



MONITORING REPORT

For the period 1st January 2008 – 31st December 2008

of the project: Reduction of Greenhouse Gases by Gasification of Sofia Municipality

Version 2

Contract: ERU 04/01 between Kingdom of the Netherlands and Overgas Inc. AD

Approved by:

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TABLE OF CONTENTS

1.	GENERAL INFORMATION FOR THE PROJECT.....	4
1.1.	General information.....	4
1.2.	Project boundaries	4
1.3.	Development of the project.....	4
2.	MAIN PRINCIPLES OF THE MONITORING PLAN.....	5
3.	REPORTING AND MANAGEMENT SYSTEMS.....	5
4.	QUALITY MANAGEMENT AND STAFF QUALIFICATION SYSTEMS.....	6
5.	PARAMETERS MEASURED AND MONITORED.....	7
5.1.	Measurements of the monthly amounts of natural gas that enters into to GDN and the gas calorific value	7
5.2.	Measurement of the monthly amount of transported and delivered natural gas to the end users	8
5.3.	Accuracy of the measurement data and measurement reliability.....	9
5.4.	Balance of the amount of natural gas which entered into the GDN and delivered to the end users.....	10
5.5.	Insignificance of the leakages, procedures for prevention and accidents’ elimination.....	11
6.	PROCEDURES FOR EMERGENCIES	13
7.	DATA ARCHIVING	13
8.	PROCESSING OF INITIAL DATA.....	14
9.	CALCULATION OF THE EMISSION REDUCTIONS.....	16
9.1.	ERUs generated by the project.....	16
9.2.	Double counting of the greenhouse gases reduced emissions	17
9.3.	Results of the conducted monitoring.....	17
10.	ENVIRONMENTAL IMPACT	18

Annexes:

- 1. Block scheme of the fuels’ supply after gasification and project boundaries;***
- 2. List of the applicable procedures and instructions from the Quality management system;***
- 3. Monthly statements for delivery of natural gas by Bulgargas EAD to Sofiagas EAD in 2008;***
- 4. Certificates of the natural gas delivered by Bulgargas EAD in 2008;***
- 5. Information from the statements of ascertainment for accidents occurred at the gas distribution network of Sofiagas EAD in 2008;***
- 6. Worksheet with the calculation of the ERUs generated (Monitoring_Sofia.xls).***
- 7. Baseline study of Joint Implementation projects in the Bulgarian energy sector. Carbon emission factor.***

ABBREVIATIONS

AAU	Assigned Amount Unit
AGDS	Automated Gas Distribution Station
CRM	Customer Relationship Management
ELM	Equipment Lifecycle Management
ERU	Emission Reduction Unit
EU ETS	European Union Emission Trading Scheme
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
NAP	National Allocation Plan
PDD	Project Design Document
SAMTS	State Agency for Metrology and Technical Surveillance
SCADA	Supervisory Control and Data Acquisition

1. GENERAL INFORMATION FOR THE PROJECT

1.1. General information

The project "Reduction of Greenhouse Gases by Gasification of Sofia Municipality" 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. AD. The project has been granted Letters of Approval by the Republic of Bulgaria and the Kingdom of the Netherlands and has been subject to an Initial and First Periodic Verification.

The project aims at the reduction of greenhouse gases in Sofia Municipality by switching to natural gas from liquid and solid fuels, and part of the electricity used by the industry, public and administrative sites and households and by increasing the energy efficiency of their combustion installations.

According to the Project Design Document (PDD) the project foresees construction of a steel and polyethylene gas distribution network (GDN), more than 32 000 relevant facilities in Sofia Municipality, reconstruction of the installations at the end users and construction of indoor installations for 135 industrial sites, 228 public and administrative sites, and more than 31 800 households.

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

1.2. Project boundaries

The project boundaries cover the combustion installations of the industrial, public and administrative, and residential end users in Sofia Municipality, excluding the sites gasified before the starting date of the project. Within the project boundaries are also included production, transportation and distribution of the electricity replaced by natural gas. Its emission factors are defined by the Ministry of Economic Affairs of the Netherlands¹ and include the optimization of the energy production facilities during the period up to 2012.

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 during the transportation and distribution 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.

The project boundaries have not been changed after the start of the project and they correspond to those described in the PDD (*Annex 1: Block scheme of the fuels' supply after gasification and project boundaries*).

1.3. Development of the project

By the end of 2008, 381 km GDN of steel and polyethylene gas pipelines with the respective facilities were constructed in Sofia Municipality, which represents 65 % from the planned for construction until the end of 2012.

¹ Operational Guidelines for Project Design Documents of Joint Implementation Projects, Volume 1: General guidelines, Version 2.2, June 2003

By the end of 2008 56 industrial users and 401 end users in the public and administrative sector, as well as 9 912 households have been gasified. In 2008 the amount of natural gas delivered to the end users reached 61 614.4 thousand sm³.

By January 2009, four Milestones under the project “Reduction of Greenhouse Gases by Gasification of Sofia Municipality” have been reported. According to contract ERU 04/01 between Kingdom of the Netherlands and Overgas Inc. AD in April 2009 the Fifth Milestone will be reported and the present Monitoring report is a part of the documents for that reporting.

The Monitoring report examines the period from 1st January 2008 until 31st December 2008. By the transport and delivery of total of 61 614.4 thousand sm³ to the end users in the three user’s sectors 68 698 ERUs have been realized during this period.

Certain slow-down is noticed in the growth trends of the natural gas deliveries. The main reasons identified causing this are the warm winter last year and the deepening financial crisis.

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) for converting the amount of delivered natural gas to the end users into ERUs for each sector, as defined in item 9.2 of the PDD is used;
- 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 of realized ERUs and the realized emissions’ reduction from the project is defined;
- The fulfilment of the contractual amount of ERUs is determined on the basis on the realized emission reductions;
- At constant caloric 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 calorific value of the delivered natural gas, a recalculation of natural gas amounts is made according to the calorific value used for the calculations in the PDD.

In order to increase the calculation accuracy of the amount of greenhouse gases emission reductions under the project and to use more actual input data the FSERF calculated in the PDD has been corrected by using the official electricity emission factor for Bulgaria, published by the Ministry of Environment and Waters (MOEW) for use in Joint Implementation projects under the Kyoto Protocol². All other input data and emission factors have not been changed in the recalculation of the FSERF.

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*.

² http://www2.moew.government.bg/recent_doc/climate/Baseline%20CEF%20Summary.pdf

The **CRM** module manages the database for all clients, including data for the location and the combustion installation. It allows customer's localization in the Geographical information system (GIS). The **CRM** module contains the main data for the customers and allows filtering the customers according to status, type, office and area. Searching of a user is possible after entering exact criteria: name, subscriber's ID and contract number. The module serves also for tracking the customer's status – it displays the stage of customer's connection. The **CRM** module allows automatic issuing, generating 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, requested and consumed amounts of natural gas, etc. In the module are also entered data for the appliances which use natural gas – type of the gas appliances and their main technical parameters.

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. It supports filters for quick search according to different criteria and allows displaying the customer's main data with opportunity for new additions and editions. 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 Report module and printing letters of notification and bills for invoices. The made payments are also indicated in it.

ELM is an information module for maintenance of the networks and the facilities. It allows customer's and facility's localization in the GIS and uses a base with the main data of the system's and customer's facilities. The module tracks the elements for electrochemical protection and the status of the odorizing system. **The ELM** module supports filters for quick search according to name, type, address, ID and facility's subscriber number.

The **Reports** module serves for issuing monthly statements for natural gas delivery and for preparation of information. 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 **Information's** module generates a part of the information of the other modules, as well as information that cannot be generated by other module.

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

The Automated System for Dispatch Control Overcomm 2.0 of the SCADA system contributes for the high reliability of the measurement 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.

4. QUALITY MANAGEMENT AND STAFF QUALIFICATION SYSTEMS

The Quality Management System developed in Overgas Inc. AD allows for the activities done in the company and GDCs to be duly documented and managed. The personnel is acquainted with and trained to implement and follow the approved procedures, instructions and work documents in the scope of their activity.

Procedure II 6.2 – 001 Procedure for employees selection is applied in the Overgas system of companies, which allows appointment of experts, who fulfil at a maximum degree the requirements for occupying a particular position regarding education, professional experience, knowledge and skills. Further increase of staff qualification is achieved through motivation trainings and seminars,

conference participations, work meetings for experience exchange, etc. following the ***Procedure II 6.2 – 005 for Organizing and Conducting of Training for the company’s employees.***

The maintenance of Overcomm 2.0 system is performed by the employees in the Central Dispatch Management Directorate. The dispatch management is centralized. It is based in Sofia and it services all the GDCs affiliates of Overgas Inc. AD. The Directorate personnel passed trainings for improvement of their skills for using the ***SCADA*** automatic system, as well as the compulsory annual trainings according to ***Regulation 12 of 10.06.2004 for the activity of the operators of the gas transmission and the gas distribution networks.***

The personnel of Directorate *Trade with Natural Gas*, which is responsible for the processing and checking-up of the information about the natural gas consumption, has attended trainings in the fields of marketing, risk management, quality management systems, etc.

The personnel of Ecology and Sustainable Development Directorate, which are involved in the development of Joint Implementation projects and realization of the monitoring of the “Reduction of Greenhouse Gases by Gasification of Sofia Municipality” project, have a high educational qualification. They participated in additional specialized trainings in the field of the greenhouse gas emissions trading, environmental impact assessments, environmental management system, quality management system, etc.

A list of the procedures and instructions of Overgas Inc. AD’s quality management system that are related to the monitoring of the “Reduction of Greenhouse Gases by Gasification of Sofia Municipality” project is presented in *Annex 2: List of the applicable procedures and instructions from the Quality management system.*

5. PARAMETERS MEASURED AND MONITORED

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

- Monthly amounts of natural gas that enter into the GDN;
- Calorific value of the natural gas;
- Monthly amounts of natural gas transported and delivered to the end users by sectors.

In the Monitoring report evidences for the accuracy of the measured data, the measurement reliability and the insignificance of the leakages are presented.

5.1. Measurements of the monthly amounts of natural gas that enters into to GDN and the gas calorific 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 by gas meters and electronic volume correctors, which are property of Bulgargas EAD.

In order 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.

For the amounts of natural gas that enter into the GDN a **Delivery Statement** signed by both parties is prepared (*Annex 3: Monthly statements for delivery of natural gas by Bulgargas EAD in 2008*). The Delivery Statement includes information for the preliminarily ordered by the GDC natural gas amount and the actual amount invoiced and received.

The monthly Delivery Statements are obligatory accompanied by monthly **Average certificate of the natural gas** issued by Bulgargas EAD. This certificate includes information for 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 in 2008*.

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

5.2. 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 amounts of natural gas delivered 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.

For measurement of the users' natural gas consumption, Sofiagas EAD is using diaphragm, roots and turbine gas meters. The company have 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.

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 II10-6.3-102 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 commercial users is done using volume correctors within the measuring devices. The measurement of the amounts of natural gas delivered to the residential and "small" commercial users (at 100 mbar pressure and maximum hourly consumption less than 25 m³/h) is done with the fixed factor, which 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:

$$V_{st} = V_p * K_t * K_p \quad (1),$$

where:

V_p the reported by the gas meter natural gas amount;

K_t the product of the temperature (K_t) and pressure (K_p) correction factors.

Procedure II8.1-011 for control of natural gas retail sales is enforced by the personnel in the Delivery Contracts Department at the Trade with Natural Gas Directorate in Overgas Inc. AD. Its goal is to regulate the order and the way for control of natural gas retail sales deliveries.

According to the procedure, monthly information is prepared, which contains the amount of natural gas deliveries by clients, the connection fees and the amount of natural gas entered into the GDN. The data is collected from the CRM module and from the monthly statement of Bulgargas EAD. The monthly information is sent to Control, Reporting and Analyses Department, where they are made systematic. On this basis all monthly and annual reports presented to the management of the company and to the regulation authorities are prepared. 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 natural gas consumption of the end users in the industrial, public and administrative, and residential sectors is read manually every month by employees of the GDC. The readings of the gas meters are recorded in a protocol, which contains also the ID of the gas meter of the respective end user and the gas meter's readings of the previous month. Consumption data for each user is 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.

For the calculation of the realized amounts of greenhouse gas emission reductions, the data for the natural gas annual consumption by sectors is taken from the Reports module of the GDCIMS and from the Monthly statements for transportation and Monthly statements for delivery of natural gas to the users.

5.3. 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 devices for natural gas measurement (gas meters) are presented for check-up to the State Agency for Metrology and Technical Surveillance (SAMTS) or to 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-412 of 16 Aug. 2004 of the chairman of SAMTS the regularity for check-ups of the volume gas meters with deformable chambers (diaphragm) or with roots bodies (pistons) and of turbine gas meters for gas and additional devices for them is two years.

In 2008 check-ups of 2 065 diaphragm and 34 roots and turbine gas meters for natural gas has been performed. In case of necessity the gas meters have been replaced with new ones.

The reliability of the measured parameters is guaranteed by the implementation of **Instruction И9-6.3-102 for technical maintenance and servicing of GRS, GRB, GRMS and GRMB** 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 co-coordinated and approved annual **Schedules for revision with disassembling the equipment in the GDN devices (working document F1-И9-6.3-102)**. For each revision with disassembling a bilateral **Act for performed revision with disassembling and setting the equipment in GDN devices (working document F2-И9-6.3-102)** is prepared.

In 2008 in accordance with the annual **Schedules for revision with disassembling the equipment in the GDN devices** totally 32 revisions including disassembling and setting the equipment in devices in the GDN of Sofiagas EAD were made.

In accordance with **Instruction И9-6.3-102**, the Head of Exploitation and Service Department of Sofiagas EAD records in the **Exploitation register of the equipment (working document F1-И8-6.3-102)** information for every technical servicing of the equipment performed. This information includes the name of the person, who performed the works or the person, who is liable for the work, the description of the fulfilled works and the results obtained.

In order to ensure the continuity of the gas supply and the reliability of the equipment operations in the GDN in 2008 preventive maintenance of part of the GRSs, GRBs, GRMSs, GRMBs, GMSs and GMBs was performed. During this preventive maintenance taps, filters, valves and gaskets of the equipments were checked and in case of necessity were replaced.

The functioning of the **ELM** module of the GDCIMS contributes for the reliability of the measurements. It allows generation of informations for the equipments in the GDN. The information consist 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 also generates information about exploitation status of the GDN, the schedules for gas meters regular inspection, inspection and setting, as well as determined revision with disassembling of the equipment of the GDN.

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

Table 1 presents the balance of the amount of natural gas, which entered into the GDN and was delivered to the end users of Sofiagas EAD in 2008 on the basis of the registered data for the natural gas amounts at the entrance and at the exit of the GDN.

	<i>Natural gas, thousand sm³</i>	<i>%</i>
Entered into the GDN	61 558.3	100.00 %
Delivered to the users	61 614.4	100.1 %
<i>Difference</i>	<i>-56.1</i>	<i>-0.1 %</i>

Table 1: Balance of natural gas amounts, entered into the GDN and delivered to the end users of Sofiagas EAD in 2008

The differences between the amounts of natural gas at the entrance and at the exit of GDN of Sofiagas EAD are insignificant and due to the different time of reporting. The natural gas amount needed for initial filling when commissioning large GDN sections also leads to deviations in the parameters.

Due to the reasons mentioned above the balance cannot represent independent evidence for insignificance of the leakages or for accuracy of the measurements. The simultaneous reporting of the readings for all end users is impossible, since the end users' gas regulation and measuring stations and boards do not have remote reading.

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

The activities for exploiting, servicing and maintaining the GDN by the exploitation personnel in Sofiagas EAD for ensuring the safe and accident-free exploitation of the gas distribution network in compliance with the legislation are regulated in ***Procedure II6.3-102 for the service of GDN*** and the relevant instructions related to it.

According to this procedure, annual and monthly plans for the GDN exploitation activities are elaborated. Walk-through checks for breaking the integrity of the gas pipelines and for gas leakages and check-ups of the equipment status, etc. are performed. At the end of each month the results from the walk-through checks and the control are summarized in monthly ***Information for the exploitation status of the GDN (working document F3-II1-6.3-102)***.

The quality parameters of the natural gas (pressure, temperature, admixtures content, amount of the odorant added etc.) are checked monthly. No malpractices have been found in the gas pipelines including in the stations for cathode protection. The monthly ***Informations for the exploitation status of the GDN*** are kept at Sofiagas EAD.

The ***SCADA (Supervisory Control and Data Acquisition)*** system monitors remotely the technological parameters of the GDN, and monitors the parameters: pressure, temperature and consumption. The system records the average hourly values of the pressure and the temperature at the controlled points and signals for all deviations from the acceptable ranges.

The reported deviations from the normal operation of the measuring devices and the telecommunications are registered in ***Form for the current status of the equipment or a part of the GDN (working document F5-II1-6.3-012)*** and ***Register for failure of the telecommunication devices and the automated system for dispatch management (working document F6-II1-6.3-012)***.

According to the information in these documents, occurred deviations in the functioning of the equipment and sections of the GDN, as well as of the telecommunications are eliminated duly and their normal operation is restored.

Procedure II6.3-008 for automated collection of data on gas consumption and technological parameters of the gas is enforced by the employees in the Central Dispatch Management. It regulates the automated data collection on gas consumption and technological parameters of the gas.

According to this procedure the dispatcher on duty configures an automated procedure for data collection for the consumption and technological parameters of the natural gas, using **Instruction II1-6.3-008 on the maintenance of the data base of the automated dispatch system OVERCOMM**. The expert checks the completeness of the received information and starts a procedure for additional data collection if necessary. In accordance with the instruction in case of failure of the communication modules, repair works are performed or confided. After restoring the operation, the maximum possible archives for the period of lack of communication are collected.

If a visual, sound or SMS signal for alarm is received it is registered in compliance with the instructions of the user's documentation of the operator program module of Overcomm 2.0. In case of necessity an emergency group is informed and the group finds and reports the reason. The reason and the reaction of the emergency group are registered in the alarm registry. The databases for the towns are archived monthly on CD and HDD.

Procedure II6.3-009 for elaboration of analyses and submission of information for GDN gives guidelines for the order and the way for elaboration of analyses and presentation of information by the GDCs. It is performed by the employees in the Central Dispatch Management.

According to this procedure, by request, the dispatcher on duty performs an automated collection of information for the natural gas consumption and/or confides to a GDC employee manual data collection. Based on the data obtained, the dispatcher on duty prepares the necessary analysis, which is registered in the document registry system. The dispatcher on duty prepares the necessary information for the processes in the GDN, which also is registered in the document registration system.

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

According to the information for accident cases and the natural gas leakages in 2008 from the Statements of ascertainment for the accidents occurred (*Annex 5: Information from the statements of ascertainment for accidents occurred at the gas distribution network of Sofiagas EAD in 2008*), the amounts of natural gas leaked are minimal. There are 104 cases of accidents in the GDN for 2008. 89 of them are related to natural gas accidental leakage.

Information for the natural gas leakages during the accidents in 2008 is presented in *Table 2*.

	2008
Amount of natural gas leaked, thousand sm ³	79.8
Amount of natural gas entered into the GDN, thousand sm ³	61 558.3
Share of the leaked natural gas, %	0.129%

Table 2: Data for the amount of natural gas leaked during accidents in the GDN of Sofiagas EAD in 2008

According to the ***Instruction H2-6.3-102 for control and diagnostics of the technical condition of natural gas leakages distribution pipelines regarding natural gas leakages***, Sofiagas EAD organizes systematic and periodical checks for natural gas leakages. The periodical checks are performed by preliminarily coordinated with Overgas Service AD annual schedules. For the performed activities a bilateral ***Acts for performed control of GDN for natural gas leakages (working document F1-H2-6.3-102)*** is signed.

The results from all checks for gas leakages, as well as the undertaken measures if one was found are registered in ***Exploitation register of GDN (working document F1-H1-6.3-102)*** and in a monthly ***Information for the exploitation status of the GDN (working document F3-H1-6.3-102)***.

In 2008 by schedule totally 126 259 m underground gas pipeline networks were investigated for natural gas leakages. According to the elaborated Statement, no breaks or leakages have been found during the investigations.

6. PROCEDURES FOR EMERGENCIES

The actions in case of occurrence of large-scale accidents are planned in compliance with the document ***D7.05.02.13 Action plan in occurrence of substantial production accident in the gas distribution network on the territory of a municipality***. 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.

The activities in Sofiagas EAD in time of accidents and emergency situations are defined in ***D7.05.02.16 Rules for work in accidents and emergency situations***. The emergency readiness in the GDC is regulated also by the state legislation and is subject of periodical planned and sudden control.

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.

In case of accident or emergency situation Sofiagas EAD cooperates also with the end users, the public supplier Bulgargas EAD and the state and municipal bodies.

Sofiagas EAD has elaborated rules for work in emergency situations. 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.

7. 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.

The information system contains the whole information relevant to the technical maintenance and the consumption of natural gas by each end user of the GDC from the stage of preliminary survey.

The electronic files from the GDCIMS are recorded on servers and a back-up copy is made on a back-up server every day. The servicing of the GDCIMS is performed by Information Technologies Directorate at Overgas Holding AD.

8. PROCESSING OF INITIAL DATA

The data for the amount of delivered natural gas to the end users, as well as the data for the number of new users is received in Overgas Inc. AD monthly according to the ***Procedure II 8.1-011 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 Reports module of the GDCIMS. The data for the amounts of natural gas transported and delivered to THP Injstroi, THP Suhata reka, THP Hadji Dimitar, THP Levski-G and Coca-Cola HBC AD are taken from the Monthly statements for transportation and Monthly statements for delivery of natural gas to these users.

In order to report the influence of the calorific 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. For that goal a correction factor is used.

The data for the amount of the delivered natural gas by Bulgargas EAD in the Monthly Statements on delivery and the average calorific 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 Low Heating Value of the natural gas ***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.

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

where:

Q_{NG m} is the amount of natural gas delivered for the month ***m*** in 1000 sm³;
LHV_{NG, m} is the calorific value of the natural gas during the month ***m*** in GJ/1000m³;
Q_{NG y} is the amount of natural gas delivered for the year ***y*** in 1000 sm³;

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

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

where:

LHV_{NG} is the calorific value of the natural gas, used in the calculations in the PDD in GJ/1000m³.

Table 3 presents information from the monthly statements and from the certificates of the natural gas for the amounts entered into the GDN and its calorific value by months and average for 2008.

Month	Natural gas entered into the GDN, thousand sm³	LHV, kcal/m³
January	8 579.4	8 033
February	7 040.9	8 024
March	5 163.8	8 005
April	3 242.3	8 033
May	2 581.8	8 019
June	2 302.2	8 019
July	2 427.4	8 029
August	2 475.7	8 044
September	3 207.0	8 039
October	3 964.7	8 040
November	8 208.2	8 035
December	12 365.0	8 035
Total	61 558.3	-
LHVav	-	8 030

*Table 3: Amounts of natural gas entered into the GDN
and calorific value of the gas in 2008*

The data for calculation of the correction factor **K** for 2008 are presented in *Table 4*.

Average calorific value of the delivered natural gas, kcal/m ³	8 030
Average calorific value of the delivered natural gas, GJ/1000 sm ³	33.621
Calorific value of the natural gas used in PDD, GJ/1000 sm ³	34.000
Correction factor for taking into account the influence of the calorific value of the natural gas	0.9888

*Table 4: Correction factor for taking into account the influence
of the natural gas calorific value in 2008*

In order to increase the calculation accuracy and to use more actual input data the FSERF calculated in the PDD is corrected by replacing the greenhouse gas emission factor of the electricity with the official electricity emission factors published by the Ministry of Environment and Waters (MOEW) for use in Joint Implementation projects under the Kyoto Protocol (*Annex 7*).

The electricity emission factors used in the PDD are defined by SenterNovem in 2003 for the ERUPT4 tender. The official MOEW factors are calculated by the National Electricity Company in 2005 by the request of the MOEW. The approved consolidated methodology ACM0002 of the UNFCCC Executive Board is used for these calculations. The official MOEW factors are the most recent at this time and show to the utmost extent the effect of the development of the electricity producing sector in Bulgaria.

In both sources the factors are defined for every year in the period 2008 – 2012. At the beginning of the period the official MOEW factors are higher than those of SenterNovem for the ERUPT4 tender, while at the end of the period they are lower. This fact makes them conservative enough for the purpose of calculation of the GHG emission reductions resulting from the project implementation.

The official MOEW factors are calculated for a Maximum and a Minimum electricity demand scenarios. For the update of the FSERFs the factors for the Maximum demand scenario are used because they are more conservative.

In Table 5 are presented the updated FSERF values by years for the three sectors.

<i>Sector</i>	<i>2008 z.</i>	<i>2009 z.</i>	<i>2010 z.</i>	<i>2011 z.</i>	<i>2012 z.</i>
Industrial	0.96	0.96	0.96	0.96	0.96
Public and administrative	0.70	0.69	0.70	0.70	0.70
Residential	2.02	1.71	1.64	1.62	1.50

Table 5: Recalculated FSERF values by years and sectors, tCO₂e/1000sm³

9. CALCULATION OF THE EMISSION REDUCTIONS

According to the approved monitoring plan, the amount of greenhouse gas emission reductions is calculated by multiplying the annual consumption of natural gas in each sector with the Fuel switch emission reduction factor (FSERF) for the respective sector for the reported year. For reporting the calorific value of the natural gas delivered to the end users in every sector are corrected by a factor. The calculation of the factor is made as described in **point 8 – Processing of Initial Data** of the Monitoring report.

9.1 ERUs generated by the project

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

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

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 transported and delivered to sector **z**, in the year **y**, 1000 sm³;
- K** is the correction factor for taking into account the change of the calorific value of the delivered natural gas.

The transported and delivered to the end users by Sofiagas EAD amount of natural gas in 2008 is 61 614.438 thousand sm³. The amounts by sectors are as follow:

	<i>2008</i>
Industrial sector	31 890.580
Public and administrative sector	16 033.155
Residential sector	13 690.703
Total	61 614.438

Table 6: Amount of natural gas transported and delivered by Sofiagas EAD, thousand sm³

The calculations of the greenhouse gas emission reductions for 2008 are presented in Table 7.

<i>Sector</i>	<i>Natural gas consumption, thousand sm³</i>	<i>Correction factor for 2008</i>	<i>Corrected natural gas consumption, thousand sm³</i>	<i>FSERF, tCO₂/thousand sm³</i>	<i>Greenhouse gas emission reductions, tCO_{2e}</i>
Industrial sector	31 890.580	0.9888	31 534.669	0.96	30 303
Public and administrative sector	16 033.155	0.9888	15 854.219	0.70	11 087
Residential sector	13 690.703	0.9888	13 537.909	2.02	27 308
Total	61 614.438		60 926.797		68 698

Table 7: Realized ERUs in 2008, tCO_{2e}

The realized emission reduction units are **68 698 tCO_{2e}** in 2008.

9.2. Double counting of the greenhouse gases reduced emissions

On the territory of the project "Reduction of the greenhouse gases by the Gasification of Sofia Municipality" Sofiagas EAD delivers natural gas to three installations, included in the scope of Directive 2003/87/EC, establishing a scheme for greenhouse gas emission allowance trading. These are the installations THP Suhata reka, THP Hadji Dimitar and THP Levski-G.

The amount of ERUs generated from the transportation of natural gas to each installation is presented in Table 8.

<i>Installation</i>	<i>Used natural gas, thousand sm³</i>	<i>ERU</i>
THP Suhata reka	1310.704	1 245
THP Hadji Dimitar	2705.140	2 570
THP Levski-G	1264.458	1 202

Table 8: ERUs generated by the transportation of natural gas to installations included in the scope of the EU ETS

According to Directive 2004/101/EC the Republic of Bulgaria provides for the avoidance of the double counting of GHG emission reductions.

9.3. Results of the conducted monitoring

In the period reported, from 1st January 2008 to 31st December 2008, the implementation of the project "Reduction of the greenhouse gases by the Gasification of Sofia Municipality" project lead to generation of **68 698 ERUs** (pt. 9.1 from the present Monitoring report).

The monitoring performed shows that the project boundaries, determined in the PDD have not been changed (pt. 1.2).

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 (pt. 5.1).

The data used for the calculation of the ERUs generated with the project implementation are accurate and reliable (pt. 5.3).

The leakages from the natural gas distribution are insignificant and have no impact on the final results (pt. 5.5).

In 2008 the calorific value of the delivered natural gas has been in the range of 8000 ± 100 kcal/nm³ (pt. 5.1).

The calculation of the greenhouse gas emission reductions are performed in accordance with the Monitoring plan of the determined PDD of the **“Reduction of Greenhouse Gases by Gasification of Sofia Municipality”** project and the **Manual for elaboration of monitoring reports on the Joint Implementation projects of Overgas Inc. AD**.

The Excel worksheet file containing the detailed calculations of the amount of the realized greenhouse gases emission reductions is integral part of the present Monitoring report (*Annex 6: Worksheet with the calculation of the ERUs generated (Monitoring_Sofia.xls)*).

10. ENVIRONMENTAL IMPACT

The amounts of the emission reductions of pollutants and greenhouse gases, as a consequence of the replacement of the traditional fuels with natural gas are calculated annually. The information is submitted to the Public Communication Directorate of Overgas Inc. AD and to the GDCs.

The switch of the traditional energy carriers to natural gas leads to a reduction of the overall amount of the emissions and to an enhancement of the natural and urban environments. In 2008 as a result of this switch the emission of more than 5 280 tones of pollutants has been avoided including 2 684 tones of sulphur oxides, 86 tones of nitrous oxides, 2 217 tones of carbon monoxide and more than 294 tones of dust.

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