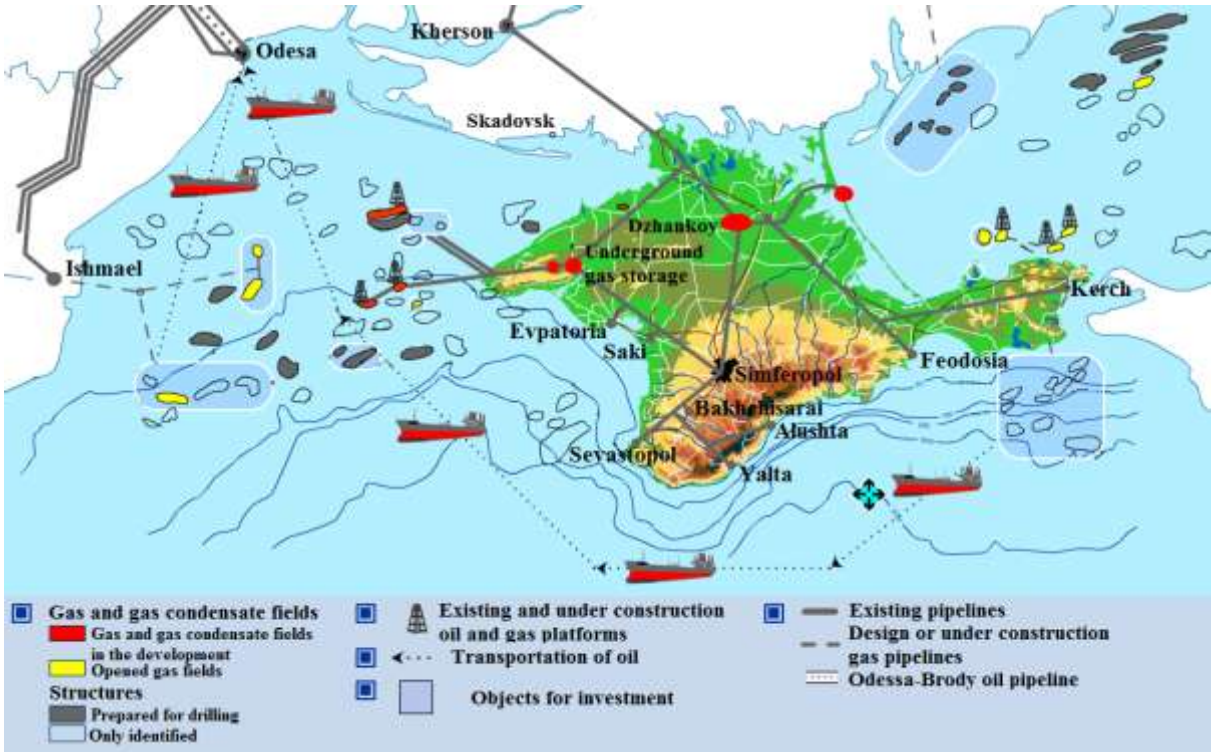

Figure. 2. Scheme of the gas transportation system of NJSC "Chornomornaftogaz"

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

The project is based on the implementation of innovative repair methods that allow the repair of corroded or mechanically damaged pipelines and welds by using of detachable sleeves and rings between the gas pipeline, that is under repair and the sleeve and the further introduction of a special high-pressure self-hardening composition (sealant) into the space formed between the outer surface of the gas pipeline and the inner surface of the sleeve. The proposed repair method includes a number of standards-based solutions that are suitable for the defects repair such as pipeline cracks, scratches, corroded areas, other areas of metal loss of the pipe, wall welds.

Implementation of new methods of repair allows not to stop the exploitation of the pipeline and not to discharge naturel gas. Under normal operation of large and relatively aged NJSC "Chornomornaftogaz" pipeline system several hundred cases of pipe corrosion or other types of pipe wall deficiency are diagnosed annually. According to the applicable standards and safety regulations the damaged section of pipe should be cut out and replaced with a new one, because the defect is dangerous for the further operation. Only this kind of repair is expected to be safe (and ensuring long-term elimination of the defect).

Traditional repair technique requires discharging the gas into the atmosphere in the process of gas pipeline repair. The pipeline is sectioned by stop valves each 10 to 30 km in most cases, therefore, before the repair it is necessary to isolate the pipeline section where the repair is going to be made by closing two valves at its ends. Then the gas contained in the section can be discharged into the atmosphere and the repair can start safely. The volume, released before repair can be a million cubic meters if the section is extended. This volume of the discharged gas is included in the total volume of gas spent on operation and maintenance of gas transmission system as the cost of repairs. Figure below shows the process of cutting out the section with damage, which will be replaced by new pipe.

Figure 3. Cutting off the damaged pipeline section

In order to reduce the amount of discharged gas and to decrease the GHG emissions NJSC "Chornomornaftogaz" introduces new repair methods suitable for permanent fixing the pipeline defects without gas discharging and in the same time complying with current safety regulations. The methods which are mostly used in practice are shown below.

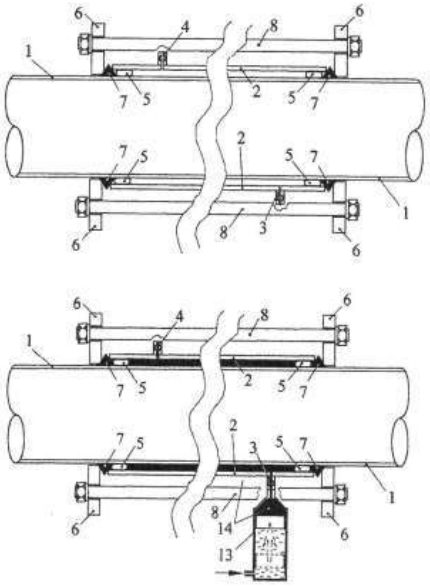

Figure 4. Method of pipeline defect repair with the use of folded sleeve and tightening flanges.

1- damaged pipeline; 2- folded sleeve; 3- lower tap; 4- upper tap; 5- flexible tubing; 6- flanges; 7- additional annular wage shaped gasket; 8- locking bolts; 13- high pressure injector; 14-self-hardening compound.

The sleeve is assembled onto the pipe, then two flexible tubing are wrapped around the pipe at the both ends of the sleeve, then the flexible tubing are inserted in an annular space under the sleeve and a pair of folded flanges (6) is installed. Then the flexible tubing (5) are inflated using compressed air or liquid thus centring the sleeve around the pipe and, at the same time sealing the annular space between the pipe and the sleeve. After this the flanges are tightened with the bolts (8), taps (3) and (4) are set open and compound is being injected through lower tap until the compound appears at the upper tap. Then the upper tap is closed and injection continues until the required pressure is reached in the annular space. After hardening of compound flanges and taps can be removed.

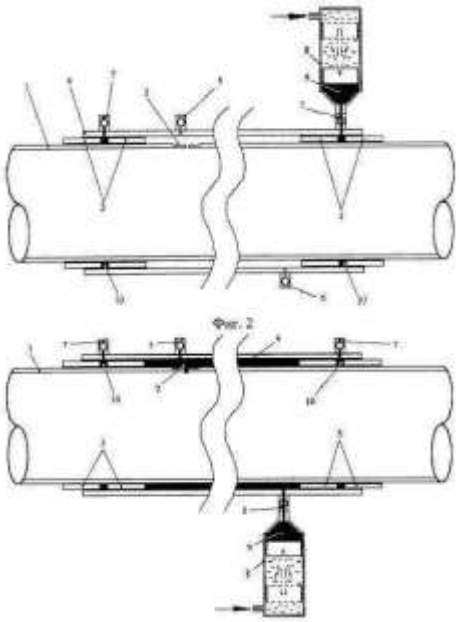

Figure 5. Method of pipeline defect repair with the use of two layer sleeve.
1-pipeline, 2- damaged place, 3-rings, 4-sleeve, 5 and 6 – upper and lower taps 7-additional taps, 8- injector, 9- self-hardening compound with filler and 10 annular gaskets.
One of the mostly used types of repair due to its simplicity and possibility to repair the pipe sections of high diameter (over 720 mm) which have deviations in dimensional parameters (change in external diameter, ovality, corrugations).
The application is similar to the previously described method, with the exception that first four stacked rings (3) is firmly mounted on the pipeline on both sides of the damaged area (2) and welded (glued or soldered) so to form two ring gasket (10). Then split sleeve mounted and welded or soldered. After that, the gaskets (10) are filled with sealant under pressure to create a high-quality sealing space between the pipeline and the clutch. After hardening sealant, this space is filled with the sleeve If special requirements are necessary for high-pressure injection, the sealant can be pre-mixed with filler to prevent leakage through the connection. The photos below shows the installation of a two-layer coupling on the pipeline of large diameter.

Figure 6. Application of two-layer sleeve – from left to right: adjustment of the rings and sleeve, assembling of the sleeve (rings on place), welding (a chain of several sleeves is shown which is covering multiple defects).

Further development of the sleeve repair method – so called double sleeve is shown below.

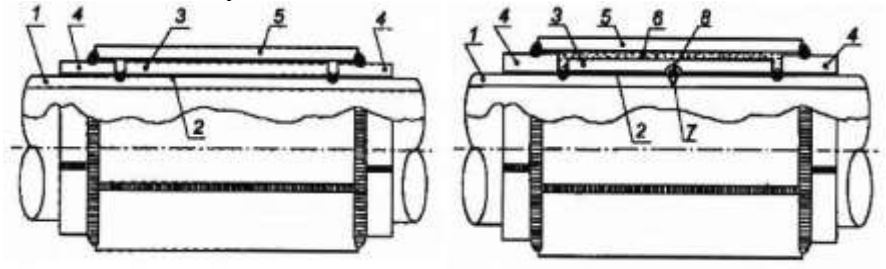

Figure 7. Double sleeve repair method.
1- gas pipeline under repaired, 2- section with defect, 3 – inner sleeve, 4- rings, 5- reinforcing sleeve, 6- gastight self-hardening compound, 7- existing welding seam on repaired pipe, 8 – groove made on inner sleeve to accommodate the overhanging welding seam on the pipe surface.

This type of repair is used to reinforce the damaged section using additional inner sleeve. If the pipe section contains out-of-flat elements e.g. welding seam, which hinders tight contact of inner sleeve and repaired pipe a grove is made to accommodate such out of-flat-element. Similarly to methods described above, the space between inner and main sleeve is filled with self-hardening compound under pressure. This method allows compensating axial and radial forces acting on damaged pipe area. Another type, suitable for repairing pipelines that have protruding corrugation or defects in welds are shown below:

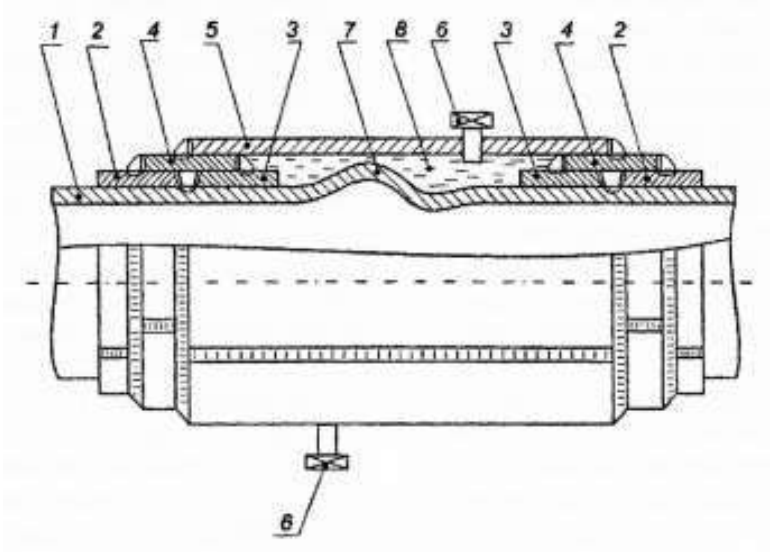

Figure 8. Tree layer sleeve repair method.
1- pipe repaired, 2 and 3 – first layer of service rings, 4-second layer of rings, 5 – reinforcing folded sleeve, 6-tapping, 7 – corrugation, 8 – compound.
To repair an operating pipe having through-wall defect, for example leaking welding seam, application of welded sleeves is impossible due to safety reasons and alternative methods, like composite wrapping cannot fix the problem as well. The proposed repair method is shown below:

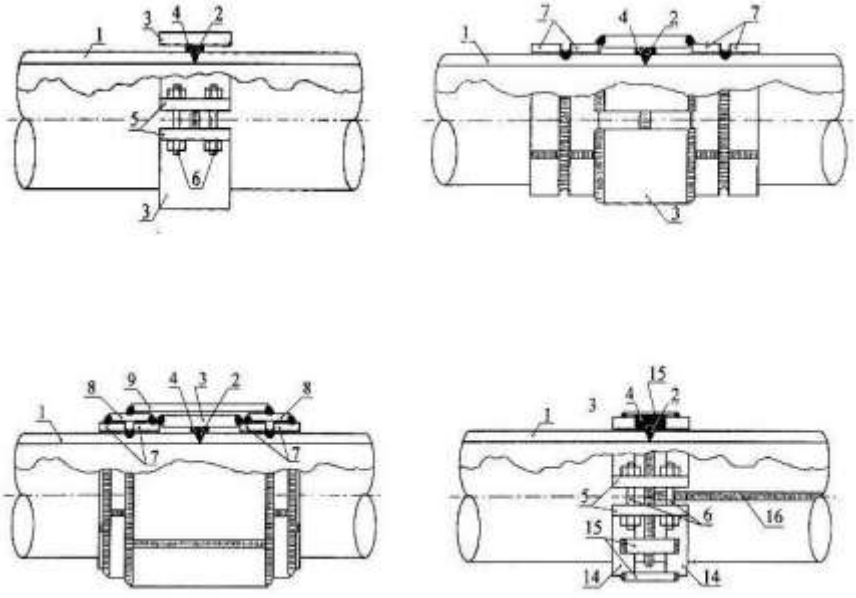

Figure 9. Method of leaking section repair.
1-repaired pipe, 2- welding seam having leak, 3- clamp, 4- gasket, 5 and 6 flange and bolts, 7- supplementary rings, 8- secondary rings, 9- main sleeve, 10 – bolt, 11- annular gasket, 12- supplementary tap, 13 – self-hardening compound, 14 – circular clamps, 15- connectors, 16- axial weld.

The repair process using this technology usually takes about 25 minutes, the sealant dries up quickly, and after 2 hours the repair operation is completed. Errors in assembly work are excluded, as technology and the uniqueness of the results of each stage setting excludes the impact of subjective factors, and allows to use not highly qualified staff.

The main milestones of the project implementation

Table 1. Schedule of gas pipeline repairs of NJSC "Chornomornaftogaz".

Gas pipeline NJSC "Chornomornaftogaz"								
Name of gas pipeline	Number of repairs							
	2005	2006	2007	2008	2009	2010	2011	2012
MG-Krasnoperekopsk Dzhankoy	3	2	2	3	2	1	2	3
MG Kherson - Crimea	2	0	2	0	1	2	1	0
MG-Krasnoperekopsk Glebovka	22	23	26	25	26	28	29	32

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:

Under normal operation of large and relatively aged pipeline system several hundred cases of pipe corrosion or other types of pipe wall deficiency are diagnosed annually, only innovative methods of gas pipeline repair allow to achieve safe operation and ensure long-term defect removal.

Due to introduction of innovative methods of gas pipeline repair, the need to stop the operation of the pipeline and the gas discharging to the atmosphere prior to the repair eliminates, thereby reducing greenhouse gas emissions to the baseline scenario.

It is impossible to achieve of anthropogenic emission reduction greenhouse gases in the atmosphere without implementation of the project activity, as the current standards Ukraine and safety regulations require to stop the operation of the gas pipeline, separating it by tap group at the ends, and the discharging of natural gas into the atmosphere.

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	3
Year	Estimate of annual emission reductions in tones of CO_2 equivalent
2005	920 425
2006	902 368
2007	973 217
Total estimated emission reductions over the period of 2005-2007 (tonnes of CO_2 equivalent)	2 796 010
Annual average of estimated emission reductions over the period of 2005-2007 (tonnes of CO_2 equivalent)	932 003

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	1 021 464
2009	1 006 408
2010	1 137 188
2011	1 173 719
2012	1 310 837
Total estimated emission reductions over the period of 2008-2012 (tonnes of CO_2 equivalent)	5 649 616
Annual average of estimated emission reductions over the period of 2008-2012 (tonnes of CO2 equivalent)	1 129 923

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	1 310 837
2014	1 310 837
2015	1 310 837
2016	1 310 837
2017	1 310 837
2018	1 310 837
2019	1 310 837
2020	1 310 837
Total estimated emission reductions over the period of 2013-2020 (tonnes of CO_2 equivalent)	10 486 696
Annual average of estimated emission reductions over the period of 2013-2020 (tonnes of CO_2 equivalent)	1 310 837

More detailed information is provided in the Supporting Document 1.

Description of formulas used to estimate emission reduction units is given in Section D and in the Supporting Document 1.

Supporting Document 1 was granted accredited independent entity for the purpose of passing determination.

A.5. Project approval by the Parties involved:

A Letter of Endorsement № 2554/23/7 dated 12/09/2012 of the JI project "Reduction of direct methane emissions by implementation of innovative repair methods 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

The proposed project uses the specific approach to JI projects based on requirements to JI projects according to paragraph 9 (a) of "Guidance on criteria for baseline setting and monitoring" (Version 03[4]).

Formulas based on "Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change" were used in the calculations of the baseline scenario.

Stepwise approach was used to justify the baseline scenario:

The following steps were applied to determine the most plausible baseline scenario:

1. Determination of the plausible alternatives that could be the baseline scenario.
2. Justification of ruling out the alternatives that are improbable from technical and (or) economic perspectives.

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

To set the baseline scenario 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 NJSC "Chornomornaftogaz";
- Local availability of technology / equipment;

Also to identify and set the baseline scenario considerable attention was paid to the state of oil and gas sector. According to the International Energy Agency (Key World Statistics, IEA, 2006[5]), 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"[6] 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

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

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

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

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.) where under the costs of well drilling and equipping 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. 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 cannot compensate the natural decrease in production. This means that the existing proven reserves cannot 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"[7] 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"[8], 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 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

[7] http://zakon2.rada.gov.ua/laws/show/2245-99-%D0%BF

[8] zakon1.rada.gov.ua/signal/kr06145a.doc

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 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 gas pipeline repair of 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.

Sub-step 2b. Assessment of alternative scenarios

Alternative 1.1
Continuation of existing practice of repair with the stop of gas pipeline operation, discharging natural gas into the atmosphere and cutting out the section with damage, 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 information 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.
• Volume of gas discharged into the meet the requirements of sanitary and environmental regulations and legal documents.

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

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 application of innovative gas pipeline repair methods as well as the use of modern technologies planned by the project will require additional training of personnel. Implementation of

innovative gas pipeline repair methods is not a common practice in Ukraine. Thus, this alternative is the least plausible baseline scenario as there is a need to invest and it is characterized by lack of qualified personnel, therefore, *Alternative 2.1* can not be regarded as the plausible baseline scenario.

Outcome of step 2.

Analysis of the alternatives described above shows that *Alternative 1.1* is the most plausible, and *Alternative 1.2* is the least plausible.

Demonstration of additionality

Results of investment analysis in Section B.2 showed that the *Alternative 1.2* cannot be considered as the most attractive alternative 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 scenario setting is stated in the tables given below.

Data/Parameter	W_{b,lot,CH_4}^{y}
Unit of measurement	%
Description	Methane concentration (CH_4) in $1m^3$ of natural gas in monitoring period *«y»* baseline scenario
Periodicity of determination/monitoring	Annually
Source of data (to be) used	"National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine in 1990-2010"[9]
Value of data applied (for ex ante calculations/determinations)	Year / CH_4 %: 2005 – 93,97; 2006 – 94,54; 2007 – 95,04; 2008 – 95,21; 2009 – 94,95; 2010 – 95,00
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to "Guidance on criteria for baseline setting and monitoring" [10]
QA/QC procedures (to be) applied	"National Inventory of anthropogenic GHG emissions by sources and removals by sinks in Ukraine" [11] is the official report submitted to the secretariat of the UN Framework Convention on Climate Change (UNFCCC)
Any comment	N/A

[9] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[10] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[11] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

Data/Parameter	GWP_{CH_4}
Unit of measurement	t CO_{2e}/ t CH_4
Description	Methane global warming potential in monitoring period *«y»* baseline scenario
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
QA/QC procedures (to be) applied	The value is used for the first commitment period, 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/Parameter	$D^2_{b,lot,NG}$
Unit of measurement	m
Description	Inner diameter of a particular gas pipeline section in monitoring period *«y»* baseline scenario
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Annex 2 to the "Protocol meeting of the central inventory commission of State Joint Stock Company "Chornomornaftogaz"
Value of data applied (for ex ante calculations/determinations)	Refer to Excel file Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Annex 2 to the "Protocol meeting of the central inventory commission of National Joint Stock Company "Chornomornaftogaz" composed annually and submitted to the National Joint Stock Company "Naftogaz of Ukraine" for further examination.
Any comment	N/A

Data/Parameter	$L^y_{b,lot,NG}$
Unit of measurement	m
Description	Length of a particular gas pipeline section in monitoring period *«y»* baseline scenario
Periodicity of determination/monitoring	Once at the beginning of the project

Source of data (to be) used	Annex 2 to the "Protocol meeting of the central inventory commission of National Joint Stock Company "Chornomornaftogaz"
Value of data applied (for ex ante calculations/determinations)	Refer to Excel file Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Annex 2 to the "Protocol meeting of the central inventory commission of National Joint Stock Company "Chornomornaftogaz" composed annually and submitted to the National Joint Stock Company «Naftogaz of Ukraine» for further examination.
Any comment	N/A

Data/Parameter	$P^{y}_{b,lot,NG,real}$
Unit of measurement	MPa
Description	Average natural gas pressure of a particular gas pipeline section in monitoring period *«y»* baseline scenario
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	Annex 2 to the "Protocol meeting of the central inventory commission of National Joint Stock Company "Chornomornaftogaz"
Value of data applied (for ex ante calculations/determinations)	Refer to Excel file Supporting document 1
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	Annex 2 to the "Protocol meeting of the central inventory commission of State Joint Stock Company "Chornomornaftogaz" composed annually and submitted to the National Joint Stock Company «Naftogaz of Ukraine» for further examination.
Any comment	N/A

Data/Parameter	$T^{y}_{b,lot,NG,real}$
Unit of measurement	K
Description	Average natural gas temperature of a particular gas pipeline section i, that would be isolated and discharged from gas
Periodicity of determination/monitoring	Annually
Source of data (to be) used	NJSC "Chornomornaftogaz"
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of	Data source NLSC "Chernomornaftogas" compiled with the software FLOWHOST based on data from gas devices

measurement methods and procedures (to be) applied	FLOUTYEK-TM.
QA/QC procedures (to be) applied	Gas devices FLOUTYEK-TM are regularly calibrated according to the procedures of quality management, the Law of Ukraine "On metrology and metrological activity"[12].
Any comment	N/A

Data/Parameter	$Z^{y}_{b,lot,NG,issue,real}$
Unit of measurement	dimensionless
Description	Natural gas compressibility factor depends on its temperature and pressure in monitoring period *«y»* baseline scenario
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	"Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change"
Value of data applied (for ex ante calculations/determinations)	0,985
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	"Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change" registered in the State Agency on Science, Innovations and Informatization of Ukraine, State registration number 0112U006548
Any comment	N/A

Data/Parameter	$k^{y}_{b,lot,NG,blow}$
Unit of measurement	dimensionless
Description	Correction factor for a gas pipeline purging in monitoring period *«y»* baseline scenario
Periodicity of determination/monitoring	Once at the beginning of the project
Source of data (to be) used	"Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change"
Value of data applied (for ex ante calculations/determinations)	1,25
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A

[12] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

QA/QC procedures (to be) applied	"Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change" registered in the State Agency on Science, Innovations and Informatization of Ukraine, State registration number 0112U006548
Any comment	N/A

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 implementation of innovative repair methods at NJSC "Chornomornaftogaz", which do not involve the stop of gas pipeline operation and discharging natural gas into the atmosphere during repair of the area with identified defects.

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" (Version 06.0[13]). 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.

Outcome of sub-step 1a. Two 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 gas pipeline repair and therefore detecting methane emissions in the process of natural gas discharging is consistent with all applicable laws and regulations of Ukraine. The legislation allows the discharging of natural gas into the atmosphere in the process of defected gas pipeline repair. GSSSR of Ukraine regulate the following standards relating to consistency of the alternatives with effective laws and regulations:

• 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.

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

• 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.

• According to NPAOP 0.00-1.20.98 "Safety regulations of gas supply systems of Ukraine", NPAOP 0.00-1.21-98 "Safety regulations for the operation of the main oil and gas pipelines" and NPAOP 11.1-1.20-03 "Safety regulations in the oil and gas industry of Ukraine" gas pipelines at the start-up should be purged with gas to the full displacement of air.

• According to NPAOP 0.00-1.20.98 "Safety regulations of gas supply systems of Ukraine" it is necessary to stop the exploitation and discharge gas filling this section in the atmosphere to carry out repairs at existing gas section with identified defect.

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"[14]. 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, NJSC "Chornomornaftogaz" has not conducted any innovated gas pipeline repair methods. Moreover, 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. NJSC "Chornomornaftogaz" does not have any financial incentives to cover such costs on implementation of this Project or similar measures, 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.
Implementation of innovative repair methods 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*.

Outcome of sub-step 1b. Under such circumstances one may conclude 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)[15] 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 is not the most economically or financially attractive, or is not economically or financially feasible without income from sale of emission reduction units (ERUs) related to the JI project.

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

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

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 Variant III, according to the "Tool for the demonstration and assessment of additionality" [16] (Version 06.0).

Sub-step 2b–Benchmark analysis.

The proposed project "Reduction of direct methane emissions by implementation of innovative repair methods at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz" will be implemented by the project participant, namely NJSC "Chornomornaftogaz". The approach recommended in paragraph 6 (a) of the "Tool for the demonstration and assessment of additionality"[17] (Version 06.0) 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"[18] 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%)[19]. 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%[20]. And nominal discount rate (IRR benchmark) is adjusted by inflation index for the eurozone (2.1%)[21] because the calculations in financial model are carried out in euros, and is equal to 14.5%[22].

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 does not require capital investment, but requires a considerable amount of money spent on repairing the pipeline - more than 49 million Euros (According to the NBU's rate)[23];

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.

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

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

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

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

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

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

[22] Supporting document 2

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

Analysis of cash flow takes into account the cash outflow connected with investments and operating costs[24] and cash inflow associated with the receipt of revenues from providing of services by the enterprise.
Financial Indicators of the project are given below.

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)
8587	-713	14.5%	-1 930.87	-2.2%	0

The source of prices for the gas transportation service provided by NJSC "Chornomornaftogaz" is the information provided by NERC of Ukraine[25]. Taking into account the fact that "Chornomornaftogaz" is oil / gas research company, the refuse from discharging of natural gas in the process of gas pipeline repairs leads to increased sales of the company's own 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 -2.2 % 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: operational expenses as well as tariff for natural gas transportation. According to the "Tool for the demonstration and assessment of additionality"[26] (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	9299.102768	9299.102768	9 299
Investment expenses of the company	0	0	0
Revenue of the company	7727.851139	8586.501266	9 445
Net present value (NPV)	-2180.744891	-1930.87	-1680.990909
Internal rate of return (IRR)	-5.1%	-2.2%	0.4%

Table 7. Operational expenses	-10%	0%	10%
Operational expenses	8369.192491	9 299	10229.01304
Investment expenses of the company	0	0	0
Revenue of the company	8586.501266	8586.501266	8586.501266
Net present value (NPV)	-1487.90	-1930.87	-2373.83
Internal rate of return (IRR)	0.7%	-2.2%	-4.8%

[24] Supporting document 2

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

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

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 -5.1%-0.4%. Analysis of investment costs in the range of -10% and +10% demonstrated that the IRR varies within 0.7% - (-)4.8%. Expenditures that are considered in the framework of the project are high, and increase of expenditures will result in a negative NPV.

Even in the expected price repair roit 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 "Tool for the demonstration and assessment of additionality"[27](Version 06.0) the barrier analysis was not conducted.

Sub-step 4a. Analysis of other activities similar to the proposed project activity
Analysis of other activities similar to the proposed project activity has shown that similar JIP "Implementation of resource and energy saving measures in the subsidiary "Ukrtransgas" of National Joint Stock Company "Naftogaz of Ukraine" was implemented within the territory of Ukraine; but according to the "Tool for the demonstration and assessment of additionality"[28] (Version 06.0) there is no need to conduct analysis of similar project activity.

Outcome of Step 4: 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:

The project boundary includes 752,575 km gas pipeline, listed in Annex 2 to the "Protocol meeting of the central inventory commission of National Joint Stock Company "Chornomornaftogaz". On the results of the inventory of state-owned property that is not subject to inventory and not included in the statutory fund and used for transportation, storage, distribution of gas (oil), using functions of which features National Joint Stock Company "Naftogaz of Ukraine" transferred for use and accounted for the balance of State Joint Stock Company "Chornomornaftogaz" from 28.03.2012.

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

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

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

Source	Gas	Included / Excluded	Substantiation / explanation
Baseline emissions			
Direct methane emissions	CH_4	Included	Only equivalent GHG emissions due to direct methane emissions in the traditional methods of gas pipelines repair

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

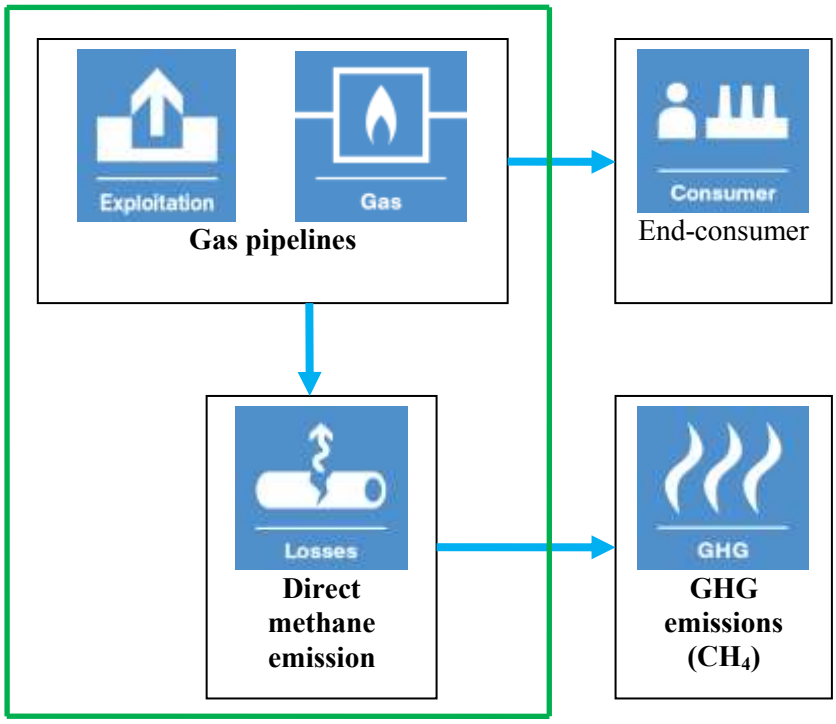

Figure 10. Boundary and GHG emissions sources in the baseline scenario

Greenhouse gas sources and boundary of the project scenario.

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

Source	Gas	Included / Excluded	Substantiation / explanation
Project emissions			
Direct methane emission	CH_4	Included	Total calculated emissions envisaged in the project scenario are equal to zero

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 below shows the boundary(outlined with green line) and GHG emission sources of the project scenario.

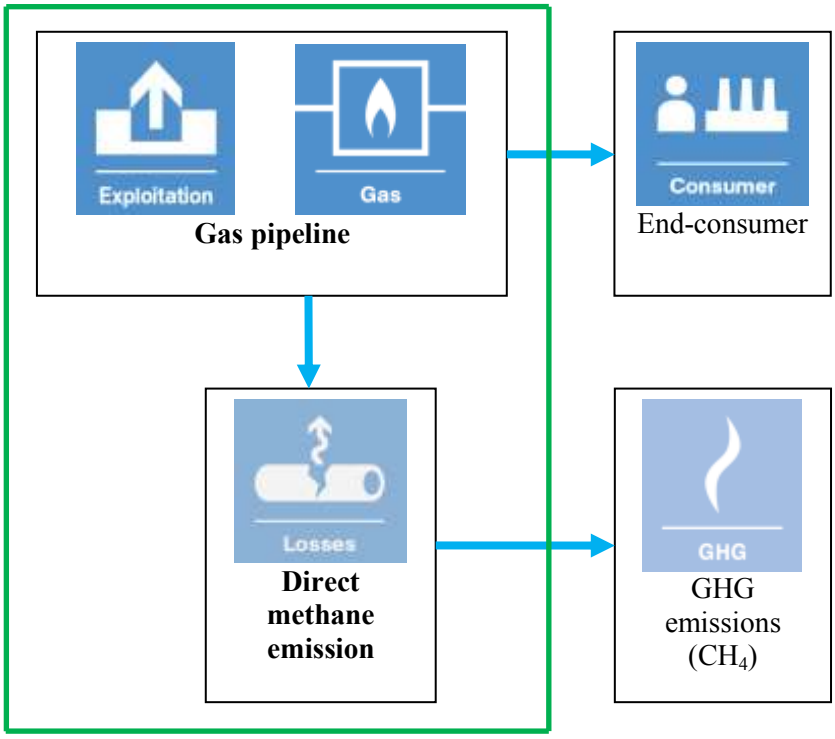

Figure 11. Boundary and GHG emissions sources in the project scenario

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: 14/09/2012

The baseline has been set by VEMA S.A. and NJSC "Chornomornaftogaz"

NJSC "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
NJSC "Chornomornaftogaz" is the project participant (stated in Annex 1).

VEMA S.A.
Route de Thonon 45, Geneva, Switzerland.
Telephone: +41 (22) 855 09 69
Fax: +41 (22) 855 09 79
E-mail:info@vemacarbon.com
Website: www.vemacarbon.com
Fabian Knodel,

Director
VEMAS.A. is the project participant (stated in Annex 1).

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

Starting date of the project is 14/05/2004, when NJSC "Chornomornaftogaz" started implementation of the project activities on introduction of innovative methods of gas pipeline repair with identified defects.

C.2. Expected operational lifetime of the project:

Number of gas pipeline repair in 2004 was not significant so the starting date of lifetime of the project is 01/01/2005

From 01/01/2005 to 31/12/2020 (16 years and 0 months, or 192 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 project provides that the first assigned amount units are expected to be generated from 01/01/2005 to 31/12/2007. 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 prolonged, 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 the specific approach to JI projects based on requirements to JI projects according to paragraph 9 (a) of "Guidance on criteria for baseline setting and monitoring" (Version 03).

Formulas based on "Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change" were used in the calculations of the baseline scenario.

All relevant data related to the calculation of direct 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, 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:

$D^2_{b,lot,NG}$	Inner diameter of a particular gas pipeline section in monitoring period *«y»* baseline scenario, m
$L^y_{b,lot,NG}$	Length of a particular gas pipeline section in monitoring period *«y»* baseline scenario, m
$P^y_{b,lot,NG,real}$	Average natural gas pressure of a particular gas pipeline section in monitoring period *«y»* baseline scenario, MPa
$Z^y_{b,lot,NG,issue,real}$	Natural gas compressibility factor depends on its temperature and pressure in monitoring period *«y»* baseline scenario, dimensionless
$k^y_{b,lot,NG,blow}$	Correction factor for a gas pipeline purging in monitoring period *«y»* baseline scenario, dimensionless

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

Data and parameters that are monitored during the whole crediting period:

W^y_{b,lot,CH_4}	Methane concentration (CH_4) in 1m^3 of natural gas in monitoring period *«y»* baseline scenario, %
GWP_{CH_4}	Methane Global warming potential in monitoring period *«y»* baseline scenario, t CO_{2e}/ t CH_4
$T^y_{b,lot,NG,real}$	Average natural gas temperature of a particular gas pipeline section i, that would be isolated and discharged from gas, K

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

The monitoring plan 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:

N/A

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

$PE_p^y = 0$; (1)

PE_p^y - total CO_2 emissions in monitoring period «*y*» in the project scenario, (t CO_2eq);

$[y]$ - index corresponding to monitoring period;

$[p]$ - index corresponding to project scenario.

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	W_{b,lot,CH_4}^y
Unit of measurement	%
Description	Methane concentration (CH_4) in $1m^3$ of natural gas in monitoring period «*y*» baseline scenario
Periodicity of determination/monitoring	Annually
Source of data (to be) used	"National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine in 1990-2010"[29]

[29] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

Value of data applied (for ex ante calculations/determinations)	<table><tr><th>Year</th><th>CH_4, %</th></tr><tr><td>2005</td><td>93,97</td></tr><tr><td>2006</td><td>94,54</td></tr><tr><td>2007</td><td>95,04</td></tr><tr><td>2008</td><td>95,21</td></tr><tr><td>2009</td><td>94,95</td></tr><tr><td>2010</td><td>95,00</td></tr></table>
Justification of the choice of data or description of measurement methods and procedures (to be) applied	According to "Guidance on criteria for baseline setting and monitoring" [30]
QA/QC procedures (to be) applied	"National Inventory of anthropogenic GHG emissions by sources and removals by sinks in Ukraine" [31] is the official report submitted to the secretariat of the UN Framework Convention on Climate Change (UNFCCC)
Any comment	N/A

Data/Parameter	GWP_{CH_4}
Unit of measurement	t CO_{2e}/ t CH_4
Description	Methane global warming potential in monitoring period *«y»* baseline scenario
Periodicity of determination/monitoring	Annually
Source of data (to be) used	IPCC
Value of data applied (for ex ante calculations/determinations)	21

[30] http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf
[31] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

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
QA/QC procedures (to be) applied	The value is used for the first commitment period, 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/Parameter	$T^{y}_{b,lot,NG,real}$
Unit of measurement	K
Description	The average temperature of the gas of separate gas pipeline i, that would be isolated and discharged from gas
Periodicity of determination/monitoring	Annually
Source of data (to be) used	NJSC "Chornomornaftogaz"
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data source NLSC "Chernomornaftogas" compiled with the software FLOWHOST based on data from gas devices FLOUTYEK-TM.
QA/QC procedures (to be) applied	Gas devices FLOUTYEK-TM are regularly calibrated according to the procedures of quality management, the Law of Ukraine "On metrology and metrological activity"[32].
Any comment	N/A

[32] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

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

$BE_b^y = \sum_{n=1}^{N} BE_{b,lot}^y$ (2)

BE_b^y - total CO_2 emissions in monitoring period «*y*» in the baseline scenario, (t CO_2eq);

$BE_{b,lot}^y$ - CO_2 emissions caused by repairs of a particular gas pipeline section in monitoring period «*y*» in the baseline scenario, (t CO_2eq).

$BE_{b,lot}^y = FC_{b,lot,NG}^y * W_{b,lot,CH_4}^y * ConvFactor * GWP_{CH_4}$ (3)

$FC_{b,lot,NG}^y$ – volume of natural gas that would be discharged into the atmosphere during repairs at a particular gas pipeline section, in monitoring period «*y*» in the baseline scenario, (ths m^3);

W_{b,lot,CH_4}^y – methane concentration (CH_4) in 1m^3 of natural gas in monitoring period *«y»* baseline scenario, %;

$ConvFactor$ - factor of conversion m^3 CH4 into t CH_4 at standard temperature and pressure (20 ^{0}C, 0.1013 MPa) is 0.000668, t CH_4 / m^3 CH_4;

GWP_{CH_4} - methane global warming potential in monitoring period *«y»* baseline scenario, т CO_2-екв/т CH_4;

$FC_{b,lot,NG}^y = FC_{b,lot,NG,issue}^y + FC_{b,lot,NG,blow}^y$ (4)

$FC_{b,lot,NG,issue}^y$ – volume of natural gas that would be discharged into the atmosphere during repairs at a particular gas pipeline section, in monitoring period «*y*» in the baseline scenario, (ths m^3);

$FC_{b,lot,NG,blow}^y$ – volume of natural gas that would be used for gas pipeline purging, in monitoring period «*y*» in the baseline scenario, (ths m^3);

$$FC_{b,lot,NG,issue}^y = \frac{\pi D_{b,lot,NG}^2}{4} \cdot L_{b,lot,NG}^y \cdot \frac{P_{b,lot,NG,real}^y \cdot T_{b,lot,NG,st}^y}{P_{b,lot,NG,st}^y \cdot T_{b,lot,NG,real}^y \cdot Z_{b,lot,NG,issue,real}^y} \cdot 10^{-3} \quad (5)$$

π - Pi number;

$D_{b,lot,NG}^2$ - inner diameter of a particular gas pipeline section in monitoring period *«y»* baseline scenario, m;

$L_{b,lot,NG}^y$ - length of a particular gas pipeline section in monitoring period *«y»* baseline scenario, m;

$P_{b,lot,NG,real}^y$ - average natural gas pressure of a particular gas pipeline section in monitoring period *«y»* baseline scenario, MPa;

$T_{b,lot,NG,real}^y$ - average natural gas temperature of a particular gas pipeline section i, that would be isolated and discharged from gas, K;

$T_{b,lot,NG,st}^y$ - temperature at standard conditions, in monitoring period «*y*» in the baseline scenario is 293.15 K;

$P_{b,lot,NG,st}^y$ - pressure at standard conditions, in monitoring period «*y*» in the baseline scenario is 0,101325 MPa;

$Z_{b,lot,NG,issue,real}^y$ - natural gas compressibility factor depends on its temperature and pressure in monitoring period *«y»* baseline scenario, dimensionless.

10^{-3} – compressibility transfer m^3 in ths m^3

$$FC_{b,lot,NG,blow}^y = 0{,}0036 \cdot \frac{\pi D_{b,lot,NG}^2}{4} \cdot L_{b,lot,NG}^y \cdot \frac{P_{b,lot,NG,st}^y + P_{b,lot,NG,real}^y}{T_{b,lot,NG,st}^y + T_{b,lot,NG,real}^y} \cdot k_{b,lot,NG,blow}^y \cdot 10^{-3} \quad (6)$$

$D^2_{b,lot,NG}$ - inner diameter of a particular gas pipeline section in monitoring period *«y»* baseline scenario, m;
$L^y_{b,lot,NG}$ - length of a particular gas pipeline section in monitoring period *«y»* baseline scenario, m;
$P^y_{b,lot,NG,real}$ - average natural gas pressure of a particular gas pipeline section in monitoring period *«y»* baseline scenario, MPa;
$T^y_{b,lot,NG,real}$ - average natural gas temperature of a particular gas pipeline section i, that would be isolated and discharged from gas, K;
$T^y_{b,lot,NG,st}$ - temperature at standard conditions, in monitoring period «*y*» in the baseline scenario is 293.15 K;
$P^y_{b,lot,NG,st}$ - pressure at standard conditions, in monitoring period «*y*» in the baseline scenario is 0,101325 MPa;
$k^y_{b,lot,NG,blow}$ - correction factor for a gas pipeline purging in monitoring period *«y»* baseline scenario, dimensionless.
10^{-3} – compressibility transfer m^3 in ths m^3
$[y]$ - index corresponding to monitoring period;
$[lot]$ - index corresponding to a separate section of the gas pipeline;
$[b]$ - index corresponding to baseline scenario;
$[real]$ - index corresponding to real conditions;
$[st]$ - index corresponding to standard conditions;
$[issue]$ - index corresponding to natural gas in a gas pipeline;
$[blow]$ - index corresponding to natural gas volume used for gas pipeline purging;
$[NG]$ - index corresponding to natural gas;
$[CH_4]$ - index corresponding to methane.

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):

$$ER^y = BE_b^y - PE_p^y \quad (7)$$

ER^y - emission reductions achieved as a result of the project activity, in period «*y*», (t CO_2e);
PE_p^y - total methane emissions from equipment after the repair or replacement, in period «*y*», (t CO_2e);
BE_b^y - total methane emissions from equipment before the repair or replacement, in period «*y*», (t CO_2e);
$[y]$ - index corresponding to monitoring period;
$[b]$ - index corresponding to baseline scenario;
$[p]$ - index corresponding to project scenario.

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"[33] dated 25/06/1991
- Law of Ukraine № 2707-XII "On atmospheric air protection"[34] 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 NJSC "Chornomornaftogaz" are:

• Conservation and sustainable use of water resources.

• Protection of air basin.

• Land protection and waste management.

Preliminary, exploratory and production drilling, 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 NJSC "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.

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

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

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.
W^{y}_{b,lot,CH_4}	Low	"National inventory report of anthropogenic greenhouse gas emissions by sources and removals by sinks in Ukraine in 1990-2010" [35] is the official report submitted to the secretariat of the UN Framework Convention on Climate Change (UNFCCC)
GWP_{CH_4}	Low	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. The value is used for the first commitment period, with Article 5 of the Kyoto Protocol
$\mathrm{D}^{2}_{b,lot,NG}$	Low	Source of data "Protocol meeting of the central inventory commission of State Joint Stock Company "Chornomornaftogaz" composed annually and submitted to the National Joint Stock Company «Naftogaz of Ukraine» for further examination.
$L^{y}_{b,lot,NG}$	Low	Source of data "Protocol meeting of the central inventory commission of State Joint Stock Company "Chornomornaftogaz" composed annually and submitted to the National Joint Stock Company «Naftogaz of Ukraine» for further examination.
$\mathrm{P}^{y}_{b,lot,NG,\mathrm{real}}$	Low	Source of data "Protocol meeting of the central inventory commission of State Joint Stock Company "Chornomornaftogaz" composed annually and submitted to the National Joint Stock Company «Naftogaz of Ukraine» for further examination.
$\mathrm{T}^{y}_{b,lot,NG,\mathrm{real}}$	Low	Data source NLSC "Chernomornaftogas" compiled with the software FLOWHOST based on data from gas devices FLOUTYEK-TM, gas devices FLOUTYEK-TM are regularly calibrated according to the procedures of quality management, the Law of Ukraine "On metrology and metrological activity"[36].
$Z^{y}_{b,lot,NG,issue,real}$	Low	Source of data "Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change" registered in the State Agency on Science, Innovations and Informatization of Ukraine, State registration number 0112U006548

[35] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

[36] http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15

$k^{y}_{b,lot,NG,blow}$	Low	Source of data "Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change" registered in the State Agency on Science, Innovations and Informatization of Ukraine, State registration number 0112U006548

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 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 below.

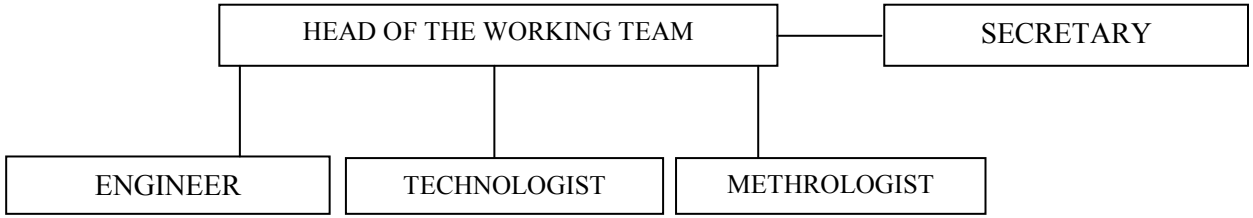

Figure 12. Structure of the Working team

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 initial data to calculate the reduction of the GHG emissions and the results of the calculations will be archived by 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. and NJSC "Chornomornaftogaz".

NJSC "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, Geneva, Switzerland.
Telephone: +41 (22) 855 09 69
Fax: +41 (22) 855 09 79
E-mail:info@vemacarbon.com
Website: www.vemacarbon.com
Fabian Knodel,

Director
VEMAS.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 monitoring period existing data of NJSC "Chornomornaftogaz" were used.

Implementation of the project activities began in the middle of 2004. However, the emission reductions achieved during 2004 are excluded from the calculation.

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

Table 10. Estimated project emissions for the period January 1, 2005– December 31, 2007

Year	Project emissions (tons of CO_2 equivalent)
2005	0
2006	0
2007	0
Total project emissions over the period from 2005 to 2007 (tons of CO_2 equivalent)	**0**

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

Year	Project emissions (tons of CO_2 equivalent)
2008	0
2009	0
2010	0
2011	0
2012	0
Total project emissions over the period from 2008 to 2012 (tons of CO_2 equivalent)	**0**

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

Year	Project emissions (tons of CO_2 equivalent)
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
Total project emissions over the period from 2013 to 2020 (tons of CO_2 equivalent)	**0**

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 for the period January 1, 2005– December 31, 2007

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)
2005	0	0	0
2006	0	0	0
2007	0	0	0
Total emissions (tons of CO_2 equivalent)	**0**	**0**	**0**

Table 14. Table containing sum of emissions from leakages and project activities for the period January 1, 2008 – December 31, 2012

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	0	0	0
2009	0	0	0
2010	0	0	0
2011	0	0	0
2012	0	0	0
Total emissions (tons of CO_2 equivalent)	**0**	**0**	**0**

Table 15. Table containing sum of emissions from leakages and project activities for the period January 1, 2013 - December 31, 2020

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	0	0	0
2014	0	0	0
2015	0	0	0
2016	0	0	0
2017	0	0	0
2018	0	0	0
2019	0	0	0
2020	0	0	0
Total emissions (tons of CO_2 equivalent)	**0**	**0**	**0**

E.4. Estimated baseline emissions:

Estimated baseline scenario 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 Excel file Supporting document 1, attached to the PDD.

To estimate emissions for the baseline scenario existing data of NJSC "Chornomornaftogaz" relating to the actual monitoring parameters values for an appropriate period were used. Results of calculation are provided in the tables below.

Table 16. Estimated baseline emissions for the period January 1, 2005– December 31, 2007

Year	Estimated baseline emissions (tons of CO_2 equivalent)
2005	920 425
2006	902 368
2007	973 217
Total baseline emissions over the period from 2005 to 2007 (tons of CO_2 equivalent)	**2 796 010**

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

Year	Estimated baseline emissions (tons of CO_2 equivalent)
2008	1 021 464
2009	1 006 408
2010	1 137 188
2011	1 173 719
2012	1 310 837
Total baseline emissions over the period from 2008 to 2012 (tons of CO_2 equivalent)	**5 649 616**

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

Year	Estimated baseline emissions (tons of CO_2 equivalent)
2013	1 310 837
2014	1 310 837
2015	1 310 837
2016	1 310 837
2017	1 310 837
2018	1 310 837
2019	1 310 837
2020	1 310 837
Total baseline emissions over the period from 2013 to 2020 (tons of CO_2 equivalent)	**10 486 696**

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 Excel file Supporting document 1, attached to the PDD.

Table 19. Estimated emission reduction for the period from January 1, 200– December 31, 2007

Year	Estimated emission reduction (tones of CO_2 equivalent)
2005	920 425
2006	902 368
2007	973 217
Total estimated emission reduction over the period from 2005 to 2007 (tons of CO_2 equivalent)	**2 796 010**

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	1 021 464
2009	1 006 408
2010	1 137 188
2011	1 173 719
2012	1 310 837
Total estimated emission reduction over the period from 2008 to 2012 (tons of CO_2 equivalent)	**5 649 616**

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

Year	Estimated emission reduction (tones of CO_2 equivalent)
2013	1 310 837
2014	1 310 837
2015	1 310 837
2016	1 310 837
2017	1 310 837
2018	1 310 837
2019	1 310 837
2020	1 310 837
Total estimated emission reduction over the period from 2013 to 2020 (tons of CO_2 equivalent)	**10 486 696**

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, 2005 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)
2005	0	0	920 425	920 425
2006	0	0	902 368	902 368
2007	0	0	973 217	973 217
Total (tones of CO_2 equivalent)	**0**	**0**	**2 796 010**	**2 796 010**

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	0	0	1 021 464	1 021 464
2009	0	0	1 006 408	1 006 408
2010	0	0	1 137 188	1 137 188
2011	0	0	1 173 719	1 173 719
2012	0	0	1 310 837	1 310 837
Total (tones of CO_2 equivalent)	**0**	**0**	**5 649 616**	**5 649 616**

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	0	0	1 310 837	1 310 837
2014	0	0	1 310 837	1 310 837
2015	0	0	1 310 837	1 310 837
2016	0	0	1 310 837	1 310 837
2017	0	0	1 310 837	1 310 837
2018	0	0	1 310 837	1 310 837
2019	0	0	1 310 837	1 310 837
2020	0	0	1 310 837	1 310 837
Total (tones of CO_2 equivalent)	**0**	**0**	**10 486 696**	**10 486 696**

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.

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.

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.
• 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.

NJSC "Chornomornaftogaz" subdivisions carried out water intake from the company’s own artesian wells (special water use), utility water pipe 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.

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 NJSC "Chornomornaftogaz".

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 Suspended substances Oil products Iron ions	2,5 3,00 0,05 0,05	2225 2225 2225 2225	$5,56 \times 10^{-3}$ $6,66 \times 10^{-3}$ $0,11 \times 10^{-3}$ $0,11 \times 10^{-3}$

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

Oil-containing bilge water on ships and platforms is 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, NJSC "Chornomornaftogaz" 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[37] 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

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

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 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 NJSC "Chornomornaftogaz" is carried out by: The State of the Azov-Black Sea Ecological Inspectorate, the State Environmental Inspection of the Sea of Azov[38], 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 NJSC "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 NJSC "Chornomornaftogaz" facilities was elaborated and will be implemented in stages.

Land protection and waste management.

To prevent pollution of lands, which are exposed to industrial activity of NJSC "Chornomornaftogaz" 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.

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

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 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 $CaSO_4$, $MgSO_4MgCe\ Fe(SO_4)$, 5% is barytes $BaSO_4$, 10% is water H_2O) - hazardous stored wastes are absent, the emissions of gas are absent.

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 NJSC "Chornomornaftogaz". All subdivisions of NJSC "Chornomornaftogaz" 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 NJSC "Chornomornaftogaz" 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 NJSC "Chornomornaftogaz" are carried out in accordance with the said permits of Reskomekoresursiv of the ARC and do not exceed the maximum allowable emissions (MAE).

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 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.

There have been numerous publications of NJSC "Chornomornaftogaz" employees in specialized and high profile national magazines. Information about work on direct methane emissions reduction at gas pipeline system at 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

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Annex 2

BASELINE INFORMATION

The proposed project uses the specific approach to JI projects based on requirements to JI projects according to paragraph 9 (a) of "Guidance on criteria for baseline setting and monitoring" (Version 03).

Formulas based on "Methodology of Evaluation of GHG Sequestration Daring New Gas Supply Grids Building According to JI Projects under Kyoto Protocol to UN Framework Convention on Climate Change" were used in the calculations of the baseline scenario.

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

Data/Parameter	Unit of measurement	Description	Value of data applied
W^{y}_{b,lot,CH_4}	%	Methane concentration (CH_4) in 1m^3 of natural gas in monitoring period «y» baseline scenario	Year / CH_4, %: 2005 – 93,97; 2006 – 94,54; 2007 – 95,04; 2008 – 95,21; 2009 – 94,95; 2010 – 95,00
GWP_{CH_4}	t CO_{2e}/ t CH_4	Methane global warming potential in monitoring period «y» baseline scenario	21
$D^{2}_{b,lot,NG}$	m	Inner diameter of a particular gas pipeline section in monitoring period «y» baseline scenario	Refer to Excel file Supporting document 1
$L^{y}_{b,lot,NG}$	m	Length of a particular gas pipeline section in monitoring period «y» baseline scenario	Refer to Excel file Supporting document 1
$P^{y}_{b,lot,NG,\text{real}}$	MPa	Average natural gas pressure of a particular gas pipeline section in monitoring period «y» baseline scenario	Refer to Excel file Supporting document 1
$T^{y}_{b,lot,NG,\text{real}}$	K	Average natural gas temperature of a particular gas pipeline section i, that would be isolated and discharged from gas	Refer to Excel file Supporting document 1
$Z^{y}_{b,lot,NG,issue,real}$	dimensionless	Natural gas compressibility factor depends on its temperature and pressure in monitoring period «y» baseline scenario	0,985
$k^{y}_{b,lot,NG,blow}$	dimensionless	Correction factor for a gas pipeline purging in monitoring period «y» baseline scenario	1,25

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

Annex 3

MONITORING PLAN

The proposed project uses the specific approach to JI projects based on requirements to JI projects according to paragraph 9 (a) of "Guidance on criteria for baseline setting and monitoring" (Version 03).

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

The monitoring plan includes the following sections:
1. At the beginning of each reporting period, number of repairs transmission system is determined by the Working Group meeting in accordance with the "Technical Report" the results of complex nondestructive testing of NJSC "Chornomornaftogaz";gas pipelines
2. At the end of each reporting period, a protocol of the Working team meeting on completed repairs is made;
3. Electronic register of gas pipelines with the number of repairs completed during the reporting period is made and submitted to secretary of the Working team for storage;
4. Monitoring report is based on Acts of completed work from electronic register of gas pipelines with the number of repairs and all primary monitoring indicators.
5. All data on the project "Reduction of direct methane emissions by implementation of innovative repair methods at technological equipment of Public Joint Stock Company "National Joint Stock Company "Chornomornaftogaz";

W^{y}_{b,lot,CH_4}	Methane concentration (CH_4) in 1m^3 of natural gas in monitoring period *«y»* baseline scenario, %
GWP_{CH_4}	Methane global warming potential in monitoring period *«y»* baseline scenario, t CO_{2e}/ t CH_4
$T^{y}_{b,lot,NG,real}$	Average natural gas temperature of a particular gas pipeline section i, that would be isolated and discharged from gas, K