

**JI MONITORING REPORT**  
**(for reporting period 01.01.2008 - 30.06.2012 )**

Title of manager of the developer of documentation  
**Director CEP Carbon Emissions Partners S.A.**

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**Monitoring report of Joint Implementation Project  
Reduction of methane emissions on the gas equipment of gas distribution  
points and on the gas armature, flanged, threaded joints of gas distribution  
networks of PJSC “Lubnygaz”**

**Monitoring period: 01/01/2008-30/06/2012**

**Version: 02 as of 06/08/2012**

**Contents:**

- A.** General project activity and monitoring information
- B.** Key monitoring activities
- C.** Quality assurance and quality control measures
- D.** Calculation of GHG emission reductions

**Annex A.**<sup>1</sup> Supporting document 1. Calculation of GHG emission reductions under JI Project Reduction of methane emissions on the gas equipment of gas distribution points and on the gas armature, flanged, threaded joints of gas distribution pipelines of PJSC “Lubnygaz” for the period of 01 January 2008 to 30 June 2012

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<sup>1</sup> Annex A shall be provided in electronic form

**LIST OF ABBREVIATIONS PRESENTED IN PDD**

GDN – Gas distribution network  
CLS – Conditional leakproof state  
SPLNG – Standard physical leak of natural gas  
APLNG – Above-standard physical leak of natural gas  
PETM – Purposeful Examination and Technical Maintenance  
NGLF – Natural gas leak factor  
GHG – GREEN HOUSE GAS  
UGSSR – Ukrainian Gas Supply System Safety Rules  
GDP – Gas distribution point  
CGDP - Cabinet-type gas distribution point  
CDM - Clean Development Mechanism  
NERC – National Electricity Regulatory Commission  
PJSC - Public Joint Stock Company  
PDD – Project Design Document  
JI – Joint Implementation

## SECTION A. General project activity and monitoring information

### A.1. Title of the Project

Reduction of methane emissions on the gas equipment of gas distribution points and on the gas armature, flanged, threaded joints of gas distribution pipelines of PJSC “Lubnygaz”

### A.2. Status of JI Project

JI Project Reduction of methane emissions on the gas equipment of gas distribution points and on the gas armature, flanged, threaded joints of gas distribution pipelines of PJSC “Lubnygaz” was determined by the Bureau Veritas Certification, determination report No. UKRAINE-DET /0540/2012 from 10/07/2012. The Project was endorsed by the State Environmental Investment Agency of Ukraine (Letter of Endorsement No. 2093/23/7 from 03/08/2012) and Swiss Federal Office for the Environment (Letter of Endorsement No. J294-0485 from 20/07/2012).

### A.3. Brief Description of the Project

As a result of unplanned reconstruction of Gas Distribution Points (GDP), Cabinet-Type Gas Distribution Points (CGDPs), and of gas fittings of gas distribution networks (GDNs) performed by PJSC “Lubnygaz” in accordance with this Project for the period of 01 January 2008 to 30 June 2012, the reduction of greenhouse gas (GHG) emission was as follows<sup>2</sup>:

*Table 1. GHG Emissions Reduction*

	2008	2009	2010	2011	01/01/2012 – 30/06/2012
Reduction of methane leaks, m <sup>3</sup>	6 791 645	7 208 614	7 599 149	7 759 084	3 926 234
Reduction of GHG leaks for the period, tCO <sub>2</sub> eq.	96 959	102 787	108 371	110 659	55 998
<b>Total reduction of methane leaks for the period of monitoring, m<sup>3</sup></b>	33 284 726				
<b>Total reduction of GHG leaks for the period of monitoring, tCO<sub>2</sub>eq.</b>	474 774				

<sup>2</sup> Volumes of GHG emission reductions are rounded to integers.

Within the framework of the JI project in order to repair methane leaks at gas equipment and gas fittings two types of repairs are applied:

1. Complete replacement of old gas equipment and gas fittings with new units.

Replacement of sealing elements with the use of modern sealing materials, changing the common practice of maintenance and repair on the basis of paronite packing and gaskets made of cotton fibers with fatty treatment and asbestic and graphite filler.

#### **A.4. Period of the monitoring**

Beginning of the monitoring period: 01/01/2008

Completion of the monitoring period: 30/06/2012

#### **A.5. Methodologies Used for Project Activities**

##### **A.5.1. Methodology for baseline determination**

The proposed project applies a JI specific approach based on the Joint Implementation requirements in accordance with paragraph 9 (a) of the JI Guidance on criteria for baseline setting and monitoring, Version 03<sup>3</sup>, and the “Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks” (registration number UkrNTI 0112U00A816 of 2012) that was developed by the Institute of Gas of the National Academy of Sciences of Ukraine to set the baseline (measurement and calculation of methane leaks). Project participants selected the calculation method for estimation of GHG emission reductions.

The Methodology is based on approved Clean Development Mechanism methodology AM0023 version 4.0 “Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities”<sup>4</sup> and takes into account the specifics of methane leak detection and repair activity in Ukraine.

The baseline scenario is based on the assumption that prior to establishing the above-standard physical leak of methane (APLNG) at the GDN component, the leak shall be deemed normative, and after its elimination, for the purposes of formation of the baseline scenario, the volume of natural gas leaks from the component per hour shall be taken from Table 1 Exhibit A.1 of the Methodology in accordance with the type of the component and its working pressure.

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<sup>3</sup> [http://ji.unfccc.int/Ref/Documents/Baseline\\_setting\\_and\\_monitoring.pdf](http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf)

<sup>4</sup> <http://cdm.unfccc.int/UserManagement/FileStorage/LV8NUI1GYWTK06COJPDIXQ35FR2MA47>

### **A.5.2. Monitoring Methodology**

The proposed project applies a JI specific approach in accordance with the JI Guidance on criteria for baseline setting and monitoring, Version 03, of the Joint Implementation Supervisory Committee – JISC<sup>5</sup>.

The Monitoring plan was developed for correct and clear calculation of greenhouse gas emissions and preparation of reports on methane emission reductions on the basis of the baseline and project activities. JI specific approach was developed in accordance with “Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks” (registration number UkrNTI 0112U00A816 of 2012) that was developed by the Institute of Gas of the National Academy of Sciences of Ukraine (hereinafter – the Methodology).

For the purposes of estimation and preparation of reporting on emission reduction, in accordance with the calculation method of the Methodology, the data on leakage of natural gas from GDN was used that are formed based on the normative values of natural gas leakage per each element of GDN, and also of the data received based on the statistical results of the actual measurements of the natural gas leakages before and after activities related to their elimination taking into account the specifics of functioning and operation GDN of Ukraine.

Reduction of natural gas leak at GDN component in a monitoring period occurs only after the component above-standard leak is repaired and is defined as the difference between NGLFs for APLNG and SPLNG for hours when the unit was under pressure.

According to the Methodology, with the purpose of strict monitoring of the state of gas equipment of GDPs and CGDP, and also of the gas armature, the working team of PJSC "Lubnygaz" made the following registries:

1. Registry of gas distribution points and gas fittings of the JI project “Reduction of methane emissions on the gas equipment of gas distribution points and on the gas armature, flanged, threaded joints of gas distribution pipelines of PJSC “Lubnygaz” (refer to Annex A), which includes detailed information about all GDPs (CGDPs), shut-off and control valves, flanges and threaded connections that are included in the project boundary.
2. Registry to APLNG repaired at GDN components (refer to Annex A).
3. Registry of monitoring of GDN component operating modes - under pressure or under pressureless condition, that is when NGLF is equal to zero (refer to Annex A).

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<sup>5</sup> [http://ji.unfccc.int/Ref/Documents/Baseline\\_setting\\_and\\_monitoring.pdf](http://ji.unfccc.int/Ref/Documents/Baseline_setting_and_monitoring.pdf)

The ambiguous nature of the measurement method was taken into account while calculating GHG emissions (see Section D PDD, Version 03).

#### **A.6. Status of implementation including the schedule of the project's milestones**

In accordance with Project Design Documentation Version 03, the scope of the Project shall include methane leak points as a result of leaking gas equipment (GDPs, CGDPs), gas armature, flanged, threaded joints of gas distribution pipelines of PJSC "Lubnygaz". The total number of equipment in the project is 287 GDPs and CGDPs, and 1163 units of gas armature. For the reporting monitoring year in the project, 72 components of gas equipment (GDPs and CGDPs) and 338 units of gas armature. In the course of the reporting monitoring period, PJSC "Lubnygaz" finished repairs of equipment of all GDPs and CGDPs and gas armature that was included into the JI Project. The number of GDPs (CGDPs) where equipmet was repaired (replaced), and the number of the repaired (replaced) gas armature of PJSC "Lubnygaz" gas distribution networks is provided in Table 2 by:

*Table 2. Number of the repaired GDPs (CGDPs) and of the repaired (replaced) gas armature of the gas pipelines in the Project by periods*

<b>Period</b>	<b>Number of GDPs (CGDPs) where gas equipment was repaired (replaced)</b>	<b>The number of repaired (replaced) gas armature of GDNs</b>
2008	56	283
2009	3	19
2010	4	6
2011	8	30
January 2012 – June 2012	-	-
<b>TOTAL</b>	<b>71</b>	<b>338</b>

The list of GDPs (CGDPs) and of gas armature repaired for the reporting monitoring period is provided in Annex A<sup>6</sup>.

Project activities for the current monitoring period (1 January 2008 – 1 June 2012) were also subject to the further Purposeful Examination and Technical

<sup>6</sup> Annex A, Supporting document 1 "Calculation of GHG leakage reduction on gas equipment of GDP (CGDP), and on the gas armature, flanged, threaded joints of gas distribution pipelines of PJSC "Lubnygaz" for the period from 1 March 2005 to 31 December 2007" is provided in electronic form.

Maintenance (PETM) of all gas equipment of GDPs (CGDPs) and gas armature that was repaired (replaced) during the JI project.

Gas equipment of GDPs (CGDPs) that was repaired (replaced) in the preliminary periods of the project activities shall be subject to regular inspections as a part of the standard monitoring program to make sure that it has not become the source of leakage again.

In accordance with the Plan of Monitoring provided in the PDD Version 3, the current repair of the gas equipment shall be performed once per year, and the technical maintenance shall be performed once every six months.

The volumes of methane leaks from the repaired (replaced) gas equipment of GDPs (CGDPs) and gas armature of gas pipelines of PJSC “Lubnygaz” shall not exceed the volumes of leaks that were measured after the first repair of the equipment.

Examples of repaired (replaced) gas equipment of GDPs (CGDPs) are provided on Figure 1.



*Figure 1. Repaired CGPD, Lubny.*



**A.7. Possible deviations or revisions of the registered version of PDD**

Present deviations from the maintenance plan are the result of insufficient financing of the project.

**A.8. Possible deviations from or revisions of the registered plan of monitoring**

There are no deviations from the registered plan of monitoring.

**A.9. Persons responsible for the preparation and submission of monitoring report**

The persons responsible for the monitoring report on behalf of PJSC “Lubnygaz”: Ovhinnikov Anatolii Anatoliiovych, the manager of the working group, the chief engineer of PJSC “Lubnygaz”; on behalf of CEP Carbon Emissions Partners S.A.: Fabian Knodel, the Director.

## Section B. Key monitoring activities

### B.1.1. Equipment used

The system of control and monitoring is subdivided into three parts:

- 1) Measuring the volumes of methane leaks prior to repairs (replacement) of gas equipment;
- 2) Measuring the volumes of methane leaks after repairs (replacement) of gas equipment;
- 3) Archiving and processing of the obtained results.

To measure the volumes of the natural gas leaks, we used the methodology of measurements by gas analyzer DOSOR-S-P, as described in the approved Baseline Methodology AM0023 Version 4.0 “Leak detection and repair in gas production, processing, transmission, storage and distribution systems and in refinery facilities”. Photo of measuring works is provided below (Figure2)



*Figure 2. Measurement using gas analyzer DOZOR-S-P.*

**Gas Analyzer DOZOR-S-P.** To establish the availability of methane leak in the sample, analyzer DOZOR-S-P is used as shown on Figure 3



*Figure 3. Gas Analyzer DOZOR-S-P*

Technical characteristics of DOZOR-S-P gas analyzer are provided in Table 1.

*Table 1. Technical characteristics of DOZOR-S-P gas leak indicator*

Parameter	Value
Dimensions, mm	Up to 190x90x60
Weight, g	Up to 480
Power supply voltage, V	From 3.05 to 4.5
The limit of sensitivity, volume share, % - For methane - For propane	From 0 to 0.25 From 0 to 0.48
Limit of wear of alarm, volume share,% - For methane - For propane	0.25 0.5
Time to working mode, s	Up to 45
Response time, s	Up to 3
Maximum power	1.5
Hours without recharging an accumulator battery, h	Not less than 12
Voltage of idle run at accumulator battery, V	Not more than 4.5

Short-circuit current at an accumulator battery, A	Not more than 0.6
The indicator has the mark of explosion protection	1ExibsIIBT4X
The indicator of method of protection against electric shock	3 class
Degree of protection - Shells of electronic module - of accumulator	IP20 IP54

After leak detection and measuring, repair or replacement at relevant GDP (CGDP) gas equipment and gas fittings of gas pipelines is carried out that will include the use of modern sealing materials (GOST 7338-90<sup>7</sup>, GOST 5152-84<sup>8</sup>, or GOST 10330-76<sup>9</sup>), and full replacement of the obsolete equipment with the state-of-the-art equipment of the European manufacturers or analogous equipment of the Ukrainian manufacturers.

### **B.1.2. Calibration**

In accordance with quality control procedures and the Law of Ukraine “On the Metrology and Metrology Activities”<sup>10</sup>, all measuring devices that are used for determination of natural gas leakages should undergo calibrating procedure.

The devices subject to calibration and used in the process of methane leakages monitoring:

- gas analyzer Variotec® 8-EX, calibration period - one year;
- manometer D-59N-100-1.0 6 kPa, calibration period - one year;
- thermometer type TL-4, calibration period - two years;
- second mater SOS np-26-2, calibration period - two years;
- aneroid barometer BAMB-1, calibration period - two years.

Based on results of calibration, certificates shall be issued confirming technically good condition of devices.

### **B.1.3. Invitation of the third parties**

“Kharkinstandardmetrology” SE.

“Kharkinstandardmetrology” SE is the enterprise that performs state inspection and calibration of gas analyzers.

<sup>7</sup> “Rubber and Rubber-fabric Planes”

<sup>8</sup> “Sealing Gland”

<sup>9</sup> “Dishevelled flax. Specifications”

<sup>10</sup> <http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1765-15>

## B.2. Data collection (data collected for all the period of monitoring).

### B.2.1. Structure of governance and management to enable the operator to implement the Monitoring Schedule.

Coordination of activities of all departments and services of PJSC “Lubnygaz” relating to the JI project implementation is carried out by the Working Team created pursuant to Order No.1/2005 of PJSC “Lubnygaz” management board as of 04/01/2005. The new line-up of the Working Team is approved by Order No. 76-V of the Chairman of PJSC “Lubnygaz” Board dated 21/03/2012. The structure of the Working Team is shown in Figure 5.



*Figure 5. Structure of the Working Group*

The following job description was approved for the working group members:

Ovchynnikov Anatolii Anatoliiiovych – manager of the Working group responsible for formation of the plan of measures in the JI project and determination of the necessary resources

Boichuk Andrii Mykhailovych – engineer of the Working Group responsible for organization of measurements and elimination of leaks on GDP (CGDP) gas equipment and gas fittings of GDNs

Ovdienko Vitalii Mykolayovych – technologist of the Working Group responsible for collection of information and performance of all the necessary calculations as provided in the Plan of monitoring of JI project

Troshev Andrii Mykolayovych – metrologist of the Working Group providing for the availability of the calibrated measurement equipment while executing JI project.

### B.2.2. List of parameters used during calculations

The parameters used during calculations are provided in Table 3.

Table 3. Parameters used for calculating GHG emissions

ID number (Please, use numbers to enable cross-referencing to D.2.)	Data variable	Source of data	Data unit	How will the data be archived? (electronic/paper)	Comments
1. $i$	Sequence number of GDN component (GDP (CGDP), gas fittings of gas pipeline) included in the project boundary	Activity on leak measurements	Dimensionless	Electronic and hard copy	All GDPs, CGDPs and gas fittings included in the project boundary are listed in the Registry and tagged correspondingly are provided in the supporting document 1 to MR Version 02.
2. $GWP_{CH_4}$	Global Warming Potential of methane	IPCC (IPCC Second Assessment Report: Climate Change 1995 SAR) and approved COP. GWP values for methane are provided on the site of UNFCCC <sup>11</sup>	tCO <sub>2</sub> e / tCH <sub>4</sub>	Electronic and hard copy	Project developer shall monitor changes in GWP methane factors published by IPCC and approved by COP
3. $h$	Number of activity (replacement/repair) at GDN component after establishing APLNG at such component	Activity on leak measurements	Dimensionless	Electronic and hard copy	Each activity carried out at GDN component that is included in the project boundary is tagged with an individual number
4. $W_y$	Average mass fraction of methane in the natural gas in period "y" in the	The value is calculated on the basis of company's official data	(t CH <sub>4</sub> / t natural gas)	Electronic and hard copy	Data of enterprises

<sup>11</sup> [http://unfccc.int/ghg\\_data/items/3825.php](http://unfccc.int/ghg_data/items/3825.php)

		project scenario	on gas net calorific value in monitoring period			
5.	$K_{i,h}^g$	Natural gas leak factor from GDN component in CLS	Standard values or data from “Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks”	$m^3/h$	Electronic and hard copy	Company’s data or calculations on the basis of company’s data
6.	$K_{i''}^n$	Natural gas leak factor that corresponds to APLNG for GDN component	“Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks”	$m^3/h$	Electronic and hard copy	Calculations on the basis of company’s data
7.	$H_{i',h,y}^g$	Time of operation of GDN component under pressure from the beginning of monitoring period “y” to implementation of project activities (repair / replacement) that resulted in the repair of APLNG at such component	Data of the company received during GDN operation and activities aimed at leak repair	h	Electronic and hard copy	Company’s data. Calculations for each GDN component for each monitoring period
8.	$H_{i'',h,y}^n$	Time of operation of GDN	Data of the company	h	Electronic and hard copy	Company data. Calculations for each

	component under pressure from the moment of implementation of project activities (repair / replacement) that resulted in the repair of APLNG at such component to the end of the monitoring period “y”	received during GDN operation and activities aimed at leak repair			GDN component where activities on leak repair was carried out; for each monitoring period
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### B.2.3. Leakage

There is no leakage related to this project. (JI Specific Approach is used based on the approved Methodology AM0023, Version 4.0, because the Methodology AM0023 does not provide on any leakage).

### B.3. Date processing and archiving

All data and documents in the project in hard or electronic copies, in accordance with Order No. 76-B of 21/03/2012 of the management of PJSC “Lubnygaz” shall be stored until 31/12/2019.

### B.4. Extraordinary situations and technical violations

In the current monitoring period (January 2008 – June 2012) no extraordinary situations occurred in gas distribution networks of PJSC “Lubnygaz”.

### B.5. Procedures for detecting of defects and repairs of GDPs and GDNs of and liquidation of PJSC “Lubnygaz”.

Detecting, repairing, and registration of defects and extraordinary situations at the shutoff gates of PJSC «Lubnygaz» shall be carried out in accordance with the Safety Rules of Gas Distribution Systems of Ukraine.

### B.6. External data (type, source, access)

The following parameters were used during monitoring:

Data/Parameter	$GWP_{CH_4}$
Data unit	$tCO_2e/tCH_4$
Description	Global Warming Potential of methane
Time of determination/monitoring	During the whole crediting period
Source of data (to be) used	IPCC (IPCC Second Assessment Report: Climate Change 1995(SAR)) and approved by COP. GWP values of methane are



	provided on UNFCCC web-site <sup>12</sup>
Value of data applied (for ex ante calculations/determinations)	21
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	In case CO2 emission factors for methane change baseline and project scenario will be recalculated according to new values.
Comments	Project developer shall monitor any changes to GWP for methane as published by IPCC and approved by COP in electronic form.

Data/Parameter	$K_{i,h}^g$
Data unit	m3/h
Description	Natural gas leak factor from GDN component in CLS
Time of determination/monitoring	Every time after activity was carried out at GDN component
Source of data (to be) used	Standard values or data from “Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks” (registration number UkrNTI 0112U00A816 of 2012) that was developed by the Institute of Gas of the National Academy of Sciences of Ukraine
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Standard values or data from Table A.1 in Annex A to “Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks” (registration number UkrNTI 0112U00A816 of 2012) that was developed by the Institute of Gas of the National Academy of Sciences of Ukraine are used
QA/QC procedures (to be) applied	N/A
Comments	Data that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

Data/Parameter	$K_i^n$
Data unit	m3/h
Description	Natural gas leak factor that corresponds to APLNG for GDN component
Time of determination/monitoring	Once at the beginning of the project for each type of component
Source of data (to be) used	“Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks” (registration number UkrNTI 0112U00A816 of 2012) that was developed by the Institute of Gas of the National Academy of Sciences of Ukraine

<sup>12</sup> [http://unfccc.int/ghg\\_data/items/3825.php](http://unfccc.int/ghg_data/items/3825.php)

Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Standard values or data from Table A.1 in Annex A to “Methodology for calculation of greenhouse gas emission reductions achieved by eliminating above-standard natural gas leaks at gas distribution networks” (registration number UkrNTI 0112U00A816 of 2012) that was developed by the Institute of Gas of the National Academy of Sciences of Ukraine
QA/QC procedures (to be) applied	N/A
Comments	Data that allow of greenhouse gas emission calculation; information will be archived in paper and electronic form.

### **B.7. Level of error of measuring equipment**

Relative error of DOZOR-S-P gas leak indicator is 5 per cent that corresponds to EN 50054/57 standard. The device is subject to annual calibration.

## **Section C. Measures of ensuring quality control and quality guarantees**

### **C.1. Documented procedures and structure of governance**

#### **C.1.1. Functions and obligations**

The Project is managed by Ovchinnikov Anatolii Anatoliyovych, the head of the working group of PJSC “Lubnygaz”. He manages and coordinates activities of all departments. The ad hoc working group is responsible for collection and processing of parameters.

Structure of data collection and project management is provided in Section B.2 of this Monitoring Report.

#### **C.1.2. Trainings**

No special trainings are needed for work with the new equipment. All project-related trainings were held by equipment suppliers and their cost is included into the cost of equipment.

### **C.2. Internal audit and control activities**

The group for measurement of all the necessary parameters provided in the plan for monitoring methane leaks was created under supervision of the ad hoc working group of PJSC “Lubnygaz”.

Monitoring measurements are executed by the specially trained personnel in accordance with the Methodology for measurements. Monitoring measurement data are registered on paper immediately while making measurements. As a result, based on the paper data on the measurements, the uniform electronic database of monitoring measurements of leaks is created.

Ordinary maintenance of gas equipment of GDP (CGDP) and gas fittings of gas distribution networks shall be performed once per year, technical maintenance is performed once each six months.

The repaired gas fittings shall be inspected on a regular basis as a part of the standard monitoring activities to make sure that it has not become the source of leak again.

### **C.3. Information on indicators of the project’s social influence and the project’s environmental impact**

As a result of the project’s implementation, the quality of the public gas distribution in the region will be improved.

It will also result in reduction of natural gas leakage and emissions that cause greenhouse effect and climate changes. Pipeline safety will also improve.

## Section D. Calculation of GHG emission reductions

### D.1. Project emissions

Greenhouse gas emissions in the project scenario according to a specific approach to Joint Implementation projects (calculations by using the tabular method of the Methodology) are calculated according to the formula:

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

where:

$PE_y$  – greenhouse gas emissions in period «y», in the project scenario (t CO<sub>2</sub>e);

$GWP_{CH_4}$  – methane global warming potential (tCO<sub>2</sub>e/tCH<sub>4</sub>);

$W_y$  – Average mass fraction of methane in the natural gas in period «y», in the project scenario (%);

$P_y$  – volume of natural gas leaks into the atmosphere in period «y», in the project scenario (m<sup>3</sup>);

$ConvFactor$  – Conversion factor to convert natural gas leaks from volume units to weight units (t CH<sub>4</sub> / m<sup>3</sup>CH<sub>4</sub>). Under normal conditions defined as 0 degree Celsius and 0.1013 MPa,  $ConvFactor = 0.0007168$  t/m<sup>3</sup>.

[y] – index that corresponds to monitoring period;

[CH<sub>4</sub>] – index that corresponds to methane.

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

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

$K_{i'h}^g$  – natural gas leak factor for GDN component  $i'$  that is in CLS (i.e. corresponds to SPLNG) in period «y», in the project scenario (m<sup>3</sup>/h);

$K_{i''h}^g$  – natural gas leak factor that corresponds to APLNG for GDN component  $i''$  in period «y», in the project scenario (m<sup>3</sup>/h);

$H_{i'hy}^g$  – Time of operation of GDN component under pressure from the beginning of monitoring period “y” to implementation of project activities (repair / replacement) that resulted in the repair of APLNG at such component (h);

$H_{i''hy}^n$  – Time of operation of GDN component under pressure from the moment of implementation of project activities (repair / replacement) that resulted in the repair of APLNG at such component to the end of the monitoring period “y” (h);

[y] – index that corresponds to monitoring period;

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

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

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

[g] – index that corresponds to SPLNG;

[n] – index that corresponds to APLNG.

Emissions resulting from project activities are provided in Table 4<sup>13</sup>.

Table 4. Project emissions tCO<sub>2</sub>e

	2008	2009	2010	2011	01/01/2012 – 30/06/2012
Project emissions in the period, tCO <sub>2</sub> e.	25 228	29 861	26 294	26 290	13 112
Total project emissions in the monitoring period, tCO <sub>2</sub> e.	120 785				

## D.2. Baseline emissions

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

$$BE_{yCO_2eq} = GWP_{CH_4} \cdot ConvFactor \cdot W_y \cdot B_y \quad (3)$$

Where:

<sup>13</sup> Project emissions are rounded to integers.

$BE_y$  – greenhouse gas emissions in period «y», in the baseline scenario (t CO<sub>2</sub>e);  
 $GWP_{CH_4}$  – global warming potential of methane (tCO<sub>2</sub>e/tCH<sub>4</sub>);  
 $W_y$  – Average mass fraction of methane in the natural gas in period «y», in the project scenario (t CH<sub>4</sub> / t natural gas);  
 $B_y$  – volume of natural gas leaks into the atmosphere in period «y», in the baseline scenario (t natural gas);  
 $ConvFactor$  – Conversion factor to convert natural gas leaks from volume units to weight units (t natural gas / m<sup>3</sup> natural gas). Under normal conditions defined as 0 degree Celsius and 0.1013 MPa,  $ConvFactor = 0.0007186 \text{ t/m}^3$ .  
 $[y]$  – index that corresponds to monitoring period;  
 $[CH_4]$  – index that corresponds to methane.

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

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

Where:

$K_{i',h,y}^g$  – natural gas leak factor for GDN component  $i'$  that is in CLS (i.e. corresponds to SPLNG) in period «y», in the baseline scenario (m<sup>3</sup>/h);  
 $K_{i'',h,y}^n$  – natural gas leak factor that corresponds to APLNG for GDN component  $i''$  in period «y», in the baseline scenario (m<sup>3</sup>/h);  
 $H_{i',h,y}^g$  – Time of operation of GDN component in CLS under pressure in period «y», in the baseline scenario (h);  
 $H_{i'',h,y}^n$  – Time of operation of GDN component from the moment when project activities (repair / replacement) that resulted in the repair of APLNG were implemented to the end of monitoring period «y» (h);  
 $[y]$  – index that corresponds to monitoring period;  
 $[i']$  – index that corresponds to a number of GDN component, which is in a set of elements  $I'$  ( $I' + I'' = I$ , where  $I$  is a set that includes all GDN components that are in the project boundary) where the project activities did not result in any emission reductions (there was no replacement / repair of components) in the reporting monitoring period;  
 $[i'']$  – index that corresponds to a number of GDN component, which is in a set of elements  $I''$  ( $I' + I'' = I$ , where  $I$  is a set that includes all GDN components that are in the project boundary) where the project activities resulted in emission reductions (there was replacement / repair of components) in the reporting monitoring period;  
 $[h]$  – index that corresponds to a number of activity under the project at GDN component, if more than one activity was carried out at reporting component in

the monitoring period (where H is a set, which includes all activities in the project scenario at GDN component in the monitoring period);

[g] – index that corresponds to SPLNG;

[n] – index that corresponds to APLNG.

Emissions in case of failure to implement reconstructions are provided in Table 5<sup>14</sup>.

Table 5. Baseline emissions tCO<sub>2</sub>e.

	2008	2009	2010	2011	01/01/2012 – 30/06/2012
Baseline emissions in the period, tCO <sub>2</sub> e	122 187	132 648	134 665	136 949	69 110
Total baseline emissions in the monitoring period, tCO <sub>2</sub> e	595 559				

### D.3. Leakage

There is no leakage related to this project. (JI Specific Approach is used based on the approved Methodology AM0023, Version 4.0, because the Methodology AM0023 does not provide on any leakage).

### D.4. Emission reductions as a result of implementation of JI Project in the current period (January 2008 – June 2012).

Emission reductions resulting from the project implementation shall be calculated as the difference between baseline emissions and project emissions.

The number of Emission reduction units (ERUs) in tCO<sub>2</sub>e shall be calculated according to the formula:

$$ERU = \sum [ BE_y - PE_y ] \quad , \quad (7)$$

ERU – emission reduction units, tCO<sub>2</sub>e;

BE<sub>y</sub> – Baseline emissions in monitoring period y, t CO<sub>2</sub>e;

PE<sub>y</sub> – Project emissions in monitoring period y, t CO<sub>2</sub>e.

<sup>14</sup> Project emissions are rounded to integers.



[y] – monitoring period index.

Table 6 provides on emission reductions for the current period of monitoring (January 2008– June 2012) as a result of the Project’s implementation<sup>15</sup>.

*Table 6. Emission reductions*

	2008	2009	2010	2011	01/01/2012 – 30/06/2012
Emission reductions in the period, tCO <sub>2</sub> e.	96 959	102 787	108 371	110 659	55 998
Total emission reductions in the period, tCO <sub>2</sub> e.	474 774				

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<sup>15</sup> Emission reductions are rounded to integers.