



JOINT IMPLEMENTATION DESIGN DOCUMENT FORM
Version 01 - in effect as of: 15 June 2006

Methane Emissions Avoidance in Stavropol Gas Distribution Network

CONTENTS

- A. General description of the project
- B. Baseline
- C. Duration of the project / crediting period
- D. Monitoring plan
- E. Estimation of greenhouse gas emission reductions
- F. Environmental impacts
- G. Stakeholders' comments

Annexes

- Annex 1: Contact information on project participants
- Annex 2: Baseline information
- Annex 3: Monitoring plan

**SECTION A. General description of the project****A.1. Title of the project:**

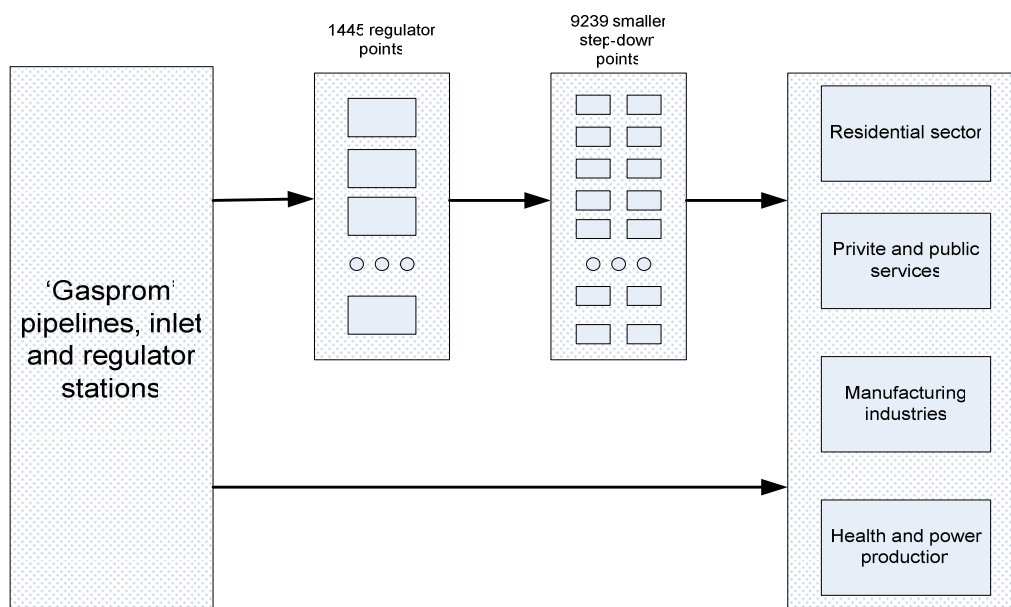
Methane Emissions Avoidance in Stavropol Gas Distribution Network.
Version 01.
December 5, 2006.

A.2. Description of the project:

The purpose of the project is to improve the integrity of Stavropol regional gas distribution network via reducing leakage of methane from the system. The Project implementation will be accomplished by performing detections, measurements and repairing leakages at gas regulator stations and step-down stations in the natural gas distribution system operated by the OJSC Stavropolkraygas. Only leaks in valves with stem packing and leaking flanges are in the project boundaries, but leaks could be also potentially found in tube fittings, pipe thread connectors, block valves, regulators, plug valves and pressure relief valves. There are also leaks from fractured parts of pipelines which are not covered by the project. Pipeline leaks are believed to be about 10% of total leaks, although no reliable survey of their contribution exists. Current practices only result in temporary leak reductions from some of the larger leaks, due to the inadequacy of repair materials and practices, as further described B.2 and Annex 2. Current inspection and repair activities are motivated by safety concerns and not by loss of natural gas as a valuable resource or by its detrimental effect on the environment.

OJSC Stavropolkraygas operates a medium and low pressure gas distribution system with an annual gas throughput of about 6.8 billion cubic metres (bcm). The supply network covers about 28,000 km of pipes, including components at 16 bar, 6 bar, 3 bar and low pressure pipes to final residential consumers. There are 1,445 regulator points and 9,239 smaller step-down points (in total 10,684 sites) which contains 74,139 valves and approximately 222,417 flanges.

Figure 1 Sketch of pipeline network, OJSC Stavropolkraygas





As part of the project activity, all sites will be inspected for leaks from all standardised components. Any leak detected will be measured, recorded and repaired, using Gore-Tex joint sealant and valve stem packing produced by W.L.Gore & Associates (Germany) (see: www.gore.com). Due to the climatic conditions in European part of Russia, project activities in the Stavropol region can only be performed during a period from about mid April to mid November¹. The leak detection and repair work started in July 2006 and is planned to be completed in 2007. If leaks re-emerge those leaks will be measured and repaired again. This will be done in conjunction with the monitoring plan of the JI project. In addition, OJSC Stavropolkraygas will use the equipment in its regular leak inspection and maintenance activities on a permanent basis beyond the crediting period of the project.

In addition to the reduction in greenhouse gas (GHG) emissions, the project activity will have important ancillary benefits such as energy conservation to benefit the end users of gas, health effects due to the elimination of asbestos as a repair material, lower risks of accidents related to gas leaks and dissemination of modern technology related to leak detection and repair as well as improved measurement practices.

A.3. Project participants:

The project is developed by AddGlobe, LLC (USA), a private company engaged in development of Joint Implementation projects. AddGlobe, LLC is an investor and has contractual title to emission reductions resulting from the project.

OJSC Stavropolkraygas operates and owns the distribution gas system in Stavropolsky Kray region. OJSC Stavropolkraygas is majority-owned by Gazpromregiongaz, which is a state owned company with mandate to operate about 60% of gas distribution systems in Russia. For the Project a subsidiary of Rosgazifikatsiya, Centergasservice-opt, has been appointed as General Contractor to coordinate all project activities. OJSC Stavropolkraygas under supervision of Centergasservice-opt will be responsible for the Project implementation and monitoring of Project emissions.

Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Party A (Host Party) Russian Federation	<ul style="list-style-type: none"> • OJSC Rosgazifikatsiya • Centergasservice-opt, LLC • OJSC Stavropolkraygas • AddGlobe, LLC (U.S.A.) • Other co-investors to be determined 	No
Party B Party (Party-buyer)	To be determined	No

PDD was developed by National Methane Centre (Russia) on the basis of PDD for three similar JI projects

- in Kursk region (“Methane Emission Avoidance in Kursk Gas Distribution Network” project), which has been developed by ECON Carbon, determined and made available for public comments in December 2005 by DNV at its homepage;

¹ This timing may vary and could be as late as mid-November. The timing is determined by the occurrence of 3 consecutive 24 hour periods of below zero weather.



- in Kostroma and Bryansk regions (“Methane Emission Avoidance in Kostroma Gas Distribution Network” project and “Methane Emission Avoidance in Bryansk Gas Distribution Network” project) developed by the National Methane Centre (Russia), determined by DNV and made available for public comments in November 2006 at UNFCCC homepage (http://ji.unfccc.int/JI_Projects/Verification/PDD).

A.4. Technical description of the project:

The project activity consists of three components:

- the identification and measurement of leaks of all regulator and step-down stations in the OJSC Stavropolkraygas supply system. Identification of leaks was provided using Heath Gasurveyor, measurement - using Heath Hi-Flow Sampler;
- repair of all detected leaks using advanced sealants (i.e. Gore-Tex Joint Sealant and Valve Stem Packing);
- design and implementation of a maintenance and monitoring program that involves the training of personnel in the use of advanced leak detection and measurement equipment.

Hi-Flow Sampler to be used for measurement of detected leaks was developed by the Gas Research Institute in the USA and then tested by the industry since 1997, most notably by Enron. Hi-Flow Sampler differs from organic vapour analyzers (OVA) and other measurement tools in that it provides a direct volumetric measurement of methane flowing from a leak. It is also faster to use and much more accurate. A series of experiments have been conducted to validate the results of the Hi-Flow Sampler. Typical results from laboratory tests show an average difference between metered leaks (with rotameter) and the Hi-Flow Sampler of 3-4% and with maximum differences to be slightly above 10%. This is considerably more accurate than measurements with OVA and similar equipment, let alone the equipment currently being used in Russia².

Leaks from valves will be repaired using Gore-Tex valve stem packing. This material is a pliable, self-lubricating packing that eliminate stem wear with durable effects. The continuous-length packing installs easily and forms a cohesive cylinder when compressed, eliminating the need to cut and form rings. In most cases it is not necessary to remove the valve from service, and no re-assembly is required. Once installed, a slight turn on the gland nut is all the maintenance that is usually required. The manufacturer of Gore-Tex valve stem packing claims that the equipment has been in service for years in severe operating conditions without faults, and the manufacturer guarantees that the stem packing will be replaced free should it fail, provided that it has been installed properly in a sound valve.

Flanges (that are leaking) will be repaired using a Gore-Tex joint sealant, which is also much more reliable than currently used material, albeit much more expensive (up to 20 times) as is Gore-Tex valve stem packing.

A.4.1. Location of the project:

The project activity is conducted for the gas distribution network of OJSC Stavropolkraygas which is located throughout the Stavropol region of the Russian Federation. Therefore, the project encompasses the entire region.

² Further information on the development and use of the Hi-Flow Sampler is found on <http://www.epa.gov/gasstar/>

A.4.1.1. Host Party(ies):

The Russian Federation.

A.4.1.2. Region/State/Province etc.:

Stavropolsky Kray (Stavropol region) is situated in the central part of Predkavkazje and on range of the Big Caucasus. The region borders with the Republics of Kabardino-Balkaria, Karachaevo-Cherkessia, Ingushetia and Chechnya in the South, with Krasnodarsky region in the West, with Rostov region in the North, with the Republic of Kalmykia in the North-East, and with the Republic of Dagestan in the East. Stavropol city is located 1,621 km from Moscow. Population of Stavropol region is about 2,650,000 people.



OJSC Stavropolkraygas is the sole provider of natural gas for the whole Stavropol region and thus the project encompasses the entire region. All the cities in Stavropol region are included in the project.

A.4.1.3. City/Town/Community etc.:

The capital of the region is Stavropol city, other largest cities in the region are Pyatigorsk and Kislovodsk. The region is divided into 26 districts and has 17 towns and town settlements, 267 villages settlements. The most important spheres of production in the region include petrochemical and chemical industry, power generation, machine building, light industry, agriculture and agricultural products processing.

A.4.1.4. Detail of physical location, including information allowing the unique identification of the project (maximum one page):

The project will be located in the Stavropol region in Russia.

**A.4.2. Technology (ies) to be employed, or measures, operations or actions to be implemented by the project:**

Gasurveyor 500 Series (see picture below) will be used under the JI project to detect methane leaks throughout natural gas distribution network. Gasurveyor 500 Series provides the most flexible measurement range among gas detectors available today.



Hi-Flow Sampler (see picture below) is a new technology to be used in Russia. Instruction and training of OJSC Stavropolkraygas staff has been organized under supervision of Centergasservice-opt specialists certified by Heath Consultant. Repair works will be conducted by use of Gore-Tex valve stem packing and joint sealant.

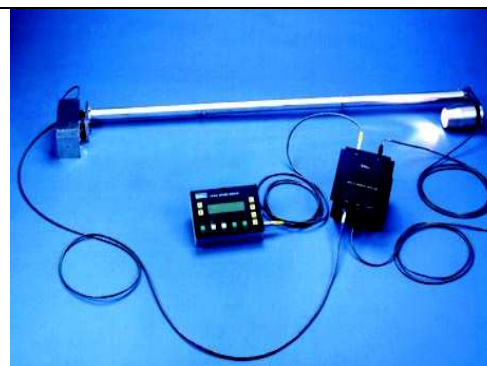


The performance of the technology is proven with documented excellent results in North America and around the world. Hi- Flow Sampler has now been cleared for import and approved in Russia. Current project activity represents its regular use in the country.

Under the JI project in Stavropol region new advanced remote leak-detection equipment will be tested: Remote Methane Leak Detector and Optical Methane Detector. On the basis of testing results, a special instruction on the use of this equipment will be developed for monitoring purposes and added to the Annex 5.



Remote Methane Leak Detector (RMLD)



Optical Methane Detector (OMD)

A.4.3. Brief explanation of how the anthropogenic emissions of greenhouse gases by sources are to be reduced by the proposed JI project, including why the emission reductions would not occur in the absence of the proposed project, taking into account national and/or sectoral policies and circumstances:

The project activity reduces anthropogenic GHGs by the near elimination of methane emissions from components at regulator and step-down stations operated by OJSC Stavropolkraygas.

With the current practice repaired leaks typically re-emerge, due to the poor quality of sealing material.

The predominant material used currently for valves is a packing consisting of a round twisted cord made of flax sodden with oil, graphite and asbestos. The material loses containment after pressure variations and changes in weather conditions. For flanges elastic oil and gasoline resistant rubber and paronite (compressed asbestos gaskets) are used.

The project activity offers a comprehensive programme for inspection and detection for leaks from components in regulator stations and step-down stations. By use of the catalytic oxidation/thermal conductivity detectors practically all leaks from these components will be traced and measured by Hi-Flow Sampler. Gore-Tex joint sealant and valve stem packing offer a durable elimination of the leaks. It is therefore expected that emission reductions will be equal or close to the level of (ex-ante) measured leaks, although annual monitoring will establish whether repairs have been effective. During the missions to Stavropol in July–October 2006, 2,093 valves were repaired with Gore-Tex sealing material. Leaks prior to the repair showed an average of 8.58 litres per minute. Leak rates after repair were zero for all the valves.

The gas distribution company in the absence of the project activity has no financial income from reducing methane leakage. The company does not purchase and sell the gas, but is merely paid by the volume of gas distributed. Therefore, the current monitoring procedures in OJSC Stavropolkraygas, which are common practice in the Russian Federation, are aimed at detection and repair of leaks that represent safety risk. The technology applied for the current detection and repair practices is inferior to what will be acquired and used for the JI project. The “additionality” arguments under JI Track Two are further developed in section B.2 below.

**A.4.3.1. Estimated amount of emission reductions over the crediting period:**

Length of the crediting period	Annual estimation of emission reductions (tons of CO ₂ e)
2006	-
2007	140,000
2008	5,000,000
2009	5,000,000
2010	5,000,000
2011	5,000,000
2012	5,000,000
Total estimated emission reductions over the crediting period	25,140,000
Total number of crediting years	6, if early crediting will be applicable
Total for 2008 to 2012	25,000,000
Annual average of estimated emission reductions over the crediting period	5,000,000

A.5. Project approval by the Parties involved:

Natural gas supply to Russian industries and population is one of priority tasks identified by the Government of the Russian Federation.

Formal approval of the project as a JI project is expected when national Russian JI procedures will be approved by the Government of the Russian Federation.

**SECTION B. Baseline****B.1. Description and justification of the baseline chosen:**

This is a new methodology, based on the following PDDs:

- for the similar project in Kursk region (“Methane Emission Avoidance in Kursk Gas Distribution Network” project) developed by ECON Carbon in the format approved for the CDM projects by the CDM Executive Board;
- for similar projects in Kostroma and Bryansk regions (“Methane Emission Avoidance in Kostroma Gas Distribution Network” project and “Methane Emission Avoidance in Bryansk Gas Distribution Network” project) developed by the National Methane Centre (Russia), determined by DNV and made available for public comments in November 2006 at UNFCCC homepage.

The JI project activity is the detection, measurement and repair of methane leaks from valves and flanges at the regulator stations and step-down stations of the OJSC Stavropolkraygas gas distribution network. The project developers have engaged an international consultant (Heath Consultants, U.S.A.) for certification of Russian experts, which undertook surveys of leaks at the stations as preparation for the project activity and this PDD, which makes possible equipment testing according to local conditions.

As a part of surveys leaks were detected using catalytic oxidation/thermal conductivity detectors (Heath Gasurveyor 500 Series, see www.heathus.com). Once the leaks were identified, leak rate measurements were made using Hi-Flow Sampler. Hi-Flow Sampler uses a high flow rate of air to completely capture the gas leaking from components. A catalytic oxidation/thermal conductivity sensor is then used to measure the sample concentration in the air stream of the high flow system. Hi-Flow Sampler essentially performs an enclosure measurement using the flow regime induced by the sampler instead of a physical enclosure.

The surveys were conducted during the missions to Stavropol in July-October 2006. During these missions 2,093 valves and 5,159 flanges were inspected for leakages. Practically no leaks were detected at the flanges whereas 34.6% of the valves had leaks at an average leak rate of 8.58 litres per minute (LPM) (see Table 1).

Table 1 Summary results from the survey of leaks, OJSC Stavropolkraygas, July-October 2006

	Inspected components			Measured leaks			
	Inspected	Leaks identified	% with leaks	Liters per minute	Leak rates - lpm		Total per year
Survey July - October 2006					all valves	with leaks	m3/year
Valve Stem Packing	2,093	715	34.6%	17,959.51	8.58	25.11	334,340,793
Flanges	5,159	0	0.0%	0.0	0.0	0.0	0.0

This rate of leakage provides evidence that leaks are wide-spread and significant within the system. (Annex 4 provides details for the survey).

In order to describe the baseline and the Project activity scenario and analyse why emissions in the baseline scenario would likely exceed emissions in the JI project activity scenarios, we assume that:

- Emissions are properly measured before leak repair **at all sites** in the project boundary. The measured baseline leak rate is assumed to stay constant over the crediting period (till the end of 2012). In the case if existing and oldest regulator stations / step-down stations will be



reconstructed using new-built valves with stem packing, these sites will be considered after reconstruction as a baseline with zero leaks.

It is possible to assess that there will be only few such a cases with low emissions. It is also impossible to assess the percentage of such kind of valves, at least Kostromaoblgas doesn't have any special plans to implement such replacements.

- b. The project activity emissions will be emissions measured after the leak repair. It is expected that few, if any, leaks will be detected after repair (project activity leak rate =0).
- c. All points will be monitored in a proper manner within a crediting period as it is described in Annex 4.

The described methodology is considered to be reliable and conservative because it is based on direct measurement (not on indirect calculations or estimations) of all point before repair works, after repair works and during the monitoring.

B.2. Description of how the anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the JI project:
--

Baseline scenario

The baseline scenario represents a continuation of the current program for leak detection and maintenance of OJSC Stavropolkraygas. Leaks can be and are detected within the city limits because of the odor and/or knowledge of some activity that would likely cause leakage (as with some type of construction or accident etc). Various leak detection devices are used, but primarily in relation to inspection of pipelines in accordance with Industry Standard OST 153-39.3-051-2003, which prescribes the frequency at which pipelines should be inspected.

Approximately 16.5% of the valves and flanges are located in the Stavropol city. Valves and flanges located within the city, should, according to the Industry Standard No. 153-39.3-051-2003, be checked once a month and outside the city once every six months. Due to resource constraints, however, this frequency may not always be achieved. The portion of valves and flanges that leak outside the city is therefore probably higher than in the city. Prior to the first leak rate measurements done in July-October 2006 there have not existed any reliable estimates of leak rates.

The main material that is used in the valves is a gas pipeline packing consisting of a round twisted cord made of flax soaked with oil, graphite and asbestos. This material loses containment after pressure variations and under the influence of changing weather. Initially the cord is elastic due to the oil lubrication, and the cord fills all the holes between the rod and the valve walls. After some period of time (approximately 1-2 months), the cord dries out. It is still vapor-proof until the rod is adjusted when regulating pressure. After this, the packing needs to be replaced because it starts leaking.

According to baseline scenario the leaks occur randomly in spite of conducted regular repair works due to imperfection of currently used sealing material. These leaks are considered to be unavoidable technical losses. Preliminary survey indicates that leaks in OJSC Stavropolkraygas occur on 34.6% of valves and average leak rate is 8.58 lpm (compared to all number of the valves). These values were taken for baseline estimates. Exact amount of ERUs will be calculated after 100% of measurements works are accomplished.

Further details of baseline practices are presented in Annex 2.



Project scenario

The project scenario envisages that all valves and flanges that are potentially related to the project boundary will be inspected for leaks. If a leak appears it will be properly measured and repaired by modern sealing materials. If there is no leak in valve, the old sealing materials will be also replaced by the modern in all valves. Sealing materials in flanges will be replaced only if a leak is detected, because most of the flanges have no leaks in baseline and few measured leaks in the flanges are very low. All valves and flanges within the project boundary will be monitored during the crediting period.

Project participants have already formed crews in Stavropol and in Moscow for implementation of leak measurements and sealing material replacement during the crediting period and solved the problem with required resources, equipment for measurements and modern sealing materials for leak liquidation.

Because the project will use high quality sealing materials it is possible to expect that no new leaks will appear during the crediting period. In the event that a new leak is detected after repair it will be measured, repaired and monitored.

Because the project suggests the use of modern Gore-Tex sealing material, more frequent inspections of leaks and effective monitoring, emissions under the project activity will be obviously lower than under baseline scenario and close to zero.

Additionality

Annex I Parties to the UNFCCC including Russia, participating in JI, have two options for JI, depending on whether they are in full or partial compliance with the eligibility criteria. The second procedure, Track II, involves an international process that is similar to CDM and requires testing additionality issues.

Two Track Procedures for Hosting JI Projects

JI Track One may be applied when the Annex I Party hosting the project fully meets all the eligibility requirements to participate in the mechanisms. In this case, the host Party may apply its own national rules to the selection of JI projects and the estimation of emission reductions. The host Party may also issue ERUs and transfer them to project participants.

JI Track Two can be used if the host Party does not meet all eligibility requirements. In such cases, the project and the quantity of ERUs it generates must be verified under rules and procedures supervised by the JI Supervisory Committee, which is an international body established under the Kyoto Protocol. The rules include independent verification/determination of the emissions baseline and monitoring plan and independent certification of the monitored reductions before ERUs can be issued. The details of the JI procedures are still being elaborated, including the Project Design Document (PDD), but they will likely be similar in scope to those of the CDM. For now, approved CDM baseline and monitoring methodologies can be used for JI projects. Most of the JI projects developed to date have followed Track II JI procedures.

Under assumption that the project will be implemented under the JI Track Two, the additionality test follows the “Tool for the demonstration of and assessment of additionality (version 02)” issued and recommended by the CDM Executive Board (EB 22 Report, Annex 8). All the recommended steps are relevant and will be addressed.

Step 0 – Preliminary screening based on the starting date of the project activity



Not relevant for JI.

Step 1 – Identification of alternatives to the project activity consistent with current laws and Regulation

Sub-step 1a

Only two scenarios are considered plausible and credible alternatives as a baseline:

1. The proposed project activity, and
2. Continuation of the current leak detection and repair practice.

OJSC Stavropolkraygas does not have incentives or the means to undertake the efforts of the project activity in the absence of project activity.

Result: Pass

Sub-step 1b. Enforcement of applicable laws and regulations

State Regulation No. 344 issued in 12 June 2003 set a pollution tax on 225 pollution substances, of which one is methane. The tax rate for methane pollution it is equal to 50 rub (approximately \$ 1.75) per 1 tCH₄ for emission within fixed limits (established case-by-case by tax authorities) and 250 rub. per 1 tCH₄ (approximately \$ 8.75) if pollution is over fixed limits. It is far below the price for natural gas even in the domestic market (approximately \$ 43.5 taking into account that a ton of CH₄ is equal to 1.45 th. m³).

The pollution tax for leaks up to the threshold of 0.6% is paid by OJSC Stavropolkraygas. The tax is then reimbursed OJSC Stavropolkraygas by the gas supplier company, who eventually pass on this cost to gas consumers. In principle OJSC Stavropolkraygas should cover the pollution tax for gas leaks above the 0.6% threshold. However this tax is currently not collected because:

- Neither the regulating authority nor companies have sufficient measurement practices to determine pollution volume.
- No pollution emission limits are established. It requires solid data based on pollution measurement of all pollutants in all spheres and all regions of the Russian Federation. As no pollution measurements are being conducted at present it will take a long time to compile this database.
- There is no methodology to calculate the volume of pollution emission.

In summary, OJSC Stavropolkraygas is not faced with any financial penalty from the pollution tax and hence no financial gain is made in terms of less taxation from reduced leaks. Enforcement of State Regulation No. 344 and issuance of any new regulation that might affect additionality will be monitored (see Annex 3 Monitoring Plan).

Result: Pass

*Step 2 – Investment Analysis*

Absent JI benefits, the project owners do not have any direct economic benefits from the leak reductions achieved through the project activity. OJSC Stavropolkraygas is a provider of transport services for the gas supplied from JSC Gazprom to final consumers. JSC Gazprom is the supplier of gas from the high pressure gas pipeline and has meters to determine the amount of gas entering the OJSC Stavropolkraygas distribution system.

According to Governmental regulation No 162 issued 5th February 1998, JSC Gazprom can charge end use consumers (i.e. not OJSC Stavropolkraygas but the final users) for the gas metered at the exit of the high pressure gas pipeline minus a 0.6% stipulated loss, as “allowable gas volume losses”. Since OJSC Stavropolkraygas is only paid for the transport volume of gas, metered when it enters its gas system, there is no benefit to OJSC Stavropolkraygas for reducing distribution losses. Only the end users of gas who will benefit from reduced losses since they currently pay for a higher volume of gas than what is actually delivered.

In addition Gore-Tex repair material is approximately 10-times more expensive than the domestically manufactured material which currently is being used.

Result: Pass

Step 3 – Barrier Analysis

The project activity involves the use of advanced leak detection and measurement practices and equipment. Such equipment and practices are relatively new and not yet used on a broad scale internationally, see <http://www.epa.gov/gasstar/>. The project activity supposes that modern catalytic oxidation/thermal conductivity detectors and Hi-Flow Sampler are used to identify and measure gas leaks in Russia. The project activity requires not only the purchase of the relevant equipment but also training of OJSC Stavropolkraygas staff to operate it.

It is the prospect of JI financing that has enabled the project developer to make preparation of the JI project activity. This includes the purchase of one Hi-Flow Sampler, missions to undertake sample leak detection, measurements and repairs and the initial training of local staff.

Current practices within OJSC Stavropolkraygas, as with most companies in this industry, work in the following manner: (1) all leaks are essentially passed on in the bill to consumers (alt: passed on to consumers’ bill) so there is no incentive to eliminate leaks; and (2) to inspect the pipeline for leaks would require increased staff with special technical training and this is not seen as cost effective by the companies.

The current repair of leaks using graphite and other outdated material is the least-cost method of repairing leaks but is technically inferior to using Gore-Tex. However, given OJSC Stavropolkraygas’ financial situation, the continued use of graphite is the preferred option.

Result: Pass

Step 4 - Common Practice

The financial incentives described under step 2 and barriers described under step 3 are not only relevant to OJSC Stavropolkraygas but prevalent throughout the low pressure gas distribution system in Russia.



For this reason the approach taken in leak detection and repair presented as the baseline scenario of this project is common practice in Russia.

By and large the same leak detection devices as in Stavropol are used throughout Russia and the use of repair material to reduce leaks differs little from region to region. Equipment to measure leak rates is not available to any gas distribution company in Russia, and repair material used is normally graphite and asbestos soaked in oil. Under the climatic conditions of the winter season in Russia such material offers only temporary reductions in leak rates. In addition, leaks that occur during the winter are rarely repaired because in order to make the repair the pipeline often needs to be shut down. Pipeline shutdown eventually causes disconnection of such essential facilities as hot water, central heating, and in some cases electricity. For this reason it is hardly possible to shut off gas supply in winter.

Result: Pass

Step 5 – Impact of JI Registration

The expected income from the sale of AAUs (for 2007 if it will be applicable according to the Russian national JI procedures) and ERUs (for 2008-2012) is for the project developer the only source of revenues from the project. Without these revenues the projects developer would not have the means to undertake the activities of the project.

Result: Pass

B.3. Description of how the definition of the project boundary is applied to the project:

There are 1,445 regulator points and 9,239 smaller step-down points (in total 10,684 sites), operated by OJSC Stavropolkraygas, which contains 74,139 valves and approximately 222,417 flanges. All valves not depending on the leak rate and only leaking flanges are included in the project boundary. The exact number of leaking valves and flanges will be stated after measurement works. Valves and flanges within the boundary of the project are located at medium (0.3 MPa) and low pressure (0.003 MPa) pipelines. Only methane emission reductions at the sites are included in the project.

No leakage (GHG emission impacts out of boundaries of the project by the project activities) is expected.

B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline:

Baseline was developed in December 2006 by the National Methane Centre, Russia, and submitted to DNV for determination on December ___, 2006.

National Methane Centre was established in spring 2005 as a non-commercial partnership for consultancy purposes serving the founders by OJSC Rosgazifikatsiya, OJSC Mezhhregiongas (Gazprom daughter Company) and Centergasservice-opt.

National Methane Centre' contact information:

Mr. Ilya Kramarenko
Executive Director
28/1, building 2, Krasnoprudnaya Street,
Moscow 107140, Russia



E-mail: kiv@cgazs.ru

National Methane Centre is not a project participant.

**SECTION C. Duration of the project / crediting period****C.1. Starting date of the project:**

July 2006

C.2. Expected operational lifetime of the project:

6 years.

C.3. Length of the crediting period:

6 years, starting on January 1, 2007 (if early crediting will not be applicable according to the Russian national JI procedures to be approved by the Government of the Russian Federation) or the length of crediting period will be 5 years (2008-2012), starting on January 1, 2008.

“Early credits” in the form of assigned amount units (AAUs) will be sought for 2007, and emission reductions units (ERUs) will be earned for 2008 to 2012.

**SECTION D. Monitoring plan****D.1. Description of monitoring plan chosen:**

The monitoring methodology assumes the use of certain type of technologies. The catalytic oxidation/thermal conductivity detectors used for leak detection and the Hi-Flow Sampler will be used for leak measurement in the project activity (see also A.4.2).

All leaks must be identified and measured, as well as a monitoring system must ensure that repaired leaks have zero emissions during the whole crediting period. If leak re-occurs after it was repaired, it will be considered that the leak started after the moment of the previous inspection of this site.

The monitoring plan includes all data necessary for estimation of anthropogenic GHG emissions by sources occurring within the project boundary. It also outlines the process that is to be used to collect and archive all relevant data.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:**D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:**

ID number (Please use numbers to ease cross-referencing to D.2.)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
D-1	Z Number	Number of Component inspected and repaired and then resurveyed.	Number	M	Once	100%	Electronic	Each component will be assigned with a number and monitored after repair for re-emerging leaks. To support documentation digital photography will be used.
D-2	Mz _{periodt} Time	Minutes of equipment operation for each	# of minutes per reporting	M	Constant	100%	Electronic	Based on records of the time of initial repair and subsequent monitoring, minutes the component has been in operation during the



		<i>component</i>	<i>period</i>					<i>reporting period is counted</i>
<i>D-3</i>	<i>Time</i>	<i>Repair and monitoring log</i>	<i>Date of repair and monitoring</i>	<i>M</i>	<i>Constant</i>	<i>100%</i>	<i>Electronic</i>	<i>Time of repair or monitoring (date, hour, minutes) will be recorded for each component that is repaired as part of the JI project activity. In cases of re-emerging leaks, the reemerging leak will be assumed to have occurred the minute after the most recent check which showed no leak.</i>
<i>D-4</i>	<i>LMP_z_{periodt} Leak rate of CH₄ for each leak detected</i>	<i>Project leak database</i>	<i>Litre per minute</i>	<i>M</i>	<i>Constant</i>	<i>100%</i>	<i>Electronic</i>	<i>For each leak point the leak rate is measured twice and the lower rate is used for calculation of emissions.</i>
<i>D-5</i>	<i>GWP_{CH4} Global Warming Potential</i>	<i>IPCC</i>	<i>Tons of CO₂ equivalent</i>	<i>C</i>	<i>Constant</i>	<i>100%</i>	<i>Electronic</i>	<i>Project developer will monitor any changes in the methane global warming potential value published by the IPCC</i>

**D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO₂ equivalent):**

Project emissions are those detected and measured as re-emerging leaks (i.e. faulty leak repairs). The leaks will be identified and measured in a manner similar to the baseline calculation. However, unlike the calculations of baseline emissions which are only done once prior to the initial repairs, project emissions are calculated regularly as part of the Monitoring Plan.

Total project emissions (TPECO_{2periodt}) for a period t (one specific period covered by a monitoring report) is the accumulated leaks over the period for components where re-emerging leaks have been detected and measured. Leaks for each component are calculated as the leak rate (liters per minute) multiplied by the length of the period (minutes). It follows from this that the leak rate for each component is assumed to stay constant over the course of the period.

The sequence of these calculations and the formulas applied are as follows:

$$(1) \text{PE}_{z\text{periodt}} = \text{M}_{z\text{periodt}} * \text{LMP}_{z\text{periodt}}$$

PE_{zperiodt} is leak from component z during period t. Each component covered by the JI project activity has a unique serial number z.

M_{zperiodt} is the number of minutes component z has been in operation from the last inspection to the moment when a leak is detected.

LMP_{zperiodt} is measured leaks of CH₄ from component z, measured in liters per minute at the moment when it was detected.

(Components where the repair has been effective (no faulty repair) will have LMP_{zperiodt} = 0)

$$(2) \text{TPE}_{\text{periodt}} = \sum \text{PE}_{z\text{periodt}} = (\text{Sum over all components/serial numbers with leaks})$$

$$(3) \text{TPECO}_{2\text{periodt}} = \text{TPE}_{\text{periodt}} * \text{GWP}_{\text{CH}_4}$$

TPE_{periodt} is CH₄ emissions from re-emerging leaks for period t.

GWP_{CH₄} is the Global Warming Potential of methane (in tons CO_{2eq}/m³ methane).



The GWP is calculated by converting the volume of methane calculated from the Hi-Flow Sampler measurements to tons of methane using the molecular weight and molecular volume of methane: tons of methane per cubic meter of methane ($\text{tCH}_4/\text{m}^3\text{CH}_4$). At standard temperature and pressure (1 degree Celsius and 1,013 bar) the density of methane is $0.0007168 \text{ tCH}_4/\text{m}^3\text{CH}_4$. As all measurements done by Hi-Flow Sample are normalized as they all were done at the temperature of 1 degree Celsius and 1,013 bar (for the purpose of comparability of measurements) all measurement results can be transformed with the ratio $0.0007168 \text{ tCH}_4/\text{m}^3\text{CH}_4$. This value is then multiplied by the IPCC-1996 conversion of 21 tons $\text{CO}_2\text{eq}/\text{tons CH}_4$. Again at standard pressure and temperature this is $0.0150528 \text{ tons CO}_2\text{eq}/\text{m}^3 \text{ methane}$.

D.1.1.3. Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:								
ID number (Please use numbers to ease cross-referencing to D.2.)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
D-1	Z Number	Number of component inspected and repaired and then resurveyed.	Number	M	Once	100%	Electronic	Each component will be assigned with a number and monitored after repair for re-emerging leaks. To support documentation digital photography will be used.
D-2	Mz _{periodt} Time	Minutes of equipment operation for each component	# of minutes per reporting period	M	Constant	100%	Electronic	Based on records of the time of initial repair minutes the component has been in operation during the year is counted
D-3	Time	Repair and monitoring log	Date of repair and monitoring	M	Constant	100%	Electronic	Time of repair or monitoring (date, hour, minutes) will be recorded for each component that is repaired as part of the JI project activity.



D-4	LMP _{zperiodt} Leak rate of CH ₄ for each leak detected	Project leak database	Litre per minute	M	Constant	100%	Electronic	For each leak point the leak rate is measured twice and the lower rate is used for calculation of emissions.
D-5	GWP _{CH4} Global Warming Potential	IPCC	Tons of CO ₂ equivalent	C	Constant	100%	Electronic	Project developer will monitor any changes in the methane global warming potential value published by the IPCC

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO₂ equivalent):

The baseline emissions are calculated using the leak rates measured by Hi-Flow Sampler prior to the initial repair. For the purpose of these calculations it is assumed that pre-repair leak rates, measured for each component, in absence of the JI project activity would have stayed constant over the crediting period of the project.

The sequence of the calculations and the formulas applied for baseline emissions are as follows:

(1) $L_{zperiodt} = M_{zperiodt} * BLMP_z$

$L_{zperiodt}$ is calculated baseline leak from component z for period t. z is the unique serial number of a component repaired under the JI project activity.

$M_{zperiodt}$ is the number of minutes component z has been in operation during period t.

$BLMP_z$ is the measured (baseline) leak rate (litres of CH₄ per minute) prior to repair

(2) $TL_{periodt} = \sum L_{zperiodt}$ (Sum over all components/serial numbers of the JI project activity)

$TL_{periodt}$ is total CH₄ emissions calculated for all components covered by the JI project activity components subject to repair) as baseline emissions for period t

(3) $BE_{CO2 periodt} = TL_{periodt} * GWP$

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.



$BECO2_{periodt}$ is the baseline emission in $CO2eq$ calculated for period t from all components that have been repaired as part of the JI project activity

The GWP is calculated by converting the volume of methane calculated from Hi-Flow Sampler measurements to tons of methane using the molecular weight and molecular volume of methane: tons of methane per cubic meter of methane (tCH_4/m^3CH_4). At standard temperature and pressure (1 degree Celsius and 1,013 bar) the density of methane is $0.0007168 tCH_4/m^3CH_4$. This value is then multiplied by the IPCC-1996 conversion of 21 tons $CO2eq/tons CH_4$. Again at standard pressure and temperature this is $0.0150528 tons CO2eq/m^3$ methane.

Thus, volume of ERUs for a period will be equal to

$$ERU_{periodt} = BECO2_{periodt} - TPECO2_{periodt}.$$

D.1.2. Option 2 – Direct monitoring of emission reductions from the project (values should be consistent with those in section E.):

>>

D.1.2.2. Description of formulae used to calculate emission reductions from the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

>>

D.1.3. Treatment of leakage in the monitoring plan:**D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:**

ID number (Please use numbers to ease cross-referencing to D.2.)	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment



Almost no leakage is expected under the project.

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO₂ equivalent):

Almost no leakage is expected under the project because of technology described above. If reemerging leaks occur it will be documented according to monitoring procedure and deducted from the volume of ERUs upon the project.

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO₂ equivalent):

Project emissions result from not 100% effective repairs. Ex-post leak detection and measurements will determine project activity emissions (the occurrence of re-emerging leaks). Since this is early experience of this kind in Russia, no data currently exist on frequency of re-emerging leaks. It is considered unlikely that re-emerging leaks will result in emissions, which are greater than 5% of baseline emissions.

As described in Section B, baseline emissions are derived from the leak rate measurements collected in the first year of project implementation, when all components will be prepared. Surveys representing 2.82% of the components covered by the project activity suggest that baseline emissions are 5,032,765 tons/year of CO₂ equivalent.

In order to keep the emission reductions estimates conservative it is assumed that they will be 1% lower than the ex-ante calculations of baseline emissions, which is 5,000,000 CO₂ equivalents per annum once all initial repairs are done.

CH₄ sources: 25,000,000 tons of CO₂ equivalents are ERUs for the period 2008 to 2012, and 140,000 tons of CO₂ equivalents are AAUs for 2007 (if early crediting will be applicable according to the Russian national JI procedures to be approved by the Government of the Russian Federation).

If post first commitment period of the Kyoto Protocol will be applicable appropriate emission reductions will be added to the carbon crediting.



Estimations of emission reductions generated by the JI project

Years	Annual estimation of emission reductions in tons of CO ₂ e
2006	-
2007	140,000
2008	5,000,000
2009	5,000,000
2010	5,000,000
2011	5,000,000
2012	5,000,000
Total emission reductions	25,140,000
Total number of crediting years	6 years , if early crediting will be applicable
Total for 2008 to 2012	25,000,000

D.1.5. Where applicable, in accordance with procedures as required by the host Party, information on the collection and archiving of information on the environmental impacts of the project:

The project activity does not require infrastructure or equipment that would yield any substantial local or regional environmental impacts. The result of the project activity, reduced emissions of CH₄, represents a reduction of risks particularly associated with indoor leaks.

D.2. Quality control (QC) and quality assurance (QA) procedures undertaken for data monitored:

Data (from tables D.1.1.1 and D.1.1.3, indicators in the tables are similar)	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.1	Low	Each valve for which a leak is detected will be assigned with a unique serial. After repair, the valve will be monitored for any additional leaks.



D.2 and D.3	Low	The data logger capability of the Hi-flow sampler will be used. For double checking purpose and documentation, digital photography will be taking of the display reading next to the leaking component with numerical tag. Digital photography will be archived in the Repair and Monitoring Log at the office of OJSC Stavropolkraygas for the period until two years after the crediting period.
D.4.	Low	Leak rates will be measured and double checked before repair – major discrepancies (10%) will warrant a new set of tests. Should Hi-Flow Sampler or other equipment need recalibration or adjustment to ensure their accuracy, the project participants will take the necessary action to do so.
D.5	Low	Project participants will keep track of any new GWPs adopted by the COP.

D.3. Please describe the operational and management structure that the project operator will apply in implementing the monitoring plan:

Monitoring plan will be implemented by OJSC Stavropolkraygas staff. OJSC Stavropolkraygas will provide detection and measurement of methane leaks by its certified technicians, repair works and documentation of leaks during the whole crediting period. AddGlobe, LLC and Centergasservice-opt will provide methodological supervision and support to OJSC Stavropolkraygas, as well as measurement equipment and Gore-Tex sealing materials.

D.4. Name of person(s)/entity(ies) establishing the monitoring plan:

National Methane Centre (Russia).

Contact information:

Mr. Ilya Kramarenko

Executive Director

28/1, building 2, Krasnoprudnaya Street,

Moscow 107140, Russia

E-mail: kiv@cgazs.ru

**SECTION E. Estimation of greenhouse gas emission reductions****E.1. Estimated project emissions:**

The estimate of emissions reductions to be achieved through the project activity is based on data from the surveys conducted in July-October 2006. Measured average leak rates for the sample of components inspected were 8.58 liters per minute (lpm) for leak screw packing, and zero rate for flanges. Applying these rates for entire population of components gives an annual level for the leaks of 334 million m³ of gas. Converting this to CO₂ equivalents using the factor 0.0007168 to convert one m³ of CH₄ to one ton of CH₄ and taking into account that the global warming potential of one ton of CH₄ is 21 ton of CO₂ equivalents, the annual emissions are 5,032,765 tons of CO₂-equivalents as shown in Table 2.

Table 2 Estimates of leaks from regulator and step-down station operated by OJSC Stavropolkraygas.

	Inspected components			Total emission per year		
	Survey	JI project	LPM	m3	tCH4	tCO2e
Valve Stem Packings	2,093	74,139	8.58	334,340,793	239,665	5,032,765
Flanges	5,159	222,417	0	0	0	0
Total	7,252	296,556	8.58	334,340,793	239,665	5,032,765

The surveys represent 2.82 % of valves and flanges of the total number of components in the system. All of inspections were done in the Novoseletsk, Budenovsk and Kocheevsky regions of Stavropol region. 54% of the inspected valves are located in the countryside and 46% of the inspected valves are located in the cities that makes the sample representative. No sizable difference in the leak rates within cities and in the countryside was detected. On the one hand valves in the cities are subject to more fluctuation in pressure, which often creates leaks, than at stations in the country side. On the other hand, the frequency of inspections and repair at stations in the cities is higher than in the countryside. No leaks at flanges were detected but it can become different when larger proportion of inspection and measurement works are done.

Repair activities of the JI project may not be 100% effective, particularly if the repair work has not been done properly. Failures in repair will be detected and rectified (see the Monitoring Plan) and this in turn will adequately be reflected in the emission reduction calculations. Taking this eventually (re-emerging leaks) into account and provisions for uncertainty in measurements done in July-October 2006. We have here estimated the emission reductions to be 5,000,000 CO₂ equivalents per annum (1% below the estimate of Table 2), once all the sites and components have been inspected. This is a conservative estimate of emission reductions also because gas consumption in Stavropol is expected to grow by 3-4% per year.

All repair works were done in July-October 2006 after the inspection of 2,093 components. It is expected that all valves (currently 74,193) will have been inspected, measured and repaired by the end of November 2006. A first full monitoring of these repairs will be done before the end of June 2008 (see Monitoring Plan). If we assume that repairs are done in 2006, the estimated emission reductions for every subsequent year (starting 2007) till 2012 will be about 100,000 tons CO₂ equivalent.

Leak detection and repair activities will be continued also in and after 2007 through new inspections at already visited sites. This will be a part of regular inspections and maintenance program initiated by the JI project, and will be coordinated with the activities described in the Monitoring Plan.



Total AAUs and ERUs for 2007-2012: 25,140,000 tons of CO₂e.

Total ERUs for 2008-2012: 25,000,000 tons of CO₂e.

E.2. Estimated leakage:

No leakage is expected.

E.3. The sum of E.1. and E.2.:

Total AAUs and ERUs for 2007-2012: 25,140,000 tons of CO₂e.

Total ERUs for 2008-2012: 25,000,000 tons of CO₂e.

E.4. Estimated baseline emissions:

5,000,000 tons CO₂e per year, or in total for 2008-2012 – 25,000,000 CO₂e

E.5. Difference between E.4. and E.3. representing the emission reductions of the project:

Total AAUs and ERUs for 2007-2012: 25,140,000 tons of CO₂e.

Total ERUs for 2008-2012: 25,000,000 tons of CO₂e.³

E.6. Table providing values obtained when applying formulae above:

Year	Estimated project emissions (tons of CO ₂ -equivalent)	Estimated leakage (tons of CO ₂ -equivalent)	Estimated baseline emissions (tons of CO ₂ -equivalent)	Estimated emission reductions (tons of CO ₂ -equivalent)
2006	Zero emissions	-	-	-
2007	Zero emissions	-	140,000	140,000
2008	Zero emissions	-	5,000,000	5,000,000
2009	Zero emissions	-	5,000,000	5,000,000
2010	Zero emissions	-	5,000,000	5,000,000
2011	Zero emissions	-	5,000,000	5,000,000
2012	Zero emissions	-	5,000,000	5,000,000
Total (2007-2012)	Zero emissions	-	25,140,000	25,140,000
Total (2008-2012)	Zero emissions	-	25,000,000	25,000,000

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts of the project, including trans boundary impacts, in accordance with procedures as determined by the host Party:

³ In order to keep the emission reductions estimates conservative it is assumed that they will be 4.6% lower than the ex-ante calculations of baseline emissions, which is 100 000 CO₂ equivalents per annum once all initial repairs are done.



The project activity does not require infrastructure or equipment that would yield any substantial local or regional environmental impacts. The result of the project activity, reduced emissions of CH₄, represents a reduction of risks particularly associated with indoor leaks.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to supporting documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

No additional environmental impacts are expected under the project.

SECTION G. Stakeholders' comments

G.1. Information on stakeholders' comments on the project, as appropriate:

Since the project is considered to have no negative environmental or social impacts, no local stakeholder involvement has been conducted. The authorities of Stavropolsky Kray have expressed strong support for the project. Russian office of WWF in Moscow is also expected to be involved to stakeholders' comments activities.

Annex 1**CONTACT INFORMATION ON PROJECT PARTICIPANTS**

Organisation:	AddGlobe, LLC
Street/P.O.Box:	CA 94402
Building:	155 Bovet Rd, Suite 476
City:	San Mateo
State/Region:	California, USA
Postal code:	CA 94402
Country:	USA
Phone:	650 357 7735
Fax:	650 357 7342
E-mail:	corporate@addglobe.com
URL:	www.addglobe.com
Represented by:	Andrei Gorski
Title:	Managing Director
Personal e-mail:	andre@addglobe.com

Organisation:	OJSC Rosgazifikatsiya
Street/P.O.Box:	Tscherbakovskaya Street
Building:	41A
City:	Moscow
Postal code:	105318
Country:	Russia
E-mail:	office@cgazs.ru
Represented by:	Valentine Izbitskich
Title:	General Director

Organisation:	Centergasservice-opt, LLC
Street/P.O.Box:	Tscherbakovskaya Street
Building:	41A
City:	Moscow
Postal code:	105318
Country:	Russia
E-mail:	office@cgazs.ru
Represented by:	Sergey Vasiliev
Title:	General Director
Personal e-mail:	svasiliev@cgazs.ru

Organisation:	OJSC Stavropolkraygas
Street/P.O.Box:	Kulakova avenue
Building:	1 A
City:	Stavropol
Postal code:	355029
Country:	Russia
Phone:	+ 7 8652-94-39-29
Fax:	+ 7 8652-94-39-29
Represented by:	Sergey Chursinov
Title:	General Director



Annex 2

BASELINE INFORMATION

The annex consists of two sections:

- The first section presents an overview of baseline leak detection and repair activities of OJSC Stavropolkraygas
- The second section explains how baseline leaks are estimated and makes the argument that these estimates provide a basis for conservative calculations of emission reductions

It should be underlined that calculation of baseline emissions to assess emission reductions will be available during project implementation only (prior to repair).

1. Baseline inspection and repair activities*OJSC Stavropolkraygas pipeline system*

Natural gas is typically delivered to customers through a pressurized pipeline. The main transmission pipelines transport millions of cubic meters of gas from gas production sites. OJSC Stavropolkraygas gas distribution system operates pipelines of medium and low pressure with an annual gas throughput of approximately 6.8 billion cubic meters (bcm). The natural gas distribution system has been operating since 1961.

The supply system covers approximately 28,000 kilometres (km) of pipes, with approximately 10,267 km of its length located within the cities – and approximately 17,732 km located outside the city limits. 42% of this pipeline is located underground. There are 1,445 regulator larger points and 10,684 smaller scale step-down stations. In total, they contain 74,139 valves and about 222,417 flanges. There are more than half of the large stations are located outside the cities, whereas 2/3 of the step-down stations are located in the cities.

There are two main sources of leaks in OJSC Stavropolkraygas network – cracks/breaks in the pipelines as well as components at gas distribution and smaller cabinet type points, most notably valve stem packing. As cracks and breaks occur randomly and can not be controlled and predicted, the only way of reducing leaks at the pipelines is systematic regular inspections. As it is extremely cost-ineffective to survey every meter of the wrapped pipeline of 28,000 km to pinpoint breaks and cracks the only alternative for reducing methane losses is to carry out a more systematic survey monitoring valves and flanges. Reduction of losses at these points will substantially contribute to the total reduction in GHG emissions.

Leak detection and repair

Survey of all valves and flanges within the city limits constitutes the part of OJSC Stavropolkraygas routine maintenance for leak detection. Leaks can be detected within the city limits because of the odour and/or knowledge of some activity that would cause leakage (as with some type of construction or accident etc). Approximately 16.5% of the valves and flanges are located in the city of Stavropol. Valves and flanges located within the city should be checked once a month according to industry standards (No. 153-39.3-051-2003) and at least once every six months if components are located outside the city. Due to resource constraints, however, this frequency might not be always achieved. Therefore, the portion of



valves and flanges that leak outside the city is likely to be higher than in the city. Prior to the first leak rate measurements done in July-October 2006 no reliable estimates of leak rates have been performed.

Repair material

The main material that is used at valves is a gas pipeline packing consisting of a round twisted cord made of flax sodden with oil, graphite and asbestos. The filling (oil, graphite and asbestos) is about 35% - 60% of total cord weight. The material loses containment due to pressure variations and under the influence of weather changes.

The cord is initially elastic being oil-saturated, and can fill all holes between the rod and the valve walls. Eventually (in about 1-2 months) the cord dries out but it is still vapor-proof until the rod is adjusted when regulating the pressure. Then the packing requires replacement due to loss of its containment property. Elastic oil and gasoline resistant rubber as well as paronite (compressed asbestos gaskets) are used at flanges. The latter is used as a sealing material at the flanges (approximately at 90% of flanges in the system).

Paronite (compressed asbestos gaskets) is also used at the flanges (approximately at 10% of the flanges). The main difference of paronite from elastic oil and gasoline resistant rubber is that this material is more elastic with lesser residual deformation and steadier to weather changing.

2. Estimates of baseline emissions

In order to describe the baseline of the project activity scenarios and analyse why emissions in the baseline scenario would likely exceed emissions in the JI project activity scenarios it is useful to distinguish between two categories of leaks from components:

Category 1: Components where leaks are detected and measured as part of the JI project activity. Under the baseline scenario these components will typically have a cyclical development in leak rates, with rates increasing in response to temperature and pipeline pressure changes (late fall and in the spring). The regular baseline inspections will detect the leaks to repair them afterwards, though usually with only temporary effect.

Category 2: Components where no leaks are detected as part of the JI project activity. Data from the surveys done in July-October 2006 suggest that about 2/3 of all valves covered by the project will belong to this category. They are, as stated in section A and B of the PDD, repaired as part of the JI project activity, despite the absence of detected leaks. These components might have had leaks in the past and leaks might appear in the future in the absence of the JI project activity.

Conservative estimate of emissions reductions

The actual leak reduction cannot be measured for the following reasons:

- Detection of leaks are not done continuously but only at certain time intervals as described in the Monitoring Plan (Annex 3).
- The leakage pattern of a particular valve may vary broadly depending on the weather, gas consumption rates and regularity of maintenance.
- Baseline leaks are hypothetical by their nature and cannot be measured.

It is therefore important that the approach taken to calculate baseline and project activity emissions and ensuring emission reduction estimate is conservative (meaning that the calculated emission reduction is



likely to be lower than the actual figures). The following approach for calculating emission reductions is applied:

Baseline emissions (TBE): Emissions measured before the leak repair⁴ (measured in volume per minute) multiplied by the number of minutes of the crediting period. This means that the measured baseline leak rate is assumed to stay constant over the crediting period (till end 2012).

Project activity emissions (TPE): Emissions measured after the repair (measured in volume per minute). It is expected that few, if any, leaks will be detected after repair (leak rate = 0). However, in the cases when leaks re-emerge, the measured leak rate will be considered to remain at the measured level from the day of the most recent previous inspection or repair. This way of calculating emission reductions ($TRE = TBE - TPE$) is conservative for the following reasons:

Category 1: components typically have baseline leaks that increase and drop as baseline maintenance/repair result in temporary reductions in leak rates (or they may drop temporary as the pressure is reduced in the summer). As the main part of measurement and repair works will be done during summer it can be expected that the leak rates measured and recorded just prior to JI project repair can will be lower than the average leak rate over the lifetime of a certain component.

Baseline emissions (BE): Emissions measured before leak repair⁵ (measured in volume per minute) multiplied by the number of minutes of the crediting period. This means that the measured baseline leak rate is assumed to stay constant over the crediting period (till end 2012).

Project activity emissions (PE): Emissions measured after repair (measured in volume per minute). It is expected that few, if any, leaks will be detected after repair (leak rate = 0). However, in the case when leaks re-emerge the measured leak rates will be considered to remain at the measured level from the day of the most recent previous inspection or repair.

It is therefore important to ensure that the approach taken to calculate baseline emission reductions and project activity emissions is conservative (meaning that the calculated emissions reductions are likely lower than the actual ones). Describing the applied approach we should take into the account the following issues:

1. In fact the volume of emission fluctuates over the time (as the leaks happen occasionally) and throughout the year (for the reasons that were described above). Therefore, from statistical point of view the more accurate way of emission estimation will be monitoring of leaks during the whole year or even longer period of time to acquire statistically supported average leak rate. But this approach is very expensive and for this reason can not be implemented. The suggested method assumes some degree of inaccuracy due to the spot measurements at the time of implementation; however, conservative restraining assumptions make it applicable and acceptable to the present and similar projects.
2. Other uncertainty is concerned with the fact that baseline emissions are hypothetical by their nature so we can not state for sure the volume of emissions that will happen in the future if the project is not implemented.

Considering these uncertainties the following approach of conservative calculation of emission reductions was applied:

⁴ Note that all valves will be repaired

⁵ Note that all valves will be repaired



- Most of the measurement and repair work (including annual monitoring) is done during summer season when gas consumption is drastically lower than in spring, fall or winter. The leak rates during the JI project activities in summer are therefore assumed to be significantly lower as well than during the cooler seasons.

- Even if the valve has no leak it is repaired under the project activity. It is likely that some of these components have had leaks in the past and might have leaks in the future in the absence of the JI project repair. Since no emission reductions are accounted for these repairs they probably represent a sizable underreporting of actual emissions reductions achieved by the project activity.

- All re-emerging leaks are detected as soon as possible and deducted from the volume of baseline emissions. Furthermore, the deduction is calculated using a conservative method. When the leak is detected the leak rate is assumed to be constant from the date of previous inspection. The two potential sources of underreporting are:

- the leak could start any time between the previous inspection and actual detection;
- the leak could develop over the time starting with minor emission and increasing later due to weather and pressure changes.

- The volume of emission was calculated with a discount in order to avoid overestimation of emission volume even under described above conservative assumptions.

The applied approach appears to be conservative enough for baseline emission estimations.

Annex 3**MONITORING PLAN****1. Procedures**

As described in the PDD, all leaks will be repaired during the first stage of project implementation (2006-2007). Subsequently, the monitoring plan will be implemented to ensure that the integrity of the leak repairing is checked annually.

Monitoring for re-emerging leaks

1. Every component repaired under the JI project activity will be given a unique serial number, which will be painted on the component and recorded with a digital photo of the component and number.
2. A record of all information in relation to each repaired component will be stored in a database, including photographs of display indicating leak rates etc. (see below).
3. Every component repaired under the JI project will be inspected by the JI monitoring crew at least once every year (normally in February – April using the catalytic oxidation/thermal conductivity detectors. These inspections will be held in addition to routine equipment inspections conducted by OJSC Stavropolkraygas.
4. If no re-emerging leak is detected, the JI monitoring crew will take a digital photo of each component (including a time stamp) that shows its serial number and the leak detector readings demonstrating no leak. This digital photo, along with the date, time, serial number of component, and details of the inspection time will be recorded in the database.
5. If there is a re-emerging leak detected, the JI monitoring crew will take a digital photograph of each component that includes its serial number and the leak detector readings, and starts the “Repair of re-emerging leaks” procedures.

Note that regular inspection of regulator stations by staff from OJSC Stavropolkraygas will also continue. This is another crew than that of JI project activity. This means that regulator stations located in the city of Stavropol shall be checked for leaks monthly, according to Industry Standard OST 153-39.3-051-2003, and once every six months - for stations located outside the city of Stavropol. In the event that the regular inspection crews detect a leak, they will immediately record a leak and repair it. In other words, re-emerging leaks may be identified either through the annual JI monitoring crew inspections or as part of the routine inspections of regulator stations.

Detailed instructions on what and how to be monitored are presented in Annex 5.

Repair of re-emerging leaks

1. Where a leak has been detected, the JI monitoring crew will use Hi-Flow Sampler to measure the leakage rate. Leak detection and measurement may not always be conducted on the same day as detection, because Hi-Flow Sampler is not brought out to the sites during routine inspections.
2. Each leak will be measured twice with High-Flow Sampler. Both leak rates will be recorded. If two measurements differ by more than 10% it normally indicates a human error and the measurements shall



be stopped. The measurement crew will change the position and start the test over again. If the two measurements differ by less than 10%, the lower one will be used for the purpose of calculating project emissions.

3. A digital photo will be taken of the component, serial number, and High-Flow Sampler reading.
4. The leak will then be repaired by the JI monitoring crew.
5. Once the leak has been repaired, the component will be inspected again using catalytic oxidation/thermal conductivity detectors to ensure that the repair had been effective. A digital photo (including time indication) will be taken demonstrating component, its serial number, and the detector readings.
6. All information on these works will be compiled in the database.

The enforcement of Government Regulation No. 344 and other new regulations that could affect additionality of the project will be monitored. This will be done by Centergasservice-opt and included in the regular monitoring reports.

2. Management of monitoring

Monitoring crew

OJSC Stavropolkraygas has formed a JI monitoring crew trained by Centergasservice-opt, to identify and repair leaks and monitor leaks that had been repaired. The person responsible for the overall monitoring plan implementation and day-to-day operations is to be appointed by OJSC Stavropolkraygas authorities.

Centergasservice-opt and OJSC Stavropolkraygas are developing detailed instructions and schedules for leak detection, repairs and measurements. The schedules and instructions will be modified and improved based on experiences from early JI project activities. It is the responsibility of JI monitoring crew to control that the performance and timeline of activities to be conducted by the Centergasservice-opt and OJSC Stavropolkraygas.

The training of OJSC Stavropolkraygas staff already started in 2006. A special training session was organized in July 2006 with participation of Health Consultants.

Calibration

An important part of the use of Hi-Flow Sampler is to check the proper functioning and calibration of the equipment. Calibration Kits and spare part kits are delivered with Hi-Flow Sampler package purchased for use in Russia. Hi-Flow Sampler has been certified for use in Russia by the Russian gas industry research institute 'GiproNiiGas'.

Procedures for checks and calibration of Hi-Slow sampler follow the procedures defined by the technology provider, including:

- Every day before use Hi-Flow sampler is being checked using calibration kit consist of two tanks with the standard percentage of methane concentration. In the event of indication of errors (deviation is more than 10%) that Hi-Flow Sampler must be recalibrated.



- Every month Hi-Flow Sampler will be recalibrated with all balloons from gas calibration kit by certified staff.

The manufacturer of the leak detector (Heath Gasurveyor 500 series) requires that device should be calibrated at least once every year under normal operating conditions. OJSC Stavropolkraygas will institute calibration validity of the detectors at least once every month following the same procedures for Hi-Flow Sampler, because accuracy of measurements within a project is considered to be very important.

Monitoring reports, quality assurance and corrective action

OJSC Stavropolkraygas will keep Centergasservice-opt and AddGlobe LLC informed about the progress in monitoring and repairs of re-emerging leaks. At the end of the monitoring period (June) draft monitoring report will be submitted for review and approval to the Head of Quality Inspection Service at OJSC Stavropolkraygas. Subsequently, OJSC Stavropolkraygas will submit the report to Centergasservice-opt for review and comments.

The quality assurance measures include procedures to handle and correct non-conformities in implementation of the Monitoring Plan. In the event that such non-conformities are observed:

- An analysis of the nonconformities and its causes will be carried out immediately.
- The management of OJSC Stavropolkraygas will make a decision, in consultation with Centergasservice-opt, on appropriate corrective actions to eliminate the non-conformity and its causes.
- Corrective actions are executed under the supervision of the Head of Quality Inspection Service at OJSC Stavropolkraygas, and necessary amendments are made to operational manual etc.
- All relevant information on non-conformities, subsequent analysis and corrective actions are presented in the annual monitoring reports.

3. Data storage

A database, where leak and repair data is entered into, is under development and will be fully operational in autumn 2006. This database is developed using the spreadsheet software Microsoft Excel and has the capacity to store all essential quantitative data, including serial numbers and photographs of all components, dates of monitoring and repairs, results of all monitoring. The data on leak measurements and repairs that were undertaken in July-October 2006 was stored in Excel workbook (Annex 4). If necessary this data can be integrated into Microsoft Access database.

For each component subject to JI project activity repair the database will contain the entire history of leaks, repairs and monitoring according to the principles indicated above. All data in order to calculate the emission reductions - leak rates (in liters per minutes), time (data, hour and minute) when measurements and repairs were done is documented according to the procedures indicated above.

- - - - -