MONITORING REPORT OF JI PROJECT

Monitoring period:
01/01/2012 – 31/05/2012

Version 04
July 23, 2012

"Reduction of greenhouse gases emissions by gasification of Odesa region"

CONTENTS

ANNEXES

[1]Annexes 2, 3 (3: 3.1 – 3.18), 4 (4: 4.1 – 4.17) are provided in the form of Excel files as separate supporting documents

SECTION A. General project activity and monitoring information

A.1. Name of the project:

"Reduction of greenhouse gases emissions by gasification of Odesa region"
Sectoral scope - 3 "Energy demand"

A.2. Information about registration and approval of the project:

The project obtained approval from Ukraine (the Host country) in September 2011 (Letter of Approval No.2401/23/7, issued by the State Environmental Investment Agency of Ukraine dated 05/09/2011). The project was also approved by Switzerland, the country – buyer of GHG emission reductions (Letter of Approval No.J294-0485, issued by the Federal Office for the Environment (FOEN) dated 23/08/2011).

A.3. Brief description of the project:

The main goal of the project is reduction of greenhouse gas emissions by changing the structure of fuel consumption in industrial, municipal, administrative and private sectors of Odesa region by replacing solid and liquid fuels with natural gas. The project provides for construction and expansion of gas distribution systems (GDS) of Odesa region, which will also improve the energy efficiency of thermal power generation due to the transition of existing thermal power plants to natural gas, and installation of individual heating and hot water supply systems characterized by better efficiency compared to centralized systems. The project initiated by PJSC "Odesagas" will result in the reduction of greenhouse gas emissions into the atmosphere and will improve the environmental situation in the region.
The ***baseline scenario*** is to continue operating the existing systems of transportation and preparation of energy carrier as well as heating systems that would result in the use by the end consumers of less eco-friendly fuel (fuel oil, coal, diesel oil), which would generate a significant amount of greenhouse gases (GHG) when combusted. In addition, the continued operation of obsolete equipment (most of which was produced in the USSR) and, consequently, low efficiency of transportation system and energy consumption system will lead to excessive use of fossil fuel that would nourish the harmful effects of atmospheric pollution by GHG emissions.

The ***project scenario*** involves expansion of the territorial gas supply system, which includes construction and reconstruction of:

- Gas distribution networks (GDN)
- Gas distribution points (GDP), including cabinet-type gas distribution points (CGDP).

The project provides for modernization of the fuel consumption system of Odesa region by means of the implementation of measures for the switch of thermal power units to natural gas and the switch of consumers from centralized to individual heating and hot water supply systems, which, in turn, will lead to the use of more efficient and environment-friendly fossil fuel (natural gas), improvement of the quality of heating and hot water supply services, reduction of heat consumption due to increased efficiency of individual systems in comparison with centralized ones.
In general, the project activity is aimed at:

- Ensuring the supply of gaseous fuels (gasification) to end users by means of construction and reconstruction of gas distribution networks;
- Replacement of solid and liquid fuels and electricity with natural gas;
- Increase in heat energy efficiency;
- GHG emission reductions under the Joint Implementation Mechanism (JI).

According to data collected, the following amount of emission reduction units was achieved during the monitoring period:

Table 1.GHG emission reductions during the monitoring period

Monitoring period	Baseline emissions, t CO_2e	Project emissions, t CO_2e	Emission reductions, t CO_2e
(01/01/2012 – 31/05/2012)	1 847 756	1 205 195	642 561
Total, t CO_2e	**1 847 756**	**1 205 195**	**642 561**

A.4. Monitoring period:

- Date of commencement of the monitoring period: 01/01/2012.
- Date of termination of the monitoring period: 31/05/2012.

A.5. Methodology applied to the project:

A.5.1. Baseline methodology:

The project activity is aimed at reduction of greenhouse gas emissions by changing the structure of fuel consumption in industrial, municipal, administrative and private sectors of Odesa region by replacing solid and liquid fuels with natural gas.

The proposed project applies a specific approach that uses the elements of approved Clean Development Mechanism methodology ACM0009 «Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas - Version 3.2»[2] in order to set the baseline.

Dynamic baseline was selected according to a specific approach based on the Guidance on criteria for baseline setting and monitoring, Version 02[3].

According to the methodology the calculation of GHG emissions in the baseline scenario was made for each year when monitoring of the project activity took place, in such a way so that to adjust volume of fossil fuel substituted with gas. This allows for calculation of the volume of greenhouse gas emissions for each project year, in the absence of the project activity.

The main indicator of the project activities implementation is the annual consumption of natural gas.
Emission factor for stationary combustion of gas is calculated according to the National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine based on factors listed in Table P.2.39, P.2.41 and P.2.42 of the Inventory Report[4].

A.5.2.Monitoring methodology:

The proposed project applies a JI specific approach that uses the elements of the approved CDM methodologyACM0009 "Consolidated baseline and monitoring methodology for fuel switching from coal or petroleum fuel to natural gas", version 3.2[5].

The most objective and cumulative factor demonstrating whether the emissions reduction actually occurred, is *volume of consumed natural gas*. Replacement of fuel oil, coal and diesel fuel with natural

[2] http://cdm.unfccc.int/methodologies/DB/2CRBYLJO5JWC9YHBSWJQWYIH2LLGMJ
[3] http://ji.unfccc.int/Sup_Committee/Meetings/018/Reports/Annex2.pdf
[4] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[5] http://cdm.unfccc.int/methodologies/DB/2CRBYLJO5JWC9YHBSWJQWYIH2LLGMJ

gas as a more environmentally friendly fuel, results in reduction of GHG emissions. In addition, the increase in efficiency of the energy carrier transportation, preparation and combustion system takes place in the course of the transition to natural gas, regardless of extraneous factors.

PJSC "Odesagas" collects and stores the data relating to natural gas consumption in the form of bills for gas with the help of program complexes "Atlas SYBIL" and "Gasolina". Information about natural gas consumption as well as necessary documentation is attached to the monitoring report in Supporting documents.

According to the monitoring methodology that is described in the determined PDD, version 02, the following parameters and data were collected and recorded throughout the monitoring period to calculate the achieved emission reductions:

1) Data and parameters not monitored throughout the whole monitoring period, but determined only once, which are available at the stage of PDD development:

GWP_{CH4}	Global warming potential, tCO_2eq/tCH_4
$k_{7,fuel}$	Specific electricity saving in the course of heat carrier transportation to end consumer including losses in power grids, MWh/TJ
$k^{b}_{1,prepfuel}$	Factor that takes into account energy losses in the course of energy carrier preparation in the baseline scenario, relative units
$k^{p}_{1,prepfuel}$	Factor that takes into account energy losses in the course of energy carrier preparation in the project scenario, relative units
$k^{b}_{3,ef}$	Efficiency factor for boiler equipment that takes into account efficiency of heat generating units in the baseline scenario, relative units
$k^{p}_{3,ef}$	Efficiency factor for boiler equipment that takes into account efficiency of heat generating units in the project scenario, relative units
$k^{b}_{4,pipes}$	Efficiency factor that takes into account heat losses in the course of heat carrier transportation to the end consumer, in the baseline scenario, relative units
$k^{p}_{4,pipes}$	Efficiency factor that takes into account heat losses in the course of heat carrier transportation to the end consumer, in the project scenario, relative units

2) Data and parameters controlled during the whole monitoring period:

$V^{y}_{gas,PP}$	Total natural gas combusted in period "y" by individual, ths m^3
$V^{y}_{p,gas,LE}$	Natural gas combusted in period "y" by legal entity, ths m^3
$L^{y}_{p,los,1}$	Length of gas distribution systems constructed under the project, ths km
NCV^{y}_{gas}	Net calorific value of natural gas, TJ/ ths m^3
CEF^{y}_{elec}	Carbon dioxide emission factor when electricity consumption is reduced, tCO_2e/MWh
NCV^{y}_{fuel}	Net calorific value of fossil fuel of "fuel" type, TJ/t (Fuel of "fuel" type means coal, fuel oil or diesel oil)
$k^{c}_{p,gas}$	Carbon emission factor for natural gas combustion, t C/TJ
$k^{o}_{p,gas}$	Carbon oxidation factor for natural gas combustion, relative units
k^{c}_{fuel}	Carbon emission factor for combustion of fossil fuel of "fuel" type, t C/TJ (Fuel of "fuel" type means coal, fuel oil or diesel oil)
k^{o}_{fuel}	Carbon oxidation factor for combustion of fossil fuel of "fuel" type, relative units
$EF^{y}_{CH_4,p,los,2}$	Default methane emission factor for technological gas equipment at end consumer's place, tCH_4e/TJ
$EF^{y}_{CH_4,p,los,1}$	Default methane emission factor for natural gas transportation and distribution, t CH_4e /ths km
$CEF^{y}_{gas,unit}$	Reduced GHG emission factor for natural gas transportation to end consumers, t CO_2/ths m^3

A.6. Status of implementation including project milestones:

Implementation of project activities started in late 2003, as provided for in the determined PDD, version 02. However, emissions generated in 2003 are excluded from the calculation from a conservative standpoint. Therefore, 01/01/2004 was taken as the crediting period start date.
This monitoring report contains information about reductions, achieved under the project during the period of 01/01/2012 – 31/05/2012.
Project implementation status as of the reporting period of 01/01/2012 – 31/05/2012, including the project milestones, is provided in Table 2.

Table 2. Project implementation status

The length of gas pipelines built during the period 01/01/2012 – 31/05/2012, thousand km
0,02140085

Implementation of project activities is realized according to the project plan provided in the determined PDD version 02.

Detailed information about measures implemented by departments and divisions is provided in Supporting Document (Excel file) "Annex 2. Registry of gas networks with legislative normative documentation".

A.7. Deviations from or change of registered PDD:

There are no deviations from or changes in the registered PDD.

A.8. Deviations from or change of registered monitoring plan:

There are no deviations from or changes in the registered monitoring plan.

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

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SECTION B. Key monitoring activities

To determine the monitoring methodology an approach for baseline setting and monitoring developed according to Appendix B of the JI Guidelines was used. The project uses a specific approach to Joint Implementation projects based on the "Guidance on criteria for baseline setting and monitoring" (Version 02[6]) of JI Supervisory Committee.

Monitoring of the project activity consists in measuring natural gas consumption by end customers and control over the length of gas distribution systems constructed under the project. Other parameters are obtained by calculation or from state statistics and inventory.

Monitoring plan provides for the following measures:

1. Identification of all potential emissions sources within the project.
2. Collection of information on greenhouse gas emissions under the project during the crediting period.
3. Assessment of the project implementation schedule.
4. Collection of the information on metering equipment and its calibration.
5. Collection and archiving the information on the environmental impact of project activities.
6. Data archiving.
7. Identification of the structure responsible for project monitoring.
8. Analysis of personnel training organization.

B.1. Information about types of metering equipment, its accuracy class and calibration procedures:

The following gas meters are used for natural gas consumption metering:

Metering equipment	Type	Producer	Verification/calibration frequency	Accuracy class
Diaphragm gas meter	MKM-U G-2.5	SP Premagas Kromshreder, Lubny city	8 years	±1.5..3.0 %
Diaphragm gas meter	MKM-U G-4	SP Premagas Kromshreder, Lubny city	8 years	±1.5..3.0 %
Diaphragm gas meter	MKM-U G-6	SP Premagas Kromshreder, Lubny city	8 years	±1.5..3.0 %
Diaphragm gas meter	VK G-1.6	Premagaz s.r.o., Slovakia[7]	8 years	±1.5..3.0 %
Diaphragm gas meter	VK G-2.5	Premagaz s.r.o., Slovakia	8 years	±1.5..3.0 %
Diaphragm gas meter	VK G-4	Premagaz s.r.o., Slovakia	8 years	±1.5..3.0 %
Diaphragm gas meter	VK G-6	Premagaz s.r.o., Slovakia	8 years	±1.5..3.0 %
Diaphragm gas meter	VK G-10	Premagaz s.r.o., Slovakia	8 years	±1.5..3.0 %
Diaphragm gas meter	G-1.6	«Samgas»[8], Rivne city, Ukraine	8 years	±1.5..3.0 %
Diaphragm gas meter	G-2.5	«Samgas», Rivne city, Ukraine	8 years	±1.5..3.0 %

[6] http://ji.unfccc.int/Sup_Committee/Meetings/018/Reports/Annex2.pdf
[7] http://www.elster.sk/
[8] http://samgas.com.ua/

Diaphragm gas meter	G-4	«Samgas», Rivne city, Ukraine	8 years	±1.5..3.0 %
Diaphragm gas meter	G-16 RS/10	«Samgas», Rivne city, Ukraine	8 years	±1.5..3.0 %
Diaphragm gas meter	BK G-10	«Samgas», Rivne city, Ukraine	8 years	±1.5..3.0 %
Diaphragm gas meter	SGMN C-1-G-6	UP "S. I. Vavilov MMZ", Minsk city	8 years	±1.5..3.0 %
Diaphragm gas meter	SGK G-1.6	VPO "Tochmash" [9], Vladimir city, Russia	8 years	±1.5..3.0 %
Diaphragm gas meter	SGK G-2.5	VPO "Tochmash", Vladimir city, Russia	8 years	±1.5..3.0 %
Diaphragm gas meter	SGK G-4	VPO "Tochmash", Vladimir city, Russia	8 years	±1.5..3.0 %

The following meters were installed over the monitoring period of 01/01/2012 – 31/05/2012:

Metering equipment	Type	Producer	Verification/ calibration frequency	Accuracy class
Diaphragm gas meter	GALLUS G-1.6 G – 2.5 G - 4	Schlumberger Industries, France	8 years	±1.5..3.0 %
Diaphragm gas meter	MTV G-2.5	Pietro Fiorentini[10], Italy	8 years	±1.5..3.0 %
Diaphragm gas meter	MTV G-4	Pietro Fiorentini, Italy	8 years	±1.5..3.0 %
Diaphragm gas meter	MTV G-6	Pietro Fiorentini, Italy	8 years	±1.5..3.0 %
Diaphragm gas meter	MTV G-10	Pietro Fiorentini, Italy	8 years	±1.5..3.0 %
Gas turbine meter	Elster G1.6 – G6	Elster s.r.o., Slovakia	8 years	±1.5..3.0 %
Diaphragm gas meter	Vizar G - 4	SE "Zhulianskyi Machinery Plant "Vizar", Vyshneve, Kyiv region	8 years	±1.5..3.0 %

Detailed information about metering equipment installed at each subscriber's place is given in Supporting document "Annex 4: Types of metering equipment" (4: 4.1-4.17).

Typical meter for natural gas metering is shown in the Figure 1.

[9] http://www.vpotochmash.ru/
[10] http://www.fiorentini.com/viewdoc?co_id=1

Figure 1. Gas meter MKM-U G-4 produced by Premagas

Figure 2. Gas meter G-2.5 produced by «Samgas»

B.2. Data collection (consolidated data for the whole monitoring period):

Data and parameters that are subject to periodic monitoring in accordance with the monitoring plan as defined in the PDD version 02, and a list of constant values used to calculate emission reductions are listed in sections B.2.1. and B.2.2. of the Monitoring report and in the Supporting document (Excel file) "Annex 3: Calculation of GHG emission reductions due to gasification of Odesa region" (3: 3.1-3.18).

B.2.1. List of fixed parameters and constant values:

Table 3. List of fixed parameters that are not controlled during the monitoring period

Parameter	Description	Source of data	Value, unit of measurement	Comments
GWP_{CH4}	Global warming potential for methane	According to data approved by the International Panel for Climate Change (IPCC)	21 t CO_2e / t CH_4	N/A
$k_{7,fuel}$	Specific electricity saving in the course of heat carrier transportation to end consumer including losses in power grids	Report «Determination of change of specific energy data of heat supply system in the course of gasification" developed by "UKRENERGOPROM -2" as of June 24, 2011	2.016 MWh/TJ	Applicable only to individuals who were previously connected to central heating system
$k^{b}_{1,prepfuel}$	Factor that takes into account energy losses in the course of energy carrier preparation in the baseline scenario	Report «Determination of change of specific energy data of heat supply system in the course of gasification" developed by "UKRENERGOPROM -2" as of June 24, 2011	Baseline heat source: Fuel, relative units (Fuel oil; Coal) CS*: 0.965; 0.965 IS**: 1; 1	Applicable in case of transfer of individual or central heat supply systems to gas.
$k^{p}_{1,prepfuel}$	Factor that takes into account energy losses in the course of energy carrier preparation in the project scenario	Report «Determination of change of specific energy data of heat supply system in the course of gasification" developed by "UKRENERGOPROM -2" as of June 24, 2011	Project heat source: Fuel, relative units: Natural gas CS: 0.98 IS: 1	Applicable in case of transfer of individual or central heat supply systems to gas.
$k^{b}_{3,ef}$	Efficiency factor for boiler equipment that takes into account efficiency of heat generating units in the baseline scenario	Report «Determination of change of specific energy data of heat supply system in the course of gasification" developed by "UKRENERGOPROM -2" as of June 24, 2011	Baseline heat source: Fuel, relative units (Fuel oil; Coal) CS: 0.79; 0.76 IS: -; 0.74	Applicable in case of transfer of individual or central heat supply systems to gas.
$k^{p}_{3,ef}$	Efficiency factor for boiler equipment that takes into account efficiency of heat generating units in the project scenario	Report «Determination of change of specific energy data of heat supply system in the course of gasification" developed by "UKRENERGOPROM -2" as of June 24, 2011	Project heat source: Fuel, relative units: Natural gas CS: 0.92 IS: 0.92	Applicable in case of transfer of individual or central heat supply systems to gas.
$k^{b}_{4,pipes}$	Efficiency factor that takes into account heat energy losses in the course of heat carrier	Report «Determination of change of specific energy data of heat supply system in the course of gasification" developed by	Baseline heat source: Fuel, relative units (Fuel oil; Coal)	Applicable in case of transfer of central heat supply systems to

	transportation to end consumer, in the baseline scenario	"UKRENERGOPROM -2" as of June 24, 2011	CS: 0.844; 0.844 IS: 1; 1	individual ones
$k^{p}_{4,\,pipes}$	Efficiency factor that takes into account heat energy losses in the course of heat carrier transportation to the end consumer, in the project scenario	Report «Determination of change of specific energy data of heat supply system in the course of gasification" developed by "UKRENERGOPROM -2" as of June 24, 2011	Project heat source: Fuel, relative units CS: Natural gas: 0.844 IS: 1	Applicable in case of transfer of central heat supply systems to individual ones

* Central heat supply system
** Individual heat supply system

B.2.2.List of parameters that are subject to periodic monitoring.

Table 4. Parameters that are controlled during the monitoring period and used to calculate project emissions.

Parameter	Description	Source of data	Unit of measurement	Monitoring frequency	Comments
$V^{y}_{gas,PP}$	Total quantity of natural gas combusted in period "y" by individual	Gas meters	ths m^3	Monthly	A cubic meter, reduced to standard conditions (T = 20 degrees, C, P = 101.325 kPa (760 mm. of mercury) and humidity is equal to zero) is taken as the unit of gas supplied to individuals and legal entities.
$V^{y}_{gas,LE}$	Total quantity of natural gas combusted in period "y" by legal entity	Gas meters	ths m^3	Monthly	A cubic meter, reduced to standard conditions (T = 20 degrees, C, P = 101.325 kPa (760 mm. of mercury) and humidity is equal to zero) is taken as the unit of gas supplied to individuals and legal entities.
NCV^{y}_{gas}	Net calorific value of natural gas	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-	TJ/ths m^3	Annually	According to principle of conservatism minimal calorific value of gas is used.

		2010. Table P.2.30.[11].			
$L^{y}_{p,los,1}$	Length of gas distribution systems constructed under the project	Certificates of commissioning of gas distribution networks	ths km	Monthly	Monitoring of the length of constructed gas distribution systems will be carried out by responsible people on the basis of commissioning certificates for each monitoring period.
$k^{c}_{p,gas}$	Carbon emission factor for natural gas combustion	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010. Table P.2.32[12]	t C/TJ	Annually	Carbon emission factor for natural gas combustion is used to determine the default carbon dioxide emission factor for stationary combustion of natural gas in Ukraine.
$k^{o}_{p,gas}$	Carbon oxidation factor for natural gas combustion	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010. Table P.2.33[13]	relative units	Annually	Carbon oxidation factor for natural gas combustion is used to determine the default carbon dioxide emission factor for stationary combustion of natural gas in Ukraine.
$EF^{y}_{CH_4,p,los,1}$	Default methane emission factor for natural gas transportation and distribution	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010. Table 1.V.2[14]	t CH_4/ths km	Annually	Default methane emission factor for natural gas transportation and distribution is used to determine GHG emissions from methane leakage at technological equipment.
$EF^{y}_{CH_4,p,los,2}$	Default methane emission factor at technological gas equipment at end consumers place	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases	t CH_4/ TJ	Annually	Default methane emission factor at technological gas equipment and at end consumers place is used to determine GHG emissions from

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

		in Ukraine for 1990-2010. Table 1.V.2[15]			methane leakage at technological equipment at end consumer's place
$CEF^{y}_{gas,unit}$	Reduced GHG emission factor for natural gas transportation to the end consumers	Official data of the Ministry of Fuel and Energy of Ukraine and the national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine[16]	t CO_2/ths m^3	Annually	Detailed calculation and references to the sources of data are provided in the Supporting Document "Annex 3. Calculation of GHG emission reductions due to gasification of Odesa region" (3: 3.1-3.18).

Table 5.Parameters that are controlled during the monitoring period and used to calculate emissions in the baseline scenario.

Parameter	Description	Source of data	Unit of measurement	Monitoring frequency	Comments
$V^{y}_{gas,PP}$	Total natural gas combusted in period "y" by individual	Gas meters	ths m^3	Monthly	A cubic meter, reduced to standard conditions (T = 20 degrees, C, P = 101.325 kPa (760 mm. of mercury) and humidity is equal to zero) is taken as the unit of gas supplied to individuals and legal entities.
$V^{y}_{gas,LE}$	Natural gas combusted in period "y" by legal entity	Gas meters	ths m^3	Monthly	A cubic meter, reduced to standard conditions (T = 20 degrees, C, P = 101.325 kPa (760 mm. of mercury) and humidity is equal to zero) is taken as the unit of gas supplied to individuals and legal entities.

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

NCV^{y}_{fuel}	Net calorific value of fossil fuel of «fuel» type (Fuel of "fuel" type means coal, fuel oil or diesel oil)	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010. Table P.2.30. [17]	TJ/t	Annually	The parameter is used according to the approved CDM methodology ACM0009 and "Guidance on criteria for baseline setting and monitoring»[18].
NCV^{y}_{gas}	Net calorific value of natural gas	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010. Table P.2.30[19].	TJ/ths m^3	Annually	Minimal value of gas calorific value is used according to the principles of conservatism
k^{c}_{fuel}	Carbon emission factor for combustion of fossil fuel of "fuel" type (Fuel of "fuel" type means coal, fuel oil or diesel oil)	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010. Table P.2.32[20].	t C/TJ	Annually	Carbon emission factor for combustion of fossil fuel is used to determine the default carbon dioxide emission factor for stationary combustion of fossil fuel in Ukraine.
k^{o}_{fuel}	Carbon oxidation factor for combustion of fossil fuel of "fuel" type (Fuel of «fuel» type means coal, fuel oil, diesel oil)	The national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010. Table P.2.33[21].	relative units	Annually	Carbon oxidation factor for combustion of fossil fuel is used to determine the default carbon dioxide emission factor for stationary combustion of fossil fuel in Ukraine.
CEF^{y}_{elec}	Carbon dioxide emission factor when electricity consumption	Carbon dioxide emission factors for 2011 are taken from the Order of NEIAU # 75 of 12.05.2011. "On approval of carbon	tCO_2/MWh	Annually	N/A

[17] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[18] http://ji.unfccc.int/Sup_Committee/Meetings/018/Reports/Annex2.pdf
[19] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[20] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[21] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip

	is reduced	dioxide emission factors in 2011"[22];			

Yearly parameter values used to calculate GHG emissions for the project and the baseline scenarios are shown in Supporting Document "Annex 3: Calculation of GHG emission reductions due to gasification of Odesa region" (3: 3.1-3.18).

B.2.3. Data related to leakage:

According to the methodology provided in the determined PDD, version 02, indirect extraneous leakage of CO_2, CH_4, N_2O from oil and coal extraction activities, petrol combustion by transport during transportation of diesel oil and coal to end consumer are excluded from a conservative standpoint. According to the determined PDD methane leakage in the course of gas transportation by gas transportation networks are included in the project emissions.

B.2.4. Data relating to environmental and social impact:

PJSC "Odesagas" has the necessary Environmental Impact Assessment for all projects on gas distribution network construction in accordance with Ukrainian law (State Construction Standard of Ukraine A.2.2-1-2003 "The composition and content of materials of environmental impact assessment (EIA) in the design and construction of plants, buildings and structures"[23]). EIA of the projects are developed by subcontracting project and assembly organizations and are transferred to PJSC "Odesagas" in the form of individual sections of reconstruction projects.

Overall, the impact of the project "Reduction of greenhouse gases emissions by gasification of Odesa region" on the environment during the construction work can be assessed as permittable. Project facilities are not included in the list of activities and facilities of environmental hazard. Analysis of the facilities impact of the environment showed that taking into consideration all the factors, in the normal technical operational mode they will neither cause any negative processes in the regional environment, nor lead to any negative social and economic consequences, and the risk of emergencies and their possible impact are minimized.

The operation of project facilities is accompanied with production and technological (normalized) gas losses–marginal gas leakage which allow for ensuring reliable operation of gas pipelines, connecting pieces, fittings, expansion joints, gas equipment, appliances etc.
To prevent impact on the environment during construction works measures aimed at restoring the ecological balance are carried out. In order to reduce impact on the environment all construction and assembly works are carried out exclusively within the right-of-way.
Land recultivation is planned on land:

- Trails of the pipeline across the width of the allotment;
- The territory of temporary storage of pipes and ancillary materials;
- Affected land surface on the trails of temporary roads;
- The area around ground facilities affected during construction;
- Other territories in the areas of construction, as a result of the passage of vehicles, clogged and polluted with industrial and domestic waste and oil.

Technical recultivation of areas includes the following measures:

- Removal and preparation of soil and vegetation layer in the areas of construction;
- Cleaning construction debris, unused materials, and all contaminants of area remained after the process of dismantling of temporary structures, bases after the completion of works on the trace;
- Restoring the topsoil.

As part of procedures undertaken at the request of relevant state services, the company reports on environmental performance on a periodical basis. Environmental department of PJSC "Odesagas"

[22] http://www.neia.gov.ua/nature/doccatalog/document?id=127498
[23] http://www.budinfo.com.ua/dbn/8.htm

develops quarterly reports in accordance with the Form No.2-TP (air) that is provided to local government statistics.

B.3. Emergency situations and procedures for detection and liquidation of malfunctions at PJSC "Odesagas":

Detection, liquidation and registration of malfunctions and emergency situations at gas networks of PJSC "Odesagas" is carried out according to Safety rules of gas supply systems of Ukraine[24].

There were no emergency situations and considerable technological malfunctions at PJSC "Odesagas" in the monitoring period of 01/01/2012 – 31/05/2012.

[24] http://dnop.com.ua/dnaop/act5048.htm

SECTION C. Quality assurance and quality control measures

C.1. Roles and responsibilities

The structure of data collection as a part of the project monitoring is shown in Figure 3.

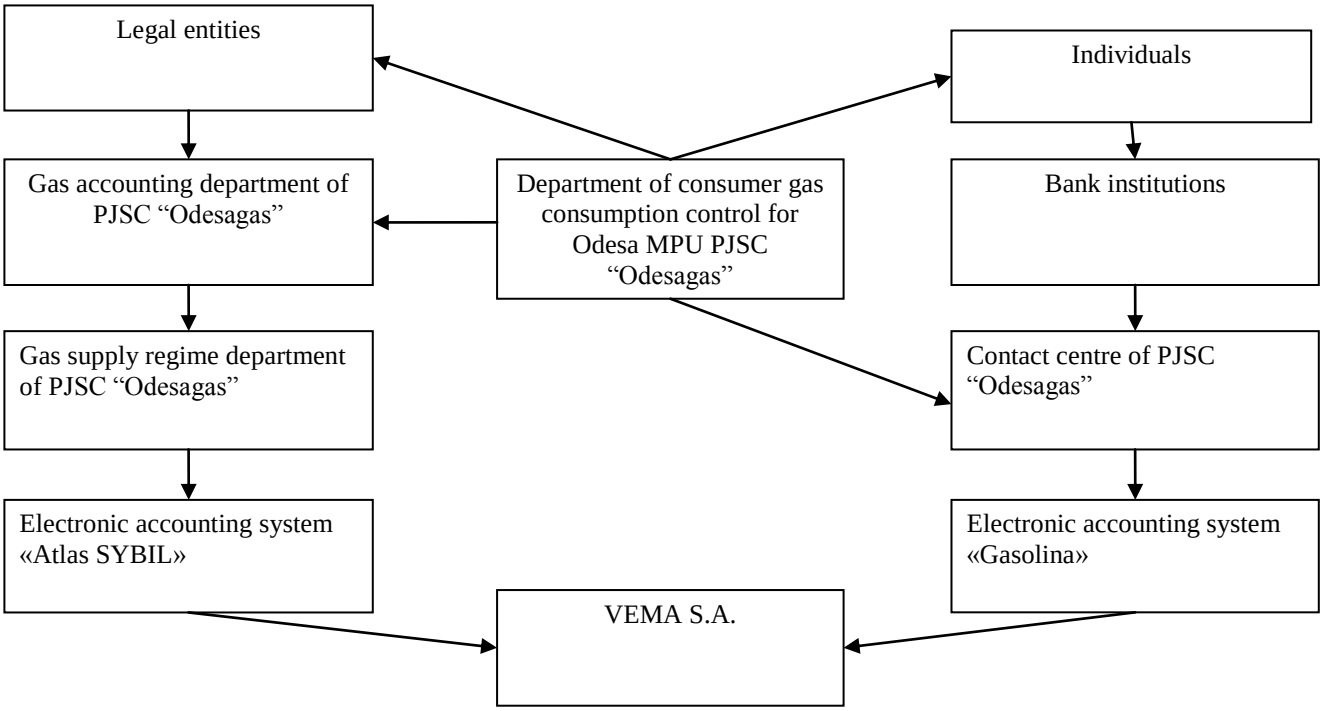

Figure 3. Structure of monitoring data collection

PJSC "Odesagas" carries out the monitoring of natural gas fuel consumption by individuals in the following way:

1. The Department of consumer gas consumption control conducts monthly inspections of meters, executes statements signed by individuals and transfers them to the Contact centre.
2. Bank institutions deliver the information on gas consumption in the form of paid bills to the Contact centre of PJSC "Odesagas".
3. Contact centre processes the information received and inputs it into "Gasolina" program.
4. Indices of gas supply volume processed by «Gasolina» program are delivered to the project developer «VEMA S.A.»
5. The length of gas distribution systems, implemented under the project is determined by the assembly and technical service based on GDN Commissioning certificates.

PJSC "Odesagas" carries out the monitoring of natural gas consumption by legal entities in the following way:

1. Legal entities supply information on gas consumption to the Gas accounting department every month.
2. The Department of consumer gas consumption control conducts monthly inspections of meters, executes statements signed by enterprises and transfers them to the Gas accounting department.
3. The Gas accounting department provides information to the Gas supply regime department for its processing into basic form by "Atlas SYBIL" program.
4. Indices of gas supply volume processed by "Atlas SYBIL" program are delivered to project developer «VEMA S.A.».

C.2. Trainings:

Since the principal activities of PJSC "Odesagas" are not changed when implementing the Joint Implementation (JI) project and the project monitoring is carried out as a part of practice established at the company, special trainings for personnel are not necessary. Technical personnel of the enterprise possess necessary knowledge and experience to carry out the project implementation and monitoring.

In case of new equipment implementation (the equipment which has not been used by this enterprise before), the company-manufacturer or the company-supplier of this equipment shall conduct trainings on the peculiarities of equipment operation for the personnel. During the monitoring period the equipment which would require special training for personnel was not installed.

PJSC "Odesagas" retrains the personnel according to the requirements of Norms of labour protection. The enterprise has the Labour Protection Department responsible for professional development and trainings of the personnel.

C.3. Involvement of third parties:

According to paragraph 6 of the Model Agreement on the provision of gas supply services, approved by Resolution NERC as of 04.01.2000 No.1[25] (registered by Ministry of Justice on 01.02.2000 No.57/4278) maintenance of gas supply systems inside buildings (low-pressure gas pipelines, gas meters, gas appliances, devices necessary for use of gas in everyday life) is the responsibility of gas transportation organization.
Calibration and verification of legal entity's gas meters are performed by respective departments of these enterprises. PJSC "Odesagas" supervises the verification and calibration of gas meters, held by legal entities on a periodic basis.

C.4. Internal audits and control methods:

Routine repair of gas networks is carried out once a year; maintenance - once every six months. Repaired gas equipment is regularly examined to ensure that it works properly and is not a source of gas leakage.
Means of metering equipment used for monitoring of the project activity are subject to periodic state verification. Personnel of PJSC "Odesagas" are subject to periodic examination of their knowledge of requirements to:

- collecting data according to the monitoring plan (the collection of data under the monitoring coincides with the usual practice of data collection at the company);
- labour protection;

Each quarter, representatives of "VEMA S.A.", developers of the project, conduct internal audits of the project monitoring system at PJSC "Odesagas".
Internal audit includes measures on verification of consumed gas accounting and record keeping by Gas accounting service, Gas supply regime department contact centre; verification of proper working condition and periodic maintenance of "Atlas SYBIL" and "Gasolina" softwares; cross-check of data of these program complexes and records of consumed gas, that are kept by the relevant services of the company; checking the timeliness of natural gas meters verification etc.

[25] http://zakon.nau.ua/doc/?uid=1027.51.0

SECTION D. Calculation of GHG emission reductions

D.1. Formulae used for calculation of GHG reductions.

The table below provides parameters from the national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2010[26], which should be used in calculation of GHG emissions in the monitoring period. These parameters were adjusted to common values and data units for the sake of simplification, which resulted in improved and more transparent calculation.

Table 6. Values and data units of parameters used in GHG emissions calculations

Parameter	Description	Value (Inventory Report)	Data unit (Inventory Report)	Value (calculations)	Data unit (calculations)
NCV^{y}_{gas}	Net calorific value of natural gas	33.8	GJ/ths m^3	0.0338	TJ/ths m^3
NCV^{y}_{fuel}	Net calorific value of coal	21.4	GJ/t	0.0214	TJ/t
NCV^{y}_{fuel}	Net calorific value of fuel oil	40.5	GJ/.м^3	0.0405	TJ/t
$k^{c}_{p,gas}$	Carbon emission factor for natural gas combustion	15.17	t C/TJ	15.17	t C/TJ
$k^{o}_{p,gas}$	Carbon oxidation factor for natural gas combustion	0.995	relative units	0.995	relative units
k^{c}_{fuel}	Carbon emission factor for coal combustion	25.3	t C/TJ	25.3	t C/TJ
k^{o}_{fuel}	Carbon oxidation factor for coal combustion	0.98	relative units	0.98	relative units
k^{c}_{fuel}	Carbon emission factor for fuel oil combustion	21.1	t C/TJ	21.1	t C/TJ
k^{o}_{fuel}	Carbon oxidation factor for fuel oil combustion	0.99	relative units	0.99	relative units
$EF^{y}_{CH_4,p,los,2}$	Default methane emission factor for technological gas equipment at end consumer's place	139.5	t CH_4/PJ	0.1395	t CH_4/TJ
$EF^{y}_{CH_4,p,los,1}$	Default methane emission factor for natural gas transportation and distribution	820	t CH_4/ths km	820	t CH_4/ths km

D.1.1.Formulae for calculation of project emissions

Formula 1 –Project emissions in reporting period, tCO_2e

$$PE^{y}_{p} = PE^{y}_{p,gas,PP} + PE^{y}_{p,gas,LE} + PE^{y}_{p,los} + PE^{y}_{tp,gf},$$

$PE^{y}_{p,gas,PP}$ - GHG emissions due to natural gas combustion by consumers of "PP" type during the period «y», in the project scenario (t CO_2e);

$PE^{y}_{p,gas,LE}$ - GHG emissions due to natural gas combustion by consumers of «LE» type during the period «y», in the project scenario (t CO_2e);

$PE^{y}_{p,los}$ - GHG emissions due to methane leakage at technological equipment and at end-users

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

	place in period «y», in the project scenario (t CO_2e); $PE^{y}_{tp,gf}$ - GHG emissions due to gas fuel combustion by gas-turbine installations when transporting natural gas to end consumers (t CO_2e); $[y]$ - index corresponding to monitoring period; $[p]$ - index corresponding to project scenario; $[PP]$ - index corresponding to individual; $[LE]$ - index corresponding to legal entity.

Formula 2 –GHG emissions due to natural gas combustion by consumers of "PP" type during the period «y», in the project scenario (t CO_{2e})	
	$PE^{y}_{p,gas,PP} = \sum_{pp=1}^{PP} V^{y}_{gas,PP} * NCV^{y}_{gas} * EF^{y}_{p,gas}$,
	$V^{y}_{gas,PP}$ - Total natural gas combusted in period «y» by individuals (ths m^3); NCV^{y}_{gas} - Net calorific value of natural gas (TJ/ths m^3); $EF^{y}_{p,gas}$ - default carbon dioxide emission factor for permanent combustion of natural gas (t CO_2e /TJ); $[y]$ - index corresponding to monitoring period; $[p]$ - index corresponding to project scenario; $[PP]$ - index corresponding to individual.

Formula 3 –GHG emissions due to natural gas combustion by consumers of «LE» type during the period «y», in the project scenario (t CO_2e)	
	$PE^{y}_{p,gas,LE} = \sum_{le=1}^{LE} V^{y}_{gas,LE} * NCV^{y}_{gas} * EF^{y}_{p,gas}$,
	$V^{y}_{gas,LE}$ - Total quantity of natural gas combusted in period «y» by legal entities, in the project scenario (ths m^3); NCV^{y}_{gas} - Net calorific value of natural gas (TJ/ths m^3); $EF^{y}_{p,gas}$ - default carbon dioxide emission factor for permanent combustion of natural gas (t CO_2e /TJ). $[y]$ - index corresponding to monitoring period; $[p]$ - index corresponding to project scenario; $[LE]$ - index corresponding to legal entity.

Formula 4 –GHG emissions due to methane leakage at technological equipment and at end-consumers place in period «y», in the project scenario (t CO_2e)	
	$PE^{y}_{p,los} = PE^{y}_{p,los,1} + PE^{y}_{p,los,2}$,
	$PE^{y}_{p,los,1}$ - GHG emissions from methane leakage at technological equipment in period «y», in the project scenario (t CO_2e); $PE^{y}_{p,los,2}$ - GHG emissions from methane leakage at equipment of end consumers in period «y», in the project scenario (t CO_2e); $[y]$ - index corresponding to monitoring period; $[p]$ - index corresponding to project scenario.

Formula 5 –GHG emissions due to methane leakage at technological equipment in period «y», in the project scenario (t CO_2e)	
	$PE^{y}_{p,los,1} = \sum L^{y}_{p,los,1} * EF^{y}_{CH_4,p,los,1} * GWP_{CH_4}$,
	$L^{y}_{p,los,1}$ - Length of gas distribution systems constructed under the project (ths km); $EF^{y}_{CH_4,p,los,1}$ - default methane emission factor for natural gas transportation and distribution (t CH_4e /ths km); GWP_{CH4} - global warming potential for methane. It is determined according to the recommendation of Intergovernmental Panel on Climate Change, (t CO_2e / t CH_4); $[y]$ - index corresponding to monitoring period; $[p]$ - index corresponding to project scenario.

Formula 6 –GHG emissions due to methane leakage at equipment of end-consumers in period «y», in the project scenario (t CO_2e)	
	$PE^{y}_{p,los,2} = (\sum_{le=1}^{LE} V^{y}_{gas,LE} + \sum_{pp=1}^{PP} V^{y}_{gas,PP}) * NCV^{y}_{gas} * EF^{y}_{CH_4,p,los,2} * GWP_{CH_4}$,
	$V^{y}_{gas,PP}$ - Total natural gas combusted in period «y» by individuals, (ths m^3); $V^{y}_{gas,LE}$ - Total natural gas combusted in period «y» by legal entities, in the project scenario (ths m^3); NCV^{y}_{gas} - Net calorific value of natural gas, (TJ/ths m^3); $EF^{y}_{CH_4,p,los,2}$ - default methane emission factor at technological gas equipment at end consumer place (t CH_4e /TJ); GWP_{CH4} - global warming potential for methane. It is determined according to the recommendation of Intergovernmental Panel on Climate Change, (t CO_2e / t CH_4); $[y]$ - index corresponding to monitoring period; $[p]$ - index corresponding to project scenario; $[PP]$ - index corresponding to individual; $[LE]$ - index corresponding to legal entity.

Formula 7 –GHG emissions due to gas fuel combustion by gas-turbine installations when transporting natural gas to end consumers (t CO_2e)	
	$PE^{y}_{tp,gf} = (\sum_{le=1}^{LE} V^{y}_{gas,LE} + \sum_{pp=1}^{PP} V^{y}_{gas,PP}) * CEF^{y}_{gas,unit}$,
	$V^{y}_{gas,PP}$ - total natural gas combusted in period «y» by individuals (ths m^3); $V^{y}_{gas,LE}$ - total natural gas combusted in period «y» by legal entities, in the project scenario (ths m^3). $CEF^{y}_{gas,unit}$ - Reduced GHG emission factor for natural gas transportation to the end consumers (t CO_2e/ ths m^3). Determination of the factor is provided in Supporting Document "Annex 3: Calculation of GHG emission reductions due to gasification of Odesa region" (3: 3.1-3.18); $[y]$ - index corresponding to monitoring period; $[p]$ - index corresponding to project scenario; $[PP]$ - index corresponding to individual; $[LE]$ - index corresponding to legal entity.

D.1.2. Formulae used for calculation of emissions in the baseline scenario:

Formula 8 – baseline emissions in reporting period (BE_b^y), tCO_2e	
	$BE_b^y = BE_{b,fuel,PP}^y + BE_{b,fuel,LE}^y$,
	$BE_{b,fuel,PP}^y$ - GHG emissions due to fossil fuel of "fuel" type combustion by consumers of "PP" type in period «y», in the baseline scenario (t CO_2e); $BE_{b,fuel,LE}^y$ - GHG emissions due to fossil fuel of "fuel" type combustion by consumers of «LE» type in period «y», in the baseline scenario (t CO_2e); $[y]$ - index corresponding to monitoring period; $[b]$ - index corresponding to baseline scenario; $[fuel]$ - index corresponding to type of fossil fuel (coal, fuel oil or diesel oil); $[PP]$ - index corresponding to individual; $[LE]$ - index corresponding to legal entity.

Formula 9 – GHG emissions due to fossil fuel of "fuel" type combustion by consumers of "PP" type in period «y», in the baseline scenario (t CO_2e)	
	$BE_{b,fuel,PP}^y = \sum_{pp=1}^{PP} V_{fuel,PP}^y * NCV_{fuel}^y * k_{h,fuel} * \left(EF_{b,fuel}^y + k_{7,fuel} * CEF_{elec}^y \right)$
	$V_{fuel,PP}^y$ - Total fossil fuel of "fuel" type that would be combusted in period «y» by individual, in the absence of the project (t); NCV_{fuel}^y - Net calorific value of fossil fuel of "fuel" type, (TJ/ t); $EF_{b,fuel}^y$ - default carbon dioxide emission factor for permanent combustion of fossil fuel of "fuel" type, in the baseline scenario (t CO_2e /TJ); $k_{h,fuel}$ - adjusting factor; $k_{7,fuel}$ - Specific electricity saving in the course of heat carrier transportation to end consumer, (MWh/TJ); CEF_{elec}^y - GHG emission factor in case of electric power consumption reduction (t CO_2e /MWh); $[y]$ - index corresponding to monitoring period; $[b]$ - index corresponding to baseline scenario; $[fuel]$ - index corresponding to type of fossil fuel; $[PP]$ - index corresponding to individual.

Formula10 – adjusting factor	
	$k_{h,fuel} = \frac{k_{1,prepfuel}^p * k_{3,ef}^p * k_{4,pipes}^p}{k_{1,prepfuel}^b * k_{3,ef}^b * k_{4,pipes}^b}$,
	$k_{1,prepfuel}^b$ - factor that takes into account energy loss in the course of energy carrier preparation in the baseline scenario. Applicable in case of transit of individual or central heat supply systems to gas. $k_{1,prepfuel}^p$ - factor that takes into account energy loss in the course of energy carrier preparation in the project scenario. Applicable in case of transit of individual or central heat supply systems to gas. $k_{3,ef}^b$ - efficiency factor for boiler equipment that takes into account efficiency of heat generating units in the baseline scenario. Applicable in case of transit of individual or central heat supply

	systems to gas. $k^{p}_{3,ef}$ - efficiency factor for boiler equipment that takes into account efficiency of heat generating units in the project scenario. Applicable in case of transit of individual or central heat supply systems to gas. $k^{b}_{4,pipes}$ - efficiency factor that takes into account heat energy losses in the course of heat carrier transportation to end consumer, in the baseline scenario. Applicable in case of transit from central heat supply systems to individual heat supply systems. $k^{p}_{4,pipes}$ - efficiency factor that takes into account heat energy losses in the course of heat carrier transportation to end consumer, in the project scenario. Applicable in case of transit from central heat supply systems to individual heat supply systems. $[p]$ - index corresponding to project scenario; $[b]$ - index corresponding to baseline scenario.

Formula 11 – Total fossil fuel of "fuel" type that would be combusted in period «y» by individual, in the absence of the project (t)
$V^{y}_{fuel,PP} = V^{y}_{gas,PP} * \frac{NCV^{y}_{gas,}}{NCV^{y}_{fuel}},$
$V^{y}_{gas,PP}$ - Total natural gas combusted in period «y» by an individual,(ths m^3); $NCV^{y}_{gas,}$ - Net calorific value of natural gas, (TJ/ ths m^3); NCV^{y}_{fuel} - Net calorific value of fossil fuel of "fuel" type, (TJ/ t); $[y]$ - index corresponding to monitoring period; $[b]$ - index corresponding to baseline scenario; $[gas]$ - index corresponding to natural gas; $[fuel]$ - index corresponding to type of fossil fuel; $[PP]$ - index corresponding to individual.

Formula 12 – GHG emissions due to fossil fuel of "fuel" type combustion by consumers of «LE» type in period «y», in the baseline scenario (t CO_2e)
$BE^{y}_{b,fuel,LE} = \sum_{le=1}^{LE} V^{y}_{fuel,LE} * NCV^{y}_{fuel} * EF^{y}_{b,fuel} * k_{m,fuel},$
$V^{y}_{fuel,LE}$ - total fossil fuel of «fuel» type, combusted during «y» period by legal entity, (t); NCV^{y}_{fuel} - Net calorific value of fossil fuel of "fuel" type, in the baseline scenario (TJ/ t); $EF^{y}_{b,fuel}$ - default carbon dioxide emission factor for permanent combustion of fossil fuel of "fuel" type, in the baseline scenario (t CO_2e /TJ); $k_{m,fuel}$ - adjusting factor (relative units); $[y]$ - index corresponding to monitoring period; $[b]$ - index corresponding to baseline scenario; $[fuel]$ - index corresponding to type of fossil fuel; $[LE]$ - index corresponding to legal entity.

Formula 13 – adjusting factor

	$k_{m,\,fuel} = \frac{k^{p}_{1,\,prepfuel}}{k^{b}_{1,\,prepfuel}},$
	$k^{b}_{1,\,prepfuel}$ - factor that takes into account energy loss in the course of energy carrier preparation in the baseline scenario (relative units). Applicable in case of transfer of individual or central heat supply systems to gas; $k^{p}_{1,\,prepfuel}$ - factor that takes into account energy loss in the course of energy carrier preparation in the project scenario (relative units). Applicable in case of transfer of individual or central heat supply systems to gas; $[p]$ - index corresponding to project scenario; $[b]$ - index corresponding to baseline scenario.

Formula 14 – total fossil fuel of «fuel» type, combusted during «y» period by legal entity, (t)	
	$V^{y}_{fuel,LE} = V^{y}_{gas,LE} * \frac{NCV^{y}_{gas}}{NCV^{y}_{fuel}},$
	$V^{y}_{gas,LE}$ - Total natural gas combusted in period «y» by legal entity (ths m^3); NCV^{y}_{gas} - Net calorific value of natural gas, (TJ/ ths m^3); NCV^{y}_{fuel} - Net calorific value of fossil fuel of "fuel" type, (TJ/ t); $[y]$ - index corresponding to monitoring period; $[b]$ - index corresponding to baseline scenario; $[gas]$ - index corresponding to natural gas; $[fuel]$ - index corresponding to type of fossil fuel; $[LE]$ - index corresponding to legal entity.

D.1.3. Formulae for calculation of GHG emission reductions:

Total emission reductions are the difference between the baseline and project emissions.

Formula 15 – Quantity of Emission Reduction Units (ERU)	
	$ER^{y} = BE^{y}_{b} - PE^{y}_{p},$
	BE^{y}_{b} - GHG emissions due to use of outdated system of energy carrier supply, in period «y», in the baseline scenario (t CO_2e); PE^{y}_{b} - GHG emissions due to use of new system of energy carrier supply, in period «y», in the project scenario (t CO_2e); $[y]$ - index corresponding to monitoring period; $[b]$ - index corresponding to baseline scenario; $[p]$ - index corresponding to project scenario.

D.2. Results of the GHG emission reductions monitoring

D.2.1. GHG emissions in the project scenario

The following GHG emission volumes were achieved in the reporting period as a result of the implementation of measures under the project:

Monitoring period	Total project emissions, tCO_2e
(01/01/2012 – 31/05/2012)	1 205 195
Total	**1 205 195**

D.2.2. GHG emissions in the baseline scenario

Emissions that would occur in the absence of implementation of measures under the project are the following:

Monitoring period	Total baseline emissions, tCO_2e
(01/01/2012 – 31/05/2012)	1 847 756
Total	**1 847 756**

D.2.3. Leakages:

According to the methodology provided in the determined PDD, version 02, there are no leakages related to this project.

D.2.4. Emissions reduction due to the project implementation in the monitoring period:

Emission reductions due to the project implementation are calculated as the difference between the baseline and the project emissions.

Monitoring period	Emission reductions, tCO_2e
(01/01/2012 – 31/05/2012)	642 561
Total	**642 561**

To estimate GHG emission reductions, values of some parameters (net calorific values of all types of fuels, carbon emission factors when fuel combustion takes place, carbon oxidation factors when fuel combustion takes place) provided in the "National inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases in Ukraine for 1990-2009"[27], submitted by the State Environmental Investment Agency of Ukraine to the UNFCCC on 06/08/2011 (the latest version at the time of PDD elaboration) were used. At the same time, in accordance with the approved monitoring methodology in the PDD, to calculate the number of ERUs for each reporting year of the monitoring period, actual values for each year were used. In addition, forecasted gas volumes and the number of consumers were used to estimate GHG reductions in the PDD. Therefore, the actual calculated amount of emission reductions for each project year is slightly different from those values provided in the PDD.

[27] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2011-nir-08jun.zip

Annex 1 – Parameter values of the project monitoring for the period of 01/01/2012 - 31/05/2012

Parameter		Year
		2012*
$V^{y}_{gas,PP}$, ths m^3	**Total natural gas consumed by individuals**	**211788,52**
Incl. by departments and administrations:		
Odesa interdistrict (hereinafter OI) gas facilities operation administration (hereinafter GFOA)		45304,50
Ananiev GFOA		1665,24
Balta GFOA		5552,41
B. Dnistrovskyi GFOA		561,27
Berezansk GFOA		15665,73
Illichivsk GFOA		9060,08
Izmail GFOA		24533,02
Liubashivka GFOA		4226,33
Rozdilna GFOA		18517,60
Shyriaievo GFOA		7538,33
Artsyz GFOA		1087,75
Ivanivka GFOA		3075,61
Kotovsk GFOA		9735,02
Ovidiopol GFOA		25799,01
Reni GFOA		7904,15
Odesa GFOA		31417,94
Bolgrad GFOA		144,53
$V^{y}_{gas,LE}$, ths m^3	**Total natural gas consumed by legal entities**	**377103,62**
Incl. by departments and administrations:		
OI GFOA		27869,61
Ananiev GFOA		802,53
Balta GFOA		707,85
B. Dnistrovskyi GFOA		6027,28
Berezansk GFOA		1442,92
Illichivsk GFOA		20818,06
Izmail GFOA		10570,96
Liubashivka GFOA		1030,48
Rozdilna GFOA		4460,22
Shyriaievo GFOA		1114,04
Artsyz GFOA		519,62
Ivanivka GFOA		528,14
Kotovsk GFOA		1997,26
Ovidiopol GFOA		1700,20
Reni GFOA		678,66
Odesa GFOA		296835,79
$L^{y}_{p,los,1}$, ths km	**Length of gas distribution systems implemented under the project**	0,83920

NCV^{y}_{gas}, TJ/ths m^3	**Net calorific value of natural gas**	0.0338[28]
NCV^{y}_{fuel}, TJ/ t	**Net calorific value of coal**	0.0214[28]
NCV^{y}_{fuel}, TJ/m^3	**Net calorific value of fuel oil**	0.0405[28]
$k^{c}_{p,gas}$, t C/TJ	**Carbon emission factor for natural gas combustion**	15.17[28]
$k^{o}_{p,gas}$, Relative units	**Carbon oxidation factor for natural gas combustion**	0.995[28]
k^{c}_{fuel}, t C/TJ	**Carbon emission factor for coal combustion**	25.3[28]
k^{o}_{fuel}, Relative units	**Carbon oxidation factor for coal combustion**	0.98[28]
k^{c}_{fuel}, t C/TJ	**Carbon emission factor for fuel oil combustion**	21.1[28]
k^{o}_{fuel}, Relative units	**Carbon oxidation factor for fuel oil combustion**	0.99[28]
CEF^{y}_{elec}, tCO$_2$/ MWh	**Carbon dioxide emission factor when electricity consumption is reduced**	1.09[29]
$EF^{y}_{CH_4,p,los,2}$, t CH$_4$/TJ	**Default methane emission factor at technological gas equipment at end consumer's place**	0.1395[30]
$EF^{y}_{CH_4,p,los,1}$, t CH$_4$/ths km	**Default methane emission factor for natural gas transportation and distribution**	820[30]
$CEF^{y}_{gas,unit}$, t CO$_2$/ths.m^3	**Reduced GHG emission factor in the course of natural gas transportation to end consumers**	0,052327[31]

* The values are provided for the period of 01/01/2012- 31/05/2012

[28] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[29] http://www.neia.gov.ua/nature/doccatalog/document?id=127498
[30] http://unfccc.int/files/national_reports/annex_i_ghg_inventories/national_inventories_submissions/application/zip/ukr-2012-nir-13apr.zip
[31] Supplying document "Annex 3. Calculation of GHG emission reductions due to gasification of Odesa region" (3: 3.1-3.18)