JI MONITORING REPORT
(for reporting period 01.01.2008 – 31.07.2012)

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MONITORING REPORT OF JI PROJECT

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

Monitoring period: 01/01/2008-31/07/2012

Version: 02 dated 25/09/2012

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Annex A.[1] Supporting Document 1 Calculation of GHG emission reductions under the JI project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Chernigivgas" for the period from 01/01/2008 to 31/07/2012.

[1] Annex A is submitted in electronic form.

ABBREVIATIONS

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

SECTION A. General project activity and monitoring information

A.1. Title of the project

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

A.2. JI project status

The JI project "Reduction of methane leaks on the gas equipment of the gas distribution points and on the gas armature, flanged, threaded joints of the gas distribution pipelines of PJSC "Chernigivgas"has been determined by Bureau Veritas Certification, determination report No.UKRAINE-DET /0612/2012 dated 17/08/2012. The project has been supported by the State Environmental Investment Agency of Ukraine that issued Letter of Endorsement No.2457/23/7 dated 05/09/2012, as well as by the Swiss Federal Office for the Environment (Letter of Approval No.J294-0485 dated 21/09/2012).

A.3 Brief description of the project

As a result of unscheduled rehabilitation of gas distribution points (GDP), cabinet-type gas control points (CGDP) and gas fittings of gas distribution networks, the following greenhouse gases (GHG) emission reductions were achieved in accordance with this project for the monitoring period from January 01, 2008 to July 31, 2012 [2]:

Table 1. GHG emission reductions

	2008	2009	2010	2011	01/01/2012 – 31/07/2012
Reduction of methane leaks over the period, m^3	34 972 960	42 339 029	52 302 024	62 211 669	38 824 556
GHG emission reductions over the period, t CO_2eq	500 120	605 454	747 926	889 636	555 198
Total reduction of methane leaks over the monitoring period, m^3	230 650 238				
GHG emission reductions over the period, t CO_2eq	3 298 334				

[2] The presented values of GHG emission reductions are approximated 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.
2. Replacement of pressure-sealing elements with the use of modern sealing materials, changing the common practice of servicing and repair on the basis of paronite gaskets and cotton fiber stuffing with oil tightening and asbestos-graphite compound.

A.4. Monitoring period

Starting date of the monitoring period: 01/01/2008
End date of the monitoring period: 31/07/2012

A.5. Methodology applied to the project activity

A.5.1. Baseline identification methodology

The proposed project uses a JI-specific approach in accordance with paragraph 9 (a) of the "Guidance on criteria for baseline setting and monitoring", Version 03, [3]and "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine (hereinafter - the Methodology) in order to set the baseline (detection and calculation of methane leaks). Project participants selected the computational method for estimation of GHG emission reductions.

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

For the sake of baseline setting it is assumed that the leak is standard until an excess physical natural gas leak (EPNGL) is detected in the GDN component, and after the repair baseline is set using natural gas leak rate per hour is taken from Table 1 of Appendix A.1 to the Methodology by component type and working pressure.

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

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

A.5.2. Monitoring methodology

The proposed project applies a JI-specific approach based on the JI Guidance on criteria for baseline setting and monitoring, Version 03. [5]
The monitoring plan was developed for reliable and clear calculation of greenhouse gases emissions and for preparation of reports on methane emissions reduction based on the baseline and project activity. The JI-specific approach is based on the 2012 "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine (hereinafter – the "Methodology").

For quantitative estimation and preparation of the report on emission reduction, in accordance with the computational method of the Methodology, data on natural gas leaks from GDN components based on standartized values of natural gas leaks by GDN component, as well as data obtained by statistical processing of the results of ex-post natural gas leak measurement before and after the repair, taking into account the peculiarities of GDN operation in Ukraine.

Methane leak reduction in GDN component i in the monitoring period takes place only after the EPNGL has been repaired and is calculated as the difference between the EPNGL and the standard physical natural gas leak (SPNGL) natural gas leak factors for the component only for time under the pressure.

According to the computational method of the Methodology, in order to ensure control over GDP (CGDP) gas equipment and gas pipeline fittings inbcluded into the project boundary, the working team created the following registries:

1. Registry of gas distribution points and gas fittings included into the project boundary of the JI project "Reduction of natural gas leaks at the gas distribution networks of PJSC "Chernigivgas" (see Annex 1), which contains full information on all GDPs (CGDPs), shut-off and control valves, flanged and threaded joints included into the project boundary.
2. Registry of EPNGL repairs at GDN components (see Annex A)
3. "Registry of monitoring of operation of GDN components under the pressure or unpressurized, i.e. when NGLF equals zero" (see Annex A)

The uncertainty of the measurement method was taken into account in the course of GHG emission reduction calculation (see Section D of PDD, version 04).

A.6. Status of implementation including schedule of project milestones

In accordance with the PDD version 04, the project boundary encompasses spots of methane leaks caused by faulty sealing of GDP (CGDP) gas equipment, gas

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

fittings, flanged and threaded joints of gas distribution networks of PJSC "Chernigivgas". In total, the project boundary includes equipment of 1611 GDP (CGDP) and 3121 units of gas fittings. Over the reporting monitoring period, 966 GDP (CGDP) equipment units and 1987 units of gas fittings were repaired (replaced) within the project boundary. Over the reporting monitoring period, PJSC "Chernigivgas" completed repairs of all GDP (CGDP) equipment and gas fittings included into the project boundary. The quantity of repaired (replaced) equipment of GDP (CGDP) and gas fittings at gas distribution networks of PJSC "Chernigivgas" by periods is provided in Table 2:

Table 2. The quantity of repaired (replaced) equipment of GDP (CGDP) and gas fittings of gas pipelines after leak detection under the project by periods

Period	**Number of GDPs (CGDPs) with repaired (replaced) gas equipment**	**Number of GDN gas fitting units repaired (replaced)**
2008	243	504
2009	241	504
2010	241	499
2011	227	480
January 2012 - July 2012	14	-
TOTAL	**966**	**1987**

The number of repaired/replaced equipment slightly differs from the figure set in the determined PDD version 04, which is attributable to the short financing of the project. The lack of funding lead to the fact that some repairs planned for 2011 were performed in the 1st half of 2012. The list of GDPs (CGDPs) and gas fittings, which were repaired (replaced) over the repaired (replaced) over the reporting monitoring period is provided in Annex A.[6].

Project activities for the current monitoring period (from January 01, 2008 – July 31, 2012) were also subject to the further Purposeful Examination and Technical Maintenance (PETM) of all gas equipment of GDPs (CGDPs) and gas fittings that were repaired (replaced) during the JI project.

GDP (CGDP) equipment and gas fittings of gas pipelines repaired (replaced) in the previous period of project activity is inspected on a regular basis as part of the monitoring programme, to make sure that there is no recurrent leaks.

[6] Annex A Supporting Document 1. "Calculation of GHG emission reductions at gas equipment of gas distribution points and gas fittings, flanged, threaded joints of gas distribution pipelines of PJSC "Chernigivgas" for January 01, 2008 - July 31, 2012" in electronic form.

In accordance with the Monitoring Plan provided in the PDD Version 04, routine repairs of gas equipment shall be performed once per year, and technical maintenance shall be performed once every six months.
The methane leaks from the repaired (replaced) gas equipment of GDPs (CGDPs) and gas armature of gas pipelines of PJSC "Chernigivgas" shall not exceed the leaks that were measured after the first repair of the equipment.

Samples of repaired (replaced) GDP (CGDP) equipment are provided on Figure 1.

Figure 1. A repaired CGDP, Chernihiv

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

No significant deviations from the registered PDD version have been observed.

According to the JI-specific approach based on the Methodology, GHG emission reductions under the project are calculated according to the statistical data, depending on the type of GDP element and its working pressure. The estimated values of greenhouse gases emission reductions listed in the determined PDD, version 04, differ from the ex-post emission reductions obtained over the reporting monitoring period by 3%. The reason is that the estimates of emission reductions provided in the determined PDD version 04 were preliminary and based on theoretical calculations; the effect of implementations was calculated starting the first day of the year and the monitoring report took account of the actual repair dates and number.

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

According to the monitoring plan, PJSC “Chernigivgas" performed permanent monitoring of GDN components after their replacement or repair, in particular:

- monitoring of gas equipment of GDP (CGDP) components was conducted every four days; inspection results were entered into a log of technical inspection of GDP (CGDP) gas equipment;
- monitoring of gas fittings at gas pipelines of PJSC “Chernigivgas" was performed once a month; inspection results were entered in a log of technical inspection of gas fittings.

Regular inspection of GDP (CGDP) gas equipment and gas fittings in the reporting monitoring period showed no recurrent leaks at the equipment replaced under the project, which is because cutting-edge equipment from foreign manufacturers and its domestic analogues was installed under the project, which ensures high reliability and much longer operational life than the reporting monitoring period. Based on the above, due to the lack of recurrent leaks, PJSC “Chernigivgas" decided not to create a Registry of monitoring of GDN components where EPNGL were removed.

Besides, there is a difference between the number of repaired/replaced equipment expected under the project activity. This is explained by the availability of preliminary data at the stage of PDD preparation, whereas at the stage of Monitoring Report preparation for the given period, the exact number of project equipment subject to repair/replacement was available. In general, the implementation schedule was fully met, although with a delay due to short financing.

There are no major deviations from the registered monitoring plan.

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

The persons responsible for the monitoring report on behalf of PJSC “Chernigivgas”: Oleksandr Karashchuk, the Working Team Leader (Chief Engineer of PJSC “Chernigivgas”); on behalf of CEP Carbon Emissions Partners S.A.: Fabian Knodel, the Director.

Section B. Key monitoring activities

B.1.1. Equipment used

The control and monitoring system is divided into three groups:

1) measurements of methane leaks before the repairs (replacement of gas equipment;
2) measurements of methane leaks after the repairs (replacement of gas equipment;
3) data archiving and processing.

Assessment of GDN component condition - whether it has conditional leak-proofness or not (methane leak detection) - is made using audio, visual and olfactory responses, detection with individual dosimeters during leak detection activities under the project.
To solve these problems, individual gas analysers (gas alarms) - Dräger X-am® 5600 (for specifications see Table 3) - were purchased.

Figure 2. A photo of repairs being conducted, Chernihiv

Dräger X-am® 5600. In order to detect methane leaks in a sample Dräger X-am® 5600 gas detector, shown in Figure 3, is used.

Figure 3. Dräger X-am® 5600 gas detector

Specifications of Dräger X-am® 5600 gas detector are provided in Table 3.

Table 3. *Specification of Dräger X-am® 5600 gas detector.*

Parameter	Value
Size, mm	max 47x130x44
Weight, g	max 250
Supply voltage, V	from 3.05 to 4.5
Sensitivity threshold, volume ratio, % - for methane - for propane	 From 0 to 0.1 From 0 to 0.1
Alarm threshold, volume ratio, % - for methane - for propane	 0.2 0.2
Ramp-up time, s	max 25
Alarm actuation period, s	max 3
Max power	1.5
Battery life, h	min 12
Battery voltage at idle, V	max 4.5
Battery short-circuit current, A	max 0.6
The gas detector has an explosion safety mark	I M1 Ex ia I Ma
Indicator of electric shock protection method	class 1
Protection level - electronic unit shell - accumulator unit	 IP67 IP67

After methane leak detection in a corresponding GDN component (GDP (CGDP) gas equipment and gas pipeline fittings), the unit is repaired or replaced with the use of modern sealing materials (GOST 7338-90, GOST 5152-84[8], or GOST

[7] "Rubber and Rubber-fabric Planes"

10330-76[9]), as well as full replacement of old equipment with new units from European producers or their domestic analogues.

B.1.2. Calibration

Measurements were carried out with flow meters which were calibrated and verified on a regular basis in accordance with quality assurance procedures and Law of Ukraine "On metrology and metrological activity".[10]
The devices subject to calibration and used in the process of methane leak monitoring are as follows:

- Dräger X-am® 5600 gas detector, calibration period - one year;
- D-59N-100-1.0 6 kPA manometer, calibration period - one year;
- TL-4 termometer, calibration period - 2 years;
- SOS pr-2b-2 stopwatch, calibration period - 2 years;
- BAMM-1 aneroid barometer, calibration period - 2 years.

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

B.1.3. Involvement of third parties

SE "Chernihivstandartmetrolohiia".
State Enterprise "Chernihivstandartmetrolohiia" is a company involved in state verifiction and calibration of gas detectors.

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

B.2.1. Structure of administration and management to enable the operator to implement the monitoring plan.

Coordination of activities of all departments and services of PJSC "Chernigivgas" relating to the JI project implementation is carried out by the Working Team created pursuant to Decree No.157 of PJSC "Chernigivgas" management board as of 18/07/2012. The structure of the Working Team is shown in Figure 4.

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[8] "Sealing Gland"

[9] "Dishevelled flax. Specifications"

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

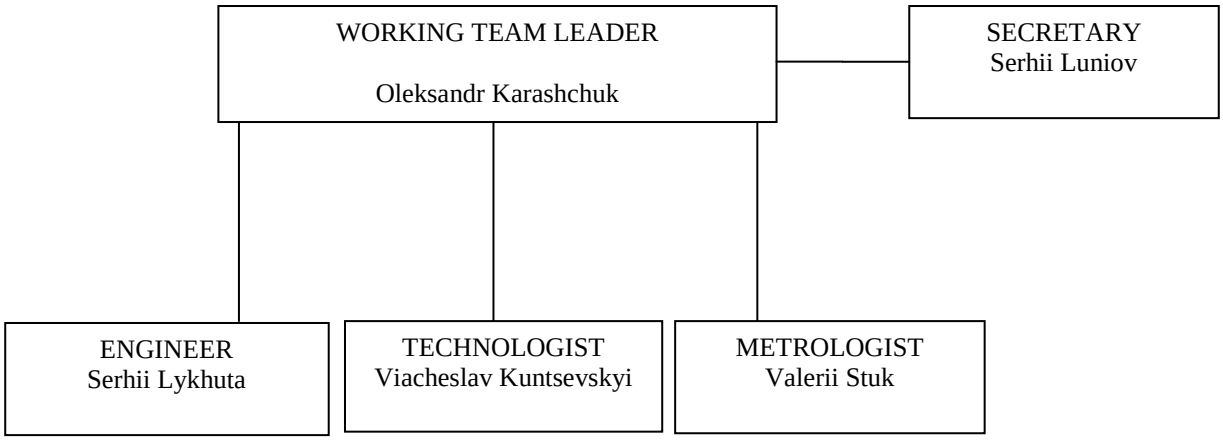

Figure 4. Working Team structure

The following responsibility structure is approved for the Working Team:

Oleksandr Karashchuk is the leader of the Working Team responsible for formation of the plan of measures in the JI project and determination of the necessary resources.
Serhii Lykhuta
is technical engineer of the Working Team responsible for organization of measurements and repair of leaks at GDN gas equipment.
Viacheslav Kuntsevskyi is technical engineer of the Working Team responsible for collection of information and performance of all the necessary calculations as provided in the monitoring plan of the JI project.
Serhii Luniov

is Working Team secretary responsible for storage, archiving and backuping of data based on the results of measurements and calculations as well as documents relating to the JI project.
Valerii Stuk is metrologist of the Working Team, who ensures the availability of the calibrated metering devices while implementing the JI project.

B.2.2. List of parameters used in calculations

The parameters used in calculations are provided in Table 4.

Table 4. Data used for GHG emission calculations

ID number *(Please use numbers to ease 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 the GDN component (GDP (CGDP), gas fitting) included into the project boundary	Leak measurement activity	None	Electronic and paper	All GDN components included into the project boundary are listed in the Registry and numbered accordingly provided in Supporting Document 1 to the Monitoring Report version 02.
2. GWP_{CH_4}	Global Warming Potential of methane	IPCC Second Assessment Report: Climate Change 1995 (SAR) and approved by COP. GWP of methane is available at UNFCCC website[11]	t CO_2eq/tCH_4	Electronic and paper	Project developer will monitor any changes in Global Warming Potential of methane published by IPCC and Approved by COP
3. h	No. of activity (replacement/repair) in GDN component after EPNGL detection	Leak measurement activity	None	Electronic and paper	Every activity conducted at a GDN component included into the project boundary is assigned a sequence number
4. W_y	Average mass ratio of methane in natural gas in period *y* of the project scenario	The value is calculated on the basis of company's official data on gas net calorific value in monitoring	%	Electronic and paper	Company data

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

		period			
5. $K^{g}_{i',h}$	i' Natural gas leakage factor of GDN component in CLP:	Standard values or data of the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks" registry No. UkrNTI 0112U00A816, dated 2012	m^3/h	Electronic and paper	Company data or calculated based on company data
6. $K^{n}_{i''}$	Natural gas leakage factor corresponding to EPNGL of GDN component i''	Calculated using the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks" registry No. UkrNTI 0112U00A816, dated 2012	m^3/h	Electronic and paper	Calculated based on company data
7. $H^{g}_{i',h,y}$	Time of GDN component operation under the pressure from the beginning of monitoring period *y* to the implementation of the project activity (repair/replacement) that caused EPNGL removal	Company data obtained in the course of GDN operation and leak repair activities	h	Electronic and paper	Company data Calculated for each GDN component for monitoring period
8. $H^{n}_{i'',h,y}$	Time of GDN component operation under the pressure from the implementation of the project	Company data obtained in the course of GDN operation and leak repair activities	h	Electronic and paper	Company data Calculated for each GDN component where leak repair activities were carried out for monitoring period

	activity (repair/replacement) that caused EPNGL removal to the end of monitoring period *y*				

B.2.3. Leakage

No leakage is expected (the JI specific approach based on the approved CDM methodology AM0023 version 4.0, as well as AM0023 Methodology, version 4, itself provides for no leakage).

B.3. Data processing and archiving

All data and documents on the project processed and archived in hard or electronic copies shall be stored until 31/12/2019, pursuant to Decree No.157 of 18/07/2012 of PJSC "Chernigivgas" management board.

B.4. Extraordinary situations and technical malfunctions

In the current monitoring period (January 2008 – July 2012) no extraordinary situations occurred in gas distribution networks of PJSC "Chernigivgas".

B.5. Procedures for detection and repairs of malfunctions at GDPs and GDNs of PJSC "Chernigivgas".

Detection, repairs and registration of malfunctions and extraordinary situations at the shutoff gates of PJSC "Chernigivgas" 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 external data were used in monitoring:

Data / Parameter	GWP_{CH_4}
Data unit	t CO_2eq/tCH_4
Description	Global Warming Potential of methane
Time of determination/monitoring	Throughout the crediting period
Source of data (to be) used	IPCC Second Assessment Report: Climate Change 1995 (SAR) and approved by COP. GWP of methane is available at UNFCCC website[12]
Value of data applied (for ex ante	21

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

calculations/determinations)	
Justification of the choice of data or description of measurement methods and procedures (to be) applied	N/A
QA/QC procedures (to be) applied	If global warming potential of methane changes, the baseline and the project scenario will be recalculated based on the new values
Comments	Project developer will monitor any changes in Global Warming Potential of methane published by IPCC and Approved by COP

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

Data / Parameter	$K^{n}_{i''}$
Data unit	m^3/h
Description	Natural gas leakage factor corresponding to EPNGL of GDN component i''
Time of determination/monitoring	Once at the beginning of the project for each GDN component
Source of data (to be) used	"Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks", registry No. UkrNTI

	0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
Value of data applied (for ex ante calculations/determinations)	N/A
Justification of the choice of data or description of measurement methods and procedures (to be) applied	Data from Table A.1 of Appendix A of the "Methodology of calculation of greenhouse gas emission reduction by eliminating excess natural gas leaks in gas distribution networks", registry No. UkrNTI 0112U00A816, dated 2012, developed by the Institute of Gas of the National Academy of Sciences of Ukraine
QA/QC procedures (to be) applied	N/A
Comments	Data allowing of calculation of GHG emissions in the baseline scenario will be archived in paper and electronic format.

B.7. Level of error of metering equipment

Relative error of Dräger X-am® 5600 gas detector is 5%, which meets EN 50054/57 standard. The device is calibrated on the annual basis.

Section C. Quality assurance and quality control measures

C.1. Documented procedures and structure of management

C.1.1. Roles and responsibility

Project management is performed by PJSC "Chernigivgas" Working Team Leader Oleksandr Karashchuk. He is responsible for the activities of all units. The Working Team was created to collect and process parameters.
The 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 required to operate the new equipment. All project-related trainings were conducted by equipment suppliers and their cost is included into the cost of equipment.

C.2. Internal audit and control activities

Under the guidance of the specially established working group PJSC "Chernigivgas" formed a group for measurement of all necessary parameters, provided for by the methane leaks monitoring plan.

Monitoring measurements are performed by specifically trained personnel according to the Methodology of measurements. Data on Monitoring measurements are recorded in hard copy directly in the course of measurements. Then, on the basis of paper data the uniform electronic database of leak monitoring measurements is formed.

Routine repairs of GDP (CGDP) gas equipment shall be performed once per year, and technical maintenance shall be performed once every six months.

The repaired GDP (CGDP) equipment is inspected on a regular basis as part of the monitoring programme, to make sure that there is no recurrent leaks.

C.3. Information on factors of social influence of the project and its environmental impact

As a result of project implementation the quality of gas supply of the region population is improved.
Also natural gas losses will decrease, and GHG emissions which cause greenhouse effect and climate change will drop. Gas pipeline operation safety will improve.

Section D. Calculation of GHG emission reductions

D.1. Project emissions

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

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

where:

PE_y - greenhouse gas emissions in period *y* of the project scenario, t CO_2eq;

GWP_{CH_4} - global warming potential of methane, tCO_2eq/tCH_4;

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

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

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

$[y]$ - index for monitoring period;

$[CH_4]$ - index for methane.

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

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

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

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

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

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

$[y]$ - index for monitoring period;

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

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

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

$[g]$ - index for SPNGL;

$[n]$ - index for EPNGL.

Emissions generated after the project implementation are povided in Table 5[13].

Table 5. Project emissions (t CO_2 equivalent)

	2008	2009	2010	2011	01/01/2012 – 31/07/2012
Project GHG emissions over the period, t CO_2eq	217 546	225 453	217 307	217 326	129 992
Total project GHG emissions over the monitoring period, t CO_2eq	1 007 624				

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:

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

where:

[13] The presented values of project GHG emissions are approximated to integers.

BE_y - greenhouse gas emissions in period *y* of the baseline scenario, t CO_2eq;

GWP_{CH_4} - global warming potential of methane, tCO_2eq/tCH_4;

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

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

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

$[y]$ - index for monitoring period;

$[CH_4]$ - index for methane.

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

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

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

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

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

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

$[y]$ - index for monitoring period;

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

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

$[h]$ - index corresponding to the number of project activity in GDN component, if more than one activity was carried out at this component in monitoring period

(where H is a set embracing all activities in the project scenario at the GDN component in monitoring period)
$[g]$ - index for SPNGL;
$[n]$ - index for EPNGL.

Emissions that would have occured if no reconstruction activities are conducted are provided in Table 6[14].

Table 6. Baseline emissions (t CO_2 equivalent)

	2008	2009	2010	2011	01/01/2012 – 31/07/2012
Baseline GHG emissions over the period, t CO_2eq	717 666	830 907	965 233	1 106 962	685 190
Total baseline GHG emissions over the monitoring period, t CO_2eq	4 305 958				

D.3. Leakage

No leakage is expected (the JI specific approach based on the approved CDM methodology AM0023 version 4.0, as well as AM0023 Methodology, version 4, itself provides for no leakage).

D.4. Emissions reductions as a result of JI project implementation in the current period (January 2008 - July 2012)

Emissions reduction as a result of project implementation is calculated as difference between baseline and project emissions.

Emission Reduction Units (ERU) in t CO_2eq are calculated by the formula:

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

ERU - Emission Reduction Units (ERU), t CO_2eq;
BE_y - greenhouse gas emissions in period *y* of the baseline scenario, t CO_2eq;
PE_y - greenhouse gas emissions in period *y* of the project scenario, t CO_2eq;
[*y*] - index for monitoring period.

[14] The presented values of baseline GHG emissions are approximated to integers.

Table 7 provides emission reductions as a result of JI project implementation in the current period (January 2008-July 2012)[1.5].

Table 6. 7. GHG emission reductions

	2008	2009	2010	2011	01/01/2012 – 30/06/2012
GHG emission reductions over the period, t CO_2eq	500 120	605 454	747 926	889 636	555 198
Total GHG emission reductions over the monitoring period, t CO_2eq	3 298 334				

[15]The presented values of GHG emission reductions are approximated to integers.