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

CONTENTS

Annexes

SECTION A. General description of the project

A.1. Title of the project:

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Lapes Landfill Gas Utilization and Energy Generation

This is the re-formatted version of the post-determination, Revised PDD version of 26th June 2006. Re-formatted (materially unaltered) on the 29th of March 2007.

A.2. Description of the project:

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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 would have an electrical capacity of 1.1 MW_e and a heating capacity of 1.4 MW_{th}. The project developer has signed agreements with the local district heating company for land lease and heat sales.

The EU landfill directive[1] 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.

A.3. Project participants:

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Party involved	Legal entity project participant (as applicable)	Please indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Lithuania (host Party)	• UAB "Ekoresursai"	No
One of the investor countries participating in the TGF, tbc. The investor countries in the	• Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the Baltic Sea Region	No

[1] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.

TGF are: Kingdom of Denmark, Republic of Finland, Federal Republic of Germany, Republic of Iceland, Kingdom of Norway and Kingdom of Sweden.	Testing Ground Facility (TGF)	

Project Entity

UAB "Ekoresursai" is the owner of the emission reductions that the project will generate and a project participant. UAB "Ekoresursai" is a private company registered in Lithuania.

The purchaser of the emission reductions from the project

Testing Ground Facility (TGF)
NEFCO, the Nordic Environment Finance Corporation, is a multilateral risk capital institution financing environmental projects in Central and Eastern Europe, increasingly with an emphasis on the Russian Federation and Ukraine. Its purpose is to facilitate the implementation of environmentally beneficial projects in the neighbouring region, with transboundary effects that also benefit the Nordic region. Today, NEFCO manages funds in an aggregate of approximately €300 million. NEFCO is located in Helsinki, in conjunction with the Nordic Investment Bank (NIB).

The Baltic Sea Region Testing Ground Facility (TGF) was established at the end of December 2003, to provide financial assistance to concrete projects by purchasing emission reduction credits. The TGF was initially set up by the governments of Denmark, Finland, Germany, Iceland, Norway and Sweden. The TGF is now a Public Private Partnership which acts as a compliance vehicle for its investors' Kyoto and EU Emissions Trading Scheme commitments. From June 2006, it includes the following Nordic and German companies from the energy sector as well as energy intensive industrial consumers: DONG Naturgas A/S (Denmark), Fortum Power and Heat Oy (Finland), Gasum Oy (Finland), Keravan Energia Oy (Finland), Kymppivoima Tuotanto Oy (Finland), Outokumpu Oyj (Finland), Vapo Oy (Finland), Vattenfall Europe Berlin AG & Co. KG (Germany) and Vattenfall Europe Generation AG & Co. KG (Germany). The TGF is currently capitalised at €35 million.

NEFCO is the Fund Manager of the TGF, and has been authorised by the governments investing in the TGF to participate on their behalf in actions leading to the generation, transfer and acquisition of ERUs under Article 6 of the Kyoto Protocol.

A.4. Technical description of the project:

A.4.1. Location of the project:

A.4.1.1. Host Party(ies):

>> Republic of Lithuania

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

>>Kaunas County

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

>> Lapes Subdistrict, Kaunas District Municipality

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

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Figure 1. Project dislocation area

Lapes landfall is located in Lepšiškės village, Lapės subdistrict in Southern part of Lithuania at a distance of 19 km northeast from Kaunas, the second largest city of the country. The cogeneration plant that will utilise the gas from Lapes shall be constructed in Domeikava district on the site of an existing heat-only boiler plant. The length of the gas pipeline from Lapes to the cogeneration plant will be about 12.5 km (see the picture 2).

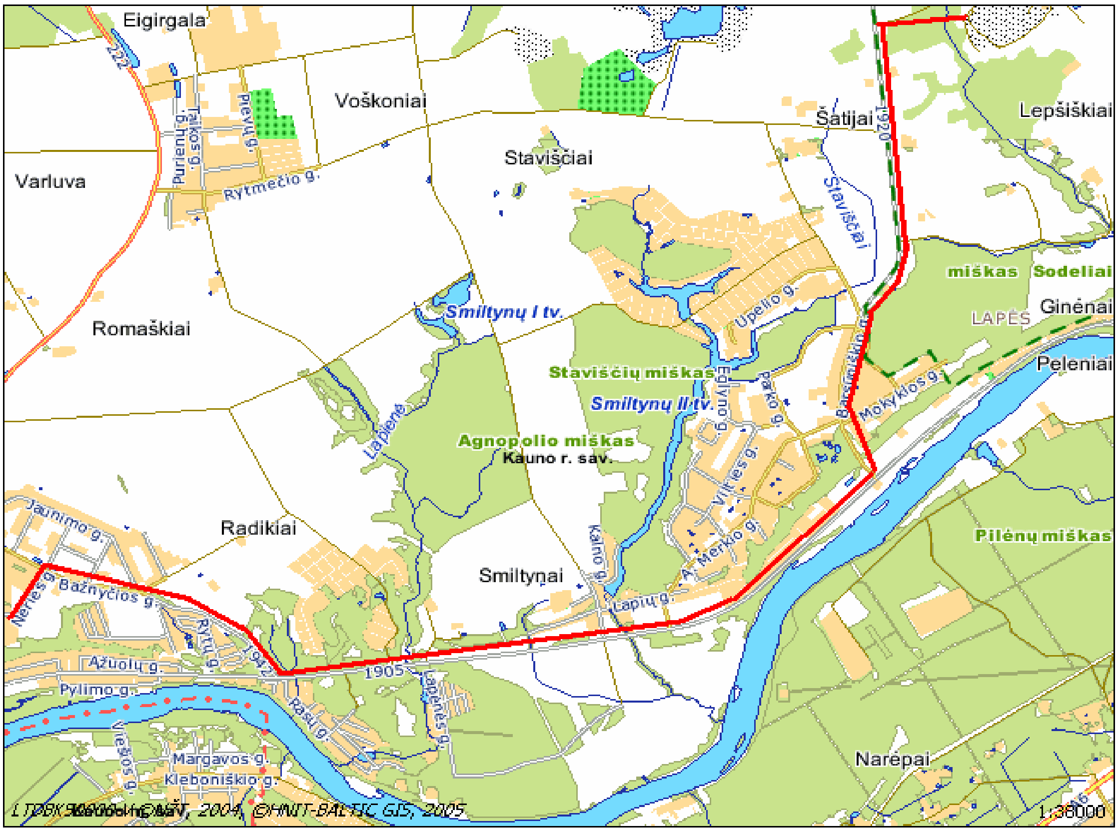

Figure 2. Detailed area plan

The pipeline will pass by the following landmarks:

- Road 1920
- Barsūniškio Street
- Road 1920
- Road 1905
- Road 1942
- Bažnyčios Street
- Neries Street

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

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The project will utilise proven conventional technologies that are used in similar projects in other parts of the world. The landfill gas is suctioned from the gas wells in the landfill site by using vacuum compressors. The gas is cleaned and fed to a gas engine. Natural gas is used as a support fuel in the engine. The small scale CHP plant with gas engine will be installed. The electricity generated is supplied to the national electricity grid and the heat is fed to the local district heating network. A flaring system is also installed in the landfill site to enable the burning of the methane when the engine is not running and for safety reasons. The principal technical components of the project are:

- Landfill gas extraction, cleaning, pumping and flaring system
- Pipeline from the landfill site to the cogeneration plant
- Cogeneration plant including electricity and heat interconnections

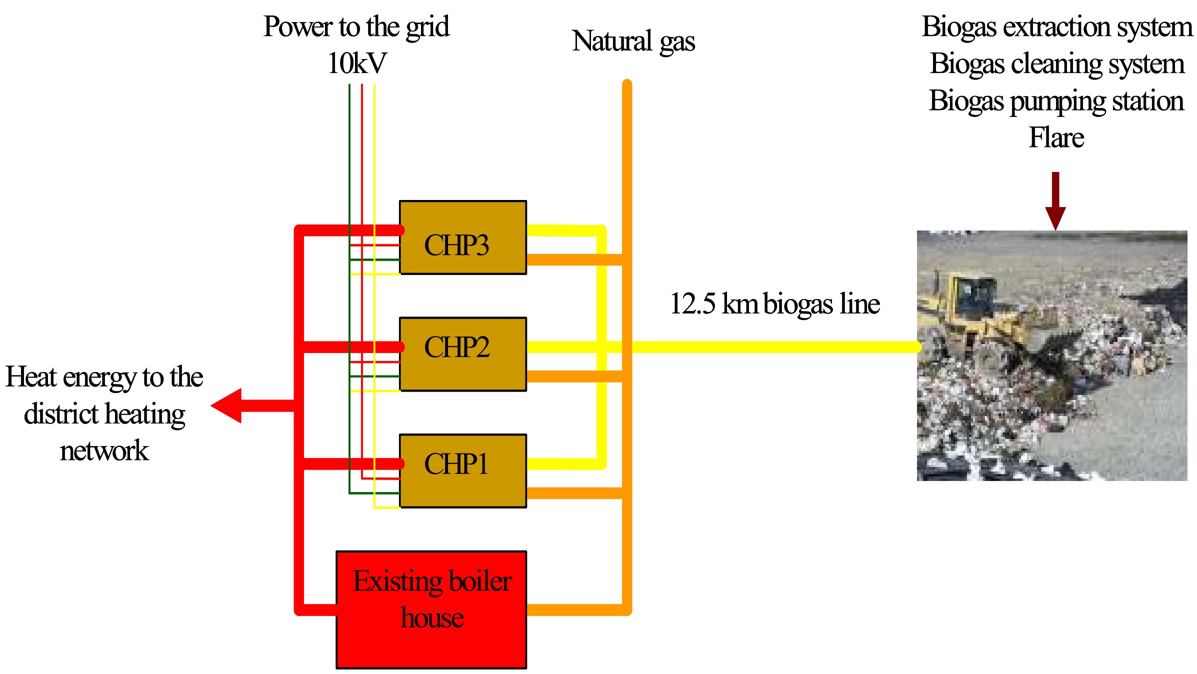

Figure 3. Principle scheme for technical solution

Characteristics of the Lapes landfill site

The exploitation of the Lapes landfill started in 1973 and the total area of the landfill is 38.7 ha. Currently the waste is being accumulated in Field No 1 of the landfill with an area of 12.5 ha and waste volume of about 2.4 million m^3. After Field No 1 is closed, the waste will be disposed in Field No 3 of the site with a designed volume of 340,000 m^3. There is also a plan to open a new field (Field No 2) with a volume of 1.2 million m^3. The annual waste volumes disposed in the landfill have been around 110–120 thousand tonnes over the past years. The thickness of the pile varies in the range of 24–30 m with an average thickness of 16 m. According to the information provided by the company AB Kauno Švara, the composition of the waste is as presented in the following table.

Table 1. Structure of wastes

Composition of the Waste in Lapes Landfill	
Kitchen waste	39 - 46%
Paper	9 - 14%
Synthetic material	3 - 6%
Glass	3 - 6%
Metals	2 - 3%
Other combustible material	6 - 10%
Unspecified composition	15 - 38%.

The gas generated by the landfill has been analysed in 1999 and 2003. In 1999 a study was conducted by the Institute of Geology and in 2003 by a Swedish expert Kare Löfgren. The following picture shows the location of the wells in the latest study.

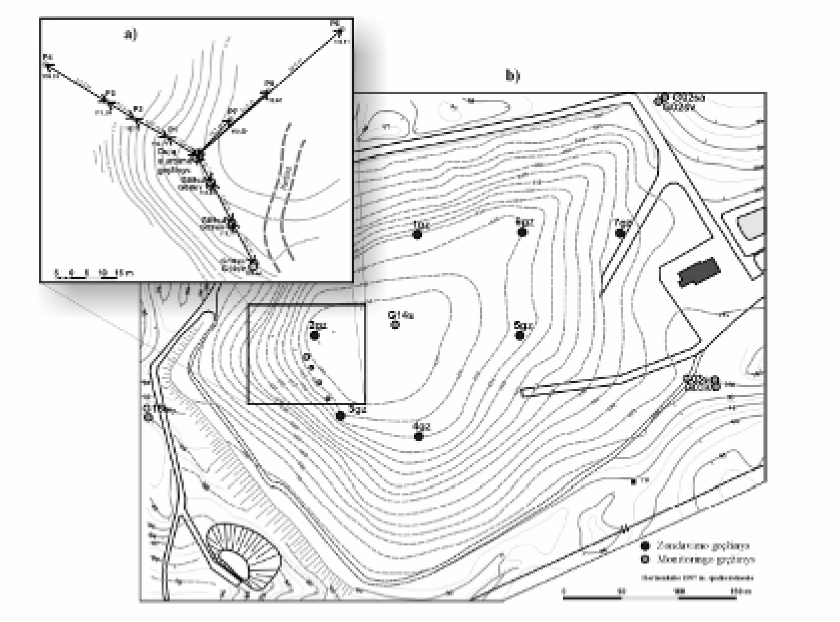

Figure 4. Location of wells

Both of these studies are available on request from UAB "Ekoresursai". The results of the assessments show that the amount and composition of the gas from the Lapes landfill are in line with the characteristics of similar landfills elsewhere. Due to large amounts of organic material present in the waste, gas is being intensely produced. Its composition comprises some 45–60% of methane (CH_4) and the remainder includes carbon dioxide (CO_2) as well as small amounts of other chemical compounds.

The landfill is located on state land and operated by a private company AB "Kauno Švara" based on a 99 years' agreement. UAB "Ekoresursai" has an agreement with the landfill operator for the extraction and utilisation of the landfill gas.

Landfill gas extraction, pumping, cleaning and flaring system

The landfill gas collection system includes:

- Gas extraction wells
- Measuring, pumping and regulation (MPR) station
- Flares
- Gas pipelines which connect the extraction wells and the MPR station

The landfill gas will be extracted from the wells by generating vacuum using compressors. Horizontal tubes are laid in the upper covering layer of the landfill to connect all the gas extraction wells with the MPR (measuring, pumping and regulation) station. Each of the gas extraction wells will be connected to the MPR station with a separate tube. Each connector will be installed with the following equipment to control and regulate the gas flow according to its quality:

- regulation valves
- manometer
- gas flow (debit) meter
- gas composition testing equipment

It will be possible to take samples from each of the extraction wells. The MPR station which is likely to be a complete module in a metal container will be placed in the territory of the Lapės landfill site. A flare system is installed to burn the gas in case of emergency or if the gas can not be used for energy production.

Pipeline

Collected gas from the MPR station will be supplied to the cogeneration plant in Domeikava via a 12.5 km long plastic pipeline. The intended route for the pipeline is shown an the picture 2.

Cogeneration plant and interconnections

High efficiency class combined cycle power plants with internal combustion engines will be used in the project. The fuel will be a mixture of biogas and natural gas (no more than 30% of calorific value of biogas). Electric power will be generated at 10 kV tension. The electric capacity of the cogeneration power plant will be of 1.1 MW_e and the heating capacity 1.4 MW_{th}. The cogeneration plant will be installed in Domeikava boiler-house, which situates in the territory of AB "Kauno energija".

At this moment Ekoresursai has preliminary technical conditions from AB VST for connecting the plant to the power grid. The CHP will be connected to the existing 10kV grid on the site of the Domeikava boiler plant.

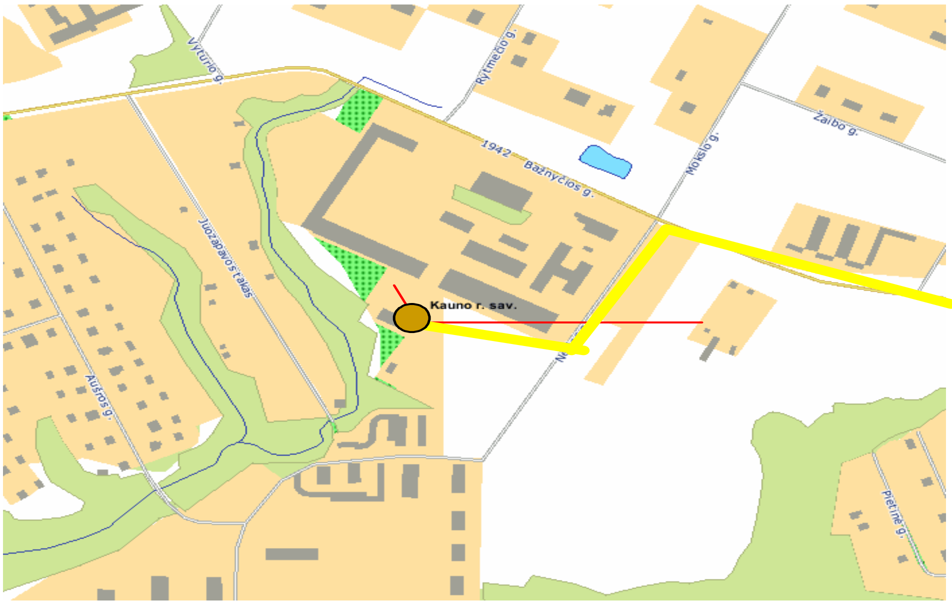

Figure 5. Connections plan

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

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The project will reduce greenhouse gas emissions in two ways:

- Reduction of methane (CH_4) emissions from the landfill site
- Reduction of carbon dioxide (CO_2) emissions from heat and power generation

Reduction of methane emissions from the landfill site

Approximately 45-60% of the gas emitted to the air by the Lapes landfill site is methane, which is a potent greenhouse gas. By implementing the project, a significant portion of the landfill gas will be collected and either flared or used for energy generation in the Domeikava cogeneration plant.

The EU landfill directive[2] requires that the landfills receiving biodegradable waste must have a gas collection system. Existing landfill sites must comply with the requirements of the directive within 8 years from the date that the national legislation implementing the directive came into force. In Lithuania, the Lapes landfill must implement a gas collection system by 1st January 2012.

In the absence of the project, the current situation would continue and landfill gases from Field 1 of the Lapes landfill would be released in the air until the end of 2011 when the landfill operator would be required to implement a gas collection system.

Reduction of CO_2 emissions from heat and power generation

Existing Domeikava boiler plant uses natural gas for district heating and has an efficiency of approximately 90%. In the 4th quarter of 2007 the new CHP plant will replace the existing boiler

[2] Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste.

producing annually 8,500 MWh of heat and 7,068 MWh of electricity from biogas and natural gas. Greenhouse gas emissions will be reduced since a part of the fossil fuels used for heat and power generation are replaced by biogas. The size of the existing Domeikava plant is less than 15 MW and it is therefore not included in the EU Emissions Trading Scheme.

The EU directive linking the Kyoto project-based mechanisms with the EU emissions trading scheme[3] states that if ERUs are credited to an activity that indirectly reduces emissions in installations covered under the EU emissions trading directive, a corresponding number of emission allowances must be reduced from the country's allocation. There is therefore no problem of double counting regarding the emission reductions from the power generation, even if the power plants where the actual reduction takes place were under the EU ETS. Lithuanian authorities have confirmed that such reserve for JI projects will be implemented in the National Allocation Plan 2008-2012.

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

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	Years
Length of the crediting period	5 years 4 months when including the early credits 5 years when considering only ERU issuance
Year	Estimate of annual emissions reductions in tonnes of CO_2 equivalent
2007	8,572
2008	29,596
2009	29,596
2010	51,398
2011	51,398
2012	5,168
Total estimated emissions reductions in 2007-2012 (tonnes of CO2 equivalent)	175,727
Total estimated emissions reductions in 2008-2012 (tonnes of CO2 equivalent)	167,155
Annual average of estimated emission reductions over 2007-2012 (tonnes of CO2 equivalent)	29,288
Annual average of estimated emission reductions over 2008-2012 (tonnes of CO2 equivalent)	33,431

A.5. Project approval by the Parties involved:

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[3] Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms

Written approval by the Host Party involved, including the necessary authorisations, is available. The Republic of Lithuania has on 14 December 2006 issued the host country approval for the project.
The investor country approval will be issued by at least one of the investor countries to the TGF at the point in time when it is required, at the latest. Currently the investor country approval according to the JI Supervisory Committee decision is needed when submitting the first verification report for publication.

SECTION B. Baseline

B.1. Description and justification of the baseline chosen:

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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 and it relies to some extent on the approved consolidated baseline methodology for CDM projects ACM0001 version 2: "Consolidated baseline methodology for landfill gas project activities". In addition, a simple electricity baseline based on the emission factor of the Lithuanian Power Plant that operates at the margin is used to estimate the emission reduction from electricity generation. The CDM methodology is not followed to the full extent, however.

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. Because the emission reductions claimed owing to the electricity generation are small (around 4,300 tCO2e per annum), a simple baseline is used for electricity.

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". Similar approach is taken in this project.

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

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The project will reduce greenhouse gas emissions in three ways:

- Reduction of methane (CH_4) emissions from the landfill site;
- Reduction of carbon dioxide (CO_2) emissions from heat generation; and
- Reduction of carbon dioxide (CO_2) power generation.

According to the chosen baseline methodology, the greenhouse gas emission reduction ER_y achieved by the project during a given year y will be calculates as

$$ER_y = ERM_y + (ERH_{y,gross} + ERE_{y,gross} - E_{ng})$$

Where

ERM_y = *net emission reduction from methane reduction*

$ERH_{y,gross}$ = *gross emission reduction from heat generation*

ERE_y = *gross emission reduction from power generation*

E_{ng} = *emissions from the utilisation of natural gas*

Reduction of methane emissions from the landfill site

The greenhouse gas emission reduction achieved by reducing methane from the landfill site during a given year "y" (ERM_y) will be calculated as

$$ERM_y = (MD_{project,y} - MD_{reg,y}) \times GWP_{CH4} - E_0$$

where

$MD_{project,y}$ = *the amount of methane actually destroyed/combusted during the year*

$MD_{reg,y}$ = *the amount of methane that would have been destroyed/combusted during the year in the absence of the project*

GWP_{CH4} = *Global Warming Potential of methane*

E_0 = *Emissions due to the electricity consumption of the landfill equipment*

The Lithuanian and EU legislation require that existing landfill sites in Lithuania must implement a gas collection system by 1st January 2012. New landfill sites must have a gas collection system by 16 July 2009. The legislation does not provide a specific efficiency for the gas collection systems. It is therefore conservative to estimate that

$MD_{reg,y}$ = 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

In the absence of the project, the current situation would continue and landfill gases from Field 1 of Lapes landfill would be released in the air until the end of 2011. A simple flaring system would be installed in 2012 because of the legislative requirements.

In 2010, Field 3 of the landfill will be opened and Field 1 will be covered and closed. Owing to the coverage, the landfill gas production in Field 1 will increase. Since the legislation requires gas capture for new landfill sites from 16 July 2009, the emission reductions from Field 3 are therefore not taken into account, as for Field 3 $MD_{reg,y} = MD_{project,y}$.

Landfill gas collection efficiency is estimated at 80%. The gas is either flared or used in the CHP plant to be built. The estimated annual reduction of emissions from the 1st field of the landfill site is about 24,500 tCO2e until 2009 and 46,400 tCO2e in 2010-2011.

Electricity consumption of the landfill equipment is caused by compressors and lightning. The level of consumption is estimated at 100 – 300 MWh/a during 2007 – 2012.

Reduction of CO_2 emissions from heat generation

For a chosen year *y* the gross emission reduction from heat generation $ERH_{y,gross}$ will be calculated as:

$$ERH_{y,gross} = ET_y \times CEF_{thermal,y}$$

Where

ET_y = *thermal energy displaced during the year y*

$CEF_{thermal,y}$ =CO_2 *emissions intensity of the thermal energy displaced*

Existing Domeikava boiler plant uses natural gas for district heating and has an efficiency of approximately 90%. In the 4th quarter of 2007 the new CHP plant will replace the existing boiler producing annually 8,500 MWh of heat from biogas and natural gas. Greenhouse gas emissions will be reduced since the natural gas for heat generation is to a great extent replaced by biogas.

Reduction of CO_2 emissions from electricity generation

For a chosen year *y* the gross emission reduction from electricity generation ERE_y will be calculated as:

$$ERE_y = EG_y \times CEF_{electricity,y}$$

Where

EG_y = *net quantity of electricity displaced during the year y*

$CEF_{electricity,y}$ = CO_2 *emissions intensity of the electricity displaced*

Since the 4th quarter of 2007 the new CHP plant will generate approximately 7,068 MWh of electricity annually from biogas and natural gas. Greenhouse gas emissions will be reduced since electricity generated by biogas will replace fossil fuels in power generation.

The Lithuanian power system mainly consists of the Ignalina nuclear power plant (2,600 MW, Unit 1 was decommissioned in 2005 leaving 1,300 MW in operation), one large thermal power plant (Lithuanian Power Plant, 1,800 MW) using natural gas, heavy fuel oil and orimulsion, as well as several minor CHP plants. The system also includes hydro power plants (114 MW) and one hydro pumping storage plant (900 MW). The total installed power capacity in Lithuania is more than 6,000 MW but the maximum need for power in Lithuania is only about 2,000 MW. Lithuania therefore exports power to Belarus, Latvia and Poland.

LIETUVOS ELEKTRINIŲ ĮRENGTOJI GALIA, MW	INSTALLED CAPACITY IN LITHUANIAN POWER PLANTS, MW	1999	2000	2001	2002	2003
ATOMINĖ ELEKTRINĖ	**NUCLEAR PLANT**	**2600**	**2600**	**2600**	**2600**	**2600**
Ignalinos atominė elektrinė	Ignalina Nuclear Power Plant	2600	2600	2600	2600	2600
ŠILUMINĖS ELEKTRINĖS	**THERMAL POWER PLANTS**	**2567**	**2567**	**2567**	**2567**	**2567**
Lietuvos elektrinė	Lithuanian Power Plant	1800	1800	1800	1800	1800
Vilniaus elektrinė	Vilnius Power Plant	384	384	384	384	384
Kauno elektrinė	Kaunas Power Plant	178	178	178	178	178
Mažeikių elektrinė	Mažeikiai Power Plant	194	194	194	194	194
Klaipėdos elektrinė	Klaipėda Power Plant	11	11	11	11	11
HIDROELEKTRINĖS	**HYDRO AND PUMPED STORAGE POWER PLANTS**	**909**	**910**	**914**	**914**	**1014**
Kauno hidroelektrinė	Kaunas Hydro Power Plant	101	101	101	101	101
Kruonio hidroakumuliacinė elektrinė	Kruonis Pumped Storage Plant	800	800	800	800	900
Mažosios hidroelektrinės	Small Hydro Power Plants	8	9	13	13	13
PRAMONĖS ĮMONIŲ ELEKTRINĖS	**POWER PLANTS OWNED BY OTHER ENTERPRISES**	**51**	**51**	**76**	**76**	**76**
IŠ VISO	**TOTAL**	**6127**	**6127**	**6157**	**6157**	**6257**

Figure 1. Installed capacity in Lithuanian power plants in 2003. Source: Lietuvos Energija, Dispatch Centre's Operations.

As mentioned, Unit 1 of Ignalina was decommissioned in 2005. It has been decided that Unit 2 of Ignalina will be decommissioned before the end of 2009. This will significantly increase power production from the Lithuanian Power Plant, as well as other fossil fuel power plants. The Figure below shows an estimated projection of electricity generation in Lithuania. It can be seen that the growing domestic demand, as well as the demand for exports will be covered by the condensing Lithuanian Power Plant. The CHP plants will be operated mainly based on their heat load.

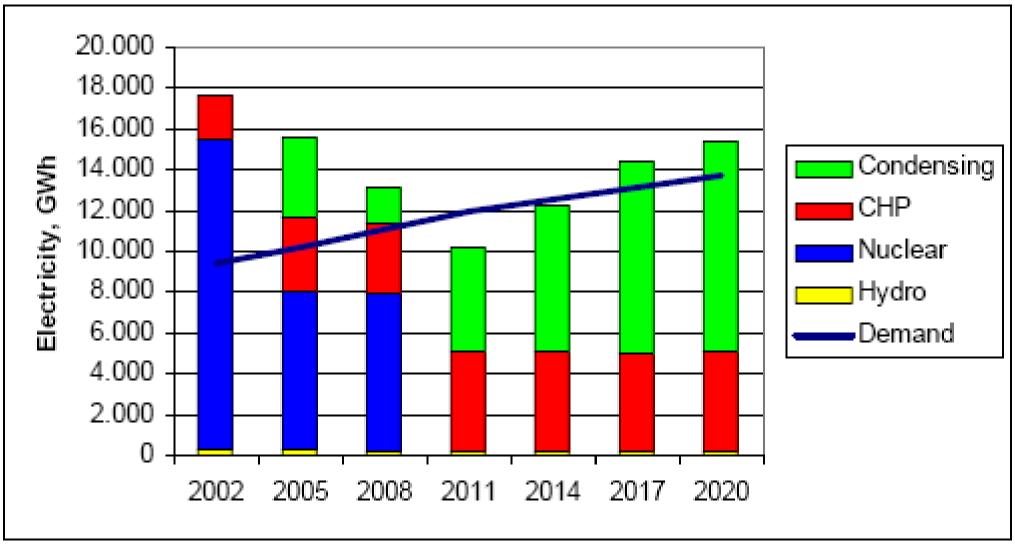

Figure 2. Electricity generation in Lithuania assuming a common Baltic electricity market and a phased closure of the Ignalina Power Plant. Source: Lithuanian Energy Institute, Economic Analyses in the Electricity Sector in Lithuania, February 2002.

Therefore the Lapes landfill project will replace electricity generated at the Lithuanian Power Plant, which is used to regulate the grid. The emission factor for the Lithuanian Power Plant is 610.54 tCO2/GWh and this has been used as the baseline factor in the Project: $CEF_{electricity} = 0.6105\ tCO2/MWh$. See Annex 2 for detailed calculation.

The EU directive linking the Kyoto project-based mechanisms with the EU emissions trading scheme[4] states that if ERUs are credited to an activity that indirectly reduces emissions in installations covered under the EU emissions trading directive, a corresponding number of emission allowances must be reduced from the country's allocation. There is therefore no problem of double counting regarding the emission reductions from the power generation, even if the Lithuanian Power Plant is under the EU ETS. Lithuanian authorities have confirmed that such reserve for JI projects will be implemented in the National Allocation Plan 2008-2012.

Additionality

In accordance with Article 6 of the Kyoto Protocol a joint implementation project has to provide a reduction in emissions by sources that is additional to any that would otherwise occur. The following information shows that conservative assumptions were used in establishing the baseline scenario, the project scenario is not part of the baseline scenario and the project will lead to reductions of GHG emissions.

Impact of JI approval

The project has been designed from the beginning as a JI project. No investment decisions have been made nor has the construction begun before the drafting of the JI documentation.

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

There are three possible alternatives for the project:

1. Continuation of the current situation

[4] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC

In the absence of the project, the current situation would continue and landfill gases from the 1st field of Lapes landfill would be released in the air until the end of 2011. The Lithuanian legislation (the Order of minister of environment on instructions for construction, operation, closure and maintenance of landfills (No 444 of October 18 of 2000) requires gas capture systems for existing landfills to be in place from 1st January 2012. A simple flaring system or other gas capture system would be installed in 2012 because of this legislative requirement.

2. Implementing a gas collection and flaring system

   This is not a viable alternative, since without JI there would be no income from the gas flaring.

3. Installation of a gas collection and utilisation system by the landfill owner

   The landfill owner does neither have capacity nor respective technical equipment to install a system to collect the landfill gas and generate heat only, electricity only or heat and electricity. Possibilities to produce electricity at the landfill site are low: project costs are too high for the connection to the electricity network as it needs 12 km cable to be installed up to Sargenai transform substation. There is also no possibility for heat utilisation.

Investment analysis

The IRR of the project without the revenues from the sale of the ERUs is only 2.9%. This is not sufficient for making the investment. The most likely alternative for the proposed project is therefore continuation of the current situation.

The estimated revenue from ERU sales are expected to significantly raise the IRR. This impact is mainly sensitive to the price of ERUs and the number of ERUs generated.

Impact of carbon revenue on project IRR	Value -10 %	Expected value	Value +10 %
ERU Price	7.8%	8.4%	9.0%
Number of ERUs	7.9%	8.4%	8,9%

Barrier analysis

Several investment and technical barriers exist that make the implementation of the project highly unlikely without the revenues from the sale of ERUs. The operator of the landfill AB “Kauno Švara” has made provisions in the closing plan of the landfill for covering the landfill but not for gas capture. The agreement between Kauno Švara and Ekoresursai for gas extraction is based on the assumption that the project will be approved as a JI project. The perceived risks for landfill gas capture projects in Lithuania are also relatively high, as no projects of this kind have yet been implemented in the country.

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

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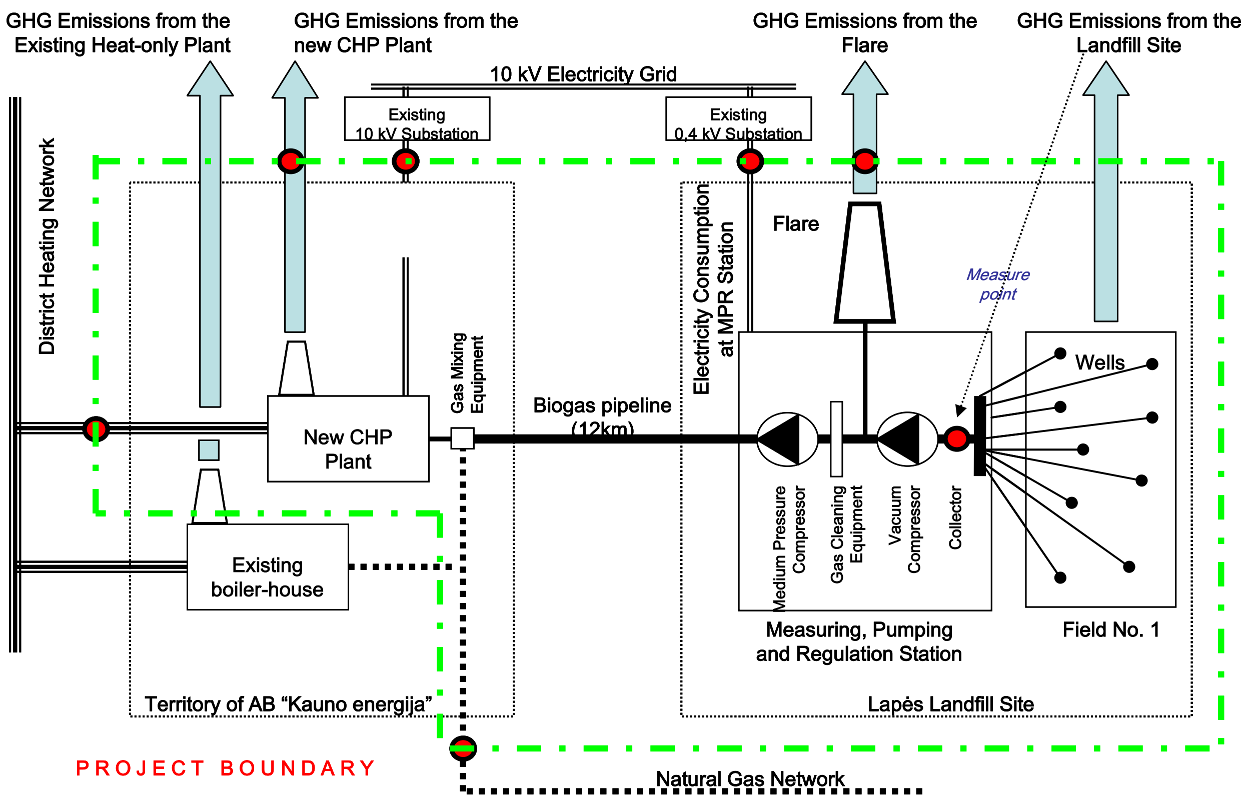
According to the consolidated CDM baseline methodology ACM0001 ver 2, the project boundary is the site of the project activity where the gas is captured and combusted. The project boundary for the Lapes project follows this approach and is presented in the following figure.



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

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The baseline study has been carried out by GreenStream Network Ltd. under a contractual with UAB "Ekoresursai". GreenStream Network is not a participant in the project. The baseline study was completed in February 2006 and revised in May 2006 and February and March 2007.

SECTION C. Duration of the project / crediting period

C.1. Starting date of the project:

>>

The starting date of the project is 1 July 2007, as the date when the concrete construction of the landfill gas extraction and flaring system is expected to start. The landfill gas extraction and flaring system is expected to be operative on 1 September 2007, and the CHP plant is expected to be commissioned during the 4th quarter of 2007. The baseline calculation assumes that the CHP plant is in operation from the 1st of December 2007.

C.2. Expected operational lifetime of the project:

>>

20 years

C.3. Length of the crediting period:

>>

Crediting period: 5 years 4 months (1 September 2007 – 31 December 2012) when including the early credits (AAUs). Early credits (AAUs) are claimed for 2007, and ERUs are claimed for 2008-2012.

5 years when considering only ERU issuance (1st January 2008 - 31 December 2012).

Starting date: For early credits (AAUs): 1 September 2007
For ERUs: 1 January 2008

In case of additional international treaties between the parties of Kyoto Protocol, the crediting period may be extended.

SECTION D. Monitoring plan

D.1. Description of monitoring plan chosen:

>>

The Monitoring Plan (MP) for the Lapes Landfill Gas Utilization for Energy Generation recovery project follows closely the approved CDM-methodology ACM0001 ver. 2 "Consolidated monitoring methodology for landfill gas project activities". In case of electricity production, the monitoring shall consist of metering the electricity generated by the landfill gas.

D.1.1. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario:

Not applicable – option 2 applied

D.1.1.1. Data to be collected in order to monitor emissions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data (See figure in Annex 4.)	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.1.2. Description of formulae used to estimate project emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

>>

Not applicable – option 2 applied

D.1.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions of greenhouse gases by sources within the project boundary, and how such data will be collected and archived:

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

referencing to D.2.)							paper)	

Not applicable – option 2 applied

D.1.1.4. Description of formulae used to estimate baseline emissions (for each gas, source etc.; emissions in units of CO_2 equivalent):

>>

Not applicable – option 2 applied

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

D.1.2.1. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. F1	Total amount of landfill gas captured	Continuous flow meter at Point 1	m^3	m	Cont.	100%	Electronic	
2. T1	Temperature of the landfill gas	Continuous measurement at Point 1	°C	m	Cont.	100%	Electronic	
3. P1	Pressure of the landfill gas	Continuous measurement at Point 1	Pa	m	Cont.	100%	Electronic	
4. $CH_4$1	Methane fraction in LFG	Continuous measurement at Point 1	m^3_{CH4}/m^3_{LFG} (vol-%)	m	Cont.	100%	Electronic	
5. F2	Amount of LFG flared	Continuous measurement at Point 2	m^3	m	Cont.	100%	Electronic	

6. FE3	Flare combustion efficiency	Quarterly analysis of CH4 amount at Point 3 Continuous measurement of flare operating time	% of CH_4 in flare gas of CH_4 going into flare % of time	m/c	Quarterly Cont.	N/A	Electronic	
7. E4	Electricity used in the MPR Station	Continuous metering at Point 4	MWh	m	Cont.	100%	Electronic	
8. F5	Amount of LFG to CHP-plant	Continuous flow meter at Point 5	m^3	m	Cont.	100%	Electronic	
9. F6	Flow of natural gas	Point 6	m3			100%	Electronic	
10. P6	Pressure of natural gas	Point 6	Pa				Electronic	
11. T6	Temperature of natural gas	Point 6	°C				Electronic	
12. E7	Electricity generated by the project	Continuous energy metering at Point 7	MWh	m	Cont.	100%	Electronic	
13. Q8	Heat generated by the project	Continuous energy metering at Point 8	MWh	m	Cont.	100%	Electronic	

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

>>

Monitoring Points 1 – 8 are presented in the figure in Annex 4.

According to the chosen baseline methodology, the greenhouse gas emission reduction ER_y achieved by the project during a given year *y* will be calculates as

$$ER_y = ERM_{y,net} + (ERH_{y,gross} + ERE_{y,gross} - E_{ng})$$

Where

$ERM_{y,net}$ = *net emission reduction from methane reduction*

$ERH_{y,gross}$ = *gross emission reduction from heat generation*

$ERE_{y,gross}$ = *gross emission reduction from power generation*

E_{ng} = *emissions generated from the utilisation of natural gas*

Reduction of methane emissions from the landfill site

The greenhouse gas emission reduction achieved by reducing methane from the landfill site during a given year "y" ($ERM_{y,net}$) will be calculated as

$$ERM_{y,net} = (MD_{project,y} - MD_{reg,y}) \times GWP_{CH4} - EO$$ *, where*

$MD_{project,y}$ = *the amount of methane actually destroyed/combusted during the year in* tCH_4

$MD_{reg,y}$ = *0 (no regulatory requirements)*

GWP_{CH4} =*21* tCO_2e/tCH_4 *(the approved Global Warming Potential of methane)*

EO = Emissions from the operation of the landfill equipment (Measuring, Pumping and Regulation Station)

$MD_{project}$ will be calculated as

$MD_{project} = MD_{flare} + MD_{CHP}$ *, where*

$MD_{flare} = F2 * CH_41 * D_{CH4} * FE3$ *(methane destroyed in the flare in tCH4)*

$MD_{CHP} = F5 * CH_41 * D_{CH4}$ *(methane destroyed in the CHP plant in tCH4)*

The volumetric flows of methane to the flare (*F2*) and to the CHP Plant (*F5*), as well as the methane content in the landfill gas (CH_41) are continuously measured. The density of the methane can be calculated from the equation

$D_{CH4}(T, p) = D_{CH4}(T0,p0) * (p1 - p0)/(T1-T0)$ *, where*

$D_{CH4}(T0, p0) = 0.0007168\ t_{CH4}/m3_{CH4}$ *(Density of methane at normal temperature and pressure)*

T0 = 273.15 K, p0 = 101300 Pa

The Flare efficiency FE3 is measured as the fraction of time the flare is functioning (burning the gas) multiplied by the efficiency of the flaring process. The efficiency is measured quarterly and the flare operating hours are measured continuously:

$FE3 = T_{flare} * (1-\eta_{flare})$, *where*

T_{flare} = *Flare operating time in %*

η_{flare} = *Measured flare combustion efficiency as of amount of CH_4 left in the flare gas from the amount going in to the flare in %.*

Finally, the emissions caused by the electricity consumed by the landfill equipment will be calculated as

$EO = E4 * CEF_{electricity}$, *where*

E4 = the electricity consumption measured continuously in MWh

$CEF_{electricity}$ =*CO_2 emissions intensity of the electricity consumed in tCO_2/MWh.*

Reduction of CO_2 emissions from heat generation

For a chosen year *y* the emission reduction from heat generation $ERH_{y,gross}$ will be calculated as:

$ERH_{y,gross} = Q8_y * CEF_{termal}$, *where*

$Q8_y$ = *amount of heat produced during the year y at the CHP Plant in MWh*

$CEF_{thermal}$ =*CO_2 emissions intensity of the thermal energy displaced tCO_2/MWh*

Q8 will be continuously metered and is the basis for the heat sales from the plant. Existing Domeikava boiler plant uses natural gas for district heating and has an efficiency of approximately 90%. Therefore the $CEF_{thermal}$ is estimated as

$CEF_{thermal} = f_{CO2} * x_{ox} / \eta_{old\ boiler}$, *where*

f_{CO2} = *carbon emission factor for natural gas (56.1 tCO_2/TJ, IPCC standard value)*

x_{ox} = *percentage of carbon oxidised in combustion (0.995, IPCC standard value)*

$\eta_{old\ boiler}$ = *efficiency of the existing boiler (90%)*

$CEF_{thermal}$ is thus 0.223 tCO_2/MWh.

Reduction of CO_2 emissions from electricity generation

For a chosen year *y* the emission reduction from electricity generation $ERE_{y,gross}$ will be calculated as:

$ERE_{y,gross} = E7_y \times CEF_{electricity}$, *where*

$E7_y$ = *net quantity of electricity generated during the year y*

$CEF_{electricity}$ = CO_2 *emissions intensity of the electricity displaced*

E7 is continuously measured and it is the basis for the electricity sales of the project. *E7* is net of any self-consumption of electricity at the CHP plant. $CEF_{electricity}$ has been calculated based on the emissions from the Lithuanian Power Plant. $CEF_{electricity}$ for the project is thus 0.610 tCO_2/MWh. The same emissions intensity is used for consumption of electricity at the landfill site; grid losses are not taken into account.

Emissions from the consumption of natural gas at the new CHP plant

Since $ERH_{y,gross}$ and $ERE_{y,gross}$ are calculated as gross emission reductions based on the use of LFG gas only, the emissions from the consumption of natural gas at the new CHP plant must be reduced. E_{ng} is calculated as

$E_{ng} = Q6 * f_{CO2} * x_{ox}$, *where*

Q6 = Consumption of natural gas in MWh per year (calculated on the basis of continuous measurements F6, p6 and T6)

f_{CO2} = *carbon emission factor for natural gas (56.1* tCO_2*/TJ, IPCC standard value)*

x_{ox} = *percentage of carbon oxidised in combustion (0.995, IPCC standard value)*

D.1.3. Treatment of leakage in the monitoring plan:

Not applicable (Following the approach of ACM001 version 2, no leakage effects need to be accounted).

D.1.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project:								
ID number *(Please use numbers to ease cross-referencing to D.2.)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.1.3.2. Description of formulae used to estimate leakage (for each gas, source etc.; emissions in units of CO_2 equivalent):

>>

Not applicable

D.1.4. Description of formulae used to estimate emission reductions for the project (for each gas, source etc.; emissions/emission reductions in units of CO_2 equivalent):

>>

The project will reduce greenhouse gas emissions in three ways:

- Reduction of methane (CH_4) emissions from the landfill site;
- Reduction of carbon dioxide (CO_2) emissions from heat generation; and
- Reduction of carbon dioxide (CO_2) power generation.

According to the chosen baseline methodology, the greenhouse gas emission reduction ER_y achieved by the project during a given year *y* will be calculates as

$$ER_y = ERM_y + (ERH_{y,gross} + ERE_{y,gross} - E_{ng})$$

Where

ERM_y = *net emission reduction from methane reduction*

$ERH_{y,gross}$ = *gross emission reduction from heat generation*

ERE_y = *gross emission reduction from power generation*

E_{ng} = *emissions from the utilisation of natural gas*

Reduction of methane emissions from the landfill site

The greenhouse gas emission reduction achieved by reducing methane from the landfill site during a given year "y" (ERM_y) will be calculated as

$$ERM_y = (MD_{project,y} - MD_{reg,y}) \times GWP_{CH4} - E_0$$

where

$MD_{project,y}$ = *the amount of methane actually destroyed/combusted during the year*

$MD_{reg,y}$ = *the amount of methane that would have been destroyed/combusted during the year in the absence of the project*

GWP_{CH4} = *Global Warming Potential of methane*

E_0 = *Emissions due to the electricity consumption of the landfill equipment*

The Lithuanian and EU legislation require that existing landfill sites in Lithuania must implement a gas collection system by 1st January 2012. New landfill sites must have a gas collection system by 16 July 2009. The legislation does not provide a specific efficiency for the gas collection systems. It is therefore conservative to estimate that

$MD_{reg,y}$ = 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

In the absence of the project, the current situation would continue and landfill gases from Field 1 of Lapes landfill would be released in the air until the end of 2011. A simple flaring system would be installed in 2012 because of the legislative requirements.

In 2010, Field 3 of the landfill will be opened and Field 1 will be covered and closed. Owing to the coverage, the landfill gas production in Field 1 will increase. Since the legislation requires gas capture for new landfill sites from 16 July 2009, the emission reductions from Field 3 are therefore not taken into account, as for Field 3 $MD_{reg,y} = MD_{project,y}$.

Landfill gas collection efficiency is estimated at 80%. The gas is either flared or used in the CHP plant to be built. The estimated annual reduction of emissions from the 1st field of the landfill site is about 24,500 tCO2e until 2009 and 46,400 tCO2e in 2010-2011.

Electricity consumption of the landfill equipment is caused by compressors and lightning. The level of consumption is estimated at 100 – 300 MWh/a during 2007 – 2012.

Reduction of CO_2 emissions from heat generation

For a chosen year *y* the gross emission reduction from heat generation $ERH_{y,gross}$ will be calculated as:

$$ERH_{y,gross} = ET_y \times CEF_{thermal,y}$$

Where

ET_y = *thermal energy displaced during the year y*

$CEF_{thermal,y}$ =CO_2 *emissions intensity of the thermal energy displaced*

Existing Domeikava boiler plant uses natural gas for district heating and has an efficiency of approximately 90%. In the 4th quarter of 2007 the new CHP plant will replace the existing boiler producing annually 8,500 MWh of heat from biogas and natural gas. Greenhouse gas emissions will be reduced since the natural gas for heat generation is to a great extent replaced by biogas.

Reduction of CO_2 emissions from electricity generation

For a chosen year *y* the gross emission reduction from electricity generation ERE_y will be calculated as:

$$ERE_y = EG_y \times CEF_{electricity,y}$$

Where

EG_y = *net quantity of electricity displaced during the year y*

$CEF_{electricity,y}$ = CO_2 *emissions intensity of the electricity displaced*

Since the 4th quarter of 2007 the new CHP plant will generate approximately 7,068 MWh of electricity annually from biogas and natural gas. Greenhouse gas emissions will be reduced since electricity generated by biogas will replace fossil fuels in power generation.

The Lithuanian power system mainly consists of the Ignalina nuclear power plant (2,600 MW, Unit 1 was decommissioned in 2005 leaving 1,300 MW in operation), one large thermal power plant (Lithuanian Power Plant, 1,800 MW) using natural gas, heavy fuel oil and orimulsion, as well as several minor CHP plants. The system also includes hydro power plants (114 MW) and one hydro pumping storage plant (900 MW). The total installed power capacity in Lithuania is more than 6,000 MW but the maximum need for power in Lithuania is only about 2,000 MW. Lithuania therefore exports power to Belarus, Latvia and Poland.

LIETUVOS ELEKTRINIŲ ĮRENGTOJI GALIA, MW	INSTALLED CAPACITY IN LITHUANIAN POWER PLANTS, MW	1999	2000	2001	2002	2003
ATOMINĖ ELEKTRINĖ	**NUCLEAR PLANT**	**2600**	**2600**	**2600**	**2600**	**2600**
Ignalinos atominė elektrinė	Ignalina Nuclear Power Plant	2600	2600	2600	2600	2600
ŠILUMINĖS ELEKTRINĖS	**THERMAL POWER PLANTS**	**2567**	**2567**	**2567**	**2567**	**2567**
Lietuvos elektrinė	Lithuanian Power Plant	1800	1800	1800	1800	1800
Vilniaus elektrinė	Vilnius Power Plant	384	384	384	384	384
Kauno elektrinė	Kaunas Power Plant	178	178	178	178	178
Mažeikių elektrinė	Mažeikiai Power Plant	194	194	194	194	194
Klaipėdos elektrinė	Klaipėda Power Plant	11	11	11	11	11
HIDROELEKTRINĖS	**HYDRO AND PUMPED STORAGE POWER PLANTS**	**909**	**910**	**914**	**914**	**1014**
Kauno hidroelektrinė	Kaunas Hydro Power Plant	101	101	101	101	101
Kruonio hidroakumuliacinė elektrinė	Kruonis Pumped Storage Plant	800	800	800	800	900
Mažosios hidroelektrinės	Small Hydro Power Plants	8	9	13	13	13
PRAMONĖS ĮMONIŲ ELEKTRINĖS	**POWER PLANTS OWNED BY OTHER ENTERPRISES**	**51**	**51**	**76**	**76**	**76**
IŠ VISO	**TOTAL**	**6127**	**6127**	**6157**	**6157**	**6257**

Figure 3. Installed capacity in Lithuanian power plants in 2003. Source: Lietuvos Energija, Dispatch Centre's Operations.

As mentioned, Unit 1 of Ignalina was decommissioned in 2005. It has been decided that Unit 2 of Ignalina will be decommissioned before the end of 2009. This will significantly increase power production from the Lithuanian Power Plant, as well as other fossil fuel power plants. The Figure below shows an estimated projection of electricity generation in Lithuania. It can be seen that the growing domestic demand, as well as the demand for exports will be covered by the condensing Lithuanian Power Plant. The CHP plants will be operated mainly based on their heat load.

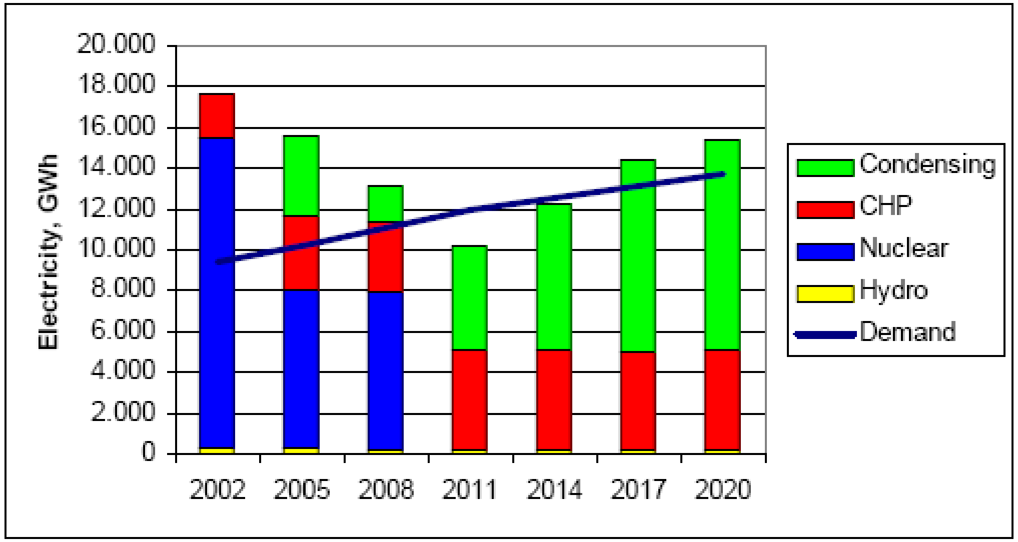

Figure 4. Electricity generation in Lithuania assuming a common Baltic electricity market and a phased closure of the Ignalina Power Plant. Source: Lithuanian Energy Institute, Economic Analyses in the Electricity Sector in Lithuania, February 2002.

Therefore the Lapes landfill project will replace electricity generated at the Lithuanian Power Plant, which is used to regulate the grid. The emission factor for the Lithuanian Power Plant is 610.54 tCO2/GWh and this has been used as the baseline factor in the Project: $CEF_{electricity} = 0.6105$ *tCO2/MWh.* See Annex 2 for detailed calculation.

The EU directive linking the Kyoto project-based mechanisms with the EU emissions trading scheme[5] states that if ERUs are credited to an activity that indirectly reduces emissions in installations covered under the EU emissions trading directive, a corresponding number of emission allowances must be reduced from the country's allocation. There is therefore no problem of double counting regarding the emission reductions from the power generation, even if the Lithuanian Power Plant is under the EU ETS. Lithuanian authorities have confirmed that such reserve for JI projects will be implemented in the National Allocation Plan 2008-2012.

[5] Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC

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

>>
Not applicable

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

Data *(Indicate table and ID number)*	Uncertainty level of data (high/medium/low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
1. F1 5. F2 8. F5	Low	Flow meters should be subject to a regular maintenance and testing regime to ensure accuracy.
6. FE3	Medium	Regular maintenance, regular checks
4. $CH_4$1	Low	Gas analyser should be subject to a regular maintenance and testing regime to ensure accuracy.

From the viewpoint of quality control and quality assurance the monitoring of the project is relatively straightforward, since the quantity of methane extracted and combusted at the CHP plant and flare stack is a key element determining the emission reductions. The reliability of the monitoring will be determined by two factors, i.e. the accuracy of the measuring instruments and the technical reliability of the equipment. The measuring instruments and equipment will meet either Lithuanian national standards or international standards (DIN-standards or comparable). During the periodic verification of the project, the authenticity of the uncertainty levels and instruments will be undertaken by the verifier and required data adjustments and other corrective actions will be taken accordingly.

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

>>

The Managing Director of UAB "Ekoresursai" will be supervising the monitoring plan and is ultimately responsible for its implementation. The Managing Director will appoint one of the operators working on the project site to take care of the daily monitoring activities including:

- Daily/Weekly check of the instrumentation
- Monthly filling of the monitoring sheets in Excel
- Quarterly measurements of the flare efficiency
- Annual calibration of the equipment or as needed

- Other tasks as needed

All the data collected will be guarded in electronic form (Excel workbooks) and archived during the crediting period and two years after (until 31st December 2014). Back-up copies of the archive will be kept in a separate physical place. Same care shall be used for handling and archiving the monitoring material as is used for the financial bookkeeping of the company.

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

>>

The monitoring plan has been developed by GreenStream Network Ltd. under a contract with UAB "Ekoresursai". GreenStream Network is not a participant in the project. The monitoring plan was completed in February 2006 and revised in May 2006 and February/March 2007.

SECTION E. Estimation of greenhouse gas emission reductions

E.1. Estimated project emissions:

>>

The methane emissions from the landfill gas after the implementation of the project can be estimated by reducing the amount of captured methane consumed by the flare, the boiler and the generator from the total estimated landfill emissions. The collection efficiency is estimated at 80%. There are also project emissions resulting from the utilisation of natural gas in the CHP plant.

The estimated greenhouse gas emissions during the project activity are:

Source	2007	2008	2009	2010	2011	2012
Landfill fugitive emissions	2044	6132	6132	11604	11604	11604
Natural gas utilisation	87	1 045	1 045	1 045	1 045	1 045
Emissions caused by the landfill equipment	34	99	99	186	186	186
TOTAL	**2165**	**7275**	**7275**	**12835**	**12835**	**12835**

E.2. Estimated leakage:

>>

No leakage is taken into account. E.2 = 0

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

>>

	2007	2008	2009	2010	2011	2012
The sum of E.1. and E.2.	**2165**	**7275**	**7275**	**12835**	**12835**	**12835**

E.4. Estimated baseline emissions:

>> The estimated baseline emissions are:

Source	2007	2008	2009	2010	2011	2012
Landfill emissions	10219	3065 8	3065 8	58020	58020	11790
Emissions from heat generation	158	1898	1898	1898	1898	1898
Emissions from power generation	360	4315	4315	4315	4315	4315
TOTAL	**10737**	**3687 1**	**3687 1**	**64233**	**64233**	**18003**

There is a significant increase in the landfill emissions from year 2009 to year 2010. This is owing to the closing of the Field No 1 of the landfill. According to a study conducted by the Swedish expert Kare Löfgren in 2003, the emissions from the Field No 1 are expected to increase from 465 Nm^3/h to 880 Nm^3/h when the field is covered.

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

>>

Emissions, tCO2e	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Baseline Emissions	10737	36871	36871	64233	64233	18003
Project Emissions	2165	7275	7275	12835	12835	12835
Emission Reduction	**8572**	**29596**	**29596**	**51398**	**51398**	**5168**

Estimated emission reductions in 2007-2012: 175,727 tCO2e.

Estimated emission reductions in 2008-2012: 167,155 tCO2e.

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

>>

Year	Estimated project emissions (tonnes of CO_2 equivalent)	Estimated leakage (tonnes of CO_2 equivalent)	Estimated baseline emissions (tonnes of CO_2 equivalent)	Estimated emission reductions (tonnes of CO_2 equivalent)
2007	2165	0	10737	8572
2008	7275	0	36871	29596
2009	7275	0	36871	29596
2010	12835	0	64233	51398
2011	12835	0	64233	51398
2012	12835	0	18003	5168
Total 2007-2012 (tonnes of CO_2 equivalent)	55221	0	230948	175727
Total 2008-2012 (tonnes of CO_2 equivalent)	53056	0	220211	167155

SECTION F. Environmental impacts

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

>>

Electricity Sector

One of the strategic targets of the Lithuanian energy sector is to implement the complex of the measures contributing to implementation of the directives of EU environmental protection and striving that renewable resources would consist up to 12 per cent in the overall primary energy balance in 2010. In this context it can be concluded that the project is in line with Lithuanian and European policies to increase the utilisation of renewable energy sources. Also, combined heat and power production is more efficient than heat or power only plants and therefore preferred.

Local environmental benefits

Reduced landfill gas emissions will have positive health and local environment benefits. The hazard risk of fire and explosions will also be reduced. In addition, replacing fossil fuels in power and heat generation with biogas will reduce sulphur and other harmful emissions.

Landfill gas utilisation system installed let to reduce the scope and amount of the gases as well as it smell's impact. In relative terms, it will positively contribute to the quality of living of the local population, which consist of 2269 persons (as of January 1st 2006).

In addition, heat will be supplied to Domeikava village. A positive environmental impact of the project here is the removal of mazut fuel storages. There will be no need to use mazut anymore for heat production, which reduces environmental risks, respectively.

Socio-economic aspects

The construction and to some extent the operation and maintenance of the system will create jobs. This will be the first landfill gas utilisation system in Lithuania and it has a large replication potential in other Lithuanian landfills. Utilisation of domestic renewable energy will reduce dependency on imported fossil fuels and has a positive impact on balance of payments.

The JI project will result in supply of heat energy to Heat producer AB "Kauno energija" for price up to 10 per cent lower than the price level before the project. In this respect AB "Kauno energija" shall have more possibilities to provide services of better quality and relatively lower price to customers as well as have more opportunities to increase the number of customers.

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

>>

According to the respective country regulation (Law on business activity environmental impact assessment (2005, June 21, No X-258), the concerned JI project does not belong to the infrastruture projects, which require an environmental assessment. Nevertheless, the Project proponent has to receive the respective formal letter thereof from the Ministry of Environment. Whereas the JI project technical solution shall be specified in detailed design, it is reasonable and respectively advised to resolve issues of environmental impact assessment at the considered project cycle stage.

SECTION G. Stakeholders' comments

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

>>

Stakeholder comments have been invited and compiled in accordance with local planning and permitting legislation as outlined below, as well as through Lithuania's JI procedures.

An application has been submitted to the Municipality in order to receive the technical conditions for designing in accordance with the Technical regulation of the construction STR 1.05.07:2002 – "the set of design conditions for a construction works" approved by the order No.215, 30.04.2002, of the Minister of Economy.

All electricity equipment must fulfil the requirements of the "Rules of the electricity equipment installation" and " the instructions of the technical exploitation " prepared by the manufacturer. Before the exploitation of the electricity equipment the requirements of "Rules of the accident prevention exploiting the electricity equipment DT 11-02" and the rules of the technical exploitation must be fulfilled.

Other relevant authorisations relate to the JI project implementation and are subject to the detailed design and construction works. They are the following:

1. Permissions for detailed design
2. Permissions for the procurement of equipment
3. Construction Permissions
4. Inspections of the constructions
    i. Construction
    ii. Electrification and automation
    iii. Environmental
    iv. Pressure vessels
    v. Safety and fire
5. Final permissions to take over and start up commercial functions.

As to the legal regulation of the country the requirements listed above are subject to normal business practice as to relevant construction works under the considered JI project. Therefore they are within the scope of the entity making detailed design or main contractor.

On 03.11.2005 the project was presented at a public Emissions trading seminar, which took place in Vilnius.

The project has also been introduced to Kaunas district municipality, as well as to the Lapės and Domeikava representatives. In addition, as part of the environmental impact assessment and the pollution evaluation of the project, an announcement was published in the „Kauno diena" newspaper on 16.3.2006. Information about the project was made public and available for all newspaper readers.

The planning and permitting procedures are public, and information about the project is made available during the procedures through posting information.

According to the country regulations for JI projects (Order of Minister of Environment regarding rules for implementation of Joint Implementation projects, April 1, 2005, No D1-183) the respective framework for public consultation shall be arranged during the PDD evaluation and approval process. The earlier PDD version of the project has been made publicly available since 20.3.2006 on the internet pages of the Lithuanian Environmental Investment Fund (LAAIF), as part of the country's JI procedures.

No comments have been received from local stakeholders.

Below a summary of the stakeholder consultations is given:

3.11.2005	Presentation in Emissions trading seminar, which took place in Vilnius
2.3.2006	Environmental impact assessment conclusion, approved by the Ministry of Environment, local office of Kaunas region
16.3.2006	Announcement in the newspaper "Kauno diena" about the place for information about the project and environmental impact assessment
12.5.2006	The project introduction to the energetic department of the Kaunas municipality
23.1.2007	Resolution no. 158 by municipal government fixing the technical conditions for designing

Annex 1

CONTACT INFORMATION ON PROJECT PARTICIPANTS

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Annex 2

BASELINE INFORMATION

BASELINE SCENARIO	**Code**	**Unit**	**Value**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Methane content		%-vol	50 %						
Methane calorific value		MJ/kg	49,8						
Methane density @ NTP		kg/m3	0,7168						
Methane GWP		tCO2e/tCH4	21						
Collection efficiency		%	80 %						
Biogas from the 1st field *(*1*)*		m3/h	-	155	465	465	880	880	880
Methane flow		m3/h	-	78	233	233	440	440	440
Methane flow		m3/a	-	678 900	2 036 700	2 036 700	3 854 400	3 854 400	3 854 400
Methane actually combusted	$MD_{project,y}$	tCH4		389	1 168	1 168	2 210	2 210	2 210
Methane actually combusted		tCO2e		8 175	24 526	24 526	46 416	46 416	46 416
Fugitive emissions		tCO2e		2 044	6 132	6 132	11 604	11 604	11 604
Baseline emissions from the landfill *(*2*)*		tCO2e	-	10 219	30 658	30 658	58 020	58 020	11 790
Baseline, tCO2/MWh *(*3*)*	$CEF_{electricity,y}$	tCO2/MWh	0,6105						
Electricity consumption of the landfill equipment (*2*)	E4	MWh/a		56	162	162	305	305	305
Emissions caused by the landfill equipment (*2*)	E_0	tCO2e		34	99	99	186	186	186
Net emission reduction from methane reduction	**ERM_y**	**tCO2e**	**-**	**8 141**	**24 428**	**24 428**	**46 230**	**46 230**	**-**
District heating (*4*)	ET_y	kWh/a		708 333	8 500 000	8 500 000	8 500 000	8 500 000	8 500 000
Existing boiler uses natural gas									
Efficiency			90 %						
Carbon Emission Factor		tC/TJ	15,3						
Carbon oxidised			99,5%						
CO2 emissions	$CEF_{thermal,y}$	tCO2/TJ	55,82						
	$CEF_{thermal,y}$	tCO2/MWh	0,223						
Gross emission reduction from heat generation	**$ERH_{y,gross}$**	**tCO2e**		**158**	**1 898**	**1 898**	**1 898**	**1 898**	**1 898**
Net Electricity (*4*)	EG_y	MWh/a		589	7 068	7 068	7 068	7 068	7 068
Baseline, tCO2/MWh *(*3*)*	$CEF_{electricity,y}$	tCO2/MWh	0,6105						
Gross emission reduction from power generation	**$ERE_{y,gross}$**	**tCO2e**		**360**	**4 315**	**4 315**	**4 315**	**4 315**	**4 315**
Natural gas heating value		MJ/m3	36,00						
Consumption of natural gas		m3/a		43 333	520 000	520 000	520 000	520 000	520 000
		MJ/a		1 560 000	18 720 000	18 720 000	18 720 000	18 720 000	18 720 000
CO2 emissions from natural gas consumption	E_{ng}	**tCO2e**		**87**	**1 045**	**1 045**	**1 045**	**1 045**	**1 045**
CO2 Emission Reduction (CHP)	**$ERH_{y,gross} + ERE_{y,gross} - E_{ng}$**	**tCO2e**		**431**	**5 168**	**5 168**	**5 168**	**5 168**	**5 168**
TOTAL BASELINE EMISSIONS		**tCO2e**		**10 737**	**36 871**	**36 871**	**64 233**	**64 233**	**18 003**
TOTAL PROJECT EMISSIONS		**tCO2e**		**2 165**	**7 275**	**7 275**	**12 835**	**12 835**	**12 835**
TOTAL EMISSION REDUCTION	**ER_y**	**tCO2e**		**8 572**	**29 596**	**29 596**	**51 398**	**51 398**	**5 168**
Total 2007-2012	**ER_y**	**tCO2e**	**175 727**						
Annual avarage 2007-2012			**29 288**						
Total 2008-2012	**ER_y**	**tCO2e**	**167 155**						
Annual avarage 2008-2012			**33 431**						

(*1*) Based on the study conducted by Kare Löfgren in 2003. Increase in the gas flow in 2010 is due to closing of the field. Estimated starting date September 1st, 2007

(*2*) Baseline in 2012 is equal to project emissions because the legislation requires collection of landfill gas starting in 2012.

(*3*) See next table for determination of the emission factor.

(*4*) Estimated starting date December 1st, 2007

IPCC Emission Factors, tC/TJ	
Heavy Fuel Oil	21,1
Natural Gas	15,3
Orimulsion	22,0
IPCC Net Calorific Values	
Heavy Fuel Oil, TJ/ktonne	40,2
Natural Gas, MJ/m3	36,0
Orimulsion, TJ/ktonne	27,5
Fraction of Carbon Oxidised	
Heavy Fuel Oil	0,990
Natural Gas	0,995
Orimulsion	0,990

Lithuanian Power Plant

Fuel Consumption in 2002		Fuel Consumption before 2010 scenario 1		Fuel Consumption before 2010 scenario 2	
(Source: LEI - EIA)		*(Source: LEI - EIA)*		*(Source: LEI - EIA)*	
Heavy Fuel Oil, ktonnes	7,8	Heavy Fuel Oil, ktonnes	35,0	Heavy Fuel Oil, ktonnes	-
Natural Gas, Million m3	199,0	Natural Gas, Million m3	550,0	Natural Gas, Million m3	400,0
Orimulsion, ktonnes	52,5	Orimulsion, ktonnes	240,0	Orimulsion, ktonnes	465,0
Power Production, GWh	**739,0**	**Power Production, GWh**	**2 850,0**	**Power Production, GWh**	**2 850,0**

CO2 emissions, tCO2					
Heavy Fuel Oil	24 011		107 740		-
Natural Gas	399 891		1 105 226		803 801
Orimulsion	115 298		527 076		1 021 210
TOTAL	**539 199**		**1 740 042**		**1 825 011**

Specific CO2 emissions tCO2/GWh	**729,63**		**610,54**		**640,35**

Most conservative baseline, tCO2/GWh	**610,54**

LEI-EIA: Lithuanian Energy Institute. Environmental Impact Assessment of Proposed Economic Activity, Lithuanian Power Plant. 8 September 2003.

Annex 3

MONITORING PLAN