MONITORING REPORT NR.1/2, VERSION NO.3.2

Project:	Lapes Landfill Gas Utilization and Energy Generation
Country:	Lithuania
Period:	01/07/2008 – 31/12/2009

Developed by:
Grue & Hornstrup A/S
in cooperation with UAB Ekoresursai

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Project Facts

Project information

Title of project activity:	Lapes Landfill Gas Utilization and Energy Generation
Location:	Lithuania, Kaunas County
Project Host:	UAB Ekoresursai
Project Investor:	Nordic Environmental Finance Corporation (NEFCO)
Start of crediting period:	2008
Date of final determination:	2009
Date of UNFCCC certification:	2009

Monitoring information

Monitoring report No:	1/2
Monitoring period:	01/07/2008 - 31/12/2009
Monitoring Excel spreadsheet version:	2008-2009 Lapes Mon. Rept Excel FINAL version 4.1
Approval date and version:	2010.03.08, version 3.2
Emission Reductions generated within the monitoring period:	**34.384,00** t CO_2
Name of person compiling monitoring report:	Gerardas Žukauskas

1. Introduction

This Monitoring Report is elaborated for the JI project entitled "Lapes Landfill Gas Utilization and Energy Generation".

The project has been successful determined by TUV on 10/11/09 and the crediting period started on 01/07/08.

For the respective monitoring period from 01/07/2008 -31/12/2009, the project generated a total of 34.384,00 tCO2 of emission reductions.

We used reliable data of national gas company AB "Lietuvos dujos", which is official Lithuanian gas provider, to determine caloric value of natural gas for monitoring period. AB "Lietuvos dujos" announces caloric value every month in web site www.lietuvosdujos.lt .

2. Project Description

UAB "Ekoresursai", a private Lithuanian company, is proposing the Lapes Landfill Gas Utilization Project as a Joint Implementation project. The objective of the project is to use landfill gas extracted from the Lapes landfill site for heat and power generation in a combined heat and power (CHP) plant to be constructed. This will significantly reduce methane emissions from the landfill. Substituting landfill gas for fossil fuels in heat and power generation will also reduce CO_2 emissions in the Lithuanian energy sector.

Lapes landfill is located near the city of Kaunas in Lithuania. Its exploitation started in 1973 and the total area of the landfill is 38.7 ha. The annual waste volumes disposed in the landfill have been around 110–120 thousand tonnes over the past years. The landfill is located on state land and operated by a private company AB "Kauno Švara". UAB "Ekoresursai" has an agreement with the landfill operator for the extraction and utilisation of the landfill gas.

The project proponent is planning to build a landfill gas extraction system in the Lapes landfill. A combined heat and power (CHP) plant will also be constructed and connected to the gas extraction system. The CHP plant will provide electricity for the Lithuanian power grid and heat for the local district heating network. The CHP plant has an electrical capacity of 1.2 MWel and a heating capacity of 1.4 MWth.

The project developer has signed agreements with the local district heating company for land lease and heat sales.

The EU landfill directive requires that the landfills receiving biodegradable waste must have a gas collection system. There is a transition period for existing landfill sites, which in the case of Lithuania implies that existing landfills are required to have a gas collection system on 1st January 2012 at latest. So far there have not been any landfill gas capture systems implemented in Lithuania.

3. Baseline and Monitoring Methodology applied

The Decision 9/CMP.1 includes an Appendix B that establishes the criteria for baseline setting and monitoring. Furthermore, the Joint Implementation Supervisory Committee has agreed on additional guidance on these criteria at its fourth meeting in September 2006. The Version 01 of the document "Guidance on Criteria for Baseline Setting and Monitoring" states, inter alia, that "*the project participants may establish a baseline that is in accordance with appendix B of the JI guidelines. In doing so, selected elements or combinations of approved CDM baseline and monitoring methodologies may be used, as appropriate*" (paragraph 20b). The baseline of this project is established according to the appendix B.

For the calculation of the baseline, a project-specific approach, mainly based on the approved baseline and monitoring methodology for CDM projects ACM0001 version 2, "Consolidated baseline methodology for landfill gas project activities", is used. Version 2 of that methodology was in use for CDM projects submitted before 14 July 2006 and the baseline for this JI project was first established during that time. There are no significant differences between version 2 and the current version of the methodology that concern this project. The applicability of the methodology is valid in both versions, the basis for the calculation of baseline emissions is the same and all the monitored parameters are the same.

Since $MD_{reg,y}$ = 0 for new landfills until 16 July 2009 and old landfills until 1st January 2012 and $MD_{reg,y} = MD_{project,y}$ for new landfills after 16 July 2009 and for old landfills after 1st January 2012, there is no need to estimate the destruction efficiency of the baseline system.

The project-specific approach deviates from ACM0001 version 2 only in its use of the CDM "Tool to determine project emissions from flaring gases containing methane" for determining the flare efficiency. This Tool was not available at the time of version 2 and thus, it was not required under version 2 of ACM0001. For this project, the Tool was applied as part of a revision of the PDD, to ensure a commonly accepted, up-to-date approach to determining flare efficiency. A default flare efficiency of 90% is selected according to the Tool.

The CDM methodology ACM0001 is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas. This methodology can be used in a situation where the captured gas is used to produce energy (e.g. electricity/thermal energy), and emission reductions are claimed for displacing or avoiding energy generation from other sources. In this case a baseline methodology for electricity and/or thermal energy displaced shall be provided or an approved one used.

According to the ACM0001 version 2 "The methane destroyed by the project activity ($MD_{project,y}$) during a year is determined by monitoring the quantity of methane actually flared and gas used to generate electricity and/or produce thermal energy". This is the approach taken in this project.

Owing to the characters of the Lithuanian electricity system and because the emission reductions claimed from the electricity generation are quite small (around 4,300 tCO2e per year), a simple methodology is used to establish the emission factor for displaced electricity. The emission factor of the Lithuanian Power Plant that operates at the margin is taken to be the emission factor for electricity displaced. This is justified by two facts:

1. The Lithuanian Power Plant is the second-largest power plant in Lithuania (after the Ignalina nuclear power plant). It operates on the grid as a marginal plant. It covers all power demand which remains after other power plants (nuclear power, CHP plants and hydro power plants) have supplied their power to the grid. The emission factor of the Lithuanian Power Plant is therefore the operating margin of the Lithuanian grid.
2. There is a surplus of installed electric capacity in Lithuania and the country is a net exporter of electricity. This means that new power plants are not being built and build margin therefore does not impact the emission factor.

4. Monitoring Management and Quality Assurance System

Monitoring Management for respective period from 2008.06.01 by 2008.12.31 was implemented by collecting data and transferring collected data to dispatch room server trough SCADA every day. We used direct SCADA data transfer to the spreadsheet as monitoring management reports for mentioned period.

A Monitoring Management and Quality Assurance System has been developed and implemented for the respective JI project activity from 2009.01.01. In this context the following forms and procedures were issued and are followed by the respective personal involved in the JI project activity:

Form A1a_Process Data Sheet (week)
Form A1b_Process data Sheet (month)
Form A2_Daily check form (LFG Plant)
Form A3_Daily Check form (CHP)
Form A4_ Monthly QA Check Form
Form A5_Calibration Log Sheet

Procedure B1_Records Keeping

Procedure B2_Data Transfer

Procedure B3a_Daily Check for LFG Plant

Procedure B3b_Daily Check for CHP

Procedure B4_Calibration Records

Procedure B5_Monthly QA Check

CHP gas Flow meter type CGR-01 G400 with corrector nr. 340127 broke down on 22 of April in 2009. Our exploitation personnel identified damage immediately because they were at site when this incident happened. Fortunately the same type of gas flow meter (type CGR-01 G400) with corrector nr. 340128 we had mounted in Landfill Flare system. As we can see from 2009 spread sheets, Flare system didn’t combusted landfill gases in 2009 at all. For temporary use, we removed Flare system’s Flow meter and placed it to the CHP plant. Unfortunately Flare gas Flow meter’s corrector nr. 340128 didn’t match with CHP PLC (control panel), so we could use only meanings of Flare Flow meter, without corrector nr. 340128. For period from 22 of April to 21 of May in 2009, landfill gas amount was appraised transferring values of Flare gas Flow meter, by evaluating temperature and pressure, to normal cubic meters (**Nm3**) by multiply from gas amount corrector coefficient K, by using formulas below:

$$V_n = V_a \; x \; K; \text{ Nm}^3 \qquad (1)$$

$$K = \frac{p}{p_n} \frac{\vartheta_n + 273,15}{\vartheta + 273,15} \frac{1}{K_z}; \qquad (2)$$

Where:

V_n - gas quantity in Nm3;

V_a - gas quantity according gas amount meter in m3;

K - Correction coefficient;

P - bar abs;

p_n- 1,01325 bar, standard parameter;

ϑ_n - 20°C, standard parameter;

ϑ - Environment temperature;

K_z – relative gas compressibility coefficient, according LST EN ISO 12213-3:2005;

Flare system has CE certificate and correspond EU regulations. Flare system is standby equipment to CHP if for some reason CHP would not be in operation. By 01/07/2008 – 31/12/2009 period Flare combusted 5-6 % of total amount of Landfill gas extracted. Flare temperature meter has manufacturer’s calibration certificate and was not calibrated additionally. According PDD arranged that Flare combustion efficiency is 90%, if flare not functioning or temperature drops below 500 °C, efficiency meaning is 0%.

5. Monitoring Parameters

ID umber	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c), estimated (e)**	**Recording**
1. F1	Total amount of landfill gas captured	Continuous flow meter at Point 1	m^3	M	Cont.
2. T1	Temperature of the landfill	Continuous measurement	°C	M	Cont.

	gas	at Point 1			
3. P1	Pressure of the landfill gas	Continuous measurement at Point 1	Pa	M	Cont.
4. $CH_4$1	Methane fraction in LFG	Continuous measurement at Point 1	m^3_{CH4}/m^3_{LFG} (vol-%)	M	Cont.
5. F2	Amount of LFG flared	Continuous measurement at Point 2	m^3	M	Cont.
6. FE3	Flare combustion efficiency	90% default efficiency used. Continuous measurement of flare operating time and temperature.	90%. If flare not functioning or temperature below 500 °C, efficiency is 0%	E	Cont.
7. E4	Electricity used in the MPR Station	Continuous metering at Point 4	MWh	M	Cont.
8. F5	Amount of LFG to CHP-plant	Continuous flow meter at Point 5	m3	M	Cont.
9. F6	Flow of natural gas	Point 6	m3	M	Cont.
10. P6	Pressure of natural gas	Point 6	Pa	M	Cont.
11. T6	Temperature of natural gas	Point 6	°C	M	Cont.
12. E7	Electricity generated by the project	Continuous energy metering at Point 7	MWh	M	Cont.
13. Q8	Heat generated by the project	Continuous energy metering at Point 8	MWh	M	Cont.

6. Emission Reductions

In the respective monitoring period 01/07/2008 – 31/12/2009, 34.384,00 t CO2 of emission reductions.

Detailed values of emission:

Emission reductions from methane avoidance (LFG flaring):	2043	t CO2/yr
Emission reductions from methane avoidance (LFG utilization)	27322	t CO2/yr
Emission reductions from heat substitution	1476	t CO2/yr
Emission reductions from electricity substitution	4511	t CO2/yr
Emissions from natural gas consumption	774	t CO2/yr
Emissions from electricity consumption	194	t CO2/yr

Monthly values of LFG plant

Year	Month	Total amount of LFG flared	Methane fraction in LFG	Flate temperature	Methane avoidance from flaring	Electricity consumed in the MPR Module
		Nm3	vol-%	C°	t CH4	MWh
2008	July	175189	56.0%	900	66	15.79
	August	46654	55.4%	900	17	6.34
	September	35675	56.6%	900	14	17.97
	October					19.10
	November					18.36
	December	0	50.7%	0	0	31.44
2009	January	0	52.6%	0	0	10.44
	February	0	53.0%	0	0	15.68
	March	0	52.8%	0	0	15.51
	April	0	52.5%	0	0	19.26
	May	0	53.5%	0	0	17.26
	June	0	53.6%	0	0	18.84
	July	0	49.3%	0	0	25.72
	August	0	55.6%	0	0	19.42
	September	0	55.7%	0	0	18.04
	October	0	48.7%	0	0	16.94
	November	0	46.3%	0	0	17.91
	December	0	52.9%	0	0	13.72
	Total/Average	**257,518**	**53%**	**169**	**97**	**318**

Monthly values of CHP

Year	Month	Total amount of LFG to CHP	Total amount of NG consumed	Calorific Value of NG	Total amount of electricity produced	Total amount of heat produced
		Nm3	Nm3	kCal/Nm3	MWh	MWh
2008	July					26.37
	August	49,536.00	11160	8035	95.168	76.03
	September	161,913.00	15861	8015	279.808	215.20
	October	183,749.00	8829	8018	329.192	370.00
	November	238,382.00	0	8019	444.740	563.00
	December	278,200.00	38829	8005	526.442	641.00
2009	January	226,486.00	9852	7997	422.492	509.00
	February	218,774.00	31475	7985	482.721	584.00
	March	227,926.00	36354	8002	517.075	612.00
	April	191,736.30	33907	8022	446.204	340.00
	May	174,012.30	26996	8058	494.225	254.50
	June	239,918.00	47631	8088	562.898	210.00
	July	283,371.00	40145	8059	561.612	205.40

August	238,465.00	0	8060	398.838	206.10
September	242,119.00	3661	8040	405.122	215.00
October	283,560.00	21000	8026	474.708	501.10
November	257,546.00	42807	8022	482.586	552.90
December	224,941.00	44141	8006	465.482	528.70
Total/Average	**3,720,634.60**	**412648**	**8026.88**	**7389.313**	**6610.30**