MONITORING REPORT

First Verification

NOVAGERAR LANDFILL GAS TO ENERGY PROJECT

REGISTRATION NUMBER: 0008

CREDITING PERIOD: 01st July 2004 to 30th June 2011
MONITORING PERIOD: 01st July 2004 to 31st December 2007

YEAR OF REFERENCE: 2007

VERSION: 01

DATE: 12 /02/2008

1. GENERAL PROJECT ACTIVITY AND MONITORING INFORMATION

1.1. Title and Registration number of the Project Activity

Novagerar Landfill Gas to Energy Project, registration number: 008

1.2. Introduction

NOVAGERAR is the environmental and energy branch of the SA PAULISTA Group, a Brazilian civil engineering and construction group based in the city of São Paulo, Brazil. S.A. Paulista´s core business is in traditional heavy construction sectors such as highways, railways, airports, ports, industries and sanitation.

In 2001, S.A. Paulista was granted a 20-year concession (PPP model) by the Nova Iguaçu Municipal Council through it's Municipal Waste Management Company (EMLURB) a government agency responsible for waste collection and disposal. The object of this concession is to Build and Operate a Waste Treatment and Disposal Plant (including a sanitary landfill – called Adrianópolis) and to close, rehabilitate and recover the existing dump site called Marambaia in Nova Iguaçu city, state of Rio de Janeiro, and to explore the landfill gas potential of these sites. The Marambaia dump site opened in 1986 and ceased operation in feb/2003 with approximately 700 thousand tons of waste deposited. The New Waste Plant (Adrianópolis) started operation in feb/2003 and receives approximately 2.000 tons of waste per day.

NOVAGERAR has implemented a landfill gas collection system, to destroy the methane gas and to generate electricity in the Waste Treatment and Disposal Plant ("Central de Tratamento de Resíduos – Nova Iguaçu - CTR Nova Iguaçu), in accordance with the Project Design Document of February 2004, and in accordance with the monitoring plan of February 2004 validated in September 2004 for validation report of DNV NB 2003-0221 – version 03 approved for the Brazilian government in June/2004.

1.3. Short Description of the Real Project Implementation

The Waste Treatment and Disposal Plant - CTR Nova Iguaçu has a Landfill divided into 4 cells for waste disposal, named Sub-Landfill 1, Sub-Landfill 2, Sub-Landfill 3, and Sub-Landfill 4. At the present moment, the waste disposal is being done in only 2 cells (Sub-Aterro 1 and Sub-Aterro 3) and the gas extraction system is operating in Sub-Aterro 1.

The Adrianópolis and Marambaia sites are adjacent to each other located beside a densely populated section of the municipality of Nova Iguaçu, Rio de Janeiro, with more than 800.000 inhabitants. Because of their location near the city of Rio de Janeiro, many manufacturing companies are either relocating existing facilities or establishing new plants in Nova Iguaçu. The municipality

today hosts more than 600 industries and 2.400 commercial establishments. The site is located approximately 10Km from the center of Nova Iguaçu city. Electrical power transmission lines are located less then 1Km from the site.

FIGURE 1 – The CTR Nova Iguaçu Landfill

The project, in the first step, is to capture and treat (burn in high temperatures), the methane produced by the solid waste anaerobic decomposition in sanitary landfill. Later, the gas will be used to power the electricity engines in the power plant. An equipment was installed to capture and burn the methane gas with capacity for 3000 m³/h, allowing for an expansion of up to 9000m³/h. This equipment consists of an enclosed flare with controlled burning.

FIGURE 2 – The Flare and Blower System

This system captures the landfill gas by way of suction in the piping network into the perforated horizontal and vertical well and the Ranzine drains, draining through well-heads, which prevents air flow into the grid and allows for measurements in each well. The gas is analyzed to ascertain its composition, temperature and pressure every 2 minutes. The burning efficiency is automatically adjusted by the system by controlling the air inlet in the burner and registering the temperatures of burn. All data is sent every 4 minutes to the management program which refreshes automatically in the program's website.

All condensation generated inside the grid is collected and sent to the leachate treatment area.

1.4. Crediting Period

The crediting period is from 01st July 2004 to 30th June 2011.

1.5. Monitoring Period

The monitoring period is from 01st July 2004 to 31st December 2007.
In the period from 1st July 2004 to 14th March 2007 did not have monitoring of the GHG Emissions Reductions.

1.6. Methodology applied to the project activity:

1.6.1. Baseline methodology:

The baseline applied to this project activity is AM003: "Simplified Financial Analysis for Landfill Gas Capture Projects" version 01.

1.6.2. Monitoring methodology:

The monitoring methodology applied to this project activity is AM003: "Simplified Financial Analysis for Landfill Gas Capture Projects" version 01.

1.7. Person(s) responsible for the preparation and submission of the monitoring report:

Eduardo Gaiotto
NOVAGERAR ECOENERGIA LTDA
Est. de Adrianópolis , 5213
Nova Iguaçu – RJ
Brazil
Phone / Fax: +55 (21) 2666-6100
http://www.novagerar.com.br/
eduardo.gaiotto@novagerar.com.br

Adriana Felipetto
NOVAGERAR ECOENERGIA LTDA
Rua da Assembléia 10, sl: 1501
Rio de Janeiro – RJ
Brazil
Phone / Fax: +55 (21) 2212-5150
http://www.novagerar.com.br/
adriana.felipetto@novagerar.com.br

2. MONITORING PLAN AND ACTIVITIES

Two landfills sites are part of the projects activity, the project has been in operation since 15th March 2007 for CTR Nova Iguaçu and 17th May 2007 for Marambaia.

2.1. Monitoring Equipments.

The following equipment are used to monitor the operation of the project and to monitor the Emission Reduction

2.1.1. Flow Meter

The flow meter is used to measure the gas flow channeled to the flare. The manufacturer of this flow meter is Thermal Instrument Company, the periodic calibration is every 18 months, in this period (March/2007 at December/2007 for Adrianópolis and May/2007 at December/2007) of the first verification is not necessary the periodic calibration.

2.1.2. Gas Analyzer

The gas analyzer is used to measure the gas composition. The manufacturer of this gas analyzer is CES Landtec Inc, the periodic calibration is every 6 months..

2.1.3. Flare

The manufacture of the flare system is the Jonh Zinc Company, the flare system is monitored to each 6 months for indicate the efficient of the destroy methane.

2.2. Involvement of Third Parties

The Novagerar Landfill Gas to Energy Project has two sub contracted parties involved

ERM Brasil Ltda.

Specialized in gas analysis: As the analysis of methane concentration in the exhaust gas is made periodically, Novagerar hired ERM, a national and certified

laboratory to develop the analysis. The collection was made on 29th and 30th August 2007 .

CES LANDTEC

LANDTEC is a leading provider of monitoring systems for renewable energy and Green House Gas (GHG) reduction validation. All readings and files of the Novagerar project is being monitored by LANDTEC System Software.

2.3. Data Collection

List of fixed default values:

- Global Warming Potential of CH4 (GWPCH4) = 21 ($tCO_2e/tCH4$);
- Density of Methane = 0,00067899 ($tCH_4/m_3\ CH_4$);
- Carbon Emission Factor of LPG(EF_{LPG}) = 17.20 (tC/TJ);
- Fraction of carbon oxidized of LPG = 0.995 ;
- Conversion factor of C to CO_2 = 44/12 = 3,67 (CO_2/C);
- Conversion factor of energy = 1.055×10^{-9} (TJ / BTU);

List of variables:

- Q_{biogas}, flares = amount of biogas sent to flare (Nm3);
- % CH_4 = percentage of methane in the biogas (% volume);
- FE = Flare Efficiency % (calculated using data from methane sent to flares and methane content in the exhaust gas, monitored by temperature);
- Emission Factor of the S-SE-CO Brazilian Grid (EF) - (tCO_2e/MWh);
- Electrical energy used (kW);
- LPG consumption (number of ignitions)
- Effectiveness Adjustment Factor (EAF) = 0.2 (restricted for Marambaia);

Data concerning GHG emissions of the project activity:

The Novagerar Landfill Gas Energy Project does consume electrical energy from the grid and use fossil fuel (LPG – Liquefied Petroleum Gas) for the ignition of the flare system. These emissions are being monitored

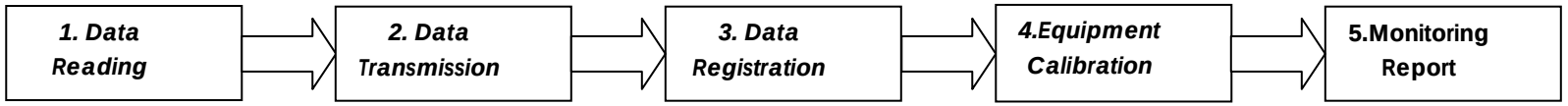
3. QUALITY ASSURANCE AND QUALITY CONTROL MEASURES

3.1. Documented procedures and management plan:

3.1.1. Roles and responsibilities:

The following flow-chart represents the procedures and responsibilities on the monitoring of each parameter:

A) Methane Concentration:



Equipment:
Type of Equipment:
Methane Analyzer
Location: Field Analytical
Manufacturer: Landtec
*Model:*FAU
Range: 0-100%
Reading Frequency
Every 2 minutes
Responsibility
PLC (continuously) and AEMS _ Automatic Extraction Monitoring System (CES Landtec)

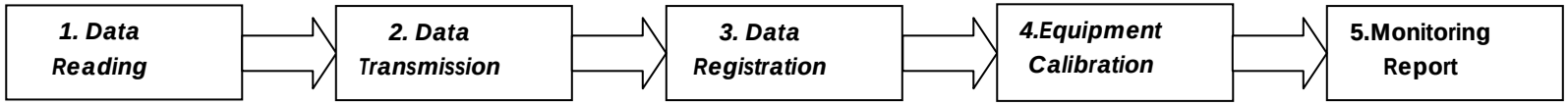
Equipment:
Type of Equipment
Supervisory System
Reading Frequency
Every 4 minutes
Responsibility
PLC (continuously) and AEMS _ Automatic Extraction Monitoring System (CES Landtec)

Equipment:
Type of Equipment
Supervisory System and Envirocomp (Landted software)
Reading Frequency
Every 2 minutes
Responsibility
Envirocomp (the Software of CES Landtec, and
Plant supervisor (monthly)

Calibration Frequency
Every hour for automatic field calibration and every 6 months, with a standard gas certified by INMETRO or Manufacturer

Every day the project engineer will check the calibration readings and the Novagerar procedures.

B) Flow to flare:



Equipment:
Type of Equipment:
Thermal Mass Flow Meter
Location: Entrance of flare
Manufacturer: Thermal Instrument Co.
*Model:*62-9/9500
Range: 0- 3000 Nm3/h
Reading Frequency
Every 2 minutes
Responsibility
PLC (continuously) and AEMS _ Automatic Extraction Monitoring System (CES Landtec)

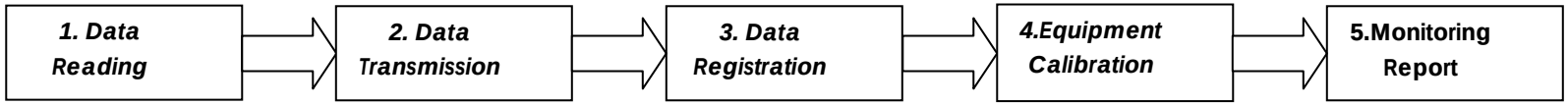
Equipment:
Type of Equipment
Supervisory System
Reading Frequency
Every 4 minutes
Responsibility
PLC (continuously) and AEMS _ Automatic Extraction Monitoring System (CES Landtec)

Equipment:
Type of Equipment
Supervisory System and Envirocomp (Landted software)
Reading Frequency
Every 2 minutes
Responsibility
Envirocomp (the Software of CES Landtec, and
Plant supervisor (monthly)

Calibration Frequency
Every 18 months, with a standard gas certified by INMETRO or Manufacturer

Every day the project engineer will check the readings and the Novagerar procedures.

C) Flare Efficiency:



Equipment:
Type of Equipment:
According whit Annex 13 – UNFCC - "Tool to determine project emissions from flaring gases containing methane"
Manufacturer:
Model
Range:
Reading Frequency
Every 6 months
Responsibility
Specialized company on gas analysis

Equipment:
Type of Equipment
Reports and MS Excel spreadsheet

Reading Frequency
NA

Responsibility
Project manager

Equipment:
Type of Equipment
Reports and MS Excel spreadsheet

Reading Frequency
NA

Responsibility
Project manager

Equipment:
NA
Calibration Frequency
NA

The project manager is responsible for checking and developing the Monitoring Report.

3.2. Trainings:

All training was performed prior to the project's implementation and certified at the initial verification.

3.3. Collect data:

The data collected in the monitoring process is summarized in table below as per the monitoring procedure AM0003 approved by the CDM executive board.

ID Number	Data Variable	Data Unit	Measured (M), calculated (C) or Estimated (E)	Recording Frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	For how long is archived data to be kept?	Comments
1	Flow of LFG to flare	M3	M	Continuous	100%	Electronic (spreadsheet)	2 years and duration of the project crediting period in files	Data will be aggregated monthly and yearly
2	Electricity Import od the Grid	KWh	M&C	Continuous	100%	Electronic (spreadsheet)	2 years and duration of the project crediting period in files	Data will be aggregated monthly and yearly
3	Flare efficiency	%	M&C	Semi-annual determination of flare efficiency (if significant variation, monthly)	Semi-annual determination of flare efficiency (if significant variation, monthly)	Electronic (spreadsheet)	2 years and duration of the project crediting period in files	Data will be used to test and, if necessary correct the generators standard heat rate plate ratings

4	Methane Fraction of LFG	%	M&C	Continuous	100%	Electronic (spreadsheet)	2 years and duration of the project crediting period in files	Data will be aggregated monthly and yearly
5	LPG for ignitions	tCO_2e	M&C	Continuous	100%	Electronic (spreadsheet)	2 years and duration of the project crediting period in files	Data will be aggregated monthly and yearly

Table 1 - Data to be monitoring

4. CALCULATION OF GHG EMISSION REDUCTIONS

4.1. Calculation Method of ERs

This method can be summarized in these following flowcharts:

Volume of landfill gas channeled to flares (m_3)

⇩

Multiplied by methane fraction (%) of landfill gas (gas analyzer)

⇩

Volume of methane combusted in flare (m_3)

⇩

Multiplied by flare efficiency (98 %)

⇩

Net volume of methane combusted in flare (m_3)

⇩

Multiplied by volume: mass conversion factor (0.00067899 t CH_4 = 1 m_3 CH_4)
(tonnes of methane)

⇩

Multiplied by Global Warming Potential of methane (21)
(tonnes of CO_2 e)

⇩

Annual emission reductions due to methane combustion in flares (tonnes of CO_2 e)

NOTE: For Marambaia site this result is further discounted by a factor of 20% (Emission Adjustment Factor - EAF = 0.2)

⇩

Total ERs generated by the project (t CO_2 e)

4.2. Calculation Method of Project Emissions

The calculation of methodology applied to this project is:
Version 01 –"Methodological Tool to determine project emissions from flaring gases containing methane"

4.3. Calculation of Emission Reduction for Adrianopolis Site:

The table bellow shows the values for emission reduction in Adrianopolis site:

Calculation ERs - Adrianopolis Site - 2007						
Month	Total Gross ERs	Project Emission			Total Net ERs	ERs Accumuladed
		Electrial Energy	Fuel Fossil (LPG)			
March	1.491,57	0,01958419	0,00154600		**1.491,55**	1.491,55
April	3.887,63	0,05893326	0,00220858		**3.887,57**	5.379,12
May	5.707,71	0,08245408	0,00220858		**5.707,62**	11.086,74
June	6.590,14	0,19433192	0,00044172		**6.589,95**	17.676,69
July	6.492,43	0,04893840	0,00077300		**6.492,38**	24.169,07
August	7.632,11	0,13242986	0,00110429		**7.631,98**	31.801,05
September	7.241,98	0,08331463	0,00231900		**7.241,89**	39.042,94
October	8.083,46	0,09038634	0,00143557		**8.083,37**	47.126,31
November	8.089,14	0,11787475	0,00077300		**8.089,02**	55.215,33
December	8.018,01	0,10644265	0,00011043		**8.017,91**	63.233,24

4.4. Calculation of Emission Reduction for Marambaia Site:

The table bellow shows the values for emission reduction in Marambaia site:

Calculation ERs - Marambaia Site - 2007								
Month	Total Gross ERs (without EAF)	Emission Adjustment Factor 20%	Total Gross ERs		Project Emission		Total Net ERs	ERs Acumulated
					Electrial Energy	Fuel Fossil (LPG)		
March	-	-	-		-	-	-	-
April	-	-	-		-	-	-	-
May	214,56	42,91	171,65		0,02433071	0,00077300	**171,62**	171,62
June	602,24	120,45	481,79		0,06459738	0,00110429	**481,72**	653,35
July	307,31	61,46	245,85		0,02309060	0,00154600	**245,83**	899,17
August	480,33	96,07	384,27		0,05717463	0,00176686	**384,21**	1.283,38
September	437,78	87,56	350,22		0,04104922	0,00077300	**350,18**	1.633,56
October	321,03	64,21	256,82		0,04509576	0,00253986	**256,78**	1.890,34
November	526,31	105,26	421,05		0,03750755	0,00287115	**421,01**	2.311,35
December	527,45	105,49	421,96		0,04038851	0,00022086	**421,92**	2.733,27

4.5. Summary of the Emission Reduction of the Project

Volume required of CER for March to December, 2007.

Summary ERs in 2007- Novagerar Project				
Month	***ERs Adrianopolis***	***ERs Marambaia***	***Total ERs for Novagerar Project***	***ERs Accumuladed***
March	1.491,55	0,00	1.491,55	**1.491,55**
April	3.887,57	0,00	3.887,57	**5.379,12**
May	5.707,62	171,62	5.879,25	**11.258,36**
June	6.589,95	481,72	7.071,67	**18.330,04**
July	6.492,38	245,83	6.738,21	**25.068,24**
August	7.631,98	384,21	8.016,18	**33.084,43**
September	7.241,89	350,18	7.592,07	**40.676,50**
October	8.083,37	256,78	8.340,15	**49.016,65**
November	8.089,02	421,01	8.510,03	**57.526,68**
December	8.017,91	421,92	8.439,83	**65.966,51**

Summary of Emission Reduction in reference year (2007)	**65.966,51**