CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDMPDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Reduction of Methane Leakages in the Gas Distribution Networks operated by the company JP Serbiagas

PDD version 1
Date: May 31, 2011

A.2. Description of the project activity:

The infrastructure of a typical gas distribution network includes low and medium pressure pipelines, gate stations, compressor stations, and pressure regulator and meter stations.

Methane emissions within gas distribution networks result from normal operations, routine maintenance, fugitive leaks and unexpected system outages. As gas moves through a distribution network, fugitive leaks can occur in all parts of the infrastructure, from connections between pipes and vessels, to valves and other specific equipment (e.g. flanges, threaded joints, meters). The leaks are caused by variations of atmospheric conditions (temperature, humidity, pressure) as well as natural deterioration and corrosion of valves and specific equipment over time.

The purpose of Reduction of Methane Leakages in the Gas Distribution Networks operated by the company JP Serbiagas (hereafter: "the project") is to reduce methane leaks in the medium and low pressure natural gas distribution networks operated by the state owned company JP Serbiagas[1] ("Serbiagas"), the major natural gas operator in the Republic of Serbia. The project activity entails the detection, measurement and repair of leaks in valves and fittings (flanges, threaded joints, stud bolts with hex nuts) located at gate stations and regulator stations, as well as other surface facilities such as the outdoor components of the compressor stations and the stand-alone valves and fittings in the gas distribution network. Collectively all valves and fittings included in the project activity shall be referred to as "components". The equipment and infrastructure within the compressor stations (i.e. compressors) are excluded from the project activity.

Methane leaks will be detected using the Gasurveryor 3-500 and the methane leak rate will be measured using a Hi-Flow Sampler. Repairs will be carried out using a variety of best practice solutions which are superior to normal operations undertaken by Serbiagas (as described in section A.4.3). The best solution will be determined by assessment of the repair requirement for each component and will include the use of modern sealing materials made from polytetrafluoroethylene (PTFE) or if required, extensive reconstruction of the component. Emission reductions will be calculated on the basis of the avoided methane leakage. If a leak recurs, it will be measured and repaired again as per the methodology.

In the scenario prior to the implementation of the project activity, the volume of methane released to the atmosphere due to leaks is not monitored or measured. Components are only inspected visually, aurally, or by smell during gas meter readings and routine activities at gate and regulator stations, in both rural and urban areas, and at the compressor stations. Stand-alone valves and fittings are inspected for leaks

[1] JP Serbiagas is Serbia's state-owned company, which engages in the transmission, distribution, storage, trade, and supply of natural gas for residential, commercial and industrial customers, and for power generation and district heating systems across the country. The company has 85% of the gas distribution market share in the Republic of Serbia. Serbiagas manages medium and low-pressure gas distribution systems with an annual gas throughput of about 2.5 billion cubic meters (bcm) with continuous increasing to reach 3.5 bcm in 2015. The distribution network covers 3650 kilometers (km) of pipes including 650 km of medium pressure (4 - 16 bars) and 3000 km of low pressure (less than 4 bars).

during pipeline repair and maintenance. Repair activities are only carried out according to current safety requirements. The repairs are carried out using klingerit (compressed asbestos jointing sheets) and/or by injecting grease.

The baseline scenario is the same as the scenario prior to the implementation of the project activity.

In addition to the reduction of methane emissions, the project activity will have important ancillary benefits toward sustainable development:

- energy conservation and sustainable use of natural resources by means of reducing natural gas distribution losses;
- improved health conditions for workers due to the elimination of asbestos in the current repair material;
- lower risk of accidents related to gas leaks;
- dissemination of modern technology related to leak detection and repair, as well as improved measurement practices.

The project will also help improve the company corporate sustainability, environmental management and operational practices.

A.3. Project participants:

Name of Party involved	Legal entities project participants (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
The Republic of Serbia (host)	JP Serbiagas	No
United Kingdom	Natsource Europe Limited	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

The Project activities are focused on the gas distribution network of the company JP Serbiagas

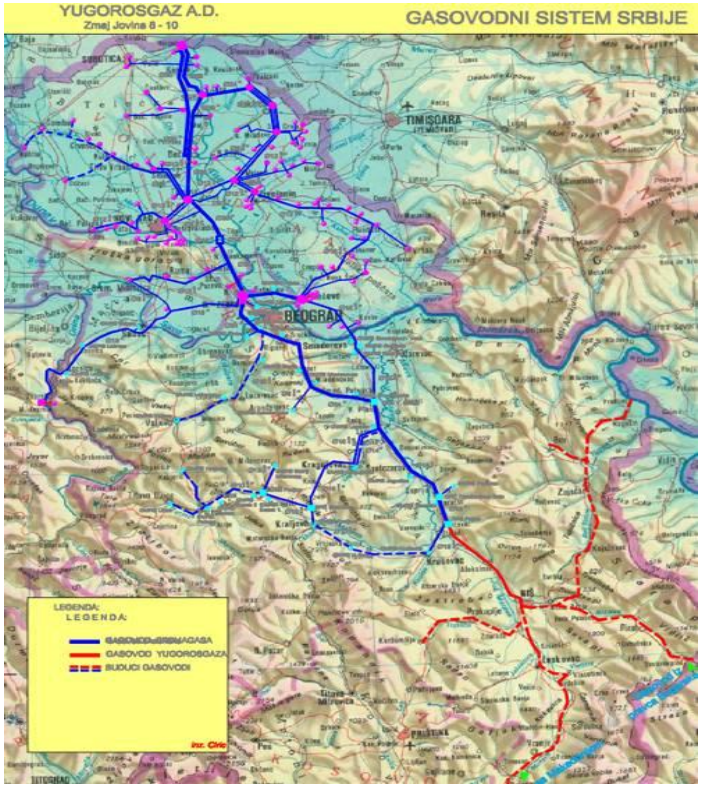

Figure 1 The gas transportation and distribution system in the Republic of Serbia

A.4.1.1. Host Party(ies):

The Republic of Serbia

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

The project activity will be implemented in the region of the city of Belgrade, the Autonomous Province of Vojvodina which includes the regions of: Central Banat, North Bačka, North Banat, South Bačka, South Banat, Syrmia, West Bačka, and Srem, and the following districts: Mačva, Kolubara, Braničevo, Bor, Podunavlje, Pomoravlje, Jablaniča, Moravica, Pčinja, Pirot, Rasina, Raška, Šumadija, Toplica, Zaječar, and Zlatibor.

Figure 2 Districts of Serbia

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

Belgrade, Novi Sad, Subotica, Kikinda, Zrenjanin, Pančevo, Sremska Mitrovica, Sombor and Ruma.

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

The project will be implemented in the low and medium pressure gas distribution system, which includes 165 gate stations, 684 gas regulator stations, 2 compressor stations and 3650 km of pipelines. The geographic coordinates of the project region are:

- the most northern point is 46.172222
- the most southern point is 44.535833
- the most western point is 19.159167
- the most eastern point is 21.519444

The headquarters of Serbiagas is located at the city of Novi Sad. Its geographical coordinates are 45.251667, 19.836944.

A.4.2. Category(ies) of project activity:

Category of project activity: Sectoral scope 10 - Fugitive emissions from fuels (solid, oil and gas)

A.4.3. Technology to be employed by the project activity:

In the scenario prior to the implementation of the project activity, there is no systematic approach to identify or repair gas leaks, nor does Serbiagas have a schedule or designated budget for this. Routine checks for leaks are not carried out. Inspection of leaks from components is carried out when there is visual damage to a component, the leak is audible or the odour of natural gas is perceived[2]. If leaks are suspected, a test is carried out using a simple soap solution. Sewerin Snooper gas leak detectors are used where there is a risk of explosion during pipeline repair work.

Serbiagas has two technical support departments tasked with the maintenance of the components. The technical support department located in Novi Sad is responsible for the gas network in the autonomous province of Vojvodina, while the department located in Belgrade is responsible for the gas network in the city of Belgrade and the central and eastern networks.

Staff from Serbiagas' gas transportation department check valves for damage during gas meter readings and other routine activities at the gate and regulator stations, in both rural and urban areas, and at other surface facilities. If any damage to a valve is identified visually, aurally, or by smell, staff check for leaks using a soap solution. The findings are reported to the technical support department, who will carry out the repair if it is deemed there is a safety concern, such as risk of explosion. Leaks are repaired using klingerit (compressed asbestos jointing sheets) and/or by injecting grease. If a valve is broken beyond repair (i.e. the valve is cracked or the thread has been stripped) then it is replaced.

The technical support department of Serbiagas also check for leaks in valves during the maintenance of the pipeline infrastructure. If a section of the pipeline is to be serviced or repaired, the valves at either end of that section will be closed to stop gas flow. However, there is no check for external methane leaks into the atmosphere from those valves, only checks for leaks internally, as this is where the danger of explosion is greatest (there should be no gas in the pipe section if work involving activities such as welding are being carried out). During these activities, staff from the technical support department will use a Sewerin Snooper device to detect methane in the section of pipeline to be serviced. This device can detect a leak, but does not measure the leak rate.

This existing situation is the same as the baseline scenario.

[2] Small amounts of organic compounds that have strong and recognizable smell are added to the natural gas as a safety measure to indicate the presence of leaks.

Figure 3 Distribution network valve

The project activity entails the detection, measurement and repair of methane leaks from components in the gas distribution network owned and operated by Serbiagas. Only components located at gate stations and regulator stations, as well as those at other surface facilities -- such as the exterior of or adjacent to the compressor station and the stand-alone valves and fittings in the gas distribution network -- are included in the project activity. The project activity will not carry out leak detection and repair activities on any other equipment, such as compressors.

The technology and equipment used prior to and after project implementation is listed in Table A-1.

Table A-1: Comparison of baseline and project technology.

Activity	Baseline Equipment / Technology	Project Equipment / Technology
Leak detection	Soap solution Sewerin Snooper	Catalytic oxidation / Thermal conductivity detectors (Gasurveyor 3-500)
Measurement of leak volumes	None	Hi-Flow Sampler™
Leak repair	Klingerit and grease	Polytetrafluoroethylene (PTFE) sealant material or component reconstruction

During the implementation of the project activity, a unique serial number will be assigned to each component included in the project boundary. Each component will be checked for leaks using the catalytic oxidation/thermal conductivity detectors (Gasurveyor 3-500). The Gasurveyor is a highly accurate and reliable instrument in a durable, anti-static case. It operates at temperatures of -20 to 50 °C. Its sampling system is equipped with an integral pump with a flow fail sensor.

After a leak has been detected, the leak rate will be measured using a Hi-Flow Sampler. A Hi-Flow sampler is a portable, safe, battery-powered instrument designed to determine the rate of natural gas leakage around various gas distribution components.. The Hi-Flow Sampler is equipped with a vacuum sampling hose that collects a large volume sample of the emissions from a leaking component. The gas leak rate can then be quantified by accurately measuring the flow rate of the sampling stream and the natural gas concentration within that stream. Technical details of the Hi-Flow Sampler are provided in Table A-2.

Table A-2: Hi-Flow Sampler specifications

Detection method	Catalytic oxidation / Thermal conductivity
Range	0-5% methane, catalytic; 5-100% methane, thermal
Measured values	Gas sample flow rate Background gas concentration Sample gas concentration
Calculated values	Leak rate of component under test Leak concentration corrected for background
Measurable leak rate	0.05 to 10.50 SCFM
Accuracy of calculated leak rate	±5% or 0.02% methane
Operating temperature	0 to 50 °C

The Gasurveyor has a display showing whether there is a leak and the Hi-Flow Sampler has a display of the leak rate. Where leaks are detected, digital photographs will be taken of the displays; photographs will be time stamped, and will also include the serial number of the monitored/repaired component. The information will be written down at the time of measurement, and later inserted into a database.

Detected and measured leaks from components will be repaired using PTFE sealant material and/or by reconstruction. The use of PTFE sealants and the reconstruction of components by Serbiagas will be a significant improvement compared to the current practice and technology used; it is expected to significantly reduce leaks in the distribution system.

The repair process will be carried out on site. Repair procedures will include:

Depressurization of the gas station pipeline system using bypass sub-system.

Discharge of pressure in the fire safe valves.

Discharge of pressure in the valves of main pipeline.

Reconstruction of ball valves:

4.1. Disassembly of ball valves.

4.2. Removal and disassembly of valve stem and inspection for physical and chemical damage.

4.3. Check and replacement of O-rings accordingly.

4.4. Assembly of valve stem.

4.5. Flushing old lubricant/sealant out of the valves.

4.6. Injecting under high pressure fresh lubricant/sealant and final adjustment.

4.7. Servicing of the valve's flange connections:

4.7.1. Release of stud bolts.

4.7.2. Removal of worn seals.

4.7.3 Replacement of seals and tightening of stud bolts.

Servicing of pipe's flanges:

5.1. Release of stud bolts.

5.2. Removal of worn seals.

5.3. Replacement of seals and tightening of stud bolts.

Servicing of fittings:

6.1. Release of fittings at threaded connections.

6.2. Wrapping of PTFE sealant around fittings.

6.3. Tightening and final adjustment of fittings.

7. Pressurize gas station pipeline system.

All repaired components will be checked immediately using the Gasurveyor to ensure there are no leaks remaining.

The project developer, Natsource Europe Limited ("Natsource") and its contractors will provide all of the equipment to detect and measure leaks, and the PTFE sealant material to repair the components. In addition, Natsource and its consultants will collaborate with Serbiagas staff to ensure that measuring instruments and repair materials will be used properly and that measurement and repair procedures will follow best practices.

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

A fixed crediting period (10 years) is adopted for the project. It is expected that the project activity will generate emission reductions of about 523,988 tCO2e per annum over the 10-year crediting period from 2012 through 2021.

Years	Annual estimation of emission reductions in tonnes of CO2 equivalent
2012	**523,988**
2013	**523,988**
2014	**523,988**
2015	**523,988**
2016	**523,988**
2017	**523,988**
2018	**523,988**
2019	**523,988**
2020	**523,988**
2021	
Total estimated emission reductions (tonnes of CO2 equivalent)	**5,239,880**

Total number of crediting years	**10**
Annual average of estimated emission reductions over the crediting period (tonnes of CO_2e)	**523,988**

A.4.5. Public funding of the project activity:

No public funding from parties included in Annex I is provided for the project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

AM0023 – "Leak reduction from natural gas pipeline compressor or gate stations" – Version 3
"Tool for the demonstration and assessment of additionality" – Version 05.2

This methodology and tool are available on the following website:
http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The project activity will reduce methane leaks in the low and medium pressure natural gas distribution networks operated by Serbiagas. The project activity satisfies all the applicability conditions in methodology AM0023, as described below.

Methodology AM0023 is applicable to project activities *"that reduce leaks in natural gas pipeline compressor stations and gate stations in natural gas long-distance transmission systems, as well as other surface facilities in gas distribution systems including pressure regulation stations by establishing advanced leak detection and repair practices".*

- The project activity meets the definition set out in AM0023; it entails the use of advanced technologies that would not have been used in the absence of the project activity (Gasurveyor 3-500, High-Flow Samplers and PTFE sealants) and will repair leaks in components in the gas distribution network.

Moreover, the project activity meets the applicability conditions of AM0023 as follows:

1. Where natural gas pipeline operators have no current systems in place to systematically identify and repair leaks;
   Serbiagas does not have in place a systematic approach to detecting and repairing leaks. Staff check for leaks using basic techniques only if a component appears to be damaged. Repairs are undertaken if it is deemed there is a safety concern, such as risk of explosion. Lack of up-to-date leak detection and measurement equipment prevents the carrying out of a systematic and effective leak repair program.
2. Where leaks can be identified and accurately measured;
   With the implementation of the project activity, modern equipment for leak detection (Gasurveyor 3-500) and measurement (Hi-Flow Sampler) will be acquired, allowing for identification and accurate measurement of leaks.
3. Where a monitoring system can be put in place to ensure leaks repaired remain repaired.
   As described in section B.7 of this document, a monitoring system will be put in place to check and repair any recurring leaks. The introduction of detection, measurement and repair procedures, development of a complete database and the use of modern leak detection and measurement equipment will ensure reliable monitoring of repaired leaks and detection of any re-emerging leaks. Training of local staff and the adoption of quality assurance procedures will ensure that the monitoring is performed according to the plan.

The methodology also applies if and only if the most likely baseline scenario is the continuation of the current leak detection and repair practices. As discussed in section B.4 of this document, the existing leak detection and repair practices for safety purposes using minimal basic technologies would have continued in absence of the project activity.

B.3. Description of the sources and gases included in the project boundary:

The physical boundary of the project activity will be the gate and regulator stations of the gas distribution network, components on the exterior of and adjacent to the compressor station, and stand-alone valves and fittings on the gas distribution pipeline. The equipment and infrastructure inside the compressor station (e.g. the compressors) are not included in the project boundary. Only methane emissions from unintentional leaks at components throughout the pipeline are included.

The project activity includes 165 gate stations, 684 regulator stations, and the outdoor components of 2 compressor stations, and all stand-alone valves and fittings in the pipelines of the gas distribution network. Approximately 15,000 valves and 60,000 fittings are included in the project boundary.

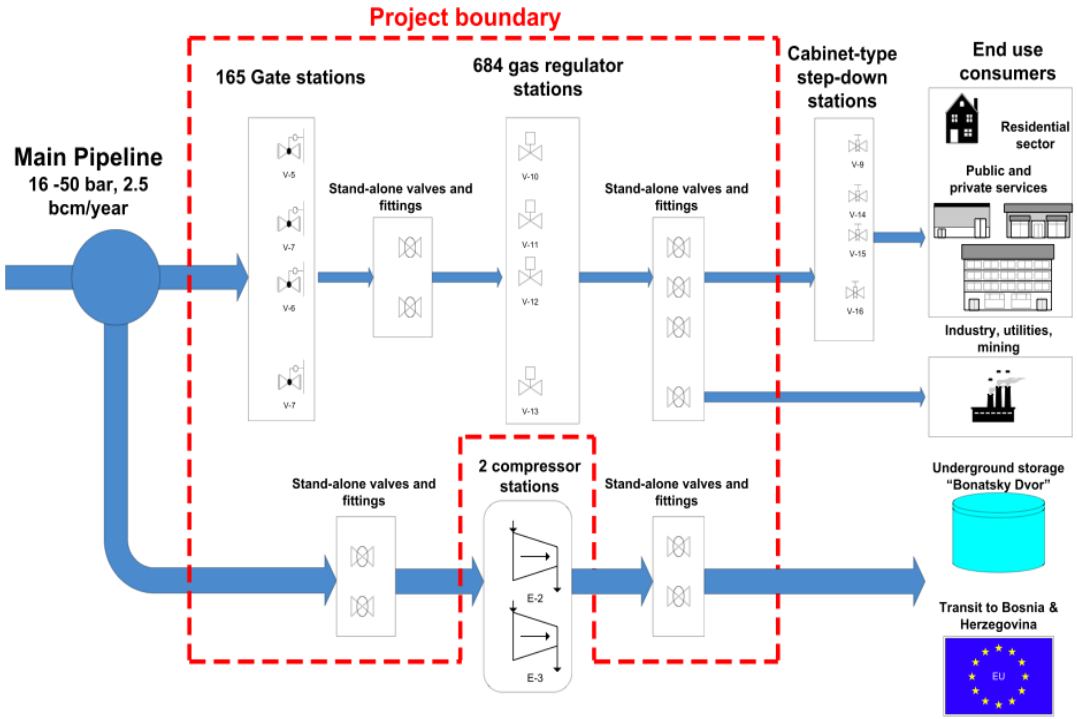

Figure 4 Project boundary diagram

Source		Gas	Included?	Justification / Explanation
Baseline	Fugitive Emissions	CO_2	Excluded	Not relevant to the project activity.
		N_2O	Excluded	Not relevant to the project activity.
		CH_4	Included	The main emission source. The project activity will reduce methane emissions from leaks in the gas distribution network operated by Serbiagas.
Project Activity	Fugitive Emissions	CO_2	Excluded	Not relevant to the project activity.
		N_2O	Excluded	Not relevant to the project activity.
		CH_4	Excluded	As per the methodology, any emissions due to recurring leaks will be excluded from the baseline emissions. Therefore, no project emissions are considered.

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

AM0023/Version 03 requires determining "*if similar efforts have been made or are expected to be made to reduce methane leaks from key components such as unit valves, blow down valves, rod packings and pressure relief valves, using similar capable leak detection and measurement technologies as described in this methodology"*.

- Serbiagas has not undertaken similar efforts in any other key components of its distribution network. Likewise, other gas distribution companies in Serbia have not implemented advanced detection or repair technologies in their distribution networks. Interviews with Serbiagas staff will confirm that this is accurate.

Reasonable and credible alternatives which would produce the same or similar results as the proposed CDM activity have been considered for determining the baseline scenario. Two alternatives have been identified:

1. Continuation of the current leak detection and repair practices; and
2. The proposed project not implemented as a CDM project.

Both alternatives are consistent with current laws and regulations.

Alternative 1: Continuation of the current leak detection and repair practices

The continuation of current leak detection and maintenance practices described in Section A.4.3 is a realistic and credible alternative to the project activity as it is the least-cost option for Serbiagas.

Operation of the gas distribution network is regulated by the "Law on Pipeline Transportation of Gaseous and Liquid Hydrocarbons and Distribution of Gaseous Hydrocarbons (Official Gazette of the Republic of Serbia, No. 104/09)"[3]. Under this law, the owner of the distribution network has developed internal procedures for the operation and maintenance of the network[4]. The law does not provide specific procedures that should be followed, and only requires that such internal procedures are in accordance with existing technical and regulatory requirements.

In line with the requirements of the law, maintenance of the gas distribution network owned by Serbiagas is governed by the "Instruction Manual for Maintenance of Gas Pipeline Facilities", referred to as the "White Book". This instructional manual has been developed taking into account the following laws and regulations:

Law on basic transport safety in the oil and gas pipelines, Official Gazette of SFRY, No: 64/1973.

Law on transport, distribution and usage of natural gas Official Gazette of RS, No: 66/1991.

Regulation on general conditions for delivery of natural gas Official Gazette of RS, No: 60/1993.

Ordinance of technical conditions and standards for safe transport of liquid and gas hydro carbons in the main oil and gas pipelines Official Gazette of SFRY, No: 26/1985.

Law on fire protection of Serbia Official Gazette of RS, No: 37/1988.

Ordinance of construction of plants for flammable liquids and storage and transport of flammable liquids Official Gazette of SFRY, No: 20/1981 and 23/1971.

Law on construction of investment facilities Official Gazette of SAPV. No: 13/1980.

Ordinance of technical standards for design, construction, plant and maintenance of gas boiler rooms Official Gazette of SFRY, No: 10/1990 and Official Gazette of SFRY, No: 52/1990.

Ordinance of technical standards for fixed compressed containers Official Gazette of SFRY, No: 16/1983.

Law on dangerous substances transports Official Gazette of SFRY, No: 27/1990.

Law on measuring quantities and standards Official Gazette of SFRY, No:. 9/1984, 59/1986, 20/1989, 9/1990 and 53/1991.

Valid laws within PTT

Regulations of electricity distribution organizations

Valid regulations for internal and external electrical installations

Valid laws and regulations on "Ex" protection

Ordinance of technical standards for protection of steel structures from corrosion Official Gazette of SFRY, No: 32/1970.

Ordinance of technical regulations for steel structures during exploitation Official Gazette of SFRY, No: 6/1965.

Ordinance of technical regulations for concrete and reinforced concrete Official Gazette of SFRY, No: 11/1987.

[3] http://www.aers.org.rs/FILES/Zakoni/ZakonOCevovodnomTransportu_01regng.pdf

[4] Article 11, Law on Pipeline Transportation of Gaseous and Liquid Hydrocarbons and Distribution of Gaseous Hydrocarbons (Official Gazette of the Republic of Serbia, No. 104/09)

The White Book does not stipulate a requirement to repair leaks unless it is for safety concerns, such as leaks occurring inside buildings and in residential areas, or when there is risk of explosion during pipeline maintenance and repair. Therefore, Serbiagas does not maintain a repair schedule or budget for it.

The current procedures only detect and temporarily repair leaks in the system. Leaks are repaired using klingerit or by injecting grease which only provides temporary repair of the leaks. There is no procedure to check the recurrence of a leak after repair and due to the relatively poor quality of the sealing materials used, the recurrence of leaks between regular inspections is common.

Furthermore, there are no laws prohibiting leaks in a gas distribution network.

Alternative 2: The proposed project not implemented as a CDM project

This alternative would entail implementing leak identification, measurement and repair activities, without CDM.

There are no laws requiring a systematic approach to identifying, measuring and repairing leaks as intended in the project activity.

Serbiagas does not incur any monetary loss in the form of penalties due to gas loss during distribution. As discussed in Section B.5, the project activity would not be implemented without the CDM revenue incentive.

Assessment: Alternative 1 does not require additional efforts or investments by Serbiagas; therefore, it is most likely to continue. Hence alternative 1 is identified as the baseline scenario.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The "Tool for the demonstration and assessment of additionality" (Version 05.2), "Guidelines for objective demonstration and assessment of barriers", and guidance from AM0023 are used to determine the project additionality.

Step 1 – Identification of alternatives to the project activity consistent with mandatory laws and regulations

Sub-step 1a: Define alternatives to the project activity
Two plausible and credible baseline scenario alternatives were identified in section B.4:

1. Continuation of the current leak detection and repair practices; and
2. The proposed project not implemented as a CDM project.

Sub-step 1b: Consistency with mandatory laws and regulations

As discussed in section B.4 both alternatives are consistent with existing mandatory laws and regulations.

- Alternative 1: The current practices follow the "Instruction Manual for Maintenance of Gas Pipeline Facilities", referred to as the "White Book". This instruction manual has been developed as required by the Law on Pipeline Transportation of Gaseous and Liquid Hydrocarbons and Distribution of Gaseous Hydrocarbons (Official Gazette of the Republic of Serbia, No. 104/09) . The manual has been developed following the relevant applicable laws and regulations listed below:
- Law on basic transport safety in the oil and gas pipelines, Official Gazette of SFRY, No: 64/1973.
- Law on transport, distribution and usage of natural gas Official Gazette of RS, No: 66/1991.
- Regulation on general conditions for delivery of natural gas Official Gazette of RS, No: 60/1993.
- Ordinance of technical conditions and standards for safe transport of liquid and gas hydro carbons in the main oil and gas pipelines Official Gazette of SFRY, No: 26/1985.
- Law on fire protection of Serbia Official Gazette of RS, No: 37/1988.
- Ordinance of construction of plants for flammable liquids and storage and transport of flammable liquids Official Gazette of SFRY, No: 20/1981 and 23/1971.
- Law on construction of investment facilities Official Gazette of SAPV. No: 13/1980.
- Ordinance of technical standards for design, construction, plant and maintenance of gas boiler rooms Official Gazette of SFRY, No: 10/1990 and Official Gazette of SFRY, No: 52/1990.
- Ordinance of technical standards for fixed compressed containers Official Gazette of SFRY, No: 16/1983.
- Law on dangerous substances transports Official Gazette of SFRY, No: 27/1990.
- Law on measuring quantities and standards Official Gazette of SFRY, No:. 9/1984, 59/1986, 20/1989, 9/1990 and 53/1991.
- Valid laws within PTT
- Regulations of electricity distribution organizations
- Valid regulations for internal and external electrical installations
- Valid laws and regulations on "Ex" protection
- Ordinance of technical standards for protection of steel structures from corrosion Official Gazette of SFRY, No: 32/1970.
- Ordinance of technical regulations for steel structures during exploitation Official Gazette of SFRY, No: 6/1965.

Ordinance of technical regulations for concrete and reinforced concrete Official Gazette of SFRY, No: 11/1987.

Serbiagas does not measure the amount of gas lost due to leaks in components.

Alternative 2: The CDM project activity also complies with the existing regulatory requirements regarding leak inspection of gate stations, regulator stations and compressor stations, and pipelines, as

well as other relevant requirements. Notably, inspections and repairs for safety requirements will continue to be carried out parallel to the project activity.

Outcome of step 1: The identified realistic and credible alternatives are in compliance with mandatory legislation and regulations.

Step 2 – Investment Analysis

Sub-step 2a: Determine appropriate analysis method

Serbiagas does not incur any penalties for gas losses and does not have any economic incentives to reduce leaks in its distribution system. The price of natural gas sold to consumer (tariff price) and the price for the distribution service is regulated by the Energy Agency[5], the regulatory body overseeing the development of Serbia's energy market. The pricing must be determined based on a set of methodologies and a tariff system that sets maximum allowed revenue for distribution gas companies. The calculation of the maximum allowed revenue for the distribution service ensures there is compensation of gas loss and is adjusted for any increase in revenue from improved performance of the distribution system. Therefore, any reduction of gas loss and any increase in revenue from the sale of the extra gas would theoretically reduce the maximum allowed revenue. In addition, the maximum allowed revenue based on the tariff price is adjusted according to the gas procurement costs. If the project activity reduces the amount of gas to be purchased by Serbiagas from the gas producer the reduction in cost must be accounted for, thus reducing the maximum allowed revenue through tariff price.

However, due to the uncertain correlation between the sale of the extra gas and the reduction in the maximum tariff , Option I, simple cost analysis cannot be applied. Step 3, Barrier Analysis will be used to demonstrate additionality.

Step 3: Barrier Analysis

Sub-step 3.a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

The following barriers are realistic and credible barriers that prevent the implementation of the proposed project activity without CDM. These barriers do not prevent the implementation of the baseline scenario, which is the continuation of the current practices.

Institutional Barriers

The current practices at Serbiagas offer only a temporary solution to stopping leaks from the distribution network, and any recurrence of the leak goes undetected. This is mainly due to the fact that Serbiagas does not have the institutional capacity needed for longer term solutions. There is no systematic leak detection and repair program in place and there is no dedicated team for carrying out this type of activity. Moreover, staff are not required to routinely inspect the components of the distribution network or to re-screen for leaks, thus the success of the repair over time is not ensured.

[5] The Energy Agency was established under the "Energy Law (Official Gazette of the Republic of Serbia No. 84/04)". http://www.aers.org.rs/Index.asp?l=1&a=91&ted=&ed=&tp=

The current leak detection and repair activities are a joint effort between two departments: the gas transportation department and the technical support department. The staff from each department are trained in limited leak detection and repair measures.

Staff from the gas transportation department are not trained in the use of advanced leak detection equipment or in leak repair. They visually inspect for damaged equipment during routine meter readings for collecting data on gas consumption at gate and regulator stations, and other surface facilities. They also identify the presence of leaks aurally or through smell. If there is reason to inspect the component further for leaks, the staff will use a soap solution to determine if it is leaking. Any leak detected during this time is reported to the technical support department.

The technical support department will repair leaks identified by the gas transportation department if there is a safety concern. Staff are trained to use klingerit and grease. The repair is not communicated to the gas transportation department. Thus, during the next meter reading activities, the gas transportation department is unlikely to confirm if the repair was successful. The technical support department will also check for leaks if there is a need to repair portions of the pipeline. The staff use a Sewerin Snooper to check for leaks internally within the pipeline after the valve has been closed, in order to prevent any explosions due to welding activities. If there is a leak, it will be repaired using klingerit and/or by injecting grease, but any recurrence goes undetected unless that same portion of pipeline requires repairing again.

Due to the lack of training in advanced detection, measurement and repair practices, and the lack of a dedicated team, the effectiveness of the repairs is not monitored. Staff from the gas transportation department and from the technical support department do not re-screen for leaks. With the implementation of the project activity a comprehensive monitoring plan will be implemented with the support of Natsource and the consultants. The project activity will create eight teams for carrying out the advanced leak detection, measurement and repair activities. Each team will comprise of staff from Serbiagas and staff from a third party. Staff will be trained in the use of the Gasurveyor, Hi-Flow Sampler and PTFE sealant by the equipment provider.

Technical Familiarity

The project activity involves the use of advanced leak detection and measurement practices that are not familiar to staff from Serbiagas. The equipment and materials used in the project activity are new to the region. Gasurveyors and Hi-Flow Samplers have not been used by staff before, as there is no systematic and effective repair program in place. The project activity also requires the reconstruction of valves, which is not currently undertaken by Serbiagas staff and introduces the use of PTFE sealants that are more effective in the repair of leaks than the materials currently used.

The current practices of leak detection and repair are limited and use out of date equipment that only temporarily repair leaks. The staff are not familiar with the equipment and materials that will be used in the project activity. It is evident in the current practices:

- Serbiagas staff are not required to routinely check for leaks. Under the current practice, staff will only identify leaks when a component appears to be physically damaged, when there is odour, or if the leak is audible. If any of these conditions are present, the staff will apply a soap solution or use a Sewerin Snooper to detect the leak. There is no check for leaks in fittings.

- In cases where the components are leaking, the leak rate cannot be measured due to the lack of measuring equipment.
- If the leak is deemed to be a safety concern, e.g. within a building or during pipeline maintenance, it will be fixed using klingerit and/or by injecting grease. The material is of poor quality and only temporarily fixes the leak. If the leak re-emerges, it may go undetected unless the conditions for detection previously described are present.

A qualified third party that is familiar with the equipment and material used in the project activity will be hired to help overcome the technical barrier. The third party will work with staff from Serbiagas in teams to implement the advanced leak detection and measurement practices, enabling the capacity building of Serbiagas in the use of modern leak detection, measurement and repair equipment (see Section B.7.2 and Annex 4).

Barriers due to financing

Serbiagas does not have a separate budget for leak detection and repair activities and it is not an investment priority to do so:

- Under current practices, any leak detection is undertaken as part of other main activities and repairs are only carried out if there is risk of explosion or fire during pipeline maintenance or due to other safety conditions. Serbiagas does not have a budget that would allow purchasing the equipment and material, as well as hiring a third party that will facilitate the implementation of the project activity.
- The current investment priority is the expansion of the gas pipeline network. Serbiagas is currently building a high-pressure gas pipeline with a total length of 1,222 km and is expanding the gas distribution network with a goal to provide gas to an additional 650,000 households[6]. The investments follow the National Investment Plan which is in accordance with the Energy Development Strategy and National Action Plan of the Republic of Serbia[7].

Therefore, the project will be funded through external resources. In light of the CDM incentive, Natsource will arrange the funding to purchase the Gasurveyors, Hi-Flow Samplers and PTFE sealants and will contract a qualified third party to assist in the initial repairs, the reconstruction of valves and for the implementation of a comprehensive monitoring plan.

Step 4: Common Practice Analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity

The "Tool for the demonstration and assessment of additionality" (Version 05.2) requires participants to "Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc."

[6] http://www.srbijagas.com/?q=investicije/razvoj_gasovodnog_sistema_u_srbiji

[7] http://www.srbijagas.com/?q=investicije/nacionalni_investicioni_plan

For the purpose of this analysis, a similar activity is defined as a systematic process for leak detection, measurement and repair of components in a gas distribution network (stand-alone components, and valves and fittings at gate and regulator stations) using similar technology, occurring in the Republic of Serbia. Only advanced technology, i.e. the use of an electronic gas analyzer for leak detection and PTFE-based material for repair, is considered as similar for the common practice analysis. The following equipment is considered for the analysis:

- Hi-Flow Sampler devices;
- Gasurveyor 500 Series devices;
- PTFE sealant;
- Measurement of leakage activity.

None of the equipment and activities listed above are being implemented in Serbia, either by Serbiagas or any other gas distributor. Serbiagas is the largest gas distributor in the country, and has not implemented this type of project activity or technology in any key component or section of its distribution network to date. There are other local companies that deliver gas to household customers and oversee the maintenance of gas distribution cabinets equipped with 1" valves and gas regulators. These cabinets are not considered similar to the infrastructure included in the project activity and therefore are not included in the common practice analysis. Because no similar activities are observed in the Republic of Serbia, the project is not considered as common practice.

Sub-step 4b: Discuss any similar Options that are occurring

No similar activities are observed in the region or country (see Sub-step 4a).

Outcome: Similar activities to the proposed CDM project are not presently observed in Serbia. The project activity is not common practice and the proposed CDM project is thus deemed additional.

CDM consideration:
In implementing the project activity, Serbiagas has considered the benefits of the CDM. Following the Guidelines on the Demonstration and Assessment of Prior Consideration of the CDM, notification of the commencement of the project activity and of the intention to seek CDM status has been sent to both the Serbian DNA and the UNFCCC secretariat within 6 months of the project start date.

Table B-2 – Key events and dates in project timeline

Key Event	Date	Notes / supporting documentation
Notification of CDM intent sent to UNFCCC	TBD	
Notification of CDM intent sent to Serbian DNA	TBD	
Start of baseline study	14 Mar 2011	Project start date
Equipment purchase (SPECIFY which)		Equipment purchase contract

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Emission reductions

Emission reduction estimates are calculated based on AM0023/Version 03 using *ex-ante* data. The emission reductions are estimated as follows:

The current practice of leak detection and repair activities is assessed and described. Clear and transparent criteria are established to identify whether the detection and repair of a leak would also have occurred in the absence of the project activity.
The time schedules for replacement of equipment in the absence of the project activity are determined.
Data on leaks is collected during project implementation.
The functioning of leak repair is checked during monitoring.
Emission reductions are calculated *ex-post* based on data collection in the previous steps.

The first two steps are described below and have been undertaken as part of the preparation of the Project Design Document. Steps 3, 4 and 5 are discussed below, and will be carried out upon project implementation, through the duration of the crediting period.

Step 1: Assessment and description of the current leak detection and repair practices

Leak detection:

AM0023/Version 03 states "Only those types of leaks that are not detected and repaired under current practices are considered in the calculation of emission reductions". Leak detection and repair practices are implemented following the instructional manual referred to as the "White Book". The following criteria are pertinent to classify leaks in the gas distribution system operated by Serbiagas.

Safety aspect: Leaks posing risk of fire and explosion.Once a month in the City and every six months outside of the Citythe technical support department carries out inspections of the above ground gas pipeline. If a portion of the pipeline is to be repaired, the staff of the department will check for internal leaks once a valve is closed to avoid explosions during the maintenance and repair activities (e.g. welding). A Sewerin Snooper may be used to detect leaks. Leaks are to be repaired using klingerit and/or by injecting grease.

Accessibility: Leaks identified by staff from the gas transportation department during meter reading and equipment checks. During this time, staff may check for leaks using a soap solution on any component that appears damaged. Some leaks may be identified based on sound or smell, and confirmed by applying the soap solution. The gas transportation department reports the leaks to the technical support department for repair. If deemed to be a safety concern, leaks are repaired using klingerit and/or by injecting grease.

Visibility, audibility and/or smell: Leaks detected by sound or smell, or by checking damaged components that have been inspected during routine meter readings and equipment checks.

Leak detection technologies: On occasion a Sewerin Snooper will be used to detect methane leaks on above ground gas pipeline facilities and installations. Soap solution will be used to test for leaks in components during meter readings and checks.

In addition to the "White Book", evidence of current practice activities is provided in the form of:

- Interviews with management and engineering staff of Serbiagas;
- Photographic proof of leak repair techniques and materials;
- Documentation relevant to current technologies used to measure leaks; and
- Samples of leak repair materials.

Leaks detected as per the above criteria are not included in the calculation of emission reductions.

Step 2: Documentation of the replacement schedules for equipment

Serbiagas does not have a formal component replacement schedule. Cracked valves or valves that have had the thread stripped are to be replaced. These damaged valves are identified during meter reading and checks.

The gas distribution network infrastructure included in the project boundary has been operational for 25 years. The lifetime of the components is 50 years. Therefore, they are not expected to be replaced during the crediting period.

Leaks detected and repaired due to the project activity will be included in the *ex-post* calculation of the emission reduction until the equipment would have been replaced under normal practice:

- When the component shows signs of extensive damage; and
- The component has ceased to function.

Therefore leaks that are stopped due to the replacement of components that have entirely ceased to function will not be included in the CDM project. Only components that are reconstructed due to the project activity, which will not have been replaced under normal practices, will be included in the *ex-post* calculation of emission reductions.

Leaks repaired as part of the project activity and leaks repaired under the normal practices discussed above will be recorded in the project activity's database. These records will ensure that there is clarity on which leaks have been repaired as part of the baseline, and which are part of the CDM project.

Step 3: Data collection during project implementation

The project implementation includes initial survey and regular subsequent surveys of components at each gate and regulator station, as well as components on other surface facilities such as the outdoor components at the compressor stations and stand-alone valves and fittings.
Leaks that will be repaired are:

- Leaks in stand-alone valves and fittings in the pipeline
- Leaks from components in the gate and regulator stations and from components on the exterior of the compressor station

Equipment and infrastructure inside of the compressor stations will not be surveyed for leaks and are not included in the project activity.

For each leak that will be detected and repaired as part of the project activity, the following information will be collected and entered into the database:

- Whether the leak would also have been detected and repaired in the absence of the project activity (using the criteria established in Step 1 above);
- Date of leak detection;
- Date of leak repair;
- Exact location of the leak;
- Measured leak flow rate (liters per minute converted to m^3 per hour);
- Measurement method, to determine the uncertainty range of the measurement.

For any component reconstructed due to the project activity, the date when it would have been replaced will be determined as the earliest of the difference between the average lifetime and the age of the equipment.

As per the project description in section A.2 of this document, all inspected leaking components will be repaired. A record of all repairs will be included in monitoring reports.

Leak detection will be carried out using the Gasurveyor 3-500. Once the leak has been detected, the Hi-Flow Sampler will be used to measure the leak flow rate. The leak flow rate of methane is calculated as follows:

$$F_{CH4,i} = F_{sampler,i} \times (C_{sample,i} - C_{back,i}) \quad (1)$$

Where:

$F_{CH4,i}$ – The leak flow rate of methane for leak *i* from the leaking valve (litre per minute);
$F_{sampler,i}$ – The sample flow rate of the sampler for leak *i* (litre per minute);
$C_{sample,i}$ – The concentration of methane in the sample flow from leak i (volume percent);
$C_{back,\ i}$ – The concentration of methane in the background near the valve (volume percent).

Once the leak rate has been measured and recorded, the component will be repaired. After the repair, a new leak detection measurement will be carried out to ensure that the repair has been successful.

Step 4: Monitoring requirements

Step 4 is the monitoring of emissions during the project to check for re-emerging leaks. The monitoring plan will cover all components that have been subject to repair. For components where no re-emerging leaks are found, emissions are taken to be zero for the entire period since the last monitoring period. Recurring leaks will be measured again using the Hi-Flow Samplers. This leak rate is conservatively assumed to have remained at the same level since the day after the last project repair of the component, or after the last inspection, whichever is most recent. This is consistent with the principles set in AM0023/Version 03. These leaks will be repaired again, and monitored as before.

The following information will be collected for each component:

- Date of monitoring;
- The number of hours the component was in operation since the last monitoring;
- An assessment as to whether the repair of the leak was successful. If a leak recurs, the date of its subsequent repair will also be noted.

Data will be recorded in a database, which will be the basis for the monitoring reports.

Step 5: Calculation of emission reductions

Calculation of emission reductions is based on the underlying assumption that a leak, which has been detected and repaired due to the project activity, would have continued to emit methane with the flow rate measured prior to repair, until the equipment concerned would have been repaired. In most cases it is conservative to assume that the leak flow rate prior to repair of the leak would have remained constant, since leaks may grow larger over time. Emission reductions will be calculated as follows:

$$ER_y = ConvFactor * \Sigma [F_{CH4,\,i} * T_{i,\,y} * (1\text{-}UR_i)] * GWP_{CH4} \qquad (6)$$

Where:

ER_y – The methane emission reductions of the project activity during the period y (tCO_2 equivalents);

$ConvFactor$ – The factor to convert m^3 CH_4 into tonnes CH_4 (this factor amounts to 0.0007168 tCH_4/m^3 CH_4 at standard pressure and temperature);

$i=1,\ldots,I$ – The index of i- th valve;

I – All leaks eligible towards accounting of emission reductions;

$F_{CH4,\,i}$ – The leak flow rate of methane for leak i from the leaking component (m^3 CH_4/h);

UR_i – The uncertainty range for measurement method applied to leak i. The uncertainty range UR_i is calculated based on technical documentation for Hi-Flow Sampler together with chapter 6 of the 2000 IPCC Good Practice Guidance. Additional detail on the calculation is provided in Annex 3.;

$T_{i,\,y}$ – The time (in hours) the component for leak i has been operating during the monitoring period y. Since the gas distribution system is in continuous operation, time $T_{i,\,y}$ is considered to be 8,760 hours (1 year);

GWP_{CH4} – The globing warming potential for methane (tCO2eq/tCH4). The global warming potential GWP_{CH4} of methane is set at 21 (t CO2eq/t CH4).

According to the methodology, leak rates (F_{CH4}) measured using the Hi-Flow will be calculated as follows:

$$F_{CH4,i} = F_{sampler,i} \times (C_{sample,i} - C_{back,i}) \qquad \textbf{(2)}$$

Where:

$F_{CH4,i}$ = The leak flow rate of methane for leak i from the leaking component (m^3/h)

$F_{sampler,i}$ = The sample flow rate of the sampler for leak i (m^3/h)

$C_{sample,i}$ = The concentration of methane in the sample flow from leak i (volume percent)

$C_{back,i}$ = The concentration of methane in the background near the component (volume percent)

However, the Hi-Flow sampler automatically adjusts for methane content, therefore:
$F_{sampler,i} = F_{CH4,i}$

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	ConvFactor
Data unit:	--
Description:	The factor to convert m^3 CH_4 into t CH_4. At standard temperature and pressure (0 °C and 101.3 kPa) this factor is 0.0007168 tCH_4/m^3 CH_4
Source of data used:	AM0023 v.3
Value applied:	0.0007168
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	

B.6.3. Ex-ante calculation of emission reductions:

The project boundary includes 15,000 valves and 60,000 fittings. *Ex-ante* emission reductions are calculated based on a survey of 539 valves and 70 fittings on the Serbiagas distribution system. The survey was carried out 14-25 March 2011. The following Table provides information on the leak survey:

Component	**Number of Components**				**Average flow rate of methane**	
	Total	Surveyed	with Leaks		L/min	m^3/h
Valves	15,000	539	172	32%	2.95	0.177
Fittings	60,000	70	15	21%	0.39	0.0234

Therefore:

Baseline emissions from valves:

$ER_y = ConvFactor * I*[F_{CH4,i} * T_{i,y} * (1-UR_i)] * GWP_{CH4}$

$= 0.0007168 * 15,000*[0.177 * 8760 * (1- 0.02)]*21 = 342,556$ t CO_2eq

Baseline emissions from fittings:

$ER_y = ConvFactor * I*[F_{CH4, i} * T_{i, y} * (1-UR_i)] * GWP_{CH4}$

$= 0.0007168 * 60,000*[0.0234 * 8760 * (1- 0.02)]*21 = 181,432$ t CO_2eq

The total *ex-ante* baseline emissions are: 342,556+181,432 = 523,988 tonnes of CO_2 equivalent.

The *ex-ante* emission reductions estimate is based on average leak rates determined in the initial baseline study, extrapolated to the entire distribution system. Though this is a reasonable approach for the *ex-ante* estimates, actual emission reductions on which CERs will be claimed will be calculated as per methodology AM0023 and may differ from this estimate. Some reasons for potential differences include:

- As discussed in previous sections, any component replaced due to safety concerns or valves that would have been replaced because of a malfunction will be excluded from the baseline.
- Because leak rates tend to increase over time, a leak rate measured during the feasibility study could differ from the rate measured for the same component during the initial inspection for repair.
- The estimate assumes 100% effectiveness of repairs.
- Older parts of the network may have a higher leak rate than those tested during the baseline study.

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimated project activity emissions (tons of CO_2 eq)	Estimated baseline emissions (tons of CO_2 eq)	Estimated leakages (tons of CO_2 eq)	Estimated emission reductions (tons of CO_2 eq)
2012	0	523,988	0	523,988
2013	0	523,988	0	523,988
2014	0	523,988	0	523,988
2015	0	523,988	0	523,988
2016	0	523,988	0	523,988
2017	0	523,988	0	523,988
2018	0	523,988	0	523,988
2019	0	523,988	0	523,988
2020	0	523,988	0	523,988
2021	0	523,988	0	523,988
Total (tons of CO_2 equivalent)	0	5,239,880	0	**5,239,880**

B.7. Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	i (Number)
Data unit:	unitless
Description:	Total number of leaks identified, repaired and re-surveyed
Source of data to be used:	Serbiagas records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	75,000
Description of measurement methods and procedures to be applied:	This parameter is a total number of components included in the project boundary. This parameter has been obtained from the technical passport of the company Serbiagas.
QA/QC procedures to be applied:	Each component for which a leak is detected will be designated a unique serial number (painted at or next to the valve). After repair, the components will be monitored for any additional leaks. All data will be stored in the database and a back-up will be made. Thus, the uncertainty level of data is low.
Any comment:	

Data / Parameter:	Time T_i
Data unit:	hours
Description:	The time that leak for component i has been operating during the monitoring period
Source of data to be used:	Serbiagas
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8,760
Description of measurement methods and procedures to be applied:	Any shutdown due to damaged component replacement or reconstruction will be recorded.
QA/QC procedures to be applied:	Any outages resulting from damaged component replacement/reconstruction or due to the repair of leaks by the project activity will be documented and logged into the project database.
Any comment:	Hours of operation will end when the equipment concerned is replaced due to a malfunction or to damage.

Data / Parameter:	Date
Data unit:	Date and time
Description:	Date and Time leak was repaired
Source of data to be used:	Repair and monitoring log
Value of data applied for the purpose of calculating expected emission reductions in section B.5	For simplicity of *ex-ante* calculations, it is assumed that all components have the same date of repair - the date when the last component will be repaired.
Description of measurement methods and procedures to be applied:	The date of repair will be entered into a database. Date of repair will be used along with hours of operation of equipment to determine total hours. In cases of re-emerging leaks, the re-emerging leak will be assumed to have occurred the day after the most recent check which showed no leak.
QA/QC procedures to be applied:	Work orders, receipts and other records will be kept in addition to repair logs.
Any comment:	

Data / Parameter:	CH_4 GWP
Data unit:	t CO_2eq/t CH_4
Description:	The GWP of methane fixed for the first commitment period of the Kyoto Protocol
Source of data to be used:	IPCC 2006
Value of data applied for the purpose of calculating expected emission reductions in section B.5	21
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	The project developer will monitor whether a new GWP is adopted by IPCC and agreed upon by COP
Any comment:	

Data / Parameter:	$F_{CH4, i}$
Data unit:	m^3 CH_4/h
Description:	The leak flow rate of methane for leak i from each component
Source of data to be used:	Measurements during project implementation and monitoring
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2.95 lpm (valves) 0.39 lpm (fittings)
Description of measurement methods and procedures to be applied:	The Hi-flow Sampler measures a component's leak rate at a high flow rate, measuring the flow rate of the sample stream and the natural gas concentration in the steam. The device then calculates the leak rate adjusting automatically for methane content in the stream and in the background ($C_{sample,i}$ and $C_{back,i}$). *The average leak rate per valve and fitting identified in the baseline survey was extrapolated to the entire gas distribution system for the* ex-ante *emission reduction estimates. The actual leak rate per component will be used for calculation the* ex-*post emission reductions. Digital photography of the display reading of the Hi-Flow Sampler of the leak rate measured will be taken as evidence.*
QA/QC procedures to be applied:	To ensure accuracy, the Hi-Flow Sampler takes two measurements at different flow rates. The first measurement is taken at the highest possible flow rate, followed by a second flow rate at approximately 70-80% of the first measurement. If the two calculated leak rates are within 10% of each other, then the measured leak rate (FCH4,i) is considered accurate.

Any comment:	

Data / Parameter:	UR_i
Data unit:	unitless
Description:	The uncertainty factor for measurement equipment applied to leak i. This parameter reflects the fact that the leak measurement equipment is not 100% accurate
Source of data to be used:	Manufacturer of the Hi-Flow Sampler
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.02
Description of measurement methods and procedures to be applied:	This number was estimated as a 95% confidence interval on the basis of Hi-Flow Sampler documentation, and the IPCC "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories", Chapter 6, p. 12.
QA/QC procedures to be applied:	The IPCC Good Practice Guidance will be consulted in compiling uncertainty estimates.
Any comment:	Estimated where possible, at a 95% confidence interval, consulting the guidance provided in chapter 6 of the 2000 IPCC Good Practice Guidance. If leak measurement equipment manufacturers report an uncertainty range without specifying a confidence interval, a confidence interval of 95% may be assumed.

Data / Parameter:	Methane content in leak flow ($C_{sample,i}$ *and* $C_{back,i}$)
Data unit:	%
Description:	Concentration of methane in the measured leak
Source of data to be used:	Hi-Flow Sampler
Value of data applied for the purpose of calculating expected emission reductions in section B.5	100% methane for the high flow rate calibration 2.5% methane for the low flow rate calibration (second measurement)
Description of measurement methods and procedures to be applied:	The methane concentration in the stream and in the background is displayed in the Hi-Flow sampler reading. Digital photography of the display reading will be taken as evidence. Data will be exported to a spreadsheet.
QA/QC procedures to be applied:	The equipment manufacturer requires calibration every 30 days at a minimum. Calibration will be done following the manufacturer's specifications.
Any comment:	

Data / Parameter:	Temperature and pressure
Data unit:	Degrees Celsius and bar
Description:	Temperature and pressure of the gas when it is leaked
Source of data to be used:	Hi-Flow Sampler (automatically taken into account by the sampler)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Temperature and pressure measurements are accounted for automatically by the Hi-Flow Sampler at the time of measurement, and are integrated into the results.
QA/QC procedures to be applied:	Data recording equipment will be calibrated and double checked on a regular basis. Procedures for checks and calibration of the Hi-Flow Sampler follow the procedures defined by the technology provider.
Any comment:	

B.7.2. Description of the monitoring plan:

The monitoring methodology applied to the project is based on the monitoring methodology AM0023/Version03. The monitoring plan reflects good monitoring practice appropriate to the type of project activity.

All data necessary to estimate anthropogenic GHG emissions by sources within the boundary of this project, as well as procedures to collect and archive this data, are included in the monitoring plan summarized below. Further detail regarding monitoring procedures is provided in Annex 4.

Serbiagas technical and engineering staff, in cooperation with the project operator "Energosystems Ltd" (Energosystems), will implement the project operations and monitoring activities by performing detection, measurement, repair and documentation of identified leaks during the crediting period. Natsource and the consultant "ET&C Consultants Limited" (ETC) will provide methodological supervision and support to the Serbiagas' team.

Operational structure:

Serbiagas, in cooperation with Energosystems will implement the project activities of detecting, measuring, repairing and documenting leaks during the crediting period. Natsource and ETC will provide CDM methodological supervision and support to local staff.

Various teams will be set-up for the implementation of the monitoring plan:

Monitoring teams: Serbiagas and Energosystems will form several CDM monitoring teams, which will be trained by the equipment provider.

Database Management team: The project operator, Energosystems, in cooperation with ETC will be responsible for documenting the leak measurement data, and ensuring that it is correctly entered into the database.

Project Management team: The Project Management team will be responsible for coordinating the CDM project in general, and will focus on planning, organizing, and managing all resources involved in the full cycle of project implementation and monitoring.

Natsource's Project team: Natsource will coordinate with Serbiagas' Legal and Accounting departments to make sure the project is fully compliant with relevant Serbian regulations and will also be responsible for ensuring the credibility of the project, by involving independent third parties on an ongoing basis.

For more detailed responsibilities refer to Annex 4

Training Program: The equipment provider will provide training for Serbiagas and Energosystems local staff on how to use the detection and measurement equipment, how to conduct effective repairs using PTFE sealant, and how to properly document the detected leaks. They will also provide Serbiagas and Energosystems with a set of instructions and manuals on how to conduct leak detection and measurements. It is expected that initially about 30 people will participate in this training program. The staff selection will be based on experience working with gas systems, and technical knowledge in working with computers and hi-tech tools.

Calibration of Equipment: Calibration kits and spare part kits are delivered with the Hi-Flow Sampler package. Procedures for checks and calibration of the Hi-Flow Sampler follow the procedures defined by the technology provider. The manufacturer of the leak detector (Heath Gas Surveyor series) requires the device to be calibrated at least once every year under normal operating conditions. Serbiagas/Energosystems will confirm the calibration validity of the detectors at least once every week following the same procedures as for the Hi-Flow Sampler. Serbiagas/Energosystems will keep all records of calibration in special paper and electronic form.

Leak Measurement: Serbiagas and Energosystems will survey for leaks in all components included in the project boundary using Gasurveyor 3-500 instruments. Once identified, leaks will be tagged and given a unique number. The flow rate for each leak will then be measured using Hi-Flow Samplers. A digital photograph will be taken of the leaking component, the tag, the Gasurveyor display and the Hi-Flow Sampler display. These photographs will be archived by the database team. In addition, the type of repair expected given the nature of the leak and its location will be categorized in general terms such as valve reconstruction, PTFE sealant, etc.

Leak Repair: After leaks have been detected and measured, they will be repaired by the Serbiagas and Energosystems team. The time period between the initial measurements and the repairs will vary based on a number of factors including proximity to other leaks on the repair teams schedule, size of leak, type of leak and time required for repairs, availability of the repair materials, etc. In case there is any discrepancy between the final measurement and the original measurement a third measurement will be taken to confirm the change. The lower of the final two measurements will be considered the final confirmed leak rate. The final, confirmed leak rate will be used to determine baseline leakage as per the methodology AM0023

regardless of whether the leak rate is lower or higher than the original leak measurement.

Monitoring Repaired Leaks: All leaks that have been subject to repair will be monitored – using the same leak detection technologies on each leak identified in the baseline – to ensure they are maintained on an annual basis. Where a leak repair fails, it is conservatively assumed that the leak resumed the day after the last inspection, or in case of the first inspection, the day after the repair has taken place. Emission reductions are counted from the date of subsequent repair of that same leak, and are measured using the same type of equipment, the Hi-Flow Sampler, as in the initial survey. Such leaks will be repaired again followed by new leak measurements.

Data archiving: During each component inspection, existence of a leak, leak rate, and type of repair will be recorded. It will be noted whether the repair was undertaken due to the project activity, or due to emergency situations or malfunctions, as noted in section B.6.1. All collected data will be stored in the database at the end of each day of inspection. Back-up electronic copies of the database and digital photographs of the Gasurveyor and Hi-Flow Sampler displays will be made (weekly or monthly) and will be kept for at least two years after the end of the crediting period or the last issuance of CERs, whichever is later.

QA/QC:

ETC will be responsible for monitoring the work of the implementation teams on a continuing basis. ETC will provide an independent valuation of the implementation team's capacities. Any issues or problems detected by ETC will be reported back to Serbiagas/Energosystems and Natsource who will then conduct corrective actions.

Natsource's team will provide support for CDM registration and verification activities. At the end of each monitoring period, ETC will submit a draft monitoring report for review and approval to Serbiagas/Energosystems' Monitoring Manager and Natsource, to check for irregularities. In the event that such irregularities are observed:

- Serbiagas/Energosystems will carry out an analysis of the irregularities and their causes immediately with any needed assistance from ETC and Natsource.
- The management of Serbiagas /Energosystems will make a decision, in consultation with Natsource, on appropriate corrective actions to eliminate the non-conformity and its causes.

Corrective actions will be executed under the supervision of the Monitoring Manager, and any necessary amendments will be made.

See Annex 4 for further QA/QC details on the Monitoring Plan.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

Natsource carried out an initial baseline study in cooperation with the measurement specialists ANEM Ltd. It was completed on 25/03/2011.

Contact details:
Ilya Kramarenko
ANEM Management, Ltd.
57 Spyrow Kypriano, office 501

Larnaka, Cyprus

ANEM is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

14 March 2011 – date of starting the baseline study

The starting date of the project activity is defined as the earliest date on which the implementation or construction or real action began, and is considered to be the date when the project participant has committed to expenditures related to the implementation. As shown in the project timeline in section B.5, the baseline study began on 14 March 2011[8] and is the first action taken in project implementation.

C.1.2. Expected operational lifetime of the project activity:

15 years

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

n/a

C.2.1.2. Length of the first crediting period:

n/a

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/01/2012, or the date of registration, whichever is later

C.2.2.2. Length:

10 years

[8] Summary report on the baseline study for 'Natural gas leaks reduction project at Srbijagas facilities'.

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The project activity does not have significant impact on the environment (air, water, soil, as well as plant and animal life) and is not subject to environmental assessment.

Materials and equipment used in this project are environmentally friendly, do not emit harmful substances into the atmosphere, and are not a source of noise, vibration, or any other harmful physical impact. All activities related to implementation of the project are performed within the right-of-way (assigned location near the pipeline), thus any impact on surrounding vegetation or pollution of water protection zones, water reservoirs, and drains is negligible.

Transport during delivery of materials to the site will be carried out using existing transport lines. Where automotive transport is utilized, its refueling will take place at the closest refueling stations.

The project activity has no trans-boundary environmental impacts.

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

Not applicable. The project activity is not considered to result in any significant environmental impacts.

SECTION E. Stakeholders' comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Stakeholder consultations were carried out 09 March 2011. The list of participants was developed under guidance provided by Serbia's Designated National Authority, the Ministry of Environment and Spatial Planning. Invitations were sent by Serbiagas. Please refer to Annex 5 for a list of invitees and a copy of the invitation.

The following participants attended the stakeholder meeting:

Natsource

Mr. John Paul Miller
Mr. Sergey Soldatenko

JP Srbijagas

Mr. Jovica Budimir
Mr. Miroslav Lekic
Mr. Borisav Milosevic
Mr. Borko Mandic
Mr. Miodrag Bakic
Ms. Jasminka Amidzic
Ms. Dragana Skoric
Ms. Adrijana Strikovic
Ms. Maja Opacic
Mr. Ilija Selakovic
Ms. Milica Prijic

Other participants:

Institute for public health of Vojvodina, Mr. Emil Zivadinovic
Economic Chamber of Serbia, Ms. Vera Raznatovic
JP "Transnafta", Mr. Sava Djuric
Provincial Secretariat for energy and mineral raw materials, Ms. Branislava Djuric
Municipality administration for environment protection Novi Sad: Mrs Ljubica Mijatovic Topalov, Ms. Aleksandra Laketa, Mrs. Janja Zulum Luka
JP "Vojvodina forests", Mr. Milenko Ilic

E.2. Summary of the comments received:

The following questions were asked by the participants:

How long will the project last?
Are there any negative expectations in relation to the level of technological development after processing the results of measurements?
Have you installed, used this equipment somewhere else, and what are your previous experiences?
Who finances the project and what is the cost of it? Will there be investments into measuring based on the results of measuring?

As far as air quality is concerned, is carbon dioxide the only parameter for determination or there are some other ways?
During this 10 year period, how often will the reports be made, on annual level or differently?
What are the obligations of Srbijagas in this project? Are they supposed to improve the network, change elements or something special?

E.3. Report on how due account was taken of any comments received:

No negative comments were received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Natsource Europe Limited
Street/P.O.Box:	Hill House, Heron Square
Building:	
City:	Richmond upon Thames
State/Region:	
Postcode/ZIP:	TW9 1EP
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Telephone:	+44 20 8439 9515
FAX:	+44 20 8439 9514
E-Mail:	cdm_representative@natsource.com
URL:	www.natsource.com
Represented by:	John Paul Miller
Title:	Project Manager
Salutation:	Mr.
Last name:	Miller
Middle name:	
First name:	John Paul
Mobile:	
Direct FAX:	+44 20 8439 9514
Direct tel:	+44 20 8439 9515
Personal e-mail:	jpmiller@natsource.com

Organization:	J.P Serbiagas
Street/P.O.Box:	Narodnog fronta
Building:	12
City:	Novi Sad
Postcode/ZIP:	21000
Country:	Republic of Serbia
Telephone:	+ 381 21 481 2703
FAX:	+ 381 21 481 2703
E-Mail:	kabinet@srbijagas.com
URL:	http://www.srbijagas.com

Represented by:	Jovica Budimir
Title:	Executive Director of Investments
Salutation:	Mr.
Last name:	Budimir
First name:	Jovica
Mobile:	
Direct FAX:	+ 381 21 481 2600
Direct tel:	+ 381 21 481 4166
Personal e-mail:	jovica.budimir@srbijagas.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public financing was or will be used for this project

Annex 3

BASELINE INFORMATION

The Serbiagas pipeline system

Natural gas is normally transported to customers through a pressurized pipeline. The medium and low-pressure gas distribution network, operated by the company Serbiagas, annually transports more than 2.5 billion cubic meters (bcm) of natural gas. This number is increasing and is expected to reach 3.5 bcm by 2015. The gas distribution system covers 3,650 km of pipes, including 650 km of medium pressure (4 - 16 bars) and 3000 km of low pressure (less than 4 bars) pipe. There are 2 compressor stations, 165 gate stations and 684 regulator stations, which together with stand alone components in the connecting pipeline, have a total of approximately 15,000 valves and 60,000 fittings.

There are two main sources of leaks in the Serbiagas network – cracks/breaks in the pipeline; and leaks from components at gate, regulator and compressor stations, most notably from valves and fittings (i.e. flanges, threaded joints, stud bolts with hex nuts), and at stand-alone valves and fittings. Because cracks and breaks occur randomly, most leak repair activities focus on leaks from components at gate, regulator and compressor stations, which are in known locations and number.

Part of the Serbiagas routine maintenance for leak detection is to inspect valves for damage, within city limits as well as in the countryside. Leaks within the city limits are more likely to be detected because of the odour, sound and/or knowledge of some activity that would likely cause leakage (e.g. construction beside a pipeline component, accident, etc.). According to industry standards, valves should be checked once a month if located within the city and once every six months if located outside the city. The proportion of valves that leak outside the city is therefore probably higher than in the city. Fittings are not surveyed at all.

Under existing practice, an identified leak is repaired by tightening bolts, injecting grease or by replacing the sealant with klingerit.

Description of the sample measurement program baseline study

The baseline study was carried out 14 - 25 March 2011, by ANEM Management, Ltd. It consists of a survey of 539 valves and 70 fittings in the gas distribution network in 30 gas distribution points at the following locations:

- Novi Sad
- Temerin
- Bachka Polanka
- Gospodintsi
- Popovicha
- Stara Pozova
- Panchevo
- Sr. Metrovicha
- Ruma

Leak detection was done using catalytic oxidation/thermal conductivity detectors (Gasurveyors 3-500). Once detected, the leaks were tagged and numbered and the leak rate was measured using Hi-Flow Samplers. All the equipment used was calibrated prior to beginning measurement as per manufacturer

specifications. The leak rates for each leaking component were entered into a database.

During the baseline study, 32% of valves and 21% of the fittings were found to be leaking. The average leak rate of the components has been extrapolated to components included in the project boundary to estimate the *ex-ante* emission reductions:

Component	Number of Components				Average flow rate of methane per all components	
	Total	In survey	With Leaks in survey		In Litre per Minute	In m3/hr
Valves	15,000	539	172	32%	2.95	0.177
Fittings	60,000	70	15	21%	0.39	0.0234

Therefore:

Baseline emissions from valves:
$ER_y = ConvFactor * I*[F_{CH4,i} * T_{i,y} * (1-UR_i)] * GWP_{CH4}$

$= 0.0007168 * 15{,}000*[0.177 * 8760 * (1- 0.02)]*21 = 342{,}556$ t CO_2eq

Baseline emissions from fittings:
$ER_y = ConvFactor * I*[F_{CH4,i} * T_{i,y} * (1-UR_i)] * GWP_{CH4}$

$= 0.0007168 * 60{,}000*[0.0234 * 8760 * (1- 0.02)]*21 = 181{,}432$ t CO_2eq

The total *ex-ante* baseline emissions are: 342,556+181,432 = 523,988 tonnes of CO_2 equivalent.

- For *ex-post* calculations, the actual leak rate measured for each component will be used to determine the emission reductions achieved.

Estimation of uncertainty factor

The Uncertainty Factor (*UR*) for Hi-Flow sampler is estimated and a 95% confidence interval is assumed (consulting the guidance provided in chapter 6, p.12 of the IPCC "Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories". The Rule A of this document is applied to estimate the uncertainty factor:

"Where uncertain quantities are to be combined by addition, the standard deviation of the sum will be the square root of the sum of the squares of the standard deviations of the quantities that are added with the standard deviations all expressed in absolute terms (this rule is exact for uncorrelated variables). Using this interpretation, a simple equation can be derived for the uncertainty of the sum, that when expressed in percentage becomes:

$$U_{total} = \frac{\sqrt{(U_1 \bullet x_1)^2 + (U_2 \bullet x_2)^2 + \ldots + (U_n \bullet x_n)^2}}{x_1 + x_2 + \ldots + x_n}$$

Where: U_{total} is the percentage uncertainty in the sum of the quantities (half the 95% confidence interval divided by the total (i.e. mean) and expressed as a percentage); and x_i and U_i are the uncertain quantities and the percentage uncertainties associated with them, respectively)

The value of *UF* was calculated as 2% based on technical characteristic of Hi-Flow Sampler.

Annex 4

MONITORING INFORMATION

1. Management of the project monitoring

Teams

To achieve all of the monitoring goals and objectives, a monitoring plan will be developed in order to monitor the quality of the work and to plan and coordinate activities of all entities involved in the monitoring.

Serbiagas, in cooperation with the project operator, "Energosystems Limited" (Energosystems) will implement the project activities of detecting, measuring, repairing and documenting leaks during the crediting period. Natsource and the consultants, "ET&C Consultants Limited" (ETC), will provide CDM methodological supervision and support to local staff.

Monitoring teams. Serbiagas and Energosystems will form several CDM monitoring teams, which will be trained by a specialised measurement company (yet to be appointed). Each monitoring team will consist of two technical specialists. One specialist will be in charge of leak detection and measurement activities, and will coordinate with the database team to make sure the detected leaks are being accurately entered into the database. These teams will be also responsible for the repair of all re-emerging leaks and any new leaks.

The teams will be equipped with:
- Gasurveyor 3-500;
- High Flow Sampler;
- Digital Camera;
- PTFE Sealant;
- Equipment to conduct repairs;
- Tags; and
- Ladder.

Database Management team. The project operator, Energosystems, in cooperation with ETC will be responsible for documenting the leak measurement data, and ensuring that it is correctly entered into the database. The data will be entered on a daily basis during the leak detection and measurement phase of the project, as well as during the repair phase. During annual monitoring, this team will support the database as new data is entered into it. This team will also be responsible for checking data and managing the collection, processing, storage, archiving and backup of all data and records. This team will also have an obligation to correctly calculate the CERs using all data entered in the database and discount any valves that would have been repaired due to safety concerns or malfunction.

Project Management Team. The Project Management team will be responsible for coordinating the CDM project in general, and will focus on planning, organizing, and managing all resources involved in full cycle of project implementation and monitoring. This team will supervise the Database Management team and Monitoring teams, and will also be responsible for coordinating all other project related activities, including cooperation with Natsource to allocate resources required for project implementation and monitoring; coordination with relevant government bodies in the Republic of Serbia; issues and conflicts resolution; etc. The leader of the project management team (the Monitoring Manager) is responsible for the

overall project monitoring. Mr. Stevan Dukić, the Serbiagas' Executive Technical Director, is the Monitoring Manager.

Natsource's Project Team. Natsource will provide funds for project implementation, monitoring, and for leak detection and measurement equipment, repair materials, digital cameras, computers and software. Natsource will coordinate with Serbiagas' Legal and Accounting departments to make sure the project is fully compliant with relevant Serbian regulations.

Natsource will also be responsible for ensuring the quality assurance of the project, by involving independent third parties on an ongoing basis. Natsource will pay for ongoing project related works and quality control services, to be provided by the independent consulting firm ETC.

Natsource will provide project management support and CDM methodological supervision, to ensure that the project is implemented in line with CDM requirements.

Training of local staff

The specialized measurement company will provide training for Serbiagas and Energosystems local staff on how to use the detection and measurement equipment, how to conduct effective repairs, and how to properly document the detected leaks. They will also provide Serbiagas and Energosystems with a set of instructions and manuals on how to conduct leak detection and measurements. It is expected that initially about 30 people will participate in this training program. The staff selection will be based on experience working with gas systems, and technical knowledge in working with computers and hi-tech tools.

The theoretical part of training will focus on essential features of the gas detectors and Hi-Flow Sampler, calibration requirements, undertaking minor equipment maintenance and upkeep, and ensuring critical equipment operation (downloading data, taking proper measurements, etc.). The field part of training will focus on practical skills of actual leak detection and measurement, data processing, and valve and fitting leak repair using PTFE sealant.

2. Field monitoring procedures

As described in the PDD, all leaks will be repaired during the first year of project implementation. Subsequently, the monitoring plan will be implemented to ensure that the effectiveness of the leak repair is checked at least annually.

Monitoring for re-emerging leaks

Each component repaired under this CDM project will be inspected in the course of regular inspections in accordance with existing industry standards. The teams to monitor repaired components will use detection equipment (Gasurveyor 3-500) to check for re-emerging leaks.

At each component, the inspection teams will record the tag information of the repaired component (date and time, information on leaks) on special forms and hand over the forms to the Monitoring Manager.

Any micro leak (a leak that is lower than the lowest sensitivity threshold of Hi-Flow Sampler and certainly cannot be measured by Hi-Flow Sampler) will be noted in a special form which will be

handed over to the Monitoring Manager who compiles it in the database. These leaks will be conservatively assumed to be 1.4 L/min (the lowest sensitivity threshold of the Hi-Flow Sampler).

In the event that the inspection teams detect a leak, they will immediately notify the monitoring team. The monitoring team should then measure and repair the leak, as per the procedures described below for repair of re-emerging leaks. Leak detection and measurement may not happen on the same day, because the Hi-flow Sampler is operated by a smaller number of staff trained and certified in use of the equipment.

Repair of re-emerging leaks

Where a leak has been detected, the monitoring team will use the Hi-Flow Sampler to measure the leakage rate. Each leak will be measured twice with the Hi-Flow Sampler. Both leak rates will be recorded. If the two measurements deviate by more than 10% it normally indicates a human error and the measurements are stopped. The monitoring team will start the test over again. If the two measurements deviate by less than 10%, the higher one will be used.

A digital photo will be taken of the component, serial number, and Hi-Flow Sampler reading.

The monitoring team will then repair the leak.

Once the leak has been repaired, the component will be inspected again using the Gasurveyor 3-500 to ensure that the repair has been effective. A digital photo will be taken of the component, serial number, and the detector read out.

All information on these events will be recorded in a special written form that is handed over to the Monitoring Manager who compiles it in the database.

Summarizing monitoring results and reporting to Project Developer

The Monitoring Manager is responsible for day-to-day monitoring. The Monitoring Manager will summarize all paper reports from regular inspections and reports from monitoring teams into the database. Monitoring report summaries will be provided to project developer and to DOE for verification.

Calibration

An important part of the use of the Hi-Flow Sampler is to check the proper functioning and calibration of the equipment. Calibration kits and spare part kits are delivered with the Hi-Flow Sampler package. Procedures for checks and calibration of the Hi-Flow Sampler follow the procedures defined by the technology provider, including:

Every day before use, the Hi-Flow Sampler is checked with a standard gas balloon with a preset percentage of methane concentration (one from calibration kit). With indication of errors (deviation of more than 10%) the Hi-Flow Sampler must be recalibrated.
Every month the Hi-Flow Sampler will be recalibrated with all balloons from calibration kit and performed by certified staff from Serbiagas/Energosystems.

The manufacturer of the leak detector (Heath Gas Surveyor series) requires the device to be calibrated at least once every year under normal operating conditions. Serbiagas/Energosystems will confirm the calibration validity of the detectors at least once every week following the same procedures as for the Hi-Flow Sampler. Serbiagas/Energosystems will keep all records of calibration in special paper and electronic forms.

Quality assurance and corrective action

1. For the purposes of quality assurance, the independent technical expert, ETC, will be monitoring the work of the implementation teams. The on-going responsibilities of ETC are as follows:

- Conduct leak sample measurement study on the Serbiagas distribution network to determine whether leak rates identified by Serbiagas/Energosystems inspection teams were in line with those found by an independent third party;
- Provide formal training to Serbiagas/Energosystems staff;
- Provide an independent evaluation of the Serbiagas/Energosystems' technical team's capabilities and techniques;
- Provide an independent assessment on what types of materials and equipment Serbiagas/Energosystems technical teams should use to most effectively repair leaks;
- Visit Serbia to provide further training as and when requested by Natsource.

2. ETC will be responsible for quality control of the project implementation on a continuing basis. ETC will visit Serbia initially every two weeks for the first 2 months of the project implementation and then slowly reduce its presence while retaining its supervisory role for the duration of the project. ETC, or a successor with relevant expertise in leak reduction projects, will visit the project at least twice a year. Their role and responsibilities will be the following:

- Make sure that maintenance and monitoring of leaks are being conducted in accordance with the Monitoring Plan;
- Examine the Serbiagas/Energosystems' database to ensure that data is being recorded and handled as per the requirements of this Monitoring Plan;
- Audit data to ensure that adequate records are being kept, and that leaks found and repaired have been accurately documented in the database;
- Examine Serbiagas/Energosystems' technical teams to ensure that they are properly operating equipment and conducting leak detection, monitoring and repair activities, and advise on any training needs required;
- Make sure that project implementation is on schedule and highlight any risks of delay;
- Check repair/replacement schedule of any equipment that are due to be replaced or repaired for the coming year;
- Submit a draft monitoring report to Natsource and Serbiagas/Energosystems for review after each visit.

Any issues or problems detected by ETC will be reported back to Serbiagas/Energosystems and Natsource who will then conduct corrective actions.

Corrective Actions. At the end of each monitoring period, ETC will submit a draft monitoring report for review and approval to Serbiagas/Energosystems' Monitoring Manager and Natsource, to check for

irregularities. In the event that such irregularities are observed:

- Serbiagas/Energosystems will carry out an analysis of the irregularities and their causes immediately with any needed assistance from ETC and Natsource.
- The management of Serbiagas /Energosystems will make a decision, in consultation with Natsource, on appropriate corrective actions to eliminate the non-conformity and its causes.
- Corrective actions will be executed under the supervision of the Monitoring Manager, and any necessary amendments will be made

3. Data storage

The inspection and Monitoring teams are required to fill out special paper forms at the sites and hand them over to the Monitoring Manager. The Monitoring Manager will:

- Check the completeness of the data;
- Compile the data in an electronic database;
- Arrange for physical storage of the paper forms and;
- Communicate the information (paper forms and electronic files) further to Natsource on a regular basis.

ETC will carry out additional quality assurance of the data, arrange the storage of data in physical and electronic databases and on a regular basis forward the data to Natsource.

4. *Ex-ante* calculation of emission reductions

Please see section B.6.3 above for detail on how the database managers will calculate emission reductions.

5. Data and parameter monitored

Please see section B.7.1 above for detail on the data and parameters that will be tracked, and information on how they will be monitored.

Annex 5

STAKEHOLDER CONSULTATIONS INVITATION AND INVITEES

List of invitees

Government and Public Entities

1. Ministry of Environment, Mining and Spatial Planning - Head of Climate Change Unit
2. Ministry of Agriculture, Trade, Foresty and Water Management
3. Ministry of Mining and Energy of Republic of Serbia
4. Ministry of economy and regional development
5. Ministry of Infrastructure
6. Serbian Chamber of Commerce
7. Chamber of Commerce of Vojvodina
8. Provincial Secretariat for Environmental Protection
9. Provincial Secretariat for Agriculture, Forestry and Water Management
10. Provincial Secretariat for Energy and Mineral Resources
11. Agency for Environmental Protection
12. Institute for nature conservation of Serbia
13. Provincial Institute for Nature Protection
14. Research and Development Institute of Lowland Forestry and Environment, Novi Sad
15. VOJVODINAŠUME -Forest holding
16. Public Water Management Company Srbijavode
17. Public water management company "Vode Vojvodine" Novi Sad
18. Republic Hidrometeorological Service of serbia
19. Municipality administration for environment protection Novi Sad
20. Institute of Public Health of Serbia
21. Institute of Public Health of Vojvodina
22. Institute for Occupational Safety
23. Faculty of Tehnical science - Department of environmental-engineering-and-safety-at-work
24. University of Novi Sad
25. Standing Conference of Towns and Municipalities of FPRY
26. Panonske Thermal Power Plant-Heating Plant
27. NIS Gasprom neft
28. JP TRANSNAFTA - Public Enterprise for transportation of crude oil through oil pipelines and transportation of petroleum products through petroleum product pipelines

Non-government Organisations

1. Vojvođanska zelena inicijativa
2. Udruženje građana «Inžinjeri zaštite životne sredine»
3. Novi Sad, Ambasadori životne sredine
4. Centar za ekologiju i održivi razvoj CEKOR
5. Beogradska otvorena škola
6. Škola za opstanak
7. Centrala Beograd
8. Akademsko društvo za proučavanje i zaštitu prirode Novi Sad

9. AgroVetManagement Project
10. Mladi istraživači Srbije
11. Volonterski centar Vojvodine
12. Centar za razvoj građanskog društva PROTEKTA
13. Edukacioni centar Leskovac
14. Unija ekologa UNECO Regionalni centar Paraćin
15. Bells pokret

Invitation

INVITATION
We are honoured and pleased to invite you to the presentation of the Project of JP "Srbijagas" and company "Natsource LLC", the aim of which is to increase energy efficiency of our company and decrease gas emissions with green house effect. The presentation and public debate will be held on 9 March 2011 at 11:00 am in the premises of JP "Srbijagas" at the address Put Sajkaskog odreda 3, Novi Sad.
Please confirm your attendance: tel. +381 64 888 6944

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