CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Annexes

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

LFG Recovery and Electricity Production at the Bubanj Landfill Site, Nis, Serbia

Version 03 – September 18th, 2012 – second revision in light of the "Draft Validation Report" issued by the DOE
Version 02 – July 19, 2012 – first revision of the document in light of the "Draft Validation Report" issued by the DOE and after the Onsite Visit
Version 01 – March 23rd, 2012 – first submission to the Validation team and beginning of the Global Stakeholder Consultation

A.2. Description of the small-scale project activity:

The "LFG Recovery and Electricity Production at the Bubanj Landfill Site, Nis, Serbia" Project intends to capture the LFG generated at the Bubanj Landfill Site ("BLS") and produce electricity to be injected in the Serbian National Grid. The remaining LFG will be flared. BLS is located in one of the most important and ancient cities in the Republic of Serbia, Niš.

The project activity will improve solid waste final disposal practices in Serbia as well as in other nearby villages that dispose domestic wastes at the BLS. This will be achieved through the installation of an active biogas recovery system. The system will collect the LFG emissions and destroy the methane currently being released in the atmosphere partially with the purpose of electricity production and the remaining part will be destroyed through a high temperature flare. The resulting emission reductions from the project activity are less than 60,000 Tons of CO2e per year. Therefore the project activity classifies it as a small-scale project.

The project will involve the installation of a LFG extraction system that includes wells, pipes, blowers, analyzers, monitoring stations as well as an efficient flare to allow for a safe destruction and combustion of methane and non-methane organic compounds. Moreover, a 320 kW genset will be installed and the electricity produced will be supplied to the Public Enterprise for electric energy transmission and transmission system control "Elektromreža Srbije" Serbian Transmission System and Market Operator the Serbian National Grid, through a medium voltage connection.

For further information on the technology, please refer to point A.4.2 of the present Proect Design Document.

BLS in Niš was opened in 1968 (at the time when there was no Law on environmental protection or currently enforced regulations such as "Rules on the criteria for determining the location and arrangement of landfill"); the location was designated for a landfill under the 1971 Zoning Plan adopted by the City of Niš. At the same time, zoning and spatial elements of the landfill location for the municipal solid waste were fully incorporated into the Zoning Plan. It was planned that the landfill should be used for disposal of all municipal and other non-hazardous waste.

In 1988 City of Niš adopted the Zoning plan of the landfill, which contained detailed technological and spatial preconditions for on-site planning and construction. The 1988 Zoning plan defined spatial elements, the status of the existing facilities and preconditions for the construction of new facilities at the site as well as their regulation and purpose. The plan also provided details on facilities, infrastructure installations networks.

By 2005, the landfill reached the full capacity of the area planned for waste disposal; at the planned time technical aspects of environment protection were only partially developed (a part of the fence was built, some elements of the infrastructure etc.).

By 2005 the City of Niš did not identify a site for the new landfill for sanitary solid waste disposal; City's Waste Management Plan is currently developed, and surveys were conducted to determine the location for the new regional landfill for sanitary solid waste disposal.

In 2005 a Remediation, Closure and Reclamation Project was developed and authorized, setting the "new" closure date of the BLS by the end of 2010 or, as declared in the above mentioned project: "the current location of the municipal landfill will be used for up to 5 years, depending on its waste storage capabilities or alternatively until the new location for the regional landfill is found".
As today, the foreseen closure date declared by MEDIANA (the service company that manages the disposal works at BLS) is the end of 2013.

BLS occupies a total area of approximately 11.5 hectares, out of which 4.5 hectares are currently used for landfilling. Additional 24.3 hectares have been acquired next to the landfill to expand its capacity. Approximately 200 tons of wastes are currently being disposed at the site on a daily basis.

With reference to the sustainability indicators accomplishment, the first and more in perspective important action, is the evidence that people can limit the entropy growth, which is an unavoidable byproduct of each stage of human life, extracting energy from waste, in a greater quantity than the one embodied in materials which compose the plant and which is necessary to operate it.
This means that the project can be utilized to grow a social and public awareness about the importance of energy recovery from waste with the aim of increasing the sustainability approach and attitude towards goods and commodities, which are necessarily consumed to sustain the life of all us.

The project will so represent a small, but qualified example of how this kind of action may contribute to the improvement of life conditions of people which produce the daily quantity of waste, and maximize of those living in the area surrounding the landfill, with a corresponding huge increase of the environmental quality. The plant will, above all, reduce consistently the emissions in atmosphere not only of GHG, like methane, but also the large crowd of micro-pollutants (Cl, S & N components) which are emitted together with the main flow of CH4 and CO2 , as all the biogas which is extracted from the wells network is burned in the high temperature flare or in the engine body chambers.
Moreover, the leachate, which could be found in the wells draining space, will be pumped out to a storage basin, so contributing to decrease the liquid head loading the landfill bottom. The project will be possible through a mature technology transfer from European companies with a consistent track record of biogas plants built and operated.
Core of this kind of technology is the skill in foreseeing the quantity of biogas that will be produced and the efficiency of capturing network, which should be installed. Another important level is constituted by the criteria of design of wells, connecting network and biogas flow transportation and purification.

The plant requires a series of information as how to manage the leachate which may be found inside the wells, to limit and possibly avoid the intrusion of air inside the landfill body, to separate the condensate which accumulates inside the pipe network. All this set of skills will be transferred, through capacity building actions, to operators of the plant and officers in charge of the Municipality; people in charge of the plant will be able, after a short experience of few months, to operate in full autonomy the plant, while officers in charge of technical design in MEDIANA, will be able to transfer the biogas capture concepts in the construction of future landfills.

The plant will need a fixed crew of three to four people, with periodic visits of technicians of equipment suppliers.
Most of materials, like HDPE pipes, inerts, concrete, steel carpentry and of services like transports and well drilling will be supplied from local suppliers.

A.3. Project participants:

Name of Party involved	Private and/or public entities Project Participants	Does the Party involved wish to be considered as a Project Participant
Republic of Serbia (Host Country)	AMEST doo	no
Italy	AMEST S.r.l. (private entity)	no

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

A.4.1.1. Host Party(ies):

Republic of Serbia

Fig 1 – Map of Europe

Fig 2 – Map of Serbia

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

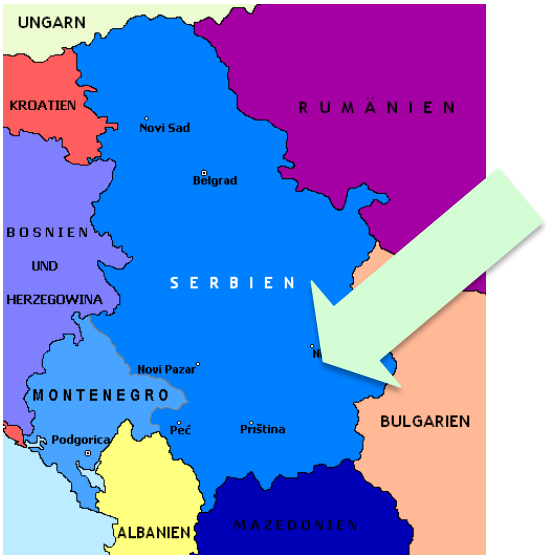


Fig 1 – Balkan's map with the Nis area highlighted

A.4.1.3. City/Town/Community etc:

Municipality of Nis – Bubanj Village

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

BLS is located in the southwestern part of the Niš valley, on the western slopes of the Mt. "Bubanj", 150 mt. away from the local road connecting the city of Niš and town of Doljevac. Unregulated waste disposal on the site dates back to 1968, and the site was fully incorporated into the Municipal Zoning Plan in 1971.
The landfill is located in the southwestern part of the metropolitan area, 250 mt. south of the New Cemetery, in the border area between Nis and Doljevac municipalities.

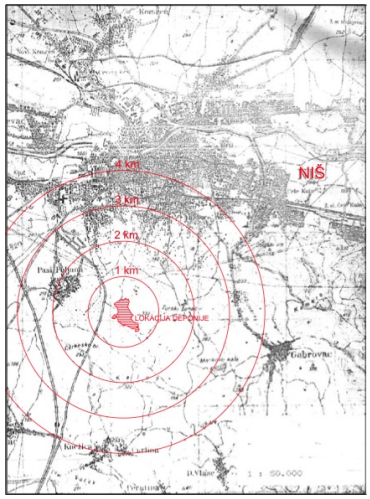


Fig 1- distance of the BLS from Nis

The location has its drawbacks, such as its position on the edge of a settlement (only 1 km away), and immediately next to the cemetery - close to the main burial area, and it is located in the general direction of the prevailing wind towards some of the neighboring settlements.

The location also has some advantages, such as the good transportation links with the areas it serves; an easy connection on the infrastructural network; surrounding agricultural land cannot be considered rational for communal purposes.
The site layout follows direction north-south. Most of the landfill rests on the clay and sub-clay belonging to the category of semi-tight rocks. In terms of soil composition the location is suitable for landfill.
The geographical coordinates of the BLS are:, N 43.2952 ; E 21.887

Fig 2 – view of the BLS from satellite and reference of the geographical coordinates

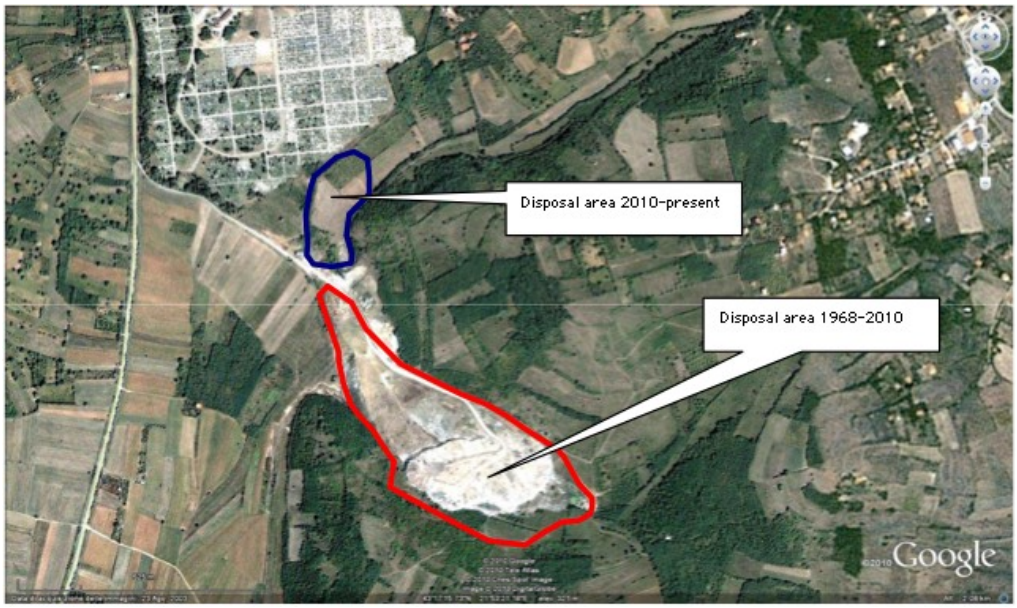


Fig 3 - view of the disposal areas of the BLS

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

The project belongs to category III. G, type III, sectoral scope 13 - Waste handling and disposal and to category I. D, type I, sectoral scope - Energy Industries (renewable - / non-renewable sources).
The small-scale project activity is based on a landfill gas collection, genset and flaring system. The equipment that will be used in this small-scale project activity includes inter alia:

- *a gas extraction field*, composed by vertical LFG extraction wells, equipped with internal HDPE perforated pipes and/or horizontal trenches*:*
- *a gas transportation network*, through which the pipes are connected to four grouping substations, where the condensate transported with the biogas flow is separated; the gas flow may be tuned through butterfly valves located on the connection of each line and the biogas compostion may be analyzed through sampling points; from the grouping substations the biogas flow is transported to the main aspiration station through HDPE pipes of 150 mm.
- *a main aspiration station*, where the biogas arrives due to the suction imposed to the network by a centrifugal blower; the biogas lines from the grouping substations end to a main header, from where it flows through a first condensate separator,following through an heat echanger , where it's cooled to 4 °C by a chiller with a mixture water-ethylen glycol; at the exit of the heat exchanger there is another condensate separator,followed from a blower; after bower delivery a continuous flow meter andpressure sensor are installed; the biogas , through aT connection may be delivered to an encosed flame flare or to a genset. Before entering the flare, another volumetric flow meter is installed; the flare is equipped with residual O_2 and CH_4 analyzers and a thermocouple for continuous measuring of these parameters.
- In this section a *monitoring and control systems* to measure continuously, besides the normalized mass flow previously described, composition of the LFG, residual CH_4 and O_2 in flaring emissions, electrical energy production measuring device.
- *a genset with an installed capacity of 320 kW*, for energy production; all the equipment is located in a sole container together with voltage elevator, main boards and protection for the genset and the network
- *concrete platforms*, where all aspiration station carpentry, enclosed flame flare, genset, personnel and technical boxes will be installed

In details the list of the main equipment that will be installed is:

- No. 2 blowers;
- No. 1 chiller for LFG flow refrigeration;
- No. 1 Flow meter (main flow/total LFG captured)
- No. 1 Flow meter (Flare)
- No. 1 High Temperature Enclosed Flare;
- No. 1 genset of 320 kW power capacity;
- No. 1 Infra-red Analyser for residual CH_4 in exhaust gas;
- No. 1 Infra-red Analyser of methane, CO2 and O2 (paramagnetic cell) in main LFG flow;
- No. 1 LFG pressure transmitter

MAIN PARAMETER/INDICATORS AS DECLARED BY TECHNOLOGY MANUFACTURER IN THE TECHNICAL SPECIFICATION:

Main Equipment	PARAMETERS
Blowers	
Type	3106.1.0.5
Quantity (n)	2
Installed power (kw)	11
Assorbed power (Kw)	8.2
Engine revolution per minute (r/')	2,900
Suction pressure (mbar)	-200
Delivery pressure (mbar)	+100
Expected lifetime (y)	15 years
Genset of 320 kW power capacity	
Type	IVECO 8291 SRG.75
Quantity	1
Rated power (kw)	320
Operating speed (r/')	1,500
Electrical Efficiency (%)	35.5%
Expected lifetime	15

For Technical Descriptions and main parameters of the analyzers, flow-meters and pressure sensor please refer to the related information in section B.7.1.

With reference to the aspects related to technologies and know-how transfer to the host country, it needs to be said that in Republic of Serbia there are no plants with this kind of technology installed, nor are foreseen by the Serbian legislation regarding Waste Management.
So, the "LFG Recovery and Electricity Production at the Bubanj Landfill Site, Nis, Serbia" project will be the very first installation on a Solid Waste Municipal Landfill in the Republic of Serbia. By that, the newest and most advanced technology currently used in the EU will be installed and transferred to the Republic of Serbia, enhancing the entire Waste Management sector and hoping that soon it will apply it as a rule for all Municipal and Regional Solid Waste Landfills.

Moreover, the know-how transfer will be upon the operation of the plant, and specifically about:

- Regulations and tuning of the LFG flow throught the foreseen sub-stations and well-heads
- Management of the Electronic Control Panel
- Maintenance of the gensets and the blower (through the monthly/yearly maintenance schedule performed also by the technology providers)
- Better management of the Solid Waste disposal, with the aim of enhancing the production of LFG and subsequently the electricity production.

The personnel will be trained during the construction works by the Project Participants, Project Designer and the technology provider staff. Once again, the need of personnel training is because since there are no other installation of the project's technology in the Republic of Serbia, there are no local professionals able to perform the correct management of the plant ensuring the targets pointed out in the present PDD.

In light of the progress of the technology, the Project Participants will install the most modern and and widely used technology in the LFG Recovery and Electricity Production sector (in EU). Therefore, the technology installed (both LFG aspiration section and gensets) in the first year of the project development will not be substituted for the entire crediting period.

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

The capture and combustion of the CH_4 component of the LFG, plus the resulting avoided emissions by the electricity production from renewable sources (genset) in the small-scale project activity is estimated to prevent emissions of 184,618 tonnes of CO_2e over the fixed crediting period of 10 years.

Table A.1 – Estimation of annual emission reductions and total crediting period

Year	Estimation of annual emission reductions in tonnes of CO_2e
2013	16,466
2014	15,769
2015	15,107
2016	14,407
2017	13,678
2018	12,987
2019	12,333
2020	11,713
2021	11,126
2022	10,569
Total estimated reductions (tonnes of CO2 e)	**134,155**
Total number of crediting years	**10**
Annual average of the estimated reductions over the crediting period (tCO_2e)	**13,415**

A.4.4. Public funding of the small-scale project activity:

There is no public funding from Parties included in Annex I of the UNFCCC involved in this small-scale project activity. Please refer to annex 2 for further details.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

According to appendix C of simplified modalities and procedures for the small-scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure; and
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

This project does not meet any of the above-mentioned requirements. It is a stand-alone activity, thus not a debundled component of a large-scale 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 small-scale project activity:

The following approved baseline and monitoring methodologies are applied to the proposed small-scale project activity:

- AMS-III.G. Landfill Methane Recovery (version 07)
- AMS-I.D. Grid Connected Renewable Electricity Generation (version 17)

The following methodological tools referred by the above methodologies are also applied:

- *"Emissions from solid waste disposal sites" (Version 06.0.1, EB 66, Annex 46)*
- *"Tool to calculate the emission factor for an electricity system" (version 02.2.1*);.
- *"Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" has not been applied since the PP does not foreseen to install an emergency diesel genset, so there will be no other fossil fuel combustion during the development ot the proposed CDM project.*
- *"Tool to determine project emissions from flaring gases containing methane" (EB 28 - Annex 13)*

B.2 Justification of the choice of the project category:

The approved methodologies AMS-III.G and AMS-I.D. are applicable to the proposed small-scale CDM project activity as justified by the following table comparing applicability criteria against the activities of the proposed project.

Applicability Condition	Project Case
AMS-III.G	
1. This project category comprises measures to capture and combust methane from landfills (i.e., solid waste disposal sites) used for disposal of residues from human activities including municipal, industrial, and other solid wastes containing biodegradable organic matter.	Bubanj Landfill Site is a municipal solid waste disposal site, used for disposal of residues from the city of Nis. The LFG emitted into atmosphere directly in the baseline scenario will be captured by the Project.
2. The recovered biogas from the above measures may also be utilised for the following applications instead of combustion/flaring: (a) Thermal or mechanical, electrical energy generation directly; (b) Thermal or mechanical, electrical energy generation after bottling of upgraded biogas, in this case additional guidance provided in Annex 1 shall	The recovered biogas will be used by the project participant to produce electrical energy directly, therefore solution (a) is chosen.

be followed; or (c) Thermal or mechanical, electrical energy generation after upgrading and distribution, in this case additional guidance provided in Annex 1 shall be followed: (i)Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; (ii) Upgrading and transportation of biogas via a dedicated piped network to a group of end users; or (iii) Upgrading and transportation of biogas (e.g. by trucks) to distribution points for end users. (d) Hydrogen production; (e) Use as fuel in transportation applications after upgrading.	
3. Measures are limited to those that result in aggregate emission reductions of less than or equal to 60 kt CO_2 equivalent annually from all Type III components of the project activity.	Expected aggregate emission reductions from all type III and I components under the proposed project activity is less than 60 kt CO_2 equivalent annually (Refer to Section B.6.4)
Applicability Condition	Project Case
AMS-I.D	
1. This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass:[1] (a) Supplying electricity to a national or a regional grid; or (b) Supplying electricity to an identified consumer facility via national/regional grid through a contractual arrangement such as wheeling.	The Project will supply electricity to a regional grid which is connected to the Serbian National Grid, operated by the Public Enterprise for electric energy transmission and transmission system control "Elektromreža Srbije" Serbian Transmission System and Market Operator
2. Illustration of respective situations under which each of the methodology (i.e. AMS-I.D, AMS-I.F and AMS-I.A2) applies is included in Table 2. - AMS-I.D Grid connected renewable electricity generation, - AMS-I.F Renewable electricity generation - for captive use and mini-grid and - AMS-I.A Electricity generation by the user	For the proposed project activity the methodology AMS ID is chosen, because: - The entire amount of electricity produced will be supplied to the Serbian National Grid - The electricity needed to operate the aspiration plant will be taken from the Serbian National Grid
3. This methodology is applicable to project activities that: (a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) Involve a capacity addition;[3] (c) Involve a retrofit[4] of (an) existing plant(s); or (d) Involve a replacement[5] of (an) existing plant(s).	This project is to install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant)

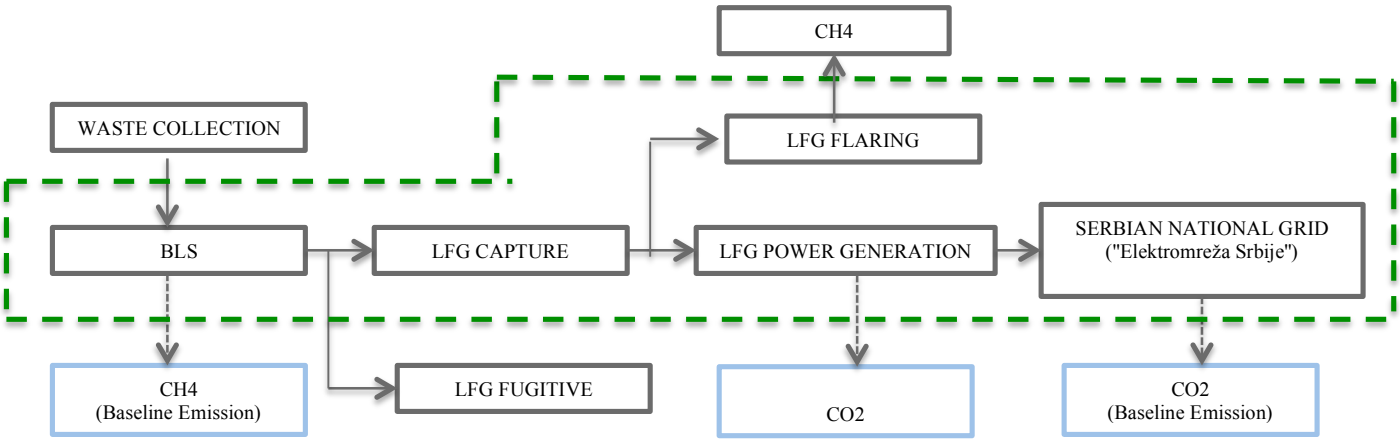
4. Hydro power plants with reservoirs[6] that satisfy at least one of the following conditions are eligible to apply this methodology: ▪ The project activity is implemented in an existing reservoir with no change in the volume of reservoir; ▪ The project activity is implemented in an existing reservoir,[7] where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m2; ▪ The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m2.	The Project LFG is collected to generate electricity, not related to hydro power production.
5. If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	There is neither nonrenewable component nor fossil fuel co-fired unit involved in the Project. The total installed capacity of the gas engine is 320 kW, significantly less than 15 MW.
6. Combined heat and power (co-generation) systems are not eligible under this category.	The Project does not involve combined heat or power generation.
7. In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct[9] from the existing units.	The Project activity does not involve addition of renewable energy generation units at an existing renewable power generation facility.
8. In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	The Project activity does not involve retrofitting activities.

B.3. Description of the project boundary:

The project boundary is the physical, geographical site of the landfill where the gas is captured and destroyed/used. In this project, the following sources and gases are included in the project boundary:

Table B.1 – Project Boundaries analysis

Source		Gas	Included	Justification/Explanation
BASELINE	Emissions from decomposition of waste at the landfill site	CH_4	Yes	Main source of GHG on the landfill
		CO_2	No	Not accounted because of biogenic origin
	Emissions from electricity generation	CH_4	No	Excluded for simplification. This is conservative
		CO_2	Yes	Emissions from electricity produced by the Serbian grid
	Emissions from thermal energy generation	CH_4	No	Excluded for simplification. This is conservative
		CO_2	No	No thermal energy is consumed / generated onsite in the baseline scenario
PROJECT	On site fossil fuel consumption due to the project activity, other than electricity generation	CH_4	No	No fossil fuel consumption other than for electricity
		CO_2	No	No fossil fuel consumption other than for electricity
	Emissions resulting from the flare	CH_4	Yes	Methane not burned due to flare efficiency correction
		CO_2	No	Not accounted because of biogenic origin
	Emissions from on-site electricity use	CH_4	No	Excluded for simplification. Assumed to be very small
		CO_2	Yes	This project uses grid electricity



With reference to the monitoring equipment, please refer to the diagram in chapter B.7.2.

B.4. Description of baseline and its development:

Baseline of the LFG recovery:
As defined by AMS-III.G., the baseline scenario of LFG recovery project is the situation where, in the absence of the project activity, the organic matter are left to decay within the project boundary and methane is emitted to the atmosphere directly. Baseline emissions shall exclude methane emissions that would have to be removed to comply with national or local safety requirement or legal regulations.

Currently in the Republic of Serbia there are a series of national and sectoral regulations relating to the management of landfills and LFG, which include:

- *Waste Management Law (12/01/2010, 282.8 KB) Law on Waste Management (Official Gazette of RS, No. 36/09) RS, Nos. 36/09 and 88/10)*
- *Regulation on disposal of waste on landfills (12/14/2010, 178.3 KB) Regulation on disposal of waste on landfills (Official Gazette of RS, No. 92/10)*
- *Law on Environmental Impact Assessment (07/22/2011, 70.9 KB) Law on Environmental Impact Assessment (Official Gazette of RS, Nos. 98/2002 and 36/09)*
- *Law on Strategic Environmental Impact (12/01/2010, 92.3 KB) Law on Strategic Environmental Assessment (Official Gazette of RS, No. 98/2008 and 88/10)*
- *Impact Assessment Act on Environment (10/27/2008, 70.7 KB) Law on Environmental Impact Assessment (Official Gazette of RS, Nos. 98/2002 and 36/09)*

However, due to the significant financial and technical difficulties widely recognized in this sector, the activities of LFG flaring/utilization have not been practiced in Serbia. None of the above-mentioned laws and regulations settled as mandatory the LFG recovery and utilization activities.

Therefore, the baseline is uncontrolled emission of LFG to the air, and the methane that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the year y is zero.

Baseline of the replacement of electricity:
According to methodology AMS-I.D., the baseline is product of electrical energy baseline expressed in kWh of electricity produced by the renewable generating unit multiplied by its specific emission factor. Therefore, the baseline is the power supplied to the Serbian National Grid ("Elektromreža Srbije") multiplied by the emission factor of the grid. The Project adopts the results of afore mentioned Ministry of Environment publication, where the calculation is based on combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the "*Tool to calculate the emission factor for an electricity system*" to calculate the emission factor in a transparent and conservative manner.

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 small-scale CDM project activity:

CDM consideration

A Framework Agreement ("Concession Agreement") was signed between the project participant AMEST S.r.l. and the Municipality of Niš on June 27th, 2011. The Concession Agreement gives the rights to project participants to exploit the LFG of the BLS for capturing, destruction and electricity production.
In the Concession Agreement it is clearly stated that both Parties intend to apply the CDM scheme, since the project would not generate enough revenues in order to recover the investment with the sole income coming from the sale of the electricity generated.

Date	Key Events	Evidence
27/06/2011	Concession Agreement ("The Republic of Serbia – City of Nis – Energy Efficient Usage of The City Landfill Biogas – Framework Agreement") is signed	Concession Agreement ("The Republic of Serbia – City of Nis – Energy Efficient Usage of The City Landfill Biogas – Framework Agreement")
28/06/2011	Consultant – Project Manager (Lorenzo Raimondi) contract for the development of the PDD and the management of the Validation and Registration project is signed	Consultant - Project Manager contract
03/10/2011	Project Designer contract is signed	Project Designer contract
16/02/2012	CDM Validation Contract with DOE is signed (TUV SUD)	CDM Validation Contract with DOE

In light of the timeline above, the technology supply contracts will be signed only if the proposed CDM project "LFG Recovery and Electricity Production at the Bubanj Landfill Site, Nis, Serbia" will be registered by the EB.

Additionality

According to the "*Guidelines on the demonstration of additionality of small-scale project activities" (Version 09.0)* for small scale project activities, Project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

The proposed project will only use barrier (a) – Investment barrier to assess and demonstrate the additionality.

Moreover, the proposed technology is not included in the positive list of grid-connected renewable electricity generation technologies that are automatically defined as additional, as foreseen by the *Guidelines on the demonstration of additionality of small-scale project activities (Version 09.0)*, therefore the point 2 of the before mentioned guideline is not applicable.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Define realistic and credible alternatives[3] to the project activity(s) through the following Sub-steps:

Sub-step 1a: Define alternatives to the project activity:

In the absence of the CDM project activity, there are three basic alternatives:

- *Alternative A*: the landfill operator continues the current business as usual, venting LFG directly to the atmosphere;
- Alternative B: the landfill operator invests in a LFG collection and flaring system;
- Alternative C: the landfill operator invests in a LFG collection system as well as in LFG power generation equipment. Power generation from other grid-connected sources would therefore be displaced.

Alternative A is the common practice for landfill management in Serbia. LFG is vented directly into the atmosphere by simple passive control systems installed for limited safety reasons in order to prevent explosions, in most landfills without registered CDM Project Activity.

Alternative B is not feasible since the proposed activity of LFG capture and flare will not generate financial or economic benefits other than the CDM related income. That is, without assistance from the CDM or any other external sources, the collection and flaring system presents no economic incentive for landfill operators. However, it does involve high investment costs.

Alternative C is not financially viable. A LFG-based power generation facility offers little incentive[1] in a country with a high percentage of renewable energy sources, which generally make methane to energy projects unattractive from a financial standpoint.
Neither Alternative B nor C are feasible at this stage and therefore Alternative A is the most likely to take place in the absence of the CDM.

[1] See as reference "DECREE ON INCENTIVE MEASURES FOR ELECTRICITY GENERATION USING RENEWABLE ENERGY SOURCES AND FOR COMBINED HEAT AND POWER (CHP) GENERATION" developed by the Ministry of Energy of the Republic of Serbia

Thus, Alternative A will be considered as the baseline scenario for the project.

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

There is no existing laws and regulations requiring landfills to adopt active LFG collection and combustion systems, nor does any law forbid the modification of the current waste treatment systems. All alternatives are therefore credible alternatives to the project developer and are consistent with applicable laws.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

Determine whether the proposed project activity is not:

(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

Please note guidance provided by the Board on investment analysis (attached as annex to this tool) shall be taken into account when applying this Step.

Sub-step 2a: Determine appropriate analysis method

1- Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis (Sub-step 2b). If the CDM project activity and the alternatives identified in Step 1 generate no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

For the proposed project activity Option III – Benchmark analysis has been chosen

Sub-step 2b: Option III. Apply benchmark analysis

The Project Participants has applied the Equity IRR as benchmark analysis.
. According to the "GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS (Version 05)", the default values for the expected return on equity for projects developed in the Republic of Serbia is 11.75[2]
The Project is not considered financially attractive without additional revenue other than the electricity sale, in fact the Equity Internal Rate of Return (IRR) is much lower than benchmark IRR 11.75%;

(2) Calculation and Comparison of Financial Indicators:

According to the Preliminary Technical Project, the basic parameters of the Project are as follows:

[2] the benchmark of 11.75% has been taken from the "GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS (Version 05)", dowloadable at the address: http://cdm.unfccc.int/Reference/Guidclarif/reg/reg_guid03.pdf

Table B.3 Basic financial parameters of the Project

PARAMETER	*DATA*	*SOURCE*
Installation Capacity (MW)	0.32	Preliminary Technical Project
Operating Hours (h/y)	8,000	Preliminary Technical Project
Project Lifetime (y)	10	Preliminary Technical Project
LFG Recovery/Collection Section (€)	141,459.39	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
Piping network / LFG Transportation Section (€)	50,635.04	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
Blowing, Treatment and Flaring section / Main Aspiration Section (€)	224,790.00	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
Electricity production section / Generation and Trasformation Section (€)	322,000.00	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
Civil & Accessory Works (€)	38,734.00	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
Other expenses (€)	172,381.57	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
TOTAL INVESTMENT COST (CAPEX) (€)	**950,000.00**	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
EQUITY (% and €)	35% → 332,500.00	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
DEBT (% and €)	65% → 617,500.00	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
BENCHMARK (%)	11.75	"GUIDELINES ON THE ASSESSMENT OF INVESTMENT ANALYSIS (Version 05)"
Feed-in Tariff (€/MWh)	67.00	DECREE ON INCENTIVE MEASURES FOR ELECTRICITY GENERATION USING RENEWABLE ENERGY SOURCES AND FOR COMBINED HEAT AND POWER (CHP) GENERATION
Annual O&M costs (€)	80,370.00	Preliminary Technical Project (for details please refer to the "IRR Sheet_Nis_rev 3" file)
Inconme Tax Rate (%)	10%	http://www.worldwide-tax.com/serbia/ser_other.asp
Royalties to the Municipality of Nis (%)	3%	Concession Agreement (Framework Agreement)

Based on the data above, without CERs revenue, the Equity IRR is -12.4 %, which is much lower than the

foreseen benchmark 11.75%[3]. Therefore, the Project activity is not financially attractive.

The above statement is valid even if the Project Participants have taken into account not just the 10 years of crediting period, but the Technical Lifetime of the Project, which has been identified to be 14 years[4].

Sub-step2d: Sensitivity analysis:
The purpose of the sensitivity analysis is to examine whether the conclusion regarding the financial viability of the proposed project is sound and tenable with those reasonable variations in the assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially attractive or is unlikely to be financially attractive.

Four financial parameters including: total investment, annual O&M cost, price of electricity and electricity generation were identified as the main variable factors for sensitivity analysis of financial attractiveness. The range of +/- 10% has been taken as the maximum variation applicable to the four above mentioned paramenters in light of the respective market trends.
Their impacts on Equity IRR were analyzed in this step.

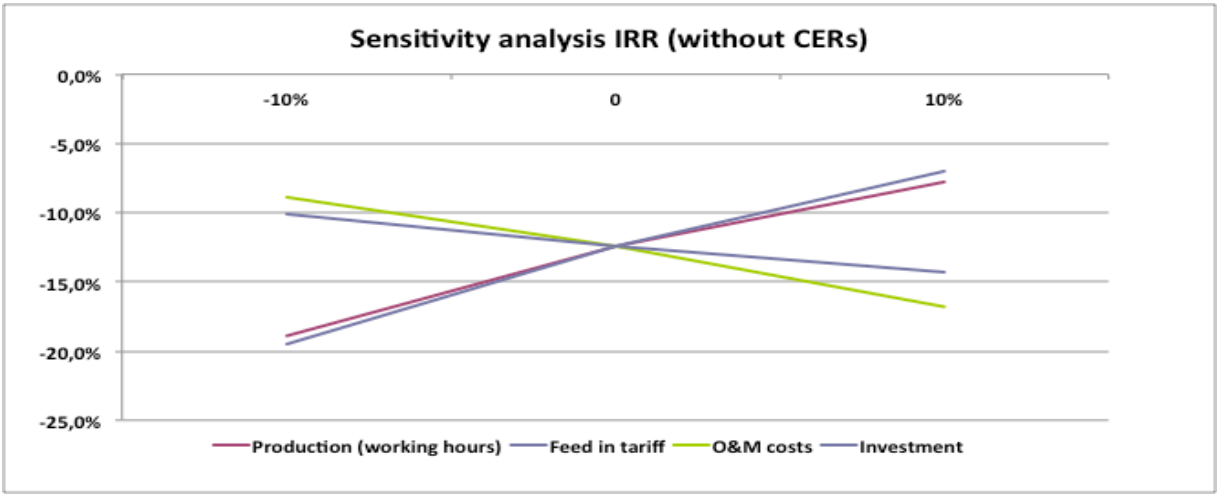
For detailed results of sensitivity analysis of the four indicators, please see Table B.4. Financial analyses were performed to assess what the impact on the Project profitability would be by altering each of these parameters by 10%. The impact on the project IRR is as follows:

Table B.4 – Sensitivity Analysis

Parameter / Range	-10%	0	+10%
Total Investment Cost	-18,9%	-12,4%	-7,8%
Annual O&M Cost	-19,5%	-12,4%	-7,0%
Annual Elec. output	-8,9%	-12,4%	-16,8%
Feed-in Tariff	-10,1%	-12,4%	-14,3%

[3] Data taken in light of the "ANNEX 5 – Guidelines on the assessment of investment analysis – (version 5)"

[4] The Project Participants, based on the DATA SHEET reported in the "Genset Efficiency" sheet of the "ER Calculation Nis_rev 3" file, has assumed as Technical Lifetime period the years where the LFG production allows the gensets to work at a minimum of 50% efficiency. The Technology Provider/Manufacturer (genset) does not guarantee the consistency of the energy production, O&M costs and Emission Reductions below that efficiency level. Therefore the PP identify in the year 2026 the last year as Technical Lifetime of the Project Activity



In conclusion, the project IRR remains low even in the case where these parameter change in favour of the project. The above sensitivity analysis provides valid argument that the financial attractiveness of the proposed project is robust to reasonable variations in the critical assumptions, and consistently supports that if without CERs revenue, the proposed project is not financially attractive.

Therefore, in light of the analysis above, the proposed project is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

According to the methodology AMS-III.G and AMS-I.D, the emission reductions of the project are calculated ex-ante as following:

Baseline emission

The Project involves introducing LFG recovery system to an existing landfill site to avoid methane emission, and the recovered LFG will be used for electricity generation. Therefore, the baseline emission includes two parts, which is calculated as per Methodology AMS-III.G and AMS-I.D separately.

$$BE_y = BE_{avoi,y} + BE_{elec,y} \quad (1)$$

Where:

BE_y	Baseline emissions in year y (tCO_{2e})
$BE_{avoi,y}$	Baseline emission of LFG avoidance that otherwise would be emitted to the atmosphere in absence of the Project in year y (tCO_{2e}) which is estimated as per AMS III.G.

$BE_{elec,y}$	Baseline emission of electricity displacement that otherwise would be provided by grid in year *y* (tCO_{2e}) which is estimated as per AMS I.D

$$BE_{avoi,y} = BE_{CH4,SWDS,y} - MD_{reg,y} * GWP_{CH4} \quad (2)$$

Where:

$BE_{CH4,SWDS,y}$	The estimation of the methane emission potential of a solid waste disposal site in year *y* (tCO_{2e}), which is calculated on the "*Emissions from solid waste disposal sites*" in formula (3).
$MD_{reg,y}$	Methane emissions that would be captured and destroyed to comply with national or local safety requirement or legal regulations in the year "y" (tCO_{2e})
GWP_{CH4}	Global Warming Potential for methane (value of 21)

With regard to $MD_{reg,y}$, as explained in section B.4, there is no regulatory and/or contractual requirement enforced to flare any amount of LFG in the baseline scenario, the $MD_{reg,y}$ for the first crediting period is taken as 0.

$$BE_{CH4,SWDS,y} = \phi * (1-f) * GWP_{CH4} * (1-OX) * 16/12 * F * DOC_f * MCF * \Sigma\Sigma W_{j,x} * DOC_j * e^{-kj(y-x)} * (1-e^{-kj}) \quad (3)$$

Where:

$BE_{CH4,SWDS,y}$	Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO2e)
φ	Model correction factor to account for model uncertainties (0.7822)
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for the relevant commitment period

OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction) (0.5)
DOCf	Fraction of degradable organic carbon (DOC) that can decompose
MCF	Methane correction factor
W_j	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tons)
kj	Decay rate for the waste type j
j	Waste type category (index)
x	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated

It is important to mention that the LFG generated at the SWDS could not be captured entirely, so a LFG collection efficiency coefficient of 60% as been considered for conservative approach.

$$BE_{elec,y} = EG_{BL,y} * EF_{CO2,grid,y} \quad (4)$$

Where:

$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$	CO_2 Emission Factor of the grid in year *y* (tCO_2e/MWh)

Calculation of the emission factor of the Serbian National Grid, Power Grid ($EF_{CO2,grid,y}$)

The electricity generated by this project will replace the same amount of electricity supplied by the Serbian National Grid, whose emission factor ($EF_{CO2,grid,y}$) was calculated by the Serbian Designated Operational Entity ("DNA") according to "*Tool to calculate the emission factor for an electricity system"*.

Project emissions

Project activity emissions consist of CO2 emissions related to the power used by the project activity facilities as per AMS-ID and methane emissions in exhaust gases from flaring the residual gas stream as per AMS III G.

$$PE_y = PE_{Flare,y} + PE_{EC,y} \quad (5)$$

Where:

PE_y	Project emissions during year y (tCO_{2e})
$PE_{Flare,y}$	Project Emissions from unburned methane content in exhaust flue gas from flaring
$PE_{EC,y}$	Project Emissions from consumption of electricity in the Project in year y (tCO_2/yr).

According to "Tool to determine project emissions from flaring gases containing methane" (EB 28 – Annex 13), the project emissions from flaring of residual gas stream $PE_{Flare,y}$,are determined considering the following steps[5]:

STEP 1: Determination of the mass flow rate of the residual gas that is flared
STEP 2: Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas
STEP 3: Determination of the volumetric flow rate of the exhaust gas on a dry basis
STEP 4: Determination of methane mass flow rate of the exhaust gas on a dry basis
STEP 5: Determination of methane mass flow rate of the residual gas on a dry basis
STEP 6: Determination of the hourly flare efficiency
STEP 7: Calculation of annual project emissions from flaring based on measured hourly values or based on default flare efficiencies.

Project participants shall apply these steps to calculate project emissions from flaring ($PE_{flare,y}$) based on the measured hourly flare efficiency or based on the default values for the flare efficiency ($\eta_{flare,h}$).
The calculation procedure in this tool determines the flow rate of methane before and after the destruction in the flare, taking into account the amount of air supplied to the combustion reaction and the exhaust gas composition (oxygen and methane). The flare efficiency is calculated for each hour of a year based either on measurements or default values plus operational parameters. Project emissions are determined by multiplying the methane flow rate in the residual gas with the flare efficiency for each hour of the year.

Step 1: Determination of the mass flow rate of the residual gas that is flared

[5] Please consider that the High Efficiency Enclosed Flare technology provider claims a combustion efficiency of more than 99%, so in this *ex-ante* calculation it is assumed to be zero

CDM – Executive Board

$$FM_{RG,h} = \rho_{RG,n,h} * FV_{RG,h} \quad (6)$$

Where:

$FM_{RG,h}$	Mass flow rate of the residual gas in hour h
$\rho_{RG,n,h}$	Density of the residual gas at normal conditions in hour h
FV_{RG}	Volumetric flow rate of the residual gas in dry basis at normal conditions in the hour h

and:

$$\rho_{RG,n,h} = \frac{Pn}{\frac{Ru}{MMRG,h} * Tn} \quad (7)$$

Where:

$\rho_{RG,n,h}$	Density of the residual gas at normal conditions in hour h
P_n	Atmospheric pressure at normal conditions
R_u	Universal ideal gas constant
$MM_{RG,h}$	Molecular mass of the residual gas in hour h
T_n	Temperature at normal conditions

And:

$$MM_{RG,h} = \Sigma\ (fv_{i,h} * MM_i) \quad (8)$$

Where:

$MM_{RG,h}$	Molecular mass of the residual gas in hour h
$fv_{i,h}$	Volumetric fraction of component i in the residual gas in the hour h
MM_i	Molecular mass of residual gas component i
I	The components CH_4, CO, CO_2, O_2, H_2, N_2

Step 2: Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas

$$fm_{j,h} = \frac{\sum_i fv_{i,h} \cdot AM_j \cdot NA_{j,i}}{MM_{RG,h}} \quad (9)$$

Where:

$fm_{j,h}$	Mass fraction of element j in the residual gas in hour h
$fv_{i,h}$	Volumetric fraction of component i in the residual gas in the hour h
AM_j	Atomic mass of element j
$NA_{j,i}$	Number of atoms of element j in component i
$MM_{RG,h}$	Molecular mass of the residual gas in hour h
j	The elements carbon, hydrogen, oxygen and nitrogen
i	The components CH_4, CO, CO_2, O_2, H_2, N_2

Step 3: Determination of the volumetric flow rate of the exhaust gas on a dry basis

$$TV_{n,FG,h} = V_{n,FG,h} \times FM_{RG,h} \quad (10)$$

Where:

$TV_{n,FG,h}$	Volumetric flow rate of the exhaust gas in dry basis at normal conditions in hour h
$V_{n,FG,h}$	Volume of the exhaust gas of the flare in dry basis at normal conditions per kg of residual gas in hour h
$FM_{RG,h}$	Mass flow rate of the residual gas in the hour h

$$V_{n,FG,h} = V_{n,CO_2,h} + V_{n,O_2,h} + V_{n,N_2,h} \quad (11)$$

Where:

$V_{n,FG,h}$	Volume of the exhaust gas of the flare in dry basis at normal conditions per kg of residual gas in the hour h
$V_{n,CO2,h}$	Quantity of CO2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour h
$V_{n,N2,h}$	Quantity of N2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour h
$V_{n,O2,h}$	Quantity of O2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour h

$$V_{n,O_2,h} = n_{O_2,h} \times MV_n \quad (12)$$

Where:

$V_{n,O2,h}$	Quantity of O2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour h
$n_{O2,h}$	Quantity of moles O2 in the exhaust gas of the flare per kg residual gas flared in hour h
MV_n	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 L/mol)

$$V_{n,N_2,h} = MV_n * \left\{ \frac{fm_{N,h}}{200 AM_N} + \left(\frac{1 - MF_{O_2}}{MF_{O_2}} \right) * \left[F_h + n_{O_2,h} \right] \right\} \quad (13)$$

Where:

$V_{n,N2,h}$	Quantity of N2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour h
MV_n	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 m3/Kmol)
$fm_{N,h}$	Mass fraction of nitrogen in the residual gas in the hour h
AM_n	Atomic mass of nitrogen
MF_{O2}	O2 volumetric fraction of air
F_h	Stochiometric quantity of moles of O2 required for a complete oxidation of one kg residual gas in hour h
$n_{O2,h}$	Quantity of moles O2 in the exhaust gas of the flare per kg residual gas flared in hour h

$$V_{n,CO_2,h} = \frac{fm_{C,h}}{AM_C} * MV_n \quad (14)$$

Where:

$V_{n,CO2,h}$	Quantity of CO2 volume free in the exhaust gas of the flare at normal conditions per kg of residual gas in the hour h
$fm_{C,h}$	Mass fraction of carbon in the residual gas in the hour h
AM_C	Atomic mass of carbon
MV_n	Volume of one mole of any ideal gas at normal temperature and pressure (22.4 m3/Kmol)

$$n_{O_2,h} = \frac{t_{O_2,h}}{\left(1-(t_{O_2,h}/MF_{O_2})\right)} \times \left[\frac{fm_{C,h}}{AM_C} + \frac{fm_{N,h}}{2AM_N} + \left(\frac{1-MF_{O_2}}{MF_{O_2}}\right) \times F_h\right] \quad (15)$$

Where:

$n_{O2,h}$	Quantity of moles O2 in the exhaust gas of the flare per kg residual gas flared in hour h
$t_{O2,h}$	Volumetric fraction of O2 in the exhaust gas in the hour h
MF_{O2}	Volumetric fraction of O2 in the air (0.21)
F_h	Stochiometric quantity of moles of O2 required for a complete oxidation of one kg residual gas in hour h
$fm_{j,h}$	Mass fraction of element j in the residual gas in hour h (from equation 4)
AM_j	Atomic mass of element j
j	The elements carbon (index C) and nitrogen (index N)

$$F_h = \frac{fm_{C,h}}{AM_C} + \frac{fm_{H,h}}{4AM_H} - \frac{fm_{O,h}}{2AM_O} \quad (16)$$

Where:

F_h	Stoichiometric quantity of moles of O2 required for a complete oxidation of one kg residual gas in hour h

$fm_{j,h}$	Mass fraction of element j in the residual gas in hour h (from equation 4)
AM_j	Atomic mass of element j
j	The elements carbon (index C), hydrogen (index H) and oxygen (index O)

STEP 4: Determination of methane mass flow rate in the exhaust gas on a dry basis

$$TM_{FG,h} = \frac{TV_{n,FG,h} * fv_{CH4,FG,h}}{1000000} \quad (17)$$

Where:

$TM_{FG,h}$	Mass flow rate of methane in the exhaust gas of the flare in dry basis at normal conditions in the hour h
$TV_{n,FG,h}$	Volumetric flow rate of the exhaust gas in dry basis at normal conditions in hour h
$fv_{CH4,FG,h}$	Concentration of methane in the exhaust gas of the flare in dry basis at normal conditions in hour h

STEP 5: Determination of methane mass flow rate in the residual gas on a dry basis

$$TM_{RG,h} = FV_{RG,h} \times fv_{CH4,RG,h} \times \rho_{CH4,n} \quad (18)$$

Where:

$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h
$FV_{RG,h}$	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h
$fv_{CH4,RG,h}$	Volumetric fraction of methane in the residual gas on dry basis in hour h (NB: this corresponds to fvi,RG,h where i refers to methane).
$\rho_{CH4,n}$	Density of methane at normal conditions (0.716)

STEP 6: Determination of the hourly flare efficiency

In case of enclosed flares and continuous monitoring of the flare efficiency, the flare efficiency in the hour h (ηflare,h) is

- 0% if the temperature of the exhaust gas of the flare (Tflare) is below 500 °C during more than 20 minutes during the hour h.
- determined as follows in cases where the temperature of the exhaust gas of the flare (Tflare) is above 500 °C for more than 40 minutes during the hour h:

$$\eta_{flare,h} = 1 - \frac{TM_{FG,h}}{TM_{RG,h}} \quad (19)$$

Where:

$\eta_{flare,h}$	Flare efficiency in the hour h
$TM_{FG,h}$	Methane mass flow rate in exhaust gas averaged in a period of time t (hour, two months or year)
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h

STEP 7: Calculation of annual project emissions from flaring:

$$PE_{Flare,y} = \sum_{n=1}^{8760} TM_{RG,h} * (1 - \eta_{flare,h}) * \frac{GWPCH4}{1000} \quad (20)$$

Where*:*

$PE_{Flare,y}$	Project emissions from flaring of the residual gas stream in year y
$TM_{RG,h}$	Mass flow rate of methane in the residual gas in the hour h
$\eta_{flare,h}$	Flare efficiency in hour h
GWP_{CH4}	Global Warming Potential of methane valid for the commitment period

Regarding the $PE_{Flare,y}$, as before mentioned several High Efficiency Enclosed Flare technology providers/manufacturers claim a combustion efficiency of more than 99%, so in this *ex-ante* calculation it is assumed to be zero.

Project Emissions due to electricity and/or fossil fuel consumption :

$$PE_{EC,y} = EL_{onsite,y} * EF_{CO2,grid,y} \quad (21)$$

Where:

$PE_{EC,y}$	Project emissions due to the electricity consumption of on-site equipments in the year y (tCO2e)
$EL_{onsite,y}$	Quantity of electricity consumed by the project activity during the year y (MWh)
$EF_{CO2,grid,y}$	CO_2 Emission Factor of the grid in year *y* (tCO_2e/MWh)

The electricity for on-site equipments will be imported from the Serbian National Grid. Metering equipment that will measure both import and export of electricity from/to the LFG recovery plant will be installed.

In light of the statement above, only the net amount of electricity exported to the Serbian National Grid have been accounted as baseline emission, therefore the project emissions of the proposed project due to the electricity consumption is 0 during the crediting period.

Moreover, there is no fossil fuel consumption due to the project activity, so there are no project emissions related to that aspect.

Conclusion:

In light of all above, the resulting project emissions ***PE,y* is 0.**

Leakage.
No leakage effects need to be accounted under the approved methodology.

Emission reduction
The emission reductions are calculated as difference between baseline & project emission as follows:

$$ER_y = BE_y - PE_y \quad (21)$$

Where:

ERy	Emission reduction in year y (tCO2e)
BEy	Baseline emission in year y(tCO2e)
PEy	Project emission in year y(tCO2e) Leakage Leakage in year y (tCO2e)

As illustrated above, at the project design stage the PEy=0 and Leakage=0

Thus: **ERy = BE**

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

AMS III.G Version 7 Requires the ex-ante estimation of the amount of methane that would have been destroyed/combusted during the year (MDproject) based on the latest version of the "*Emissions from solid waste disposal sites*".
The following data and parameters are used. These parameters are not required to be monitored, but only used for forecast of avoided methane emissions.

Data / Parameter:	**Wj,x**
Data unit:	t
Description:	Total amount of MSW disposed in Bubanj SWDS in years from 1991 to 2011
Source of data used:	Registered records from Mediana company since 2000 up to 2011; P.P. estimated figures for years 1991-1999; all figures from Mediana are reported on documents or taken during local interviews with company officers.

Value applied:	

YEAR	TONS
1991	36,000
1992	36,000
1993	36,500
1994	36,500
1995	37,000
1996	37,000
1997	38,000
1998	39,691
1999	36,266
2000	40,296
2001	43,026
2002	46,188
2003	45,202
2004	53,905
2005	58,024
2006	63,777
2007	68,720
2008	76,044
2009	77,543
2010	71.,764
2011	69,011
2012	0
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
TOTAL	**1,046,457**

Justification of the choice of data or description of measurement methods and procedures actually applied :	The data are available from landfill operator Mediana
Any comment:	-----

Data / Parameter:	Organic waste composition
Data unit:	%
Description:	Composition of organic waste type j
Source of data used:	University of Nis (2009) [6]
Value applied:	

CATEGORY	Average percentage (%)
Food Waste	44.10 %
Wood	0.61%
Paper	15.30 %
Textile	8.26 %
Plastic	17.70 %
Metal	1.90 %
Glass	5.10 %
Brick and Ceramics	n.r.
Other inorganic matter	7.03 %
TOTAL	**100%**

Justification of the choice of data or description of measurement methods and procedures actually applied :	The above mentioned analisys come from the Univesity of Nis Study – Faculty of Mechanical Engineering "*Comparative Analysis of the Waste Management Possibility in the Territories of Serbia and Croatia*" 2009
Any comment:	---

Data / Parameter:	$\varphi_{default}$
Data unit:	----
Description:	Default value for the model correction factor to account for model uncertainties
Source of data used:	Methodological tool "Emissions from solid waste disposal sites" (Version 06.1.0)
Value applied:	0.7822
Justification of the choice of data or description of measurement methods and procedures actually applied :	The option 2 was chosen totake into account the uncertainties of the specific project; the coefficient calculation is reported in the Excel file named "ER Calculation_Nis"
Any comment:	

[6] Extract from the study: "COMPARATIVE ANALYSIS OF THE WASTE MANAGEMENT POSSIBILITY ON THE TERRITORIES OF SERBIA AND CROATIA" by Ph.D. Gordana Stefanović, Assistant professor University of Nis, the Faculty of Mechanical Engineering (Please note that the figure of the fraction "other" in the mentioned study has been splitted in three sub-categories: a)Wood (including also leather – slowly degrading matter) 0,61% b) Textile (and diapers) 8,26% c)The remaining part in the fraction named "other inorganic matter" . The estimation and division as reported, has been performed by the PP in light of the data/analysis provided by MEDIANA).

Data / Parameter:	**OX**
Data unit:	--
Description:	Oxidation factor (reflecting the amount of methane from the landfill that is oxidized in the soil or other material covering the waste)
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Soil cover has been used in Bubanj landfill, thus OX = 0.1
Any comment:	

Data / Parameter:	**F**
Data unit:	--
Description:	Fraction of methane in the SWDS biogas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories, volume 5, page 3.15
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.
Any comment:	

Data / Parameter:	**$DOC_{f,default}$**
Data unit:	Weight fraction
Description:	Default value for the fraction of degradable organic carbon (DOC) in MSW that decomposes in the SWDS
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	2006 IPCC Guidelines provide 0.5 as the default value for DOCf
Any comment:	

Data / Parameter:	$MCF_{default}$
Data unit:	---
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	1.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use the following values for MCF: • 1.0 for **anaerobic managed solid waste disposal sites**. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste. • 0.5 for **semi-aerobic managed solid waste disposal sites**. These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system. • 0.8 for **unmanaged solid waste disposal sites – deep and/or with high water table**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste. • 0.4 for **unmanaged-shallow solid waste disposal sites**. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres. The waste from Nis City is transported directly to Bubanj Landfill, and the waste dumped in Bubanj Landfill is compacted and covered. So 1.0 for anaerobic managed solid waste disposal sites is adopted.
Any comment:	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.

Data / Parameter:	DOC_j
Data unit:	---
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j (weight fraction)*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	

WASTE TYPE j	DOC_j (% wet waste)	DOC_j (% dry waste)
Wood and Woods Products	43	50
Pulp, paper and cardboard (other than sludge)	40	44
Food, food waste, beverages and tobacco (other than sludge)	15	38
Textiles	24	30
Garden, yard and park waste	20	49

	Glass, plastic, metal, other inert waste | - | -
Justification of the choice of data or description of measurement methods and procedures actually applied :	The waste type of this project has be sorted clearly into components which are reported clearly in the table above. The waste is on a wet basis in Mediana values, so the wet values in the table should be used.
Any comment:	

Data / Parameter:	**kj**
Data unit:	1/yr
Description:	Decay rate for the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	Apply the following default values for the different waste types j:

WASTE TYPE j		Boreal and Temperate (MAT≤20°C)		Tropical (MAT > 20°C)	
		Dry (MAP/PET <1)	Wet (MAP/PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)
Slowly degrading	Pulp, paper and cardboard (other than sludge), texiles	0.04	0.06	0.045	0.07
Slowly degrading	Wood, wood products and straw	0.02	0.03	0.025	0.035
Moderately degrating	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.017
Rapidly degrating	Food, food waste, beverages and tobacco (other than sludge)	0.06	0.185	0.085	0.040

N.B.: MAT – mean annual temperature, MAP – Mean annual precipitation, PET – potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration.

Justification of the choice of data or description of measurement methods and procedures	Since the local k value is not available, the project participant decided to adopt the default values reported in the table above, at the column "Dry (MAP/PET <1)"

actually applied :	
Any comment:	The waste type of this project can be sorted into table above clearly. The MAT of the Project is 14.1℃, the MAP / PET is small than 1 so the Boreal and temperature dry values should be used.

Data / Parameter:	$EF_{CO2,i,y}$
Data unit:	TCO_2/MWh
Description:	Serbian National Grid Emission Factor
Source of data used:	Serbian Designated National Authority
Value applied:	0.945
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data was developed by the Serbian Designated National Authority – calculations are available at the address: http://www.ekoplan.gov.rs/DNA/index_en.html
Any comment:	

Data / Parameter:	GWP_{CH4}
Data unit:	$t\ CO_2e\ /\ t\ CH_4$
Description:	Global Warming Potential of methane
Source of data:	IPCC
Value to be applied:	21 for the first commitment period. Shall be updated for future commitment periods according to any future COP/MOP decisions
Any comment:	-

Data / Parameter:	$\rho_{CH4,n;}$
Data unit:	$kgCH_4/m^3CH_4$
Description:	Methane density
Source of data used:	ACM 0001 version 11, adopted at EB 47
Value applied:	0.0007168
Justification of the choice of data or description of measurement methods and procedures actually applied :	At standard temperature and pressure (0 degree Celsius and 1,013 bars), the density of methane is 0.0007168 kg/m^3
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

The ex-ante estimation of emission reductions of the Project will be conducted according to the following methods and steps:

1-Baseline emission
Estimation of emission reduction of methane avoidance ($BE_{avoi,y}$);

The yearly disposed waste is reported in the table B.6 below:

Table B.6 - amounts of waste that have been dumped into the landfill since 1991

YEAR	Annual Waste Dumped (Tons)
1991	36,000
1992	36,000
1993	36,500
1994	36,500
1995	37,000
1996	37.,000
1997	38,000
1998	39,691
1999	36,266
2000	40,296
2001	43,026
2002	46,188
2003	45,202
2004	53,905
2005	58,024
2006	63,777
2007	68,720
2008	76,044
2009	77,543
2010	71,764
2011	69.011
2012	0
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
TOTAL	**1,046,457**

According to the Study performed by the Univeristy of Nis (2009)[7], the waste type composition is as reported in the following Table B.7

Table B.7 – Waste composition

CATEGORY	Average percentage (%)
Food Waste	44.10 %
Wood	0.61%
Paper	15.30 %
Textile	8.26 %
Plastic	17.70 %
Metal	1.90 %
Glass	5.10 %
Brick and Ceramics	n.r.
Other inorganic matter	7.03 %
TOTAL	**100%**

Climate

The climate in Nis falls into the Boreal and Temperate category, since the annual average temperature in the area is 12.1°C; the average yearly precipitation is 580.3 mm. Regarding the evapotranspiration, the data is 653 mm per year[8].
In light of all above, Nis area meets the conditions of MAT⩽20 and MAP/PET<1 according to the "Emissions from solid waste disposal site", therefore, the values for DOCj and kj are shown in the table B.8, below:

Table B.8 – values for type of waste

Waste type j	DOCj (% wet)	kj
Wood and wood products	43	0.02
Pulp paper and cardboard (other than sludge)	40	0.04
Food, food waste, beverages and tobacco (other than sludge)	15	0.06
Textiles	24	0.04
Garden, yard and park waste	20	0.05

[7] "Comparative Analysis of the Waste Management Possibility in the Territories of Serbia and Croatia" 2009 by Ph.D. Gordana Stefanović, Assistant professor University of Nis, the Faculty of Mechanical Engineering (Please note that the figure of the fraction "other" in the mentioned study has been splitted in three sub-categories: a)Wood (including also leather – slowly degrading matter) 0,61% b) Textile (and diapers) 8,26% c)The remaining part in the fraction named "other inorganic matter" . The estimation and division as reported, has been performed by the PP in light of the data/analysis provided by MEDIANA).

[8] data are available at the addresses:
PET: http://www.hidmet.gov.rs/eng/meteorologija/pros_pet.php,
MAT: http://www.hidmet.gov.rs/eng/meteorologija/stanica_sr.php?moss_id=13388 and http://en.wikipedia.org/wiki/Niš
MAP: http://www.world-climates.com/city-climate-nis-serbia-europe/ and
http://www.hidmet.gov.rs/podaci/meteorologija/Padavinski_rezim_u_Srbiji_eng.pdf and
http://www.hidmet.gov.rs/eng/meteorologija/klimatologija_padav_rezim.php ,

The parameters adopted to calculate the methane generation and collection are listed in the Table B.9 below:

Table B.9

φ	*0.7822*[9]
f	*0*
GWP_{CH4}	*21*
OX	*0.1*
F	*0.5*
DOCf	*0.5*
MCF	*1.0*
$W_{j,x}$	*Result of amount of waste in Table B.6 multiply by percentage of each organic waste type in Table B.7*
DOCj	*See Table B.8*
k_j	*See Table B.8*
$D_{CH4,y}$	*0.0007168*

The estimation of methane emission potential $BE_{CH4,SWDS,y}$ could be calculated as per formula (3) which is shown in Table B.10. $MD_{reg,y}$ is taken 0, and due to a LFG collection efficiency of 60% is considered for a conservative consideration, the $BE_{avoi,y}$ is the result of $BE_{CH4,SWDS,y}$ multiply the coefficient.

Table B.10 Ex-ante estimation of $BE_{CH4,SWDS,y}$ and $BE_{avoi,y}$

Year	*Methane emission potential (tCO_2/year) $BE_{CH4,SWDS,y}$*	*LFG Collection Efficiency*	*Baseline emission of LFG avoidance (tCO_2/year) $BE_{avoi,y}$*
2013	23,883	60%	14,330
2014	22,722	60%	13,633
2015	21,619	60%	12,971
2016	20,572	60%	12,343
2017	19,578	60%	11,747
2018	18,633	60%	11,180
2019	17,737	60%	10,642
2020	16,885	60%	10,131
2021	16,076	60%	9,645
2022	15,307	60%	9,184
TOTAL	**193,011**	**60%**	**115,807**

Estimation of emission reduction due to electricity displacement $BE_{elec,y}$

According to the Preliminary Technical Design , the installed capacity and annual operational hours (8,000 h) emissions from electricity generation by grid-connected power plants under baseline scenario that is displaced by LFG electricity generation under the project activity are tabulated below.
The baseline emission factor ($EF_{CO2,y}$) is 0.945 tCO_2e/MWh.

[9] for reference to the related calculation of the parameter φ, please see the Excel file "ER Calculation_NIS_rev3"

Table B.11: emission reduction due to electricity displacement $BE_{elec,y}$

Year	LOAD (MW)	Electricity export (MWh/y)	Electricity import (MWh/y)	Net Electricity Supply to the Grid $EG_{facility,y}$ (MWh)	Baseline emission of electricity displacement $BE_{elec,y}$ (tCO2/year)
2013	0.32	2,560	299	2,261	2,137
2014	0.32	2,560	299	2,261	2,137
2015	0.32	2,560	299	2,261	2,137
2016	0.32	2,483	299	2,184	2,064
2017	0.32	2,343	299	2,044	1,932
2018	0.32	2,212	299	1,913	1,807
2019	0.32	2,089	299	1,790	1,692
2020	0.32	1,974	299	1,675	1,583
2021	0.32	1,866	299	1,567	1,481
2022	0.32	1,765	299	1,466	1,386
TOTAL		**22,413**	**2,990**	**19,423**	**18,355**

Estimate of baseline emission reduction (BE_y)

As per formula (1), the baseline emission reduction is estimated in Table B.12

Table B.12 Estimation of baseline emission BE_y

Year	$BE_{avoid,y}$ (tCO_2)	$BE_{elec,y}$ (tCO_2)	BE_y (tCO_2)
2013	14,330	2,137	16,466
2014	13,633	2,137	15,769
2015	12,971	2,137	15,107
2016	12,343	2,089	14,407
2017	11,747	1,953	13,678
2018	11,180	1,830	12,987
2019	10,642	1,711	12,333
2020	10,131	1,602	11,713
2021	9,645	1,498	11,126
2022	9,184	1,402	10,569
TOTAL	**115,807**	**18,495**	**134,155**

2. Project Emission

The Project Emissions are considered 0 because:

- With reference to the project emissions from electricity consumption $PE_{EC,y}$ are deemed as 0, since the baseline emissions for the electricity displacement take into account the import and export of the electricity from/to the Serbian National Grid;
- With reference to the project emissions from flaring, the Project Participant assume them to be 0 for

ex-ante calculation; (High Efficiency Enclosed Flare technology providers claim a combustion efficiency of more than 99%, so in this *ex-ante* calculation it is assumed to be zero)

- There is no fossil fuel consumption due to the project activity;

3. Leakage

There are no equipments transferred in the Project, no leakage effects need to be accounted under AMS-III.G and AMS-I.D.

Therefore, Leakage=0

4. Emission Reduction

$$\boldsymbol{ER_y = BE_y - PE_y}$$

Where:

ER_y	Emission reduction in year y (tCO2e)
BE_y	Baseline emission in year y(tCO2e)
PE_y	Project emission in year y(tCO2e) Leakage Leakage in year y (tCO2e)

As illustrated above, at the project design stage the PEy=0 and Leakage=0

Thus: **ERy = BEy**

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

Emission reductions resulting by the methane destruction ($BE_{avoi,y}$):

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)
2013	0	14,330	0	14,330
2014	0	13,633	0	13,633
2015	0	12,971	0	12,971
2016	0	12,343	0	12,343
2017	0	11,747	0	11,747
2018	0	11,180	0	11,180
2019	0	10,642	0	10,642
2020	0	10,131	0	10,131
2021	0	9,645	0	9,645
2022	0	9,184	0	9,184
TOTAL	**0**	**115,807**	**0**	**115,807**

Emission reductions resulting due to electricity displacement ($BE_{elec,y}$)

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)
2013	0	2,137	0	2,137
2014	0	2,137	0	2,137
2015	0	2,137	0	2,137
2016	0	2,064	0	2,064
2017	0	1,932	0	1,932
2018	0	1,807	0	1,807
2019	0	1,692	0	1,692
2020	0	1,583	0	1,583
2021	0	1,481	0	1,481
2022	0	1,386	0	1,386
TOTAL	**0**	**18,355**	**0**	**18,355**

Total of the emission reductions due to the project activity (BEy):

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2e)
2013	0	16,466	0	**16,466**
2014	0	15,769	0	**15,769**
2015	0	15,107	0	**15,107**
2016	0	14,407	0	**14,407**
2017	0	13,678	0	**13,678**
2018	0	12,987	0	**12,987**
2019	0	12,333	0	**12,333**
2020	0	11,713	0	**11,713**
2021	0	11,126	0	**11,126**
2022	0	10,569	0	**10,569**
TOTAL	**0**	**134,155**	0	**134,155**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$LFG_{flare,y}$
Data unit:	m^3
Description:	Amount of LFG destroyed via flare in year y
Source of data to be used:	Monitored data from on-site measurement ex-post will be used during implementation of the Project for verification.
Value of data	--
Description of measurement methods and procedures to be applied:	The LFG flared will be monitored by a continuous thermal dispersion flow meter, the readings will be compensated for normal pressure and temperature values; data will be recorded on a daily basis, and kept for further two years at the end of crediting period Flowmeter is in conformity with Directive 94/9/EC ATEX; accuracy at > 0.21 nmps; ± 1% reading;± 0.5% full scale.
QA/QC procedures to be applied:	The flow meter will undergo cleaning operation every six months from trained staff; during the yearly periodic supplier's visit, the settings of equipmet will be checked
Any comment:	--

Data / Parameter:	$LFG_{electricity,y}$
Data unit:	m^3
Description:	Amount of LFG combusted in power plant in year y
Source of data to be	Monitored data from on-site measurement ex-post will be used during

used:	implementation of the Project for verification.
Value of data	--
Description of measurement methods and procedures to be applied:	The LFG combusted in power plant will be monitored by a continuous thermal dispersion flow meter, the readings will be compensated for normal pressure and temperature values; data will be recorded on a daily basis, and kept for further two years at the end of crediting period Flowmeter is in conformity with Directive 94/9/EC ATEX; accuracy at > 0.21 nmps; ± 1% reading;± 0.5% full scale.
QA/QC procedures to be applied:	The flow meter will undergo cleaning operation every six months from trained staff; during the yearly periodic supplier's visit, the settings of equipmet will be checked
Any comment:	--

Data / Parameter:	$w_{CH4,y}$
Data unit:	%, volume basis
Description:	Methane content in the landfill gas in the year y
Source of data to be used:	Monitored data from on-site measurement ex-post will be used during implementation of the Project for verification.
Value of data	50%
Description of measurement methods and procedures to be applied:	Methane fraction will be measured on a continuous basis (dry) with an infra-red analyzer; accuracy ± 1% full scale. The data will be kept up to two years after the end of the crediting period.
QA/QC procedures to be applied:	The monitoring staff will be trained by equipment supplier on calibration and zero checks routines. The equipment will undergo calibration operations (in accordance with appropriate suppliers's standards) at least every six months. Calibration will be accomplished by means of reference gas bottles, which will be available at the plant; supplier will supervise the instrument during his programmed periodic (yearly) visit.
Any comment:	--

Data / Parameter:	P
Data unit:	Pa
Description:	Pressure of the landfill gas
Source of data to be used:	Pressure gauge
Value of data	To be determined
Description of measurement methods and procedures to be applied:	The pressure of the gas is required to determine the density of the methane combusted. The biogas pressure wil be continuously monitored with a pressure transmitter, certified IEC 61508, with accuracy of 0.06 % of calibrated spam. Data will be recorded on hourly basis.
QA/QC procedures to be applied:	Trained staff will accomplish cleaning of the sensor every six months; settings check done yearly during the programmed supplier's visit.
Any comment:	--

Data / Parameter:	$EG_{facility,y}$
Data unit:	MWh/y
Description:	Quantity of net electricity supplied to the grid in year *y*
Source of data to be used:	Monitored data from on-site measurement ex-post will be used during implementation of the Project for verification.
Value of data	--
Description of measurement methods and procedures to be applied:	Continuously measured by active electrical energy meter, meeting with 93/68 EWG EU standards; accuracy class A. Data will be recorded on a daily basis.
QA/QC procedures to be applied:	Data will be kept up to two years after the end of the crediting period. Meters will be checked once a year, during supplier's personnel programmed visit.
Any comment:	--

Data / Parameter:	$PE_{power,y}$
Data unit:	tCO2e
Description:	Parameters related to emission from electricity and/or fuel consumption in the year y
Source of data to be used:	Monitored data from on-site measurement ex-post will be used during implementation of the Project for verification.
Value of data	--
Description of measurement methods and procedures to be applied:	Electricity consumption is directly and continuously metered on a daily basis by active electrical energy meter, meeting with 93/68 EWG EU standards; accuracy class A and resulting values are multiplied by Serbian GEF, to obtain $PE_{power,y}$.
QA/QC procedures to be applied:	Data will be kept up to two years after the end of the crediting period. Meters will be checked once a year, during supplier's personnel programmed visit.
Any comment:	--

Data / Parameter:	$\eta_{flare,h}$
Data unit:	----
Description:	Flare efficiency in the hour h based on measurements
Source of data to be used:	Thermistor, Samples, Calculation
Value of data	To be determined
Description of measurement methods and procedures to be applied:	T_{flare} , $fv_{CH4,FG,h}$, $fv_{i,h}$, $t_{O2,h}$ measured as described in every related data table. Calculation procedure as per ANNEX 13
QA/QC procedures to be applied:	QA/QC procedures will be applied as reported in each parameters table needed for calculation.
Any comment:	--

Data / Parameter:	T_{flare}
Data unit:	°C

Description:	Temperature in the exhaust gas of the flare
Source of data to be used:	Monitored data from on-site measurement ex-post will be used during implementation of the Project for verification.
Value of data	--
Description of measurement methods and procedures to be applied:	Measure the temperature of the exhaust gas stream in the flare by a thermocouple continuously. A temperature above 500 °C indicates that a significant amount of gases are still being burnt and that the flare is operating.
QA/QC procedures to be applied:	Thermocouple will be calibrated or replaced every year, during the supplier's visit.
Any comment:	--

Data / Parameter:	$PE_{flare,y}$
Data unit:	tCO2e
Description:	Project emissions from flaring the residual gas stream in the year y
Source of data to be used:	Calculated as per the "*Tool to determine the project emissions from flaring gases containing methane"*
Value of data	To be determined
Description of measurement methods and procedures to be applied:	The parameters $\mathbf{FV_{RG,h}}$; $\mathbf{t_{o2,h}}$; $\mathbf{fv_{CH4,RG,h}}$ h and T flare will be monitored, so PEflare,y can be calculated according to the "*Tool to determine the project emissions from flaring gases containing methane".* The flare efficiency will be continuously monitored.
QA/QC procedures to be applied:	See parameters $\mathbf{fv_{i,h}}$, FVRG,h, to2,h, fvCH4,FG,h and T flare
Any comment:	As a simplified approach, project participants will only measure the methane content of the residual gas and consider the remaining part as N2

Data / Parameter:	$\mathbf{fv_{i,h}}$
Data unit:	-
Description:	Volumetric fraction of component i in the residual gas in the hour h, where i = CH4 and N2
Source of data to be used:	Continuous measurement by an infra-red analyser. Values will be averaged on hourly time interval.
Value of data	To be determined
Description of measurement methods and procedures to be applied:	An infra-red analyser will be installed, with accuracy ± 1% full scale. It will be measured on dry basis, as well as the concentration of methane in the exhaust gas of the flare ($\mathbf{FV_{RG,h}}$.) will be done on dry basis. This is possible because the residual gas temperature will never exceed 60 °C.
QA/QC procedures to be applied:	The analyser will be periodically calibrated by trained staff on a monthly basis, although according to the manufacturer's recommendation every 6 month calibration is sufficient. A zero check and a full scale check are performed by comparison with a standard gas.
Any comment:	A simplified approach is applied – only methane content of the residual gas is measured. The remaining part is considered to be N2.

Data / Parameter:	$\mathbf{FV_{RG,h}}$

Data unit:	m^3/h
Description:	Volumetric flow rate of the residual gas in wet basis at normal conditions in the hour h
Source of data to be used:	Measurements will be done using a flow meter
Value of data	to be determined
Description of measurement methods and procedures to be applied:	The flow of LFG flared will be monitored by a continuos thermal dispercsion flow meter; the readings will be compensated for normal pressure and temperature values; data will be recorded on a daily basis and kept for two years at the end of the crediting period. Flowmeter is in conformity with Directive 94/9/EC ATEX; accuracy at > 0,21 nmps; ± 1% reading and ± 0,5% full scale.
QA/QC procedures to be applied:	The flow meter will undergo cleaning operation every six months by trained staff. During the yearly periodic supplier's visit, the settings of equipment will be checked.
Any comment:	--

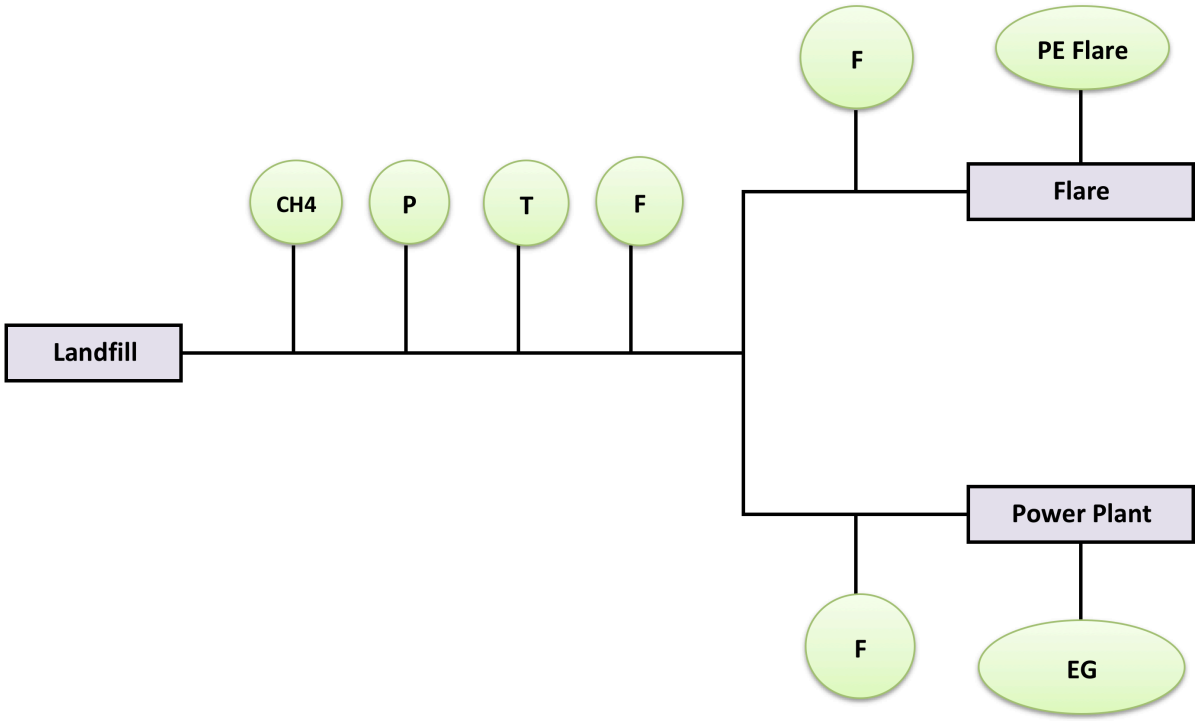
Data / Parameter:	$\mathbf{t_{02,h}}$
Data unit:	-
Description:	Volumetric fraction of O2 in the exhaust gas of the flare in the hour h
Source of data to be used:	Measurements will be done using special Zirconium Oxideprobe The data is measured on hourly basis.
Value of data	to be determined
Description of measurement methods and procedures to be applied:	Measurements will be conducted with appropriate Zirconium Oxide special probe adequate to high temperatures level Continuous monitoring frequency. Values will be averaged at least hourly
QA/QC procedures to be applied:	Zirconium Oxide special probe will be calibrated every six months by trained staff, zero and full scale values will be tuned with the aid of sample gas bottles (N_2 for zero check, ambient air for full scale check); controls operations will be done yearly together with the supplier's personell during scheduled visits.
Any comment:	--

Data / Parameter:	$\mathbf{fv_{CH4,FG,h}}$
Data unit:	mg/m^3
Description:	Concentration of methane in the exhaust gas of the flare in dry basis at normal conditions in the hour h
Source of data to be used:	Measurements will be done by using an infrared gas analyser. The data is measured on hourly basis.
Value of data	To be measured.
Description of measurement methods and procedures to be applied:	Extractive sampling analysers with water and particulates removal devices. The point of measurement (sampling point) will be the upper section of the flare. Sampling will be conducted with appropriate sampling probes adequate to high temperatures level (e.g. incolloy probes). An infra-red analyser will be installed,

	with accuracy ± 1% full scale.
QA/QC procedures to be applied:	Analysers will be calibrated on a monthly basis by trained staff, although manufacturer advices to perform it every six months. A zero check and a typical value check are performed by comparison with a standard gas.
Any comment:	Monitoring of this parameter is only applicable for enclosed flares and continuous monitoring of the flare efficiency.

B.7.2 Description of the monitoring plan:

To monitor this project activity, monitoring methodologies AMS-III.G. Landfil methane recovery (version 07) and AMS-I.D. Grid connected renewable electricity generation (Version 17) are applied.
The methodologies are applicable to landfill gas capture project activities, where the baseline scenarios the partial or total atmospheric release of the gas. The monitoring methodology is based on direct measurement of the amount of landfill gas captured and destroyed at the electricity generating energy unit and the flare platform to determine the quantities as on the following scheme:



where:

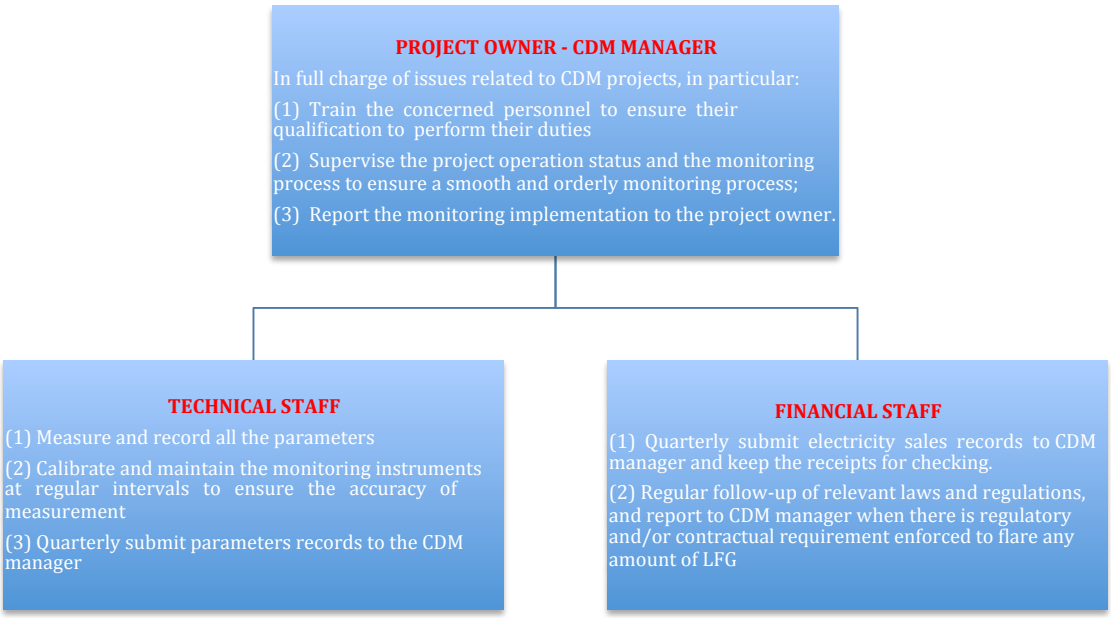
- CH_4 → fraction of CH_4
- T →temperature
- P → pressure

- F → flow of LFG [m_3]
- PE_{flare} → project emissions from flaring of the residual gas stream
- $EG_{facility,y}$: import-export electricity meter

Additionally, the "Tool to determine project emission from flaring gases containing methane" is applied. All the monitored parameters are summarized in chapter B.7.1.

1. Management structure

A CDM director is nominated to take the overall responsibility for the monitoring activity on this project. The management structure and position duties are specified in the figure below:



Management Structure for the Monitoring Plan

The Project Participants are fully responsible for the monitoring procedures. Technology supplier will deliver a guidebook in English, which will be translated into Serbian. It will provide a short training of the local technical personnel for maintenance and calibration works. Chosen trainees must have a good understanding the processes and technology of the installation of landfill gas extraction.

The guidebook will include information about the following aspects:

- operation manual of the gas extraction system, flares and gas engines
- technical drawings of the installation
- maintenance instructions
- description of parts of the equipment

• telephone of a person who will be available in case of technical failures (a help desk shall be available for 24 hours per day in case of technical failures.)

2 . QA/QC

In order to ensure monitoring plan with high quality, QA/QC measures are carried out in procedures making, equipment calibrating and staff training.

Training

All the staffs involved in this monitoring plan will take training before project operation, and the training plan includes CDM knowledge and special skill for monitoring, which is:

(1) Roles and responsibility of each staff

(2) Information about data to be collected

(3) Maintenance of data records in logbook and spreadsheet

(4) Procedures of monitoring instruments calibration

Data collection and management

The monitoring data should be collected and recorded at a pre-fixed frequency by technical staff. The records should be submitted to the CDM manager monthly, and the technical staff keep a set of copy ones. All these records shall be verified by the CDM manager and kept up to 2 years after the end of the crediting period.

Calibration

In order to ensure the reliability of the data measured, the monitoring instruments should be calibrated as per state and/or sector standards and rules, as specified in each box describing the parameter measurement at B 7.1 ; yearly the calibration oparations will be accomplished together equipment's supplier,during the programmed visit on site of its personnel

Emergency cases
In case of failure at the degassing installation, in order to minimise the consequences as much as possible the following will be performed:

- No electrical power
If no electrical power is available, the blower of the degassing installation cannot operate, therefore no LFG stream is available and flow-meter cannot detect anything. In such situations no emission reductions are accounted for.

- Failure of metering equipment:
In case of failure of any of installed metering equipment, the procedure to be followed is :

- n. 1 flowmeter,n.1 pressure transmitter,n. 1flare thermocouple, n. 1 energy meter will always be available at plant's warehouse

- in case of failure of one of two CH4 analyzers or of residual O2 analyzer the suppier will be able to send o new one to the pant by flight from malpensa within 24 hours from therequest coming from plant's staff

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

06/12/2011

AMEST S.r.l.
Lorenzo Raimondi
"LFG Recovery and Electricity Production at the Bubanj Landfill Site, Nis, Serbia" Project Manager
Mobile: +39339 313 5522

The above mentiond responsible person/entity does not have to be considered as 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:

01/10/2013 – The Equipment Purchase Agreement is signed

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

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:

01/01/2014 - Expected to be the date Final Commissioning of the LFG Recovery and Electricity Production Plant

C.2.2.2. Length:

10 years fixed period

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

According to Serbian regulations, an Environmental Impact Assessment[10] is not required[11] for the development of this CDM project. The installation and the operation of this CDM project are not expected to result in any significant negative environmental impacts.
Anyway the main related issues would be shortly addressed.

Emissions from the flare include the carbon dioxide that is considered to be a natural product of the carbon cycle. In the combustion of landfill gas, carbon dioxide is additionally produced, but this is also considered to be part of the natural carbon cycle and not of anthropogenic origin. There will be minimal visual impact from the flare, and noise and vibration from the blower and flare will be limited to the localized site, which has no near settlements around. There is a positive environmental impact on the environment due to the project activity. Landfill gas emissions are decreased, reducing greenhouse gas emissions and impacts to localized air pollution. Bad odors will be diminished. Operationally, proper management of the landfill gas will reduce the potential for landfill fires and the associated release of incomplete combustion products. Further, the driving force for subsurface migration of landfill gas and landfill gas components is minimized.

The social impact of the project is expected to be positive, as implementing new technologies will have environmental benefits, while triggering climate change awareness in the community. In addition, the implementation of the proposed project activity and the commitment with the CDM will allow not only improvements in the landfill operation in the short term but also to establish sustainable MSW management practices in the long run. The proposed project will also deliver local community benefits, as it will create a new source of jobs during the construction, operation and maintenance of the LFG recovery plant. Similarly, it will also contribute to attract new players who could bring the capacity to implement a new technology. The city of Nis is head of a region of great importance for the economy of Serbia. The project is critical in the sense that the region faces numerous environmental problems and lack of adequate solid waste is still commonplace. At last, the project has an important replication potential, which will trigger environmental awareness (specifically in terms of climate change and renewable energy sources) and improved waste management techniques.

The project participants will offer to the local educational institutions full and unrestricted access to the information and to the site for the development of teaching, training and research activities.

Besides generating clean electricity, which can make good use of the local biogas resource and reduce the GHG emission, the project is beneficial to improve the local air environment, as may be argued from following considerations:

Construction phase

Air pollution

[10] Law on Enviromental Impact Assessment – downloadable at the address: http://www.ekoplan.gov.rs/en/2-Law-on-Strategic-Environmental-Impact-233-document.htm

[11] Regulation on the determination of the list of projects that are subject to an environmental impact assessment – downloadable at the address: http://www.ekoplan.gov.rs/en/Regulation-on-the-determination-of-the-list-of-projects-that-are-subject-to-an-environmental-impact-assessment--966-c69-content.html

Construction site activities such as digging, filling, and gravel hauling will mainly cause the disturbance and creation of dust and particles in the air. In order to prevent such dust pollution, watering and spraying at the construction site will be performed regularly. Water will be regularly sprayed onto onsite dirt piles when there is a delay in their clearing and removal.
Also, water will be used when loading dirt into trucks, and covering materials will be used to prevent dirt from falling from them. In addition, vehicles carrying dirt and rubble will be fully closed to prevent its escape during the transportation period.
During the operation phase, the main purpose of the project is to reduce the level of the greenhouse gas methane that is released from the landfill surface directly to the atmosphere

Wastewater
Domestic wastewater will be treated in a wastewater treatment plant to meet national discharge standards. Water condensate from the gas collection system will be sent directly back to the existing landfill leachate storage pond, or directly returned to the landfill body.

Noise
The operation of machinery will produce noise. Noise will mainly come from blower and transformer units. By barring the sound with special soundproof boots and through distance, this noise will have a minimum impact on the environment; the genset also will be installed in a close and soundproof container.

Solid Waste
During the operation period, rubbish will be generated by facility workers and will be disposed of at the landfill.
During the construction and operation periods of the project, all requirements will be strictly carried out in accordance with the local existing regulations, and effective measures will be taken to control and reduce environmental pollution.

In summary, the Project will not have significant impacts on the environment.

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:

There are no significant negative environmental impacts due to the small-scale project activity. All the impacts of the project activity listed above will contribute to improve both local and global environment. There are no transboundary environmental impacts.

SECTION E. Stakeholders' comments

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

The project participants with the support of the Municipality of Nis has invited a large number of local and national stakeholder to participate at the Stakeholder Consultation which took place at the Nis City Hall on Monday January 16th, 2012.

Moreover, the project owner on Saturday, January 14th published an invitation notice on the local newspaper "Narodne Novine".

The response of the invitation has been great for the number and for the level of the stakeholder that participated. The participants to the stakeholder consultation are listed in table E1 below:

Table E1 – list of the participants

	Name	Entity	e-mail address
1	Ivana Stankovic	NGO "Grupa Kobra"	ivana_stankovic_arh@yahoo.com
2	Zorica Stefanovic	Centar za razvoj gradjanskog dru_tva 'protecta' - Center for Development of Civil Society	zorica@protecta.org.rs
3	Marko Mančić	Regionalni Centar za Energetsku Efikasnost - Regional Center for Energy Efficiency	markomancic@yahoo.com
4	Milka Silajev	BM technology canada	milkasil2007@gmail.com
5	Srdjan Glišić	Fakultet zaštite na radu Univerzitet u Nišu - Faculty for Protection at Work, University of Nis	srdjan.glisovic@znrfak.ni.ac.rs
6	Boričić P Predrag	ESAB international AG	predrag.boricic@esab.hu
7	Radoslav Milojević	Grad b Niš uprava za privredu, održivi razvoj i zaštitu životne sredine - Department for Economy, Sustainable Development and Environmental Protection	mradoslav@gu.ni.rs
8	Gordana stefanović	Mašinski Fakultet - Faculty of Mechanical Engineering, University of Nis	goca@masfak.ni.ac.rs
9	Slavoljub Stamenković	Assistant at the Municipality of Palilula	slavoljub.savic@palilula.eu
10	Goran Vučković	Coordinator of Niš Energy Efficiency Department	goran.vuckovic@gmail.com
11	Dragan Radivojević	Zavod za Urbanizam Niš - Urban Development Department Nis	dragan.radivojević@zurbnis.rs
12	Predrag Cvetković	Advisor of the mayor of Niš,	pepicvetković@gmail.com
13	Ivana Stefanović	City of Niš, KLER (office for local development)	ivana.stefanovic@gu.ni.rs
14	Slavoljub Djokić	Eco Intech Niš	slavoljub@ecointech.rs
15	Bojan Gajić	Uprava za komunalne delatnosti energetiku i saobraćaj Niš - Department for Communal Services, Energy and Traffic of the city of Niš),	gbojan@gu.ni.rs
16	Ivana Milošević	uprava za komunalne delatnosti energetiku i saobraćaj – Energy and Trasportation Administration Utility	milivana@gu.ni.rs
17	Silvana Petrović	ekopolis medijska mreža	slv.moreno@gmail.com

18	Branko Savić	ekopolis medijska mreža	savic-branko@hotmail.com
19	Tomislav Jovančić	Advisor for Agriculture	ano.jovancic@hotmail.com
20	Boban Janković	Klaster 'reciklaža Jug'	boban.jankovic@klaster-reciklazajug.com
21	Zoran Stanojević	Danipet doo	zoran@danipet.com
22	Marija Micaković	Jugo-impex ttr doo,	marija@erecikllaza.com
23	Jelena stanković	Ekološki fakultet, univerzitet Niš – Faculty of Environmental Enrgineering, University of Nis	jelena.stankovic@ekufak.ni.ac.rs
24	Dragana Vukadinović	Inkubator Centar Niš	dragana.vukadinović@bicnis.org.rs
25	Bogdan Cirić	Udruženje gradjana Plant – Civil Society Association	bogdan.ciric23@gmail.com
26	Dragana Stojković	Uprava za imovinu - Department for property	zljasmina@gu.ni.rs
27	Danijela Bozanic	Serbian Designated National Authority – Ministry of the Enviroment, Mining and Spatial Planning	danijela.bozanic@ekoplan.gov.rs

The main topics of the stakeholder consulting meeting were as listed below:

- Presentation of the Stakeholder Consultation meeting by the Municipality of Nis, Mr. Predrag Cvetković assistant and advisor of the mayor in the fields of International Economic Relations
- Presentation of the Kyoto Protocol and its Flexible Mechanisms by Mr. Lorenzo Raimondi - Project Manager of the "LFG Recovery and Electricity Production at the Bubanj Landfill Site, Nis, Serbia" project and AMEST consultant
- Presentation of the project by Mr. Alessandro Francese, Project Designer of the LFG Recovery and Electricity Production at the Bubanj Landfill Site, Nis, Serbia" project:
  1. Project overview
  2. Technical aspects
  3. Social, Economic and Enviromental impacts of the project
- Questions and Answers session

At the end of the presentations, the Project Participants distributed to all the participants a questionnaire along with a brief description of the project. The questions and the analysis of the questionnaire are listed in section E2.

E.2. Summary of the comments received:

Unfortunately, despite the fact that the questionnaire has been distributed to all participants, not everybody has provided it back filled to the project owner. The response ratio is 60%.

The summary of the questions and the analysis of the questionnaire are listed in table E2 below:

Table E2 – summary of the comments received

	Questions	Comments					
1	**How do you think the project would affect you?**	**Positively**	**10**	**Neutral**	**6**	**Negatively**	**0**
2	What do you think are the main economic impacts of the project?						
2.1	Employment	Positive	10	Neutral	6	Negative	0
2.2	Local Tax Revenues	Positive	10	Neutral	6	Negative	0
2.3	Economic Development	Positive	11	Neutral	5	Negative	0
2.4	Other impacts ……. (Enviromental Protection)	Positive	11	Neutral	3	Negative	0
3	What do you think are the main social impacts of the project?						
3.1	Poverty Reduction	Positive	7	Neutral	9	Negative	0
3.2	Quality of Life	Positive	13	Neutral	3	Negative	0
3.3	Access to Land	Positive	6	Neutral	9	Negative	1
3.4	Other impacts ……. (Development of local system of waste management)	Positive	9	Neutral	2	Negative	0
3.5	**How do you rate the social impacts of the project?**	**Positively**	**14**	**Neutral**	**2**	**Negatively**	**0**
4	What do you think are the main environmental impacts of the project?						
4.1	Noise	Positive	7	Neutral	7	Negative	2
4.2	Air quality	Positive	13	Neutral	0	Negative	3
4.3	Water Quality	Positive	10	Neutral	4	Negative	2
4.4	Other impacts …….	Positive	9	Neutral	2	Negative	0
4.5	**How do you rate the environmental impacts of the project?**	**Positively**	**13**	**Neutral**	**2**	**Negatively**	**1**
5	**Overall, how do you judge the impact of the project on the community?**	**Positively**	**13**	**Neutral**	**3**	**Negatively**	**0**

The response tab above shows that the majority of the Stakeholders that attended the meeting support the project.

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

The opinions collected from the stakeholders will be seriously considered by the project participant, as reported also in section D1.

The questions from the stakeholders have been answered as below:

As concerns the issues raised in the questionnaires:

- As to the noise issue, sound insulation and shock absorption measures will be introduced to reduce noise and vibration for the proposed project;
- As to water quality, a collection and treatment plant is already been developed in the "Remediation, Closure and Reclamation of the "Bubanj" Landfill in Nis", so the Municipality of Nis and the company MEDIANA are fully responsible to develop what has been reported and authorized.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	AMEST S.r.l.
Street/P.O.Box:	Via Arino, 2
Building:	
City:	Dolo (VENEZIA)
State/Region:	
Postfix/ZIP:	30031
Country:	Italy
Telephone:	+39 041 513 9811
FAX:	+39 041 513 9853
E-Mail:	amest@amest.biz
URL:	
Represented by:	
Title:	Dr.
Salutation:	
Last Name:	Scoccimarro
Middle Name:	
First Name:	Felice
Department:	
Mobile:	+39 3489897962
Direct FAX:	
Direct tel:	
Personal E-Mail:	f.scoccimarro@amest.pl

Organization:	AMEST doo
Street/P.O.Box:	Karadziceva 4
Building:	
City:	Nis
State/Region:	
Postfix/ZIP:	18000
Country:	Republic of Serbia
Telephone:	+381 (11) 3348 446, 3348 447, 3348 448
FAX:	+381 11 3348 453
E-Mail:	office@icpartnersbelgrade.com
URL:	
Represented by:	
Title:	Dr.
Salutation:	
Last Name:	Zorzenon
Middle Name:	
First Name:	Kristina
Department:	
Mobile:	+381113348448

Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There will be no public funding, under any form, for the proposed CDM project.
It will be financed exclusively by private capital that is being raised from investments funds and/or banks, either locally or in the European Union.

Annex 3

BASELINE INFORMATION

- *Waste Management Law (12/01/2010, 282.8 KB) Law on Waste Management (Official Gazette of RS, No. 36/09) RS, Nos. 36/09 and 88/10)*
- *Regulation on disposal of waste on landfills (12/14/2010, 178.3 KB) Regulation on disposal of waste on landfills (Official Gazette of RS, No. 92/10)*
- *Law on Environmental Impact Assessment (07/22/2011, 70.9 KB) Law on Environmental Impact Assessment (Official Gazette of RS, Nos. 98/2002 and 36/09)*
- *Law on Strategic Environmental Impact (12/01/2010, 92.3 KB) Law on Strategic Environmental Assessment (Official Gazette of RS, No. 98/2008 and 88/10)*
- *Impact Assessment Act on Environment (10/27/2008, 70.7 KB) Law on Environmental Impact Assessment (Official Gazette of RS, Nos. 98/2002 and 36/09)*
- *http://www.hidmet.gov.rs/eng/meteorologija/klimatologija_srbije.php*
- *http://www.world-climates.com/city-climate-kragujevac-serbia-europe/*
- *http://www.hidmet.gov.rs/eng/meteorologija/pros_pet.php*
- *http://re.jrc.ec.europa.eu/pvgis/apps3/pvest.php#*
- *Law on Enviromental Impact Assessment – downloadable at the address: http://www.ekoplan.gov.rs/en/2-Law-on-Strategic-Environmental-Impact-233-document.htm*
- *Regulation on the determination of the list of projects that are subject to an environmental impact assessment – downloadable at the address: http://www.ekoplan.gov.rs/en/Regulation-on-the-determination-of-the-list-of-projects-that-are-subject-to-an-environmental-impact-assessment--966-c69-content.html*

WASTE AMOUNT

Waste amount: declaration by the Municipal Company MEDIANA, who is in charge for the disposal activities on the landfill site.

YEAR	TONS
1991	36,000
1992	36,000
1993	36,500
1994	36,500
1995	37,000
1996	37,000
1997	38,000
1998	39,691
1999	36,266
2000	40,296
2001	43,026
2002	46,188
2003	45,202
2004	53,905
2005	58,024
2006	63,777
2007	68,720
2008	76,044

2009	77,543
2010	71.,764
2011	69,011
2012	0
2013	0
2014	0
2015	0
2016	0
2017	0
2018	0
2019	0
2020	0
2021	0
2022	0
TOTAL	**1,046,457**

COMPOSITION

Composition: Study performed by the Univeristy of Nis (2009) Faculty of Mechanical Engineering "*Comparative Analysis of the Waste Management Possibility in the Territories of Serbia and Croatia*":

CATEGORY	Average percentage (%)
Food Waste	44.10 %
Wood	0.61%
Paper	15.30 %
Textile	8.26 %
Plastic	17.70 %
Metal	1.90 %
Glass	5.10 %
Brick and Ceramics	n.r.
Other inorganic matter	7.03 %
TOTAL	**100%**

GRID EMISSION FACTOR

The following data have been provided by the Serbian Ministry of the Natural Resources, Mining and Spatial Planning and are related to the Power Plants list used by the Serbian Ministry of the Natural Resources, Mining and Spatial Planning to calculate the Grid Emission Factor.

POWER PLANTS	POWER (MW)	COMMISSIONING YEAR	PLANT IN OPERATION YES / NO	FUEL	NET CALORIFIC VALUE (MWh/t or GJ/t)	ELECTRICITY PRODUCTION (GWh/y)			FUEL CONSUMPTION (t/y)		
						Year 2008	Year 2009	Year 2010	Year 2008	Year 2009	Year 2010
HPP DJERDAP I – A1	1.058	1970-1972	YES			870.0	928.8	1,319.0			
HPP DJERDAP I – A2						899.1	985.0	1,325.5			
HPP DJERDAP I – A3						917.2	1,052.4	1,232.4			
HPP DJERDAP I – A4						969.8	1,053.0	1,269.6			
HPP DJERDAP I – A5						846.5	1,059.2	1,250.5			
HPP DJERDAP I – A6						895.2	681.8	0.0			
HPP DJERDAP I – TOTAL						**5,397.4**	**5,760.2**	**6,395.2**			
HPP DJERDAP II –A1	270	1985-87,98,2001	YES			177.7	134.4	166.0			
HPP DJERDAP II –A2						165.5	113.1	161.4			
HPP DJERDAP II –A3						173.8	182.1	116.1			
HPP DJERDAP II –A4						171.8	171.2	116.7			
HPP DJERDAP II –A5						178.4	173.1	167.0			
HPP DJERDAP II –A6						11.9	172.5	164.1			
HPP DJERDAP II-A7						94.7	36.0	163.8			
HPP DJERDAP II –A8						171.5	136.3	167.1			
HPP DJERDAP II –A9						186.1	181.7	167.4			
HPP DJERDAP II-A10						178.6	189.3	166.6			
HPP DJERDAP II– TOTAL						**1,510.,0**	**1,489.5**	**1,556.2**			
HPP PIROT - A1	80	1990	YES			55.9	47.0	109.4			
HPP PIROT - A2						55,1	44.2	102.4			
HPP PIROT - TOTAL						**111.0**	**91.2**	**211.8**			
HPP VLASINA VRLA 1 - (A1-A4)	129	1955	YES			54.9	111.0	153.8			
HPP VLASINA VRLA 2 - (A1-A2)		1954				30.0	60.3	84.9			
HPP VLASINA VRLA 3 - (A1-A2)		1975				45.0	84.6	116.1			
HPP VLASINA VRLA 4 - (A1-A2)		1958				38.5	74.7	103.0			
HPP VLASINA - **TOTAL**						**168.5**	**330.5**	**4623**			
HPP DJERDAP KLADOVO - TOTAL	**1.537**		**YES**			**7,186.9**	**7,671.4**	**8,625.5**			
HPP BAJINA BASTA A1	364	1966-1968	YES			222.7	224.3	159.2			
HPP BAJINA BASTA A2						463.7	543.1	460.6			
HPP BAJINA BASTA A3						316.8	432.0	537.5			
HPP BAJINA BASTA A4						289.3	442.1	519.7			
HPP BAJINA BASTA - TOTAL						**1,292.6**	**1,641.5**	**1,677.1**			
PUMPED-STORAGE PP BAJINA BASTA A1	614	1982	YES			270.0	298.9	329.8			
PUMPED-STORAGE PP BAJINA BASTA A2						273.8	303.8	349.8			
PUMPED-STORAGE PP BAJINA BASTA TOTAL						**543.8**	**602.7**	**679.7**			
HPP ZVORNIK – A1	96	1955-1958	YES			106.7	123.6	137.5			
HPP ZVORNIK – A2						114.6	129.2	147.2			
HPP ZVORNIK – A3						89.1	126.3	145.8			
HPP ZVORNIK – A4						94.9	130.7	144.4			
HPP ZVORNIK – –TOTAL						**405.3**	**509.8**	**574,8**			
HPP ELEKTROMORAVA MEDJUVRSJE A1	13	1954-1957	YES			10.3	8.0	10.8			
HPP ELEKTROMORAVA MEDJUVRSJE A2		1954-1958				18.5	15.9	24.2			
HPP ELEKTROMORAVA OVCAR BANJAA1		1954-1959				5.6	7.0	12.8			
HPP ELEKTROMORAVA OVCAR BANJA A2		1954-1960				13.2	18.2	23.7			
HPP ELEKTROMORAVA - TOTAL						**47.6**	**49.0**	**71.5**			
HPP LIMSKE POTPEC - A1	51	1967-1970	YES			47.5	61.3	79.8			
HPP LIMSKE POTPEC – A2						44.9	67.4	86.4			
HPP LIMSKE POTPEC – A3						56.6	70.1	81.8			
HPP LIMSKE POTPEC - TOTAL						**149.1**	**198.8**	**248.1**			
HPP LIMSKE BISTRICA – A1	102	1960	YES			151.6	147.8	212.3			
HPP LIMSKE BISTRICA – A2						140,4	119,4	202,1			
HPP LIMSKE BISTRICA – TOTAL						**292.1**	**267.2**	**414.4**			
HPP LIMSKE KOKIN BROD – A1	22	1962-1967	YES			22.8	22.6	36.2			
HPP LIMSKE KOKIN BROD – A1						25.7	23.1	38.7			
HPP LIMSKE KOKIN BROD – TOTAL						**48.5**	**45.7**	**74.9**			
HPP LIMSKE UVAC - A1	36	1979	YES			45.5	58.8	68.3			
HPP DRINSKO – LIMSKE - TOTAL	**1.298**					**2,824.4**	**3,373.5**	**3,808.7**			
HPP EPS	**2.835**					**10,011.3**	**11,045.0**	**12,434.2**			
IMPORTED POWER											

POWER PLANTS	POWER (MW); *(MW_t) [1](t/h)	COMMISSIONING YEAR	PLANT IN OPERATION YES / NO	FUEL	NET CALORIFIC VALUE (MWh/t) or (GJ/t)			ELECTRICITY PRODUCTION (GWh/y) (**GWh_t/y)			FUEL CONSUMPTION (t/y); (m^3/y)		
					2008	2009	2010	Year 2008	Year 2009	Year 2010	Year 2008	Year 2009	Year 2010
TPP NIKOLA TESLA A 1	210	1970	YES	Coal	8.034	7.922	7.445	1,291.1	1,118.4	1,168.9	1,872,116	1,636,095	1,777,848
TPP NIKOLA TESLA A 2	210	1970	YES		8.034	7.922	7.445	1,175.3	1,262.9	1,058.9	1,703,228	1,846,153	1,609,747
TPP NIKOLA TESLA A 3	305	1976	YES		8.034	7.922	7.445	1,965.0	1,825.9	1,646.3	2,844,115	2,660,987	2,502,703
TPP NIKOLA TESLA A 4	308.5	1978	YES		8.034	7.922	7.445	2,222.1	2,051.1	1,938.9	3,214,820	2,992,013	2,944,782
TPP NIKOLA TESLA A 5	308.5	1979	YES		8.034	7.922	7.445	2,023.3	1,945.3	1,906.9	2,928,026	2,839,536	2,897,997
TPP NIKOLA TESLA A 6	308.5	1979	YES		8.034	7.922	7.445	1,003.6	1,972.1	860.9	1,456,257	2,879,571	1,320,590
TOTAL	**1,650.5**							**9,680.4**	**10,175.7**	**8,580.8**	**14,018,562**	**14,854,355**	**13,053,667**
TPP NIKOLA TESLA A 1				Heavy fuel oil	39.000	39.000	39.000				3,814	3,676	3,687
TPP NIKOLA TESLA A 2					39.000	39.000	39.000				2,094	2,469	3,120
TPP NIKOLA TESLA A 3					39.000	39.000	39.000				3,659	2,848	3,290
TPP NIKOLA TESLA A 4					39.000	39.000	39.000				8,953	5,924	5,434
TPP NIKOLA TESLA A 5					39.000	39.000	39.000				5,065	5,698	5,780
TPP NIKOLA TESLA A 6					39.000	39.000	39.000				4,257	3,039	6,453
TOTAL											**27,842**	**23,654**	**27,764**
TPP NIKOLA TESLA B 1	620	1983	YES	Coal	7.801	7.768	7.429	4,509.5	4,116.3	3,641.1	6,262,556	5,858,825	5,281,353
TPP NIKOLA TESLA B 2	620	1985	YES		7.801	7.768	7.429	3,867.7	3,323.1	4,472.2	5,373,146	4,728,422	6,480,212
TOTAL	**1,240**							**8,377.1**	**7,439.3**	**8,113.3**	**11,635,702**	**10,587,247**	**11,761,565**
TPP NIKOLA TESLA B 1				Heavy fuel oil	39.000	39.000	39.000				4,106	4,798	7,058
TPP NIKOLA TESLA B 2					39.000	39.000	39.000				5,330	4,847	9,471
TOTAL											**9,436**	**9,645**	**16,529**
TPP KOLUBARA A 1	35	1956	YES	Coal	7.719	6.689	6.694	179.9	182.3	183.4	1,006,763	1,334,997	397,760
TPP KOLUBARA A 2	35	1957	YES		7.719	6.689	6.646	144.4	56.2	128.3			305,280
TPP KOLUBARA A 3	35	1961	YES		7.719	6.689	6.684	0.0	213.4	159.1			198,790
TPP KOLUBARA A 4	55	1961	YES		7.719	6.689	6.710	148.6	107.0	0.0			232,530
TPP KOLUBARA A 5	110	1979	YES		7.505	6.689	6.618	618.2	270.0	610.0	1,100,769	529,667	1,162,450
TOTAL	**270**							**1,091.0**	**829.0**	**1,080.9**	**2,107,532**		**2,296,810**
TPP KOLUBARA A 1				oil	42.226	42.267	42.2058				1,449	1,855	992
TPP KOLUBARA A 2					42.226	42.267	42.2058						598
TPP KOLUBARA A 3					42.226	42.267	42.2058						631
TPP KOLUBARA A 4					42.226	42.267	42.2058						731
TPP KOLUBARA A 5					42.226	42.222	42.2058				815	863	1,320
TOTAL											**2,364**		**4,272**
TPP MORAVA A 1	**110**	1969	YES	Coal	8.475	8.630	8.426	**635.8**	**539.1**	**578.3**	**802,822**	**697,941**	**778,865**
TPP MORAVA A 1				Heavy fuel oil	39.000	40.729	40.997				**1,514**	**1,387**	**1,831**
TPP MORAVA A 1				oil	42.226	42.474	40.997				**154**	**269**	**248**
TPP KOSTOLAC A 1		1967	YES	Coal	8187	8.202	8.085	551.7	601.1	574.7	907,498	957,421	916,672
TPP KOSTOLAC A 2		1980	YES		8.150	8.198	8.088	1,313.4	1,309.5	1,313.2	1,970,068	1,869,872	1,949,629
TOTAL								**1,865.1**	**1,910.6**	**1,887.9**	**2,877,566**	**2,827,293**	**2,866,301**
TPP KOSTOLAC A 1	100			oil	42.000	42.000	42.000				1,150	912	707
TPP KOSTOLAC A 2	210				42.000	42.000	42.000				1,153	902	768
TOTAL	**310**										**2,303**	**1,814**	**1475**
TPP KOSTOLAC B 1	350	1987	YES	Coal	8.012	8.141	8.093	1,422.5	1,973.8	2,012.2	1,940,775	2,731,316	2,758,583
TPP KOSTOLAC B 2	330	1991	YES		8.323	8.140	8.083	1,589.1	2,013.1	908.6	2,099,983	2,790,128	1,269,260
TOTAL	**700**							**3,011.6**	**3,986.9**	**2,920.9**	**4,040,758**	**5,521,444**	**4,027,843**
TPP KOSTOLAC B 1				Heavy fuel oil	41.001	41.001	41.001				3,498	1,931	2,790
TPP KOSTOLAC B 2					41.001	41.001	41.001				3,254	3,055	925
TOTAL											**6,752**	**4,986**	**3,715**

Annex 4

MONITORING INFORMATION

- DWG LFG/MAS 05, IN" PROJECT COMPONENTS DRAWINGS " ; drawing showing location of monitoring equipment
- MAPRO temperature: statement of 4th july 2012, about biogas temperature at blower's exit from blower supplier
- SEA sampling temperature: statement of 3th july 2012 about biogas sample temperature before entering the analysis section from analysis section supplier
- PI -05-Model: P&I of sampling and analysis section, supplied by Sea and quoted in previous document

M A P R O I N T E R N A T I O N A L S . p . A .

20834 Nova Milanese - MB - Italia - via Enrico Fermi, 3
Tel: +39 0362 366356 – Fax: +39 0362 450342
e-mail: mapro@maproint.com web: www.maproint.com

To	**Ing. Francese**	From	**M. Contato**
Company	**AMEST S.r.l. (VE)**	Phone	
Object	**Offer n° 12/1511/M**	Data	**4 July 2012**
Ref.		Page	**1**

Subject: outlet temperature

Dear sir,
regarding our offer in object, we confirm that the exit temperature of biogas outlet of the blower will be 53°C.

Best regards

MAPRO INTERNATIONAL S.p.A.
M. Contato

strumentazione
elettricità
automazione

S.E.A. di Mora Pierangelo & C. s.n.c.
28021 BORGOMANERO (NO) - Via L. da Vinci. 26
Tel. 0322-80.41.81 - Fax 0322-80.39.35
Cod.Fisc./Part. IVA 00534610035

SPETT.
AMEST S.r.l.
Venezia
Italy
To the kind attention of Mr.
Alessandro Francese

Subject: biogas components analyzer; sample conditioning system.

Following your request we confirm that, as per attached Dwg "P&I Armadio analisi", the biogas sample entering the analysis section is first refrigerated in FR-1, at a temperature of max 1°C; following the dry sample crosses a filtering unit (F-1) and finally enters the analyzer cells.
The condensate is sent outdoor the analysis cabinet through a Peristalthic pump PP-1.

Faithfully

SEA s.n.c.