



MONITORING REPORT

Project: BG 1000151 Reduction of Greenhouse Gases by Gasification of Sofia Municipality

Project proponent:	Overgas Inc. AD, 5 Philip Kutev str.; Sofia - 1407, Bulgaria
Verification period:	1st January 2012 – 30st November 2012
Emission reductions:	80 914 tCO₂e
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ABBREVIATIONS

AAU	Assigned Amount Unit
AGDS	Automated Gas Distribution Station
CRM	Customer Relationship Management
ELM	Equipment Lifecycle Management
ERU	Emission Reduction Unit
FSERF	Fuel Switch Emission Reduction Factor
GDC	Gas Distribution Company
GDCIMS	Gas Distribution Companies Information Management System
GDN	Gas Distribution Network
GIS	Geographic Information System
GMB	Gas Measuring Board
GMS	Gas Measuring Station
GRB	Gas Regulation Board
GRMB	Gas Regulation and Measuring Board
GRMS	Gas Regulation and Measuring Station
GRS	Gas Regulation Station
LHV	Low Heating Value
LHV _{av}	Average Low Heating Value
PDD	Project Design Document
SAMTS	State Agency for Metrology and Technical Surveillance
SCADA	Supervisory Control and Data Acquisition

1. GENERAL INFORMATION FOR THE PROJECT

The project BG 1000151 is implemented under the Track 1 procedure is implemented under the Joint Implementation (JI) mechanism of the Kyoto Protocol according to the contract ERU 04/01 between the Kingdom of the Netherlands and Overgas Inc. The project has been granted Letters of Approval by the Republic of Bulgaria and the Kingdom of the Netherlands and has passed an Initial and three Periodic Verifications.

This JI project is implemented under the technical scope Fuel Switch and aims at reduction of greenhouse gases by:

- fuel switch from liquid and solid fuels and part of the electricity used by industrial, public and administrative consumers and households to natural gas;
- improvement of the energy efficiency of the combustion installations of the end-users.

The Project design document (PDD) of the project has been subject to Determination by KPMG Sustainability B.V. A Determination report states that the PDD has been prepared in accordance with the rules and requirements of Article 6 of the Kyoto Protocol and the guidelines for the implementation of Article 6 of the Kyoto Protocol in the Marrakech Accords (FCCC/CP/2001/13/ADD.2).

The project has been subject of Initial, First, Second, Third, Fourth and Fifth Periodic Verification by TÜV SÜD Industrie Service GmbH. A sixth periodic verification will take place in the year 2012 based on this Monitoring report encompassing the period 1 January – 30 November 2012.

The project implementation envisages the generation of 728 590 Emission Reduction Units (ERUs) in the period 2008-2012.

The ERUs are generated by fuel switch from solid and liquid fuels and electricity to natural gas and by improvement of the energy efficiency of the combustion installations of the industrial, public and administrative, and residential end users. The production, transportation and distribution of the electricity replaced by natural gas are included within the project boundaries as it is described in the PDD (*Annex 1: Block scheme of the fuels' supply after gasification and project boundaries*). Its emission factors are calculated particularly for Bulgaria and are approved and officially published by the Ministry of Environment and Water for use in Joint Implementation projects¹.

Due to the negligible leakages during the transportation and delivery of the solid and liquid fuels, the intermediate storehouses for storage and sale are not included in the project boundaries. The natural gas leakages are also not included in the project boundaries since the constructed GDN is new, with high quality and reliability, and since the anticipated leakages are insignificant.

From 1 January 2012 to the 30 November 2012 the amount of natural gas delivered to the end users reached **77 305.118** thousand sm³. During the monitoring period **80 914 ERUs** have been generated.

Brief Description of project activity

Sofiagas AD has licenses up to 17 December 2039, issued by SEWRC, for the activities "Natural Gas Distribution" and "Natural Gas Delivery by End-Supplier" for Sofia Municipality.

¹ Baseline study of Joint Implementation projects in the Bulgarian energy sector. Carbon emission factor, April 2005, http://www.moew.government.bg/recent_doc/climate/Baseline%20CEF%20Summary.pdf

In the year 2012 new 17.1 km of gas distribution network and gas branches have been constructed on the territory of the project and 89% of the planned kilometres are reached.

Indicator	Total for the project	Completed in 2011	Completed until the end of 2011	In the period 2004-2012, %
Constructed GDN and GB, km	583.4	17.1	520,1	89,15%

Table 1: Constructed GDN and GB, km

Information about the number of active users by sectors at the end of 2011 and at the end of 2012 is presented in Table 2:

Sectors	2011	2012
Industrial	67	70
Public and Administrative	323	313
Residential	14647	16408
Total for all sectors	15037	16792

Table 2. The number of end users by sectors

The decreasing of the number of users in public and administrative sector is a result of economical crisis (termination of activity). The increasing of end users in residential sector is a result of successful advertising campaign „Home line“ and promotions.

For the period from 01.01.2012 until 30.11.2012 supply of natural gas from the national supplier – Bulgargas EAD to the GDN of "Sofiagas" AD in Sofia Municipality is not interrupted. "Sofiagas" AD has provided for that period in Sofia Municipality continuous supply of natural gas to its customers through implementation of planned maintenance of GDN and all related facilities. Detailed information about these prevention activities is provided in item 5.4.

Short interruptions of gas supply for a limited number of clients has only to prophylactic and/or repair, when it is technically required, such as replacement of measuring device. In these cases, customers are notified in advance in an appropriate manner.

In 2012 there were a limited number of interruptions of natural gas supply in some short sections of the network due to failures of the pipeline network. In item 5.6 more detailed information on the number and nature of accidents is presented.

As a consequence of external factors beyond the control of Overgas Inc. (the extremely warm autumn, the continuing economic crisis and the raising of the price of natural gas) there is certain slow-down of the consumption of natural gas. As the GHG emission reductions depend in direct proportion on the gas deliveries there is a reduction in the ERUs generation during the summer and autumn of 2012 in comparison with the same period of 2011.

2. MAIN PRINCIPLES OF THE MONITORING PLAN

The Monitoring Plan described in the PDD is based on the following principles:

- The total annual natural gas consumption by the end users by sectors is used as an activity indicator to control and determine the greenhouse gas emissions during the project implementation;
- The fuel switch emission reduction factor (FSERF) is used for converting the amount of delivered natural gas to the end users into ERUs for each sector;
- The FSERFs take into account the fuel switch effect and the reduced energy consumption due to the increase of the efficiency of the combustion installations;
- The natural gas amounts delivered to the end users in the three sectors are taken into account for the calculation of the total amount emission reductions generated by the project;
- The fulfilment of the contractual amount of ERUs is determined on the basis on the realized emission reductions;

- At constant low heating value, the change in the natural gas composition does not lead to change in the carbon dioxide emission factor. On an energy base the carbon dioxide emission factor is identical for all kinds of natural gas independently of its quality;
- In case of a change in the low heating value of the delivered natural gas, a recalculation of natural gas amounts is made according to the low heating value used for the calculations in the PDD.

The monitoring of the JI project is performed by the personnel of the 'Ecology and sustainable development' Department of Overgas Inc. The employees have a high educational qualification and have participated in additional specialized trainings in the field of greenhouse gas emissions trading, environmental management systems, quality management systems, environmental impact assessment, etc.

3. REPORTING AND MANAGEMENT SYSTEMS

The **Gas Distribution Companies Information Management System (GDCIMS)** includes the modules **Customer Relationship Management (CRM)**, **Billing**, **Equipment Lifecycle Management (ELM)**, **Reports** and **Informations**.

The **CRM** module manages the database of all clients, including data for the combustion installation. The module serves also for tracking the customer's status – it displays the stage of customer's connection. The **CRM** module allows automatic issuing, generation and printing of documents and contracts. It contains statistic and marketing data for the users – site type, gas pressure data, mode of use, level of continuity, agreed and consumed amounts of natural gas, etc. In the module data for the appliances which use natural gas – type of the gas appliances and their main technical parameters are entered.

The **Billing** module uses a database for the consumption of natural gas by clients, generates invoices and allows remote control of the activities of natural gas delivery to the end users. The module works with data base which contains the main information necessary for the GDC's financial relations with the customer. The **Billing** module allows automatic invoice generation, which is made after conclusion of series of reports in the **Reports** module and printing letters of notification and bills for invoices. The payments are also indicated in it.

ELM is an information module for maintenance of the networks and the devices. It allows generation of information about the equipments in the GDN. The information contains data about the address and the factory number of each equipment, maximum hourly consumption, input and output pressure, date of exploitation initiation, manufacturer and type of gas meter, etc. The module tracks the elements for electric and chemical protection and the status of the odorizing system. The module also generates information about exploitation status of the GDN, inspection and setting, as well as determined revision with disassembling of the equipment of the GDN.

The **Reports** module serves for preparation of various informations. The readings of the gas meters of the end users are input in this module for the calculation of their monthly consumption of natural gas.

The **Informations** module generates various informations using the data managed by the other modules. This module is used for the generation of the data for the natural gas consumption by sectors, used for the calculation of the ERUs generated by the project.

All information modules use unified geographic information system (GIS) and data base.

The Automated System for Dispatch Control Overcomm 2.0 of the **SCADA (Supervisory Control and Data Acquisition)** system contributes for the high reliability of the measurements and accuracy of the data of controlled variables: pressure, temperature and consumption. It reports occurrence of deviations from the technological parameters in the value of measured parameter and deviations in the operation of the measuring devices. The

dispatch management is centralized; it is based in Sofia and it services all the GDCs affiliates of Overgas Inc. AD.

4. QUALITY MANAGEMENT AND ASSURANCE SYSTEM

The Quality Management System developed in Overgas Inc. AD allows for the proper documentation and management of the activities done in the company and Sofiagas AD. The personnel is acquainted with and trained to implement and follow the approved procedures, instructions and work documents in the scope of their activity.

The maintenance of **GDCIMS** and Overcomm 2.0 systems, as well as the activities relevant to the exploitation, technical maintenance and servicing of the GDN and to the control over the deliveries of natural gas are performed in accordance with the unified quality management system of Overgas Inc. and the GDCs. The procedures from the QMS are in compliance with the existing national legislation regulating the activities of Sofiagas EAD. All activities are implemented by the appropriate staff in the company, which is selected and trained in accordance with the above mentioned procedures.

The QMS includes also a procedure for selection of employees requiring a high degree of education, professional experience, knowledge and skills for occupying a particular position and a procedure for further increase of staff's qualification through motivation trainings and seminars, conference participations, work meetings for experience exchange, etc.

A list of the procedures and instructions of Overgas Inc.'s quality management system that are related to the monitoring of the JI project BG 1000151 is presented in *Annex 2: List of the applicable procedures and instructions from the Quality management system*.

Brief information about the quality control and quality assurance procedures relevant to the exploitation, technical maintenance and servicing of the GDN and to the control over the deliveries of natural gas is presented below in the respective sections of the monitoring report.

5. PARAMETERS MEASURED AND MONITORED

For the preparation of the Monitoring report data were used from the monitoring and the measurement results of:

- Amounts of natural gas entered into the GDN – measured monthly at the Automated Gas Distribution Stations;
- Average low heating value of the natural gas – measured monthly by a licensed laboratory of the Public supplier Bulgargas EAD;
- Amounts of natural gas transmitted and delivered to the end users by sectors – measured monthly at each user's gas measuring station or board.

5.1. Data archiving

The data about the amount of natural gas delivered to the end users, as well as other data, necessary for the elaboration of the Monitoring report, are entered, stored and archived in the GDCIMS by authorized employees of Overgas Inc. and/or the Sofiagas EAD.

This information system contains all the information relevant to the technical maintenance and the consumption of natural gas by each client of the GDC from the stage of preliminary survey.

All the information entered in the modules of the ISMGDC is stored on a back-up hard drive at Sofiagas EAD. The data are subsequently recorded on servers and a back-up copy is made on a back-up server every day.

Paper and digital copies of the Monthly acts for delivery and Certificates of Natural gas from Bulgargas EAD are archived and stored at Sofiagas EAD and at Overgas Inc.'s headquarters.

Paper copies of the monthly invoices and acts for delivery to every user are stored at Sofiagas EAD, while digital copies can be generated by the IMSGDC.

All the documentation regarding the BG 1000151 JI project, relevant to the determination, monitoring, reporting and verification of the project is archived and kept on paper and digital copies at the *Ecology and Sustainable Development Dept.* This information will be submitted to the company's Archive after the project implementation.

5.2. Measurements of the monthly amounts of natural gas that enters into to GDN and the gas' low heating value

The measurement of the natural gas delivered by Bulgargas EAD is performed monthly on the basis of a contract for delivery signed with Sofiagas EAD. The delivered amounts are measured at the GMS, by gas meter and electronic volume corrector, property of Bulgargas EAD.

A general block scheme of the natural gas supply to the GDN of Sofiagas is presented in *Annex 1*. To improve the management of the process of distribution and delivery of natural gas to the end users at part of the sites for measurement of the monthly amounts of natural gas incoming in the GDN electronic volume correctors, property of Sofiagas EAD are also installed. The devices are of the same type as the ones of Bulgargas EAD. They are connected to GPRS modems which transmit in real time to the Central Dispatch Management via the GSM network data for gas consumption, temperature and pressure. The devices store archives with hourly, daily and monthly data for the amounts of natural gas and the technological parameters of the gas.

With regard to the amounts of natural gas that enters into the GDN monthly, a **Delivery Statement** is prepared and signed by both parties. The Delivery Statement includes information about the natural gas amount preliminarily ordered by the GDC and the actual amount invoiced and received. Copies of the acts are presented in *Annex 3: Acts for volume of natural gas delivered by Bulgargas EAD for monitored period of 2012*.

The monthly Delivery Statements are obligatorily accompanied by monthly **Average certificate of the natural gas** issued by Bulgargas EAD. This certificate includes information about the composition of the natural gas and its low heating value (LHV). Copies of the certificates are presented in *Annex 4: Certificates of natural gas delivered by Bulgargas EAD to Sofiagas EAD in 2012*.

For taking into account the influence of the low heating value of the natural gas delivered by Bulgargas EAD over the greenhouse gas emission reductions realized, the annual weighted average of the natural gas low heating value is calculated on the basis of the monthly certificates and the monthly statements for natural gas delivery.

5.3. Measurement of the monthly amount of transported and delivered natural gas to the end users

The conditions and the order for reporting the delivered by each GDC natural gas amounts are regulated by **Rules for working with the users, General terms and conditions for selling natural gas to users for residential needs, Contract for distribution and delivery of natural gas**, and **Contract for transportation**.

The natural gas amounts are measured in cubic meters at standard conditions. "Cubic meter at standard conditions" means the amount of natural gas in a volume of one cubic meter at a temperature of 293.15 K and absolute pressure of 0.101325 MPa.

According to the **Rules for working with the users** and **Instruction I10-6.3-102 for correction of the readings of natural gas consumption-measuring systems** from Overgas Inc. AD's quality management system, two methods are applied to transform the measured amounts of natural gas into standard conditions:

- Use of special devices called volume correctors;

- Use of a fixed factor, based on the meteorological characteristics of the respective geographic area.

The transformation of the measured natural gas amounts into standard conditions for the industrial users is done using volume correctors within the measuring devices. The measurement of the amounts of natural gas delivered to the residential and "small" industrial users (at 100 mbar pressure and maximum hourly consumption less than 25 m³/h) is done with the fixed factor, whose definition is described in the **Rules for working with the users** and in the **PDD**.

In the presence of a volume corrector within the measuring device, the volume of the gas consumed V_{st} is read directly from the electronic corrector or from the counter of the gas meter if it is equipped with a built-in temperature mechanical corrector.

In the absence of a volume corrector within the measuring device, the volume of the natural gas consumed is calculated by the formula:

$$V_{st} = V_p * K_{tp} \quad (1),$$

where:

V_p the natural gas amount read on the gas meter;

K_{tp} the product of the temperature (K_t) and pressure (K_p) correction factors.

The natural gas consumption of the users in the industrial, public and administrative, and residential sectors is read manually every month by employees of Sofiagas EAD. In case of an industrial or institutional client the reading of the metering device is done in the presence of a representative of the client, who confirms the accuracy of the reading. These users receive a monthly statement about the amount of natural gas delivered which is signed by the client and a representative of Sofiagas EAD.

The readings of the gas meters are recorded in a protocol, which also contains the ID of the gas meter of the respective user and the gas meter's readings of the previous month. The consumption data for each user are typed manually in the **Reports** module of the GDCIMS by authorized employee of the GDC. The **Billing** module of this system serves for generation of monthly invoices for all users in the three sectors.

5.4. Accuracy of the measurement data and measurement reliability

The high accuracy of the measurements of different parameters and data is guaranteed by the reliable and precise work of the gas meters, manometers, temperature converters, electronic correctors and pressure converters at the Gas Regulation Stations (GRS), Gas Regulation Boards (GRB), Gas Measuring Stations (GMS), Gas Measuring Boards (GMB), Gas Regulation and Measuring Stations (GRMS) and Gas Regulation and Measuring Boards (GRMB).

The delivered amounts of natural gas to the end users are measured on the user's property borderline with measurement devices (gas meters), which are subject to a type approval, to an initial control and to a subsequent periodic control in a defined time interval according to the legislation of the Republic of Bulgaria.

The devices for natural gas measurement (gas meters) are subject to check-up by the State Agency for Metrology and Technical Surveillance (SAMTS) or an authorized person as per art. 43, par. 4 of the **Law on Measurements** in the terms, defined with an Order of the chairman of SAMTS.

As per Order № A-441 of 13 October 2011 of the chairman of SAMTS the regularity for check-ups of the volume gas meters with deformable chambers (diaphragm) is four years and for roots bodies (pistons) and turbine gas meters for gas and additional devices for them is two years.

For measurement of the users' natural gas consumption, Sofiagas EAD is using diaphragm, roots and turbine gas meters. The company has a certificate for gas meters type approval, as

well as a passport with ID for each device. Sofiagas EAD prepares annual schedules for subsequent metrological control of the measurement devices. For 2012 the metrological check-ups of 5000 diaphragm and 155 roots and turbine gas meters have been scheduled.

In 2012 metrological check-ups of **5002** diaphragm and **149** roots and turbine gas meters for natural gas have been performed.

The metering devices of Bulgargas EAD measuring the amount of natural gas entering into the GDN, which are used as cross-check parameter for the plausibility of the total consumption, are also calibrated.

If a metering device or a volume corrector without correct calibration is identified, the device is disassembled and sent to a licensed laboratory for metrological check. Such devices are replaced by calibrated devices at the moment they are disassembled.

In case of failure of a metering device or a volume corrector, an average correction factor is applied for the determination of the consumption by the user. This factor is calculated using the consumption by similar users with similar metering devices in the same area or the consumption by the same user in the same month the previous year. A bilateral protocol stating the agreed consumption of natural gas is issued and signed by the consumer and a representative of the GDC. There aren't any events of this type occurred in 2012.

The reliability of the measured parameters is guaranteed by the implementation of **Instruction G-02.02.04 for execution of technical maintenance of devices on GDM** of Overgas Inc. AD. According to this instruction, the technical service and repair of the GRSs, GRBs, GRMSs and GRMBs should be requested by the GDCs. The regularity, scope and responsibilities for servicing and maintenance of the technical devices for measurement of natural gas amounts are described in the instruction.

In conformity with this instruction, revision with disassembling the equipment is performed with regard to the integrated system for centralized repair by the service company Overgas Service AD on the basis of contracts with Sofiagas EAD and annual **Schedules for revision with disassembling the equipment in the GDN devices (annex II to the Instruction G-02.02.04)**, co-coordinated and approved by Sofiagas EAD. For each revision with disassembling a bilateral **Statement for performed revision with disassembling and setting the equipment in GDN devices** is prepared by Overgas Service AD. In 2011 a total number of 126 revisions including disassembling and setting the equipment in devices in the GDN of Sofiagas EAD were performed and the respective acts have been issued.

In accordance with **Instruction G-02.02.04**, the data from the signed Acts is recorded in the **Exploitation register (working document G-02.02.04-RD1)** information for every technical servicing of the equipment is performed.

From 01.01.2012 to 30.11.2012, preventive maintenance of 3370 equipment on the GDN was performed (GRSs, GRBs, GRMSs, GRMBs, GMSs and GMBs) in order to ensure the continuity of the gas supply and the reliability of the equipment operations in the GDN. During this preventive maintenance taps, filters, valves and gaskets of the equipments were checked and in case of necessity were replaced.

5.5. Balance of the amount of natural gas which entered into the GDN and delivered to the end users

According to **Procedure P 03.00.00-2 for Control of Natural Gas Retail Sales** the amount of natural gas delivered to the clients and the amount of natural gas that entered into the GDN are compared. The data are collected from the GDCIMS and from the monthly statements of Bulgargas EAD, and the reasons for the deviations are analyzed. The main reason is the different time of reporting. The monthly amounts of natural gas delivered to the GDCs are compared also to the data for the weekly amounts, which are received by the SCADA dispatch system in order to serve for the preparation of weekly operation reports.

The balance of the amount of natural gas input into the GDN and delivered to the end users of Sofiagas EAD from 01.01.2012 to 30.11.2012 is presented in *Table 3*. The balance is prepared on the basis of the registered data for the natural gas amounts at the entrance and at the exit of the GDN. The data is collected from the GDCIMS and from the monthly statements of Bulgargas EAD.

	Natural gas, thousand sm³	%
Entered into the GDN	77311.055	100.0 %
Delivered to the users	77305.118	99.992 %
Difference	5.937	0.008 %

Table 3: Balance of natural gas amounts, entered into the GDN and delivered to the end users of Sofiagas EAD from 01.01.2012 to 30.11.2012

The difference between the amounts of natural gas at the entrance and at the exit of GDN of Sofiagas EAD is insignificant and due to the different time of reporting. The simultaneous reporting of the readings for all end users is impossible, since the users' gas regulation and measuring stations and boards do not have remote reading. The natural gas amount needed for initial filling when commissioning large GDN sections also leads to deviations in the parameters.

The balance of the amounts of natural gas at the entrance and at the exit of GDN confirms the plausibility of the total gas consumption of the users.

5.6. Insignificance of the leakages, procedures for prevention and accidents' elimination

According to **Instruction G-02.02.02 for Technical maintenance of linear parts of GDN** walk-through checks for breaking the integrity of the gas pipelines and for gas leakages and check-ups of the equipment status, etc. were performed daily, weekly, monthly or on every three months depending of the location of the pipelines. At the end of each walk-through check the information is recorded into the **Exploitation diary (working document G-02.02.02-RD1)**.

The deviations from the normal operation of the measuring devices and the telecommunications reported by the **SCADA** system are registered in **Form for the current status of the equipment or a part of the GDN (working document F5-I1-6.3-012)** and **Failures of the telecommunication devices and the automated system for dispatch management (working document F6-I1-6.3-012)**. According to the information in these documents, occurrence of any deviations or failures in the functioning of the equipment and sections of the GDN, as well as of the telecommunications are dully watched and eliminated so their normal operation is restored.

From 01.01.2012 to 30.11.2012 totally **130 km** underground gas pipeline networks were investigated for natural gas leakages. According to the elaborated Statements for inspection for leakages in the GDN in 2012 no cases of leakages in the tap of gas pipeline branch have been found.

The cases of natural gas leakage along the GDN are very rare and are due to accident leakages after breaking a distribution pipeline and to the scavenging before repairs and connections. The accidents are registered by Sofiagas EAD in Statements of ascertainment.

According to the information for accidents from 01.01.2012 to 30.11.2012 from the Statements of ascertainment for the accidents occurred, the amounts of natural gas leaked are minimal there are 91 cases of accidents in the GDN and 76 of them are related to natural gas accidental leakage.

Information for the natural gas leakages during the accidents from 01.01.2012 to 30.11.2012 is presented in *Table 4*.

	2012
Amount of natural gas leaked, thousand sm ³	46.174
Amount of natural gas entered into the GDN, thousand sm ³	77311.055
Share of the natural gas leakages, %	0.06%

Table 4: Data for the amount of natural gas leaked during accidents in the GDN from 01.01.2012 to 30.11.2012.

6. PROCEDURES FOR EMERGENCIES

The actions in case of occurrence of large-scale accidents are regulated in compliance with the document **Plan for rescue, emergency and reconstruction works on the territory of GDC (Annex 2 to Procedure P 02.00.00-3)**. The plan includes preventive actions for non-admission of accidents' occurrence, forecasting the type and the consequences of accidents in the GDN, defining the actions and the obligations of the operational personnel.

In accordance with the legislation the activities in GDC in time of accidents and emergency situations are implemented following **Procedure P 02.00.00-3 for elimination of an accident and its consequences**. In case of accident or emergency situation, information for the implemented changes and the reasons for them are elaborated, as well as protocols after investigating the reasons for the accidents occurred. In case of accident or emergency situation Sofiagas EAD cooperates also with the users, the public supplier Bulgargas EAD and the state and municipal bodies.

The emergency readiness of Sofiagas EAD is ensured by the development of an Emergency plan. This Emergency plan is agreed following the respective order with the Regional Service for Fire and Emergency Safety and with Civil Protection. Sofiagas EAD provides for the emergency technical equipment and instrumentation, as well as an emergency reserve of technological materials – elements of the GDN and implements control over the emergency readiness – over the status of the technical equipment, the reserve and the efficiency of actions on the emergency plan. The emergency readiness in the GDC is regulated also by the state legislation and is subject of periodical planned and sudden control.

7. PROCESSING OF INITIAL DATA

The data on the amount of natural gas delivered to the end users is received in Overgas Inc. AD monthly according to the **Procedure P 03.00.00-2 for Control of Natural Gas Retail Sales**. They are entered into the GDCIMS by authorized employee of Sofiagas EAD. The data about the amount of consumed natural gas in each sector, used for the calculation of the generated greenhouse gases emission reductions of the project, are taken from the **Information** module of the GDCIMS.

To report the influence of the low heating value of the natural gas delivered, the amount of the consumed natural gas had to be corrected as it is envisaged in the Monitoring plan of the PDD. Toward that goal, a correction factor was used.

The data on the amount of the delivered natural gas by Bulgargas EAD in the Monthly Statements on delivery and the average low heating value of the natural gas in the Certificates of the natural gas are used for calculation of the correction factor. The correction factor calculation is made according to **Formula 2** and **Formula 3**.

The average weighted value of natural gas's low heating value **LHV_{av}** is calculated on the basis of the monthly certificates and the monthly statements on delivery of natural gas to Sofiagas EAD by Bulgargas EAD.

$$LHV_{av} = \sum Q_{NG\ m} * LHV_{NG\ m} / Q_{NG\ y} \quad (2),$$

where:

$Q_{NG\ m}$ is the amount of natural gas delivered for the month m in 1000 sm^3 ;
 $LHV_{NG, m}$ is the low heating value of the natural gas during the month m in GJ/1000 m^3 ;
 $Q_{NG\ y}$ is the amount of natural gas delivered for the year y in 1000 sm^3 ;

The correction factor for taking into account the influence of the low heating value of the delivered natural gas K is calculated according the formula:

$$K = LHV_{av} / LHV_{NG} \quad (3)$$

where:

LHV_{NG} is the low heating value of the natural gas, used in the calculations in the PDD in GJ/1000 m^3 .

Information about the amounts entered into the GDN and its low heating value by months from the monthly statements and the certificates of the natural gas is presented in *Table 4*. The calculated annual weighted average of the LHV from 01.01.2012 to 30.11.2012 is also presented in the table.

Month	Natural gas entered into GDN, thousand sm^3	LHV, kcal/m^3
January	16427.161	8094
February	16890.396	8043
March	10375.892	8040
April	5503.371	8095
May	3647.744	8059
June	3206.302	8074
July	2845.192	8050
August	2941.371	8039
September	2923.533	8043
October	3875.148	8052
November	8674.945	8105
December	-	-
Total	77311.055	-
LHVav	-	8066.690

Table 5: Amounts of natural gas entered into the GDN and low heating value of the gas from 01.01.2012 to 30.11.2012.

The data for calculation of the correction factor K from 01.01.2012 to 30.11.2012 are presented in *Table 6*.

Average low heating value of the delivered natural gas, kcal/ m^3	8066.690
Average low heating value of the delivered natural gas, GJ/1000 sm^3	33.774
Low heating value of the natural gas used in PDD, GJ/1000 sm^3	34,000
Correction factor for taking into account the influence of the low heating value of the natural gas	0.9933

Table 6: Correction factor for taking into account the influence of the natural gas low heating value from 01.01.2012 to 30.11.2012.

8. CALCULATION OF THE EMISSION REDUCTIONS

According to the monitoring plan, the amount of greenhouse gas emission reductions is calculated by multiplying the annual consumption of natural gas in each sector by the FSERF for the respective sector for the reported year. For reporting, the amounts of natural gas delivered to the end users in every sector are corrected by a factor taking into account the low heating value of the gas.

8.1. ERUs generated by the project

The amount of the emission reductions generated in the year is calculated by the formula:

$$ERU_{z,y} = FSERF_{z,y} * Q_{NG\ z,y} * K(4),$$

where:

$ERU_{z,y}$ is the amount of emission reduction units for the year **y** in the sector **z** , tCO₂e;
 $FSERF_{z,y}$ is the fuel switch emission reduction factor for sector **z** , for the year **y** , tCO₂e/1000sm³;
 $Q_{NG\ z,y}$ is the amount of natural gas delivered to sector **z** , in the year **y** , 1000 sm³;
 K is the correction factor for taking into account the change of the low heating value of the delivered natural gas.

The amount of natural gas delivered to the end users by Sofiagas EAD from 01.01.2012 to 30.11.2012 is **77305.118** thousand sm³. The calculations of the greenhouse gas emission reductions for this period of 2012 are presented in Table 7.

Sector	Natural gas consumption, thousand sm ³	Correction factor for 2012	Corrected natural gas consumption thousand sm ³	FSERF, tCO ₂ /thousand sm ³ for 2012	Greenhouse gas emission reductions, tCO ₂ e
Industrial sector	42800.967	0,9933	42515.983	0.96	40619
Public and administrative sector	14419.293	0,9933	14323.284	0.70	10022
Residential sector	20084.858	0,9933	19951.126	1.52	30273
Total	77305.118		76790.393		80914

Table 7: ERUs realized from 01.01.2012 to 30.11.2012, tCO₂e

In the Table 8 is presented comparison between monitored ERUs from 01.01.2012 to 30.11.2012 and estimated amount of ERUs in PDD. The main deviations are observed in Industrial and Residential sectors.

Sector	Greenhouse gas emission reductions in monitored period, tCO ₂ e	Estimated greenhouse gas emission reductions in PDD for all 2012 tCO ₂ e
Industrial sector	40619	77748
Public and administrative sector	10022	14590
Residential sector	30273	65562
Total	80914	157900

Table 8: Comparison between ERUs realized from 01.01.2012 to 30.11.2012 and estimated in PDD, tCO₂e

The lack of double counting of greenhouse gas emission reductions is guaranteed by setting aside in the National Allocation Plan for the period 2008-2012 a special Reserve of allowances. The canceling of allowances from this Reserve is performed by the Environmental Executive Agency in accordance with the data presented in the Monitoring and Verification reports of all approved JI projects, implemented in Bulgaria.

8.2. Results of the conducted monitoring

In the period reported, from 1st January 2012 to 30st November 2012, the implementation of BG 1000151 project lead to generation **80 914 ERUs** (Item 8.1).

The monitoring shows that the project boundaries, determined in the PDD, have not been changed (Item 1.3).

The reporting of the amounts of natural gas, which enters into the GDN, is implemented at high degree of accuracy and is controlled by Bulgargas EAD and Sofiagas EAD (Item 5.2).

The data used for the calculation of the ERUs generated with the project implementation are accurate and reliable (Item 5.4).

The leakages from the natural gas distribution are insignificant and have no impact on the final results (Item 5.6).

In 2012 the low heating value of the delivered natural gas has been in the range of $8000 \pm 100 \text{ kcal/sm}^3$ (Table 5).

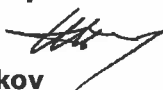
The calculation of the greenhouse gas emission reductions are performed in accordance with the Monitoring plan of the determined PDD and the **Manual for elaboration of monitoring reports on the Joint Implementation projects of Overgas Inc. AD**.

The Excel worksheet file *Annex5_Sofia_v2_10_12_2012_protected.xls* containing the detailed calculations of the amount of the realized greenhouse gases emission reductions is integral part of the present Monitoring report.

9. ENVIRONMENTAL IMPACT

The switch from the traditional energy sources to natural gas leads to a reduction of the overall amount of the emissions and to an enhancement of the natural and urban environments. The amounts of the emission reductions of pollutants and greenhouse gases resulted the replacement of the traditional fuels with natural gas are calculated annually. The information is submitted to the Public Communications Management Process of Overgas Inc. AD and to the GDCs.

Elaborated by:



Ivan Mastikov

Overgas Inc. AD