# DETERMINATION REPORT TISECO

## DETERMINATION OF THE LANDFILL METHANE CAPTURE AND UTILISATION AT MARIUPOL LANDFILLS, UKRAINE.

REPORT NO. UKRAINE/0053/2009

REVISION NO. 01

BUREAU VERITAS CERTIFICATION

# DETERMINATION REPORT

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| Date of first issue:<br>18/01/2010 | Organizational unit<br>Bureau Veritas Certification Holding SAS |
| Client:<br>TisEco | Client ref.:<br>Nina Isayeva |

Summary:

Bureau Veritas Certification has made the determination of the «Landfill methane capture and utilisation at Mariupol landfills, Ukraine» project of TisEco located in Mariupol city on the basis of UNFCCC criteria for the JI, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 6 of the Kyoto Protocol, the JI rules and modalities and the subsequent decisions by the JI Supervisory Committee, as well as the host country criteria. The project is submitted under the track 1 procedure.

The determination scope is defined as an independent and objective review of the project design document, the project's baseline study, monitoring plan and other relevant documents, and consisted of the following three phases: i) desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) resolution of outstanding issues and the issuance of the final determination report and opinion. The overall determination, from Contract Review to Determination Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

The first output of the determination process is a list of Clarification and Corrective Actions Requests (CL and CAR), presented in Appendix A. Taking into account this output, the project proponent revised its project design document.

In summary, it is Bureau Veritas Certification's opinion that the project correctly applies the baseline and monitoring methodology developed according the Guidance on Criteria for Baseline Setting and Monitoring and meets the relevant UNFCCC requirements for the JI and the relevant host country criteria.

On behalf of determination team Flavio Gomes, Bureau Veritas Certification Holding SAS Global Product Manager for Climate Change, approved final version of the Determination Report. Determination Report is signed by Ivan Sokolov authorized Bureau Veritas Certification Holding SAS Local product manager for Climate Change in Ukraine.

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|---|---|---|
| Report No.:<br>UKRAINE/0053/2009 | Subject Group:<br>JI | |
| Report title:<br>Landfill methane capture and utilisation at Mariupol landfills, Ukraine | | |
| Work carried out by:<br>Nadiya Kaiiun – Team leader , Lead Verifier<br>Oleg Skoblyk - Team member, Verifier<br>Kateryna Zinevych – Team member, Verifier | | |
| Work verified by:<br>Ivan Sokolov - Internal Technical Reviewer | | |
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**Indexing terms:**

Climate Change, Kyoto Protocol, JI, Emission Reductions, Verification

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## Abbreviations

| | |
|---|---|
| CAR | Corrective Action Request |
| CL | Clarification Request |
| CO | Carbon Monoxide |
| $CO_2$ | Carbon Dioxide |
| $CH_4$ | Methane |
| EIA | Environmental Impact Assessment |
| ERU | Emission Reduction Unit |
| FCCC | Framework Convention On Climate Changes |
| GHG | Green House Gas(es) |
| JI | Joint Implementation |
| JIP | Joint Implementation Projects |
| JISC | Joint Implementation Supervisory Committee |
| I | Interview |
| IE | Independent Entity |
| IETA | International Emissions Trading Association |
| MoV | Means of Verification |
| PDD | Project Design Document |
| PP | Project Participant |
| SP | Sub Project |
| UNFCCC | United Nations Framework Convention for Climate Change |
| UES | United Energy System |

# DETERMINATION REPORT

## Table of Contents

# 1 INTRODUCTION

TisEco has commissioned Bureau Veritas Certification to determinate the JI project Improvement of the "Landfill methane capture and utilisation at Mariupol landfills, Ukraine".

This report summarizes the findings of the determination of the project, performed on the basis of UNFCCC criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting, under track 1.

## 1.1 Objective

The determination serves as project design verification and is a requirement of all projects. The determination is an independent third party assessment of the project design. In particular, the project's baseline, the monitoring plan, and the project's compliance with relevant UNFCCC and host country criteria are determined in order to confirm that the project design, as documented, is sound and reasonable, and meet the stated requirements and identified criteria. Determination is a requirement for all JI projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of emission reduction units (ERUs).

UNFCCC criteria refer to Article 6 of the Kyoto Protocol, the JI rules and modalities and the subsequent decisions by the JI Supervisory Committee, as well as the host country criteria.

## 1.2 Scope

The determination scope is defined as an independent and objective review of the project design document, the project's baseline study and monitoring plan and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations.

The determination is not meant to provide any consulting towards the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.

## 1.3 GHG Project Description

The project "Landfill methane capture and utilisation at Mariupol landfills {hereinafter referred to as Sites}, Ukraine" {hereinafter referred to as Project} has been developed by Scientific-Engineering Centre Biomass, Ukraine.

The Project consists of developing a Landfill Gas ("LFG") collection and flaring system with an opportunity of its further energy utilization in order to avoid emissions of methane being released into the atmosphere. LFG production results from waste decay

in the anaerobic conditions created in the landfill body. LFG contains approximately 50% methane ("$CH_4$"), which is a powerful greenhouse gas ("GhG") contributing to global warming. Additionally, LFG is a fire hazard and causes bad odours in the vicinity of the site. By capturing the LFG, GhG emissions are reduced, local environmental impacts are mitigated and the operational safety of the site is increased.

The proposed Project includes capturing LFG and combusting it in the flare and further utilization for combined electricity and heat production. The estimated capacity of LFG power engines which can be commissioned is 0.7 MW for the Primorsky landfill and 1.5 MW for the Ordzhonikidze landfill. The decision to invest in LFG to Energy ("LFGTE") modules and choice of the actual capacity will be made on the basis of an economic review, possibility to connect to the public grid, heat consumers availability and whether a Power Purchase Agreement ("PPA") can be obtained.

Mariupol is one the largest cities in Donetsk Region and the most developed industrial cities of Eastern Region of Ukraine with population of about 500 thousand inhabitants.

For MSW storage there are two landfills located on the territory of the city, which are among the 900 largest registered landfills of Ukraine. The landfills are owned by municipality and are operated by municipal company "Poligon TPV". The company received official state acts on use of land for operation of MSW landfill sites in 2005.

"TisEco" company has concluded contracts with Mariupol city council on the right of JI LFG collection project realization on two city's landfills in 2009.

Landfills' addresses are:

- 167 Krasnoflotska str., Prymorsky District (further referred to as "Prymorsky" landfill)
- 1 of May avenue, Ordzhonikidze District (further referred to as "Ordzhonikidzevsky" landfill)

Prymorsky landfill is located within the city boundary, 3 km from Azov sea and has a total area of 14.3 ha and the active area of 12.43 ha. The operation of the landfill was started in 1967. It is situated in the previous opencast mine of brick factory with the depth of about 10 meters. Currently the landfill represents a dump with a height of 7 to 23 meters. From the middle of 2008 the landfill doesn't receive waste except inert waste for surface covering.

According to operator's data annual amount of municipal solid waste disposed at the landfill during last years was about 250-300 thousand $m^3$/year (60-70 thousand tons/year), waste is registered by trucks number and volume. According to operator's the total amount of disposed waste is about 4930 thousand tons. This figure is probably overestimated due to lack of weighting. Total amount of waste accumulated at the landfill is estimated by landfill volume to be about 2.56 million tons (end of 2008).

Ordzhonikidzevsky landfill was put into operation in 1976; it is situated between two residential districts of the city – Illichivskyi and Ordzhonikidzensky, 100 meters from

Kalmius river. According to the landfill passport the total area of waste disposal is about 17,6 ha, an active area is 12,16 ha. According to operator's data annual amount of municipal solid waste disposed at the landfill during last years was about 350-400 thousand $m^3$ per annum (90-100 thousand tons a year). According to operator's data during last years the amount of disposed waste was about 3654 1thousand tons (to the end of 2008). Total amount of waste accumulated at the landfill to the end of 2008 is estimated by landfill volume to be about 2.54 million tons (end of 2008)

The landfills were opened as unofficial dumps not complying with waste disposal standards and ecological and sanitary norms: there are no leachate collection system and leachate protection screen for surface water and soil protection, surface water drainage system, working zone isolation, gas drainage and other environmental arrangements are also absent. Uncontrolled LFG output raises the risks of fires and explosions.

Technology of LFG capture and flaring/utilization is widely used throughout the world increasing safety of landfill operations and providing additional advantage through energy production. LFG collection and flaring system implementation enables methane emission into the atmosphere. In case of energy production additional emission reduction will be obtained by replacement of part of electrical and thermal energy from fossil fuels with the electricity and heat produced from $CO_2$ neutral fuel – landfill gas.

However, such projects are not financially viable under Ukrainian conditions and therefore cannot be implemented under "business-as-usual" scenario. Historically, non-compliance with requirements on proper operation of landfills is widespread in the host country mainly due to financial barriers, as well as lack of technical knowledge this is expected to continue. These obstacles create very high risk of the LFG project implementation. Currently LFG collection and flaring systems are installed on only 3 landfill sites in Ukraine within the JI Kyoto Protocol frames. Nevertheless, on a national level a potential for LFG recovery is large and LFG recovery and energy utilization can be replicated on other landfills.

Mariupol Municipality has signed the concession long-term agreement granting the rights for degasification of landfills and utilization of LFG to the Ukrainian private company TisEco. TisEco will be the owner and operator of the described projects at both sites.

The Project will contain the main activities at the Sites including:

- installation of wells and a piping network for LFG collection,
- installation of a flaring system including gas booster, flare and monitoring system, and
- commissioning of an CHP-unit set for power and heat production with connection to the power grid and heat supply to consumer.

Additional remediation activities at the landfill will address its environmental liabilities. These include:

- Reshaping the land and accumulated residues; and
- Partial sealing the site with clay or an industrial liner to facilitate the high efficiency of the LFG collection and contribute to the stability of the landfill as well as prevent methane from leaking into the atmosphere.

Planned Project Implementation is presented below (for Prymorsky landfill).

1. **August – September 2009 –** Project Design Document (PDD) prepared and project business plan finalized.
2. **December 2009** – Obtaining Letter of Approval from Ukrainian Government.
3. **December 2009 –** Complete drilling on all wells in Prymorsky landfill. Installation of pipes. Purchase of flaring plant and monitoring equipment.
4. **January 2010** – Flaring project testing, trials and fully operational in Prymorsky landfill.
5. **March 2010 –** Feasibility study on power generation.
6. **April 2010** - Decision making on CHP purchase and capacity selection.
7. **September 2010** – engine installation and start-up in Prymorsky landfill.
8. **September – December 2010** – Wells drilling in Ordzhonikidze landfill. Installation of pipes. Purchase of flaring plant and monitoring equipment.
9. **January 2010** – Flaring project testing, trials and fully operational in Ordzhonikidze landfill.
10. **March 2010 –** Feasibility study on power generation.
11. **April 2010** - Decision making on CHP purchase and capacity selection
12. **September 2010** – engine installation and start-up in Ordzhonikidze landfill

Please note: final timing of the project implementation phase will depend on the transaction process and investment agreement. The project will be implemented in two stages, first at the Primorsky landfill, than at the Ordzhonikidze landfill with at least one year delay.

Project costs will be partially covered by “TisEco” company and rest will be covered by loan capital; currently negotiations with few banks are in the process, in particular with European Bank of Reconstruction and Development. Also the option of partial project financing by ERUs buyer is under consideration.

The ex-ante analysis shows that the average amount of methane collected annually during the period of 2010-2012 will be 2,5-3,0 million $m^3$ of LFG per year (with methane share of 50%) at the Primorsky landfill and 4,5-6,0 million $m^3$ of LFG per year (with methane share of 50%) at the Ordzhonikidze landfill. Flaring alone will achieve an estimate of **126,000 tonnes** of $CO_2e$ reductions over the 3-year commitment period and flaring with combined electricity and heat production will achieve an estimate **of 176,000 tonnes** of $CO_2e$ reductions over the same period.

Besides GHG emission reductions, LFG capture will contribute to the improvement of local environmental, economic and social situations; providing benefits; the most important of which are listed below:
increasing safety of landfill operational procedures (for the Ordzhonikidze landfill);

demonstrating the state-of-the-art technology of LFG recovery in Ukraine and knowledge of the best landfill site management after the closing time, thus creating a better environment for replicating of similar investments projects; and
increasing clean technology investments and promoting of renewable energy sources.

## 1.4 Determination Group

The determination team consists of the following personnel:

Nadiya Kaiiun
Bureau Veritas Certification Team leader, Climate Change Lead Verifier

Oleg Skoblyk -
Bureau Veritas Certification Team member, Climate Change Verifier

Kateryna Zinevych -
Bureau Veritas Certification Team member, Climate Change Verifier

Report was reviewed by:

Ivan Sokolov
Bureau Veritas Certification Internal Technical Reviewer

# 2. METHODOLOGY

The overall determination, from Contract Review to Determination Report & Opinion, was conducted using Bureau Veritas Certification internal procedures.

In order to ensure transparency, a determination protocol was customized for the project, according to the Determination and Verification Manual (IETA/PCF). The protocol shows, in a transparent manner, criteria (requirements), means of verification and the results from validating the identified criteria. The determination protocol serves the following purposes:

It organizes, details and clarifies the requirements JI project is expected to meet;

It ensures a transparent determination process where the determinator will document how a particular requirement has been validated and the result of the determination.

The determination protocol consists of five tables. The different columns in these tables are described in Figure 1

# DETERMINATION REPORT

The completed determination protocol is enclosed in Appendix A to this report.

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| Determination Protocol Table 1: Mandatory Requirements | | | |
|---|---|---|---|
| **Requirement** | **Reference** | **Conclusion** | **Cross reference** |
| The requirements the project must meet. | Gives reference to the legislation or agreement where the requirement is found. | This is either acceptable based on evidence provided (**OK**), a **Corrective Action Request (CAR)** or a **Clarification Request (CL)** of risk or non-compliance with stated requirements. The CAR's and CL's are numbered and presented to the client in the Determination Report. | Used to refer to the relevant protocol questions in Tables 2, 3 and 4 to show how the specific requirement is determined. This is to ensure a transparent determination process. |

| Determination Protocol Table 2: Requirements checklist | | | | |
|---|---|---|---|---|
| **Checklist Question** | **Reference** | **Means of verification (MoV)** | **Comment** | **Draft and/or Final Conclusion** |
| The various requirements in Table 1 are linked to checklist questions the project should meet. The checklist is organized in several sections. Each section is then further sub-divided. The lowest level constitutes a checklist question. | Gives reference to documents where the answer to the checklist question or section is found. | Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable. | The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached. | This is either acceptable based on evidence provided (**OK**), or a **Corrective Action Request (CAR)** due to non-compliance with the checklist question. (See below). **Clarification Request (CL)** is used when the determination team has identified a need for further clarification. |
| **Determination Protocol Table 3: Baseline and Monitoring Methodologies** | | | | |
| **Checklist Question** | **Reference** | **Means of verification (MoV)** | **Comment** | **Draft and/or Final Conclusion** |
| The various requirements of baseline and monitoring methodologies should be met. The checklist is organized in several sections. Each section is then further sub-divided. The lowest level constitutes a checklist question. | Gives reference to documents where the answer to the checklist question or section is found. | Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable. | The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached. | This is either acceptable based on evidence provided (**OK**), or a **Corrective Action Request (CAR)** due to non-compliance with the checklist question. (See below). **Clarification Request (CL)** is used when the determination team has identified a need for further clarification. |

| Determination Protocol Table 4: Legal requirements | | | | |
|---|---|---|---|---|
| **Checklist Question** | **Reference** | **Means of verification (MoV)** | **Comment** | **Draft and/or Final Conclusion** |
| The national legal requirements the project must meet. | Gives reference to documents where the answer to the checklist question or section is found. | Explains how conformance with the checklist question is investigated. Examples of means of verification are document review (DR) or interview (I). N/A means not applicable. | The section is used to elaborate and discuss the checklist question and/or the conformance to the question. It is further used to explain the conclusions reached. | This is either acceptable based on evidence provided (**OK**), or a **Corrective Action Request (CAR)** due to non-compliance with the checklist question. (See below). **Clarification Request (CL)** is used when the determination team has identified a need for further clarification. |

| Determination Protocol Table 5: Resolution of Corrective Action and Clarification Requests | | | |
|---|---|---|---|
| **Report clarifications and corrective action requests** | **Ref. to checklist question in tables 1/2/3/4** | **Summary of project owner response** | **Determination conclusion** |
| If the conclusions from the Determination are either a Corrective Action Request or a Clarification Request, these should be listed in this section. | Reference to the checklist question number in Tables 2, 3 and 4 where the Corrective Action Request or Clarification Request is explained. | The responses given by the Client or other project participants during the communications with the determination team should be summarized in this section. | This section should summarize the determination team's responses and final conclusions. The conclusions should also be included in Tables 2, 3 and 4, under "Final Conclusion". |

**Figure 1 Determination protocol tables**

## 2.1 Review of Documents

The Project Design Document (PDD version 1.0) submitted by TisEco 31/08/2009 and additional background documents related to the project design and baseline, i.e. country Law, Guidelines for Completing the Project Design Document (JI-PDD), methodology, Kyoto Protocol, Clarifications on Determination Requirements to be Checked by an Independent Entity were reviewed.

To address Bureau Veritas Certification corrective action and clarification requests, TisEco revised the PDD and resubmitted it on 18/01/2010, version 1.2.

The determination findings presented in this report relate to the project as described in the PDD, revision 1.0.

## 2.2 Follow-Up Interviews

On 15/09/2009 Bureau Veritas Certification performed interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review.

Representatives of TisEco and SEC Biomass were interviewed (see References). The main topics of the interviews are summarized in Table 1.

**Table 1 Interview topics**

| Interviewed organization | Interviews Topics |
|---|---|
| TisEco | ➢ Organizational structure.<br>➢ Responsibilities and authorities.<br>➢ Training of personnel.<br>➢ Quality management procedures and technology.<br>➢ Rehabilitation /Implementation of equipment (records).<br>➢ Metering equipment control.<br>➢ Metering record keeping system, database. |
| SEC Biomass | ➢ Baseline methodology.<br>➢ Monitoring plan.<br>➢ Monitoring report.<br>➢ Deviations from PDD. |

## 2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the determination is to raise the requests for corrective actions and clarification and any other outstanding issues that needed to be clarified for Bureau Veritas Certification positive conclusion on the project design.

To guarantee the transparency of the determination process, the concerns raised are documented in more detail in the determination protocol in Appendix A.

# 3 DETERMINATION FINDINGS

In the following sections, the findings of the determination are stated. The determination findings for each determination subject are presented as follows:

1) The findings from the desk review of the original project design documents and the findings from interviews during the follow up visit are summarized. A more detailed record of these findings can be found in the Determination Protocol in Appendix A.

2) Where Bureau Veritas Certification had identified issues that needed clarification or that represented a risk to the fulfillment of the project objectives, a Clarification or Corrective Action Request, respectively, have been issued. The Clarification and Corrective Action Requests are stated, where applicable, in the following sections and are further documented in the Determination Protocol in Appendix A. The determination of the Project resulted in 12 Corrective Action Requests and 12 Clarification Requests.

3) The conclusions for determination subject are presented.

## 3.1 Project Design

Bureau Veritas Certification recognizes that TisEco Project is helping country fulfill its goals of promoting sustainable development. The project is expected to be in line with host-country specific JI requirements.

The Project Scenario is considered additional in comparison to the baseline scenario, and therefore eligible to receive Emissions Reductions Units (ERUs) under the JI, based on an analysis, presented by the PDD, of investment, technological and other barriers, and prevailing practice.

The project design is sound and the geographical and temporal (15 years) boundaries of the project are clearly defined.

Outstanding issues related to project design are given in the Table 5 below (see CAR1, CAR2, CAR3, CAR4, CAR5, CAR12, CAR13, CAR14, CL1, CL2, CL3, CL4, CL5).

## 3.2 Baseline and Additionality

To measure and to calculate natural gas leaks there is an approved methodology under The baseline and monitoring methodology to be applied for the proposed project activity is the approved consolidated baseline methodology ACM0001, version 11, May 2009: ***"Consolidated baseline and monitoring methodology for landfill gas project activities"***.
ACM0001 is applicable to this Project since the Project baseline is the continuation of the current situation (no landfill gas extraction and its total atmospheric release) and the Project Activities are landfill gas capture and flaring and possible energy generation.

There are only 4 options of pre conditions, which can be considered as possible and reliable alternatives for the Project:
(a) The continuation of the current situation: no landfill gas extraction

(b) Extraction of landfill gas and combustion of the gas in a flaring stack for methane emission reduction only (as non-JI project);

(c) Landfill owner invests in the landfill gas extraction system and LFG power and heat generation facility for electricity supply to the public network and heat providing to consumer (as non-JI project);

(d) A different use of biogas offsite is proposed/

Option (a) fits the best of all the suggested and determined options, and makes a basic option against all basic considered options.

Outstanding questions connected with baseline and additionality are given in Table 5 below (See CAR6, CAR7, CAR8, CAR9, CAR10, CAR11, CL6, CL7, CL8, CL9, CL10, CL11, CL12, CL13, CL14, CL15, CL16, CL17, CL18, CL19, CL23, CL24).

## 3.3 Monitoring plan

The Project uses the approved consolidated monitoring methodology ACM0001, version 11, May 2009: ***"Consolidated baseline and monitoring methodology for landfill gas project activities"***. Refer to section 3.2 above.

Outstanding questions connected with monitoring plan are given in Table 5 below (See CL20).

## 3.4 Calculation of GHG Emissions

The methodology ACM0001 "Consolidated baseline and monitoring methodology for landfill gas project activities" uses following formula for estimation of the GhG emissions reduction from the Project activity:

$ER_y = BE_y - PE_y = [(MD_{project,\ y} - MD_{BL,y}) * GWP_{CH4} + EL_{LFG,y} * CEF_{elec,BL,\ y} + ET_{LFG,y} * CEF_{ther,BL,\ y}] -$
$- [PE_{EC,y} + PE_{FC,j,y}]$ *(1)*

**Step 1**

| | |
|---|---|
| $ER_y$ | GHG emissions reduction (in year y), in tonnes of $CO_2$ equivalents ($tCO_2$) as a result of project implementation |
| $BE_y$ | Baseline emissions in year *y* ($tCO_2e$) |
| $PE_y$ | Project emissions in year *y* ($tCO_2e$) |
| $MD_{project,\ y}$ | The amount of methane that will be destroyed/combusted during the year, in, tonnes of methane ($tCH_4$) in project scenario |
| $MD_{BL,\ y}$ | The amount of methane that would have been destroyed/combusted during the year in absence of the project due to regulatory and/or contractual requirement, in, tonnes of methane ($tCH_4$) |
| $GWP_{CH4}$ | Global Warming Potential value for methane for the first commitment period is 21 $tCO_2e/CH_4$ |
| $EL_{LFG,y}$ | Net quantity of electricity produced using LFG which in the absence of the project activity would have been produced by power plants during year y, in megawatt hours (MWh) |
| $CEF_{electricity,\ y}$ | The $CO_2$ emissions intensity of the electricity displaced, tCO2e/MWh. Baseline emission factor for Ukrainian electricity grid will be taken from the baseline study **"***Standardized emission factors for the Ukrainian electricity grid"*, version 5, 02 February 2007, (please refer for details to the Annex 2. Baseline Information) |
| $ET_{LFG,y}$ | The quantity of thermal energy produced utilizing the landfill gas, which in the absence of the project activity would have been produced from |

| | |
|---|---|
| | onsite/offsite fossil fuel fired boiler/air heater, during the year y, in TJ |
| $CEF_{thermal, y}$ | $CO_2$ emissions intensity of the fuel used by boiler/air heater to generate thermal energy which is displaced by LFG based thermal energy generation , in $tCO_{2e}$/TJ (*IPCC Guideline*) |
| $PE_{EC,y}$ | Emissions from consumption electricity in the project case. Will be calculated following the latest version of "Tool to calculate baseline, project, and/or leakage emissions from electricity consumption" (Ver. 01) |
| $PE_{FC,j,y}$ | Emissions from consumption of heat in the project case. Calculated following the latest version of "Tool to calculate project or leakage $CO_2$ emissions from Fossil fuel consumption" (Ver. 02) * |

**Step 2**

The amount of methane that would have been destroyed/consumed in the absence of the Project Activity is as:

$MD_{BL,y} = MD_{project,y} * AF$ *(2)*

The Adjustment factor ("AF") is defined as the ratio of the destruction efficiency of the collection and destruction system mandated by regulatory or contractual requirements to that of the collection and destruction system in the Project Activity. For this project, regulatory and contractual requirements are not considered and the baseline scenario chosen above is that all landfill gas would be released into the atmosphere. Therefore, the AF applied to the Project Activity is 0% and $MD_{reg}$ is = 0.

**Step 3**

In general case the formula used to determine $MD_{project, y}$ is as follows:

$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} + MD_{thermal,y}$

In Project activity following formulas can be applied:

***Flaring option:*** In Project activity methane is destroyed through flaring only

$MD_{project,y} = MD_{flared,y}$ *(3a)*

***LFG-to-energy option:*** The amount of methane that would have been destroyed / combusted during the year will be the addition of the following terms:

$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} + MD_{thermal,y}$ *(3b)*

Components of the equations above are expressed separately in Step 4 and Step 7

**Step 4**

$MD_{flared,y}$ is the quantity of methane destroyed by flaring by the Project Activity. It is calculated as follows:

$MD_{flared,y} = (LFG_{flared,y} * W_{CH4y} * D_{CH4}) - (PE_{flare,y} / GWP_{CH4})$ *(4)*

| | |
|---|---|
| $LFG_{flare,y}$ | The quantity of landfill gas fed to the flare during the year measured in cubic meters ($m^3$) |

* Reference: http://cdm.unfccc.int/goto/MPappmeth.

| | |
|---|---|
| $W_{CH4}$ | The average methane fraction of the landfill gas as measured* during the year and expressed as a fraction (in $m^3$ $CH_4$ / $m^3$ LFG) |
| $D_{CH4}$ | The methane density expressed in tonnes of methane per cubic meter of methane ($tCH_4/m^3CH_4$)** |
| $PE_{flare,y}$ | The project emissions from flaring of the residual gas stream in the year y ($tCO_2$) |

(*) Methane fraction of the landfill gas to be measured on wet basis
(**) At standard temperature and pressure (101.325 kPa and 273.15 K) the density of methane is 0.0007168 $tCH_4/m^3CH_4$)

Formula for calculation of methane density $D_{CH4}$ in every specific hour is:

$$D_{CH4} = \frac{P_{CH4}}{\frac{R_U}{MM_{CH4}} \times T_{CH4}}$$ , where

| | |
|---|---|
| $D_{CH4}$ | The methane density expressed in tonnes of methane per cubic meter of methane ($tCH_4/m^3CH_4$) |
| $P_{CH4}$ | Measured pressure of methane in the hour *h* (Pa) |
| $R_U$ | Universal ideal gas constant (8 314 Pa.m3/kmol.K) |
| $MM_{CH4}$ | Molecular mass of methane (kg/kmol) |
| $T_{CH4}$ | Measured temperature of methane in the hour *h* (K) |

**Step 5**
The Project Emissions (PE) will be determined following the procedure described in the "*Tool to determine project emissions from flaring gases containing Methane" (Ver. 1)* and "*Tool to calculate baseline, project and/or leakage emissions from electricity consumption"(Ver. 01)*. The tool offers two options for enclosed flares. Where possible, option 2 will be used: continuous monitoring of the methane destruction efficiency of the flare as per the tool methodology. When this is not possible, option 1 will be used: 90% default efficiency factor with continuous monitoring of manufacturer's specifications (temperature and flow rate of residual gas at the inlet of the flare). If in any specific hour, any parameter is out of the limit of manufacturer's specifications, an efficiency of 50% will be used.

This tool involves the following seven steps:
STEP 1: Determination of the mass flow rate of the residual gas that is flared
STEP 2: Determination of the mass fraction of carbon, hydrogen, oxygen and nitrogen in the residual gas
STEP 3: Determination of the volumetric flow rate of the exhaust gas on a dry basis
STEP 4: Determination of methane mass flow rate of the exhaust gas on a dry basis
STEP 5: Determination of methane mass flow rate of the residual gas on a dry basis
STEP 6: Determination of the hourly flare efficiency

STEP 7: Calculation of annual project emissions from flaring based on measured hourly values or based on default flare efficiencies.

These steps will be applied to calculate project emissions from flaring ($PE_{flare,y}$) based on the measured hourly flare efficiency or based on the default values for the flare efficiency ($PE_{flare,h}$). Steps 3 and 4 will be applied only in case of enclosed flares and continuous monitoring of the flare efficiency.

The calculation procedure in this tool determines the flow rate of methane before and after the destruction in the flare, taking into account the amount of air supplied to the combustion reaction and the exhaust gas composition (oxygen and methane). The flare efficiency is calculated for each hour of a year based either on measurements or default values plus operational parameters. Project emissions are determined by multiplying the methane flow rate in the residual gas with the flare efficiency for each hour of the year.

**Step 6**

***LFG-to-energy option:*** $MD_{electricity}$ represents the quantity of methane destroyed for the generation of electricity in the Project Activity and is expressed by the following equation:

$$MD_{electricity,\,y} = LFG_{electricity,\,y} * W_{CH4y} * D_{CH4} \quad (7)$$

| | |
|---|---|
| $LFG_{electricity\ y}$ | Quantity of landfill gas used to generate electricity during a year measured in cubic meters ($m^3$) |
| $W_{CH4y}$ | Average methane fraction of the LFG as measured during the year and expressed as a fraction ($m^3\ CH_4/m^3$ LFG) |
| $D_{CH4}$ | Density of methane expressed in tonnes of methane ($tCH_4/m^3$ LFG) |

$MD_{thermal}$ represents the quantity of methane destroyed for the generation of thermal energy in the Project Activity and is expressed by the following equation:

$$MD_{thermal,\,y} = LFG_{thermal,\,y} * W_{CH4y} * D_{CH4} \quad (8)$$

| | |
|---|---|
| $LFG_{thermal\ y}$ | Quantity of landfill gas fed into the boiler/air heater/heat generation equipment during a year measured in cubic meters ($m^3$) |
| $W_{CH4y}$ | Average methane fraction of the LFG as measured during the year and expressed as a fraction ($m^3\ CH_4/m^3$ LFG) |
| $D_{CH4}$ | Density of methane expressed in tonnes of methane ($tCH_4/m^3$ LFG) |

**Step 7**

Net quantity of electricity produced using LFG which in the absence of the project activity would have been produced by power plants ($EL_{LFG,y)}$ will be measured by electricity meter.

The quantity of thermal energy produced utilizing the landfill gas, which in the absence of the project activity would have been produced from onsite/offsite fossil fuel fired boiler/air heater ($ET_{LFG,y}$) will be measured by thermal energy meter.

**Step 8**

For calculation of the electricity consumption for own needs of LFG plant the electricity meter will be applied.
Consumption of heat is out of the project case.

Total expected emission reductions of the Project (LFG-CHP):

For the period 2010-2012 – 176 203 t CO2 eq., average annual – 58 734 t CO2 eq.

For the period 2013-2024 – 590 368 t CO2 eq., average annual – 49 197 t CO2 eq.

Outstanding questions connected with GHG calculations are given in Table 5 below (See CL21, CL22).

## 3.5 Environmental impacts

**In the baseline situation,** landfill gas is generated as a result of decomposition of municipal waste under anaerobic conditions. Landfill gas is mainly composed of carbon dioxide and methane. Carbon dioxide and methane are greenhouse gases, which contribute to global warming. LFG in general causes harmful effects to the local environment and effect the economic value of the area where the landfill is implemented. In the baseline situation, landfill gas is associated with the following negative impacts:

- Undesirable odour, nuisance especially for human settlements surrounding the landfill area;
- Methane migration destroying vegetation next to the landfill or on the rehabilitated landfill compartments;
- Safety and health risks to landfills staff due to generation of methane concentration above safe limits as well as explosions and fires at the landfill site;
- Potential for landfill fires and the associated release of incomplete combustion products; and
- Slowing down of the mineralisation process of the waste body leading to more leachate generation and leachate seeping.

A very small percentage of volatile organic compounds (VOCs) are also found in the landfill gas, contributing to the undesirable odour. VOCs emissions are photochemically reactive, and result in the formation of tropospheric ozone. The latter might cause

adverse effects to the respiratory system such as breathing difficulties and aggravated asthma, and damages to crops and plants. VOCs are also known for their toxicity and carcinogenic effect from chronic exposure.

**In the project activity**, the main activity is combusting the landfill gas to convert methane to carbon dioxide. Flaring of the collected biogas will destroy methane and thus lead to a decrease in the amount of greenhouse gases released to the atmosphere. By capture and combustion of LFG, release of VOCs into the atmosphere is significantly reduced. Overall, the project activity leads to positive environmental impacts which contribute to the sustainable development of the area with no significant negative impacts expected.

Transboundary impact is not considered within the project because the project activity is located in the territory of Ukraine, wastes are received from Ukrainian consumers, adverse effects on any territory especially of other states are not expected and produced electricity will be supplied to Ukrainian grid.

The potential environmental effects from implementation of the Project according to the EIA requirements are presented herein:

**Human**
High concentration of gases in the landfills brings about a risk of explosion. Controlled capture and combustion of LFG will reduce the risks of explosions or poisoning with high-toxic combustion products of inhabitants of surroundings and on site workers.

While the LFG collection and utilization system will minimize explosion risks from methane emissions on the whole landfill site, there are obviously some risks associated with the operation of the flare, similar to any other industrial risks involving a source of fire. Safety devices on the flaring unit will mitigate this risk.

**Flora and fauna**
Remediation of the landfill site (reshaping and capping) will reduce presence of birds searching for prey and food, abating the pests and disease vectors. The Project will also abate methane migration destroying vegetation next to the landfill.

**Air**
The LFG collection and flaring system might lead to some minor CO, NOx and VOCs emissions. However, due to the high-efficiency combustion and high-temperature an almost total destruction of the gases is ensured. In that way, emissions of CO, NOx and VOCs and other compounds present in the biogas such as ammonia will be minimal, and much lower to that which would have occurred in the absence of the project activity.

The installed equipment does not produce any significant noise, since it will be placed in noise insulated container or small buildings that will form a sound-absorbing casing.

**The landscape**

The reshaped body and capped top of the landfill will contribute to better fitting of the landfill into the surrounding landscape. Visual impact from the flare, and noise and vibration will be limited to the localized site.

**Conclusions**

The landfill collection and flaring system has a significant positive impact on the environment. The system reduces emissions of greenhouse gases, odours and gases causing explosions as well as open fires and damage to wildlife. Additionally, the project will produce the following:

- positive effects on climate and local air quality;
- positive effects on flora and fauna in the surroundings; and
- improved conditions for local inhabitants and site workers.

Environmental impact assessment had been completed by Professional Design Company and is under consideration of the ecological inspection authority. Environmental impact assessment can be available at request.

**Local EIA procedure**

In the Ukraine, both an Environmental Impact Assessment (EIA) and a State Environmental Expertise (EE) are used for estimation of environmental impact of the project activity.

An EIA estimates impact the levels a project may have on the environment, development of actions on prevention or reduction of these influences, and acceptability of design decisions from the environmental point of view. An EIA is a compulsory part of the design documentation of any economic activity and is carried out under strictly established requirements.

An EE is determined based on the analysis and estimation of pre-design, design documentation and other documents concerning the Project which have potential impacts on the state of the environment. Also, an EE is used to determine conformity of the planned project activity with norms and requirements of the legislation on environmental protection and for maintenance of ecological safety.

EIA legislative requirements are defined by Clause 36 of the Law of Ukraine "On Environmental Expertise". Requirements for the EIA structure is contained in the state construction norms of Ukraine DBN A.2.2-1-2003. Requirements for the documentation of the state EE are set in the “Instruction on realization of the state environmental expertise”. Requirements for the conclusions of the EE are defined by the Clause 43 of the Law of Ukraine "On Environmental Expertise ".

Design documentation including the EIA is submitted for execution of environmental expertise to the Ministry of Environment and Natural Resources Protection of Ukraine (MENRPU) or its regional bodies. The State EE is undertaken by the MENRPU who then issues an official response.

According to the aforementioned documents, the EIA must contain data about local public opinion on the project activity and problems that should be solved. However, methods and procedures for collection and consideration of public opinions are not specified.

For the proposed Project, the project design documentation (including an EIA) will be submitted to the Mariupol Regional Environmental Inspection for the environmental expertise. In the EIA section of the design documentation the conclusion was made by the project developer that no significant negative environmental impacts are related to the project activity.

Outstanding questions connected with baseline and additionality are given in Table 5 below (See CAR15, CAR16, CL25).

## 4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

According to the modalities for the Determination of JI projects, the AIE shall make publicly available the project design document and receive, within 30 days, comments from Parties, stakeholders and UNFCCC accredited non-governmental organizations and make them publicly available.

Bureau Veritas Certification published the project documents on the website (http://www.bureauveritas.com/) on 15/09/2009 and invited comments within 15/10/2009 by Parties, stakeholders and non-governmental organizations.

There are no comments from stakeholders.

## 5 DETERMINATION OPINION

Bureau Veritas Certification has performed a determination of Landfill methane capture and utilisation at Mariupol landfills, Ukraine Project. The determination was performed on the basis of UNFCCC criteria and host country criteria and also on the criteria given to provide for consistent project operations, monitoring and reporting.

The determination consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan; ii) follow-up interviews with project stakeholders; iii) the resolution of outstanding issues and the issuance of the final determination report and opinion.

Project participant/s used the latest tool for demonstration of the additionality. In line with this tool, the PDD provides analysis of investment and other barriers to determine that the project activity itself is not the baseline scenario.

Landfill methane capture and utilisation at Mariupol landfills, Ukraine. An analysis of the investment and other barriers demonstrates that the proposed project activity is not a

likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity. Given that the project is implemented and maintained as designed, the project is likely to achieve the estimated amount of emission reductions.

The review of the project design documentation (1.2) and the subsequent follow-up interviews have provided Bureau Veritas Certification with sufficient evidence to determine the fulfillment of stated criteria. In our opinion, the project correctly applies and meets the relevant UNFCCC requirements for the JI and the relevant host country criteria, meeting the expectations of interested parties.

The determination is based on the information made available to us and the engagement conditions detailed in this report

## 6 REFERENCES

**Category 1 Documents:**
Documents provided by TisEco that related directly to the GHG components of the project.

1 PPD Landfill methane capture and utilisation at Mariupol landfills, Ukraine, Revision 1.0, 28/08/2009.
2 PPD Landfill methane capture and utilisation at Mariupol landfills, Ukraine, Revision 2.0, 17/12/2009.
3 Guidelines for Users of the Joint Implementation Project Design Document Form/Version 03, JISC.
4 Glossary of JI terms/Version 01, JISC.
5 Guidance on criteria for baseline setting and monitoring. Version 01. JISC.
6 Tool for the demonstration and assessment of additionality. Version 05.2.
7 ACM0001, version 11, May 2009: “Consolidated baseline and monitoring methodology for landfill gas project activities”
8 A Letter of Endorsement of National Environmental Investment Agency

**Category 2 Documents:**
Background documents related to the design and/or methodologies employed in the design or other reference documents.

/1/. Licence AB #479048. Construction of biogas collection and utilization at Prymorskyi landfill of MSW in Mariupol in Donetsk region. Volume 2. Book 1. ПР 1 - 2009.
/2/. Licence AB #479048 LLC "Research centre "Biomass" from 19.05.2009.
/3/. Licence AB #9294354 of LLC "Stroigeo". Term of validity: 24.02.2006 to 24.02.2011.
/4/. Methodology of the norms determination of municipal solid waste in Mariupol. Contract #2275-07.
/5/. Basic indicators of enterprise work for 2008.

/6/. Environmental impact assessment "Construction of biogas collection and utilization system at Prymorskyi landfill of MSW" Volume IV.
/7/. Passport MBB. Information of the monitoring system of water, soil, and the athmosphere quality at the MBB region. Technical and technological characteristics of MBB. Natural and geological characteristics of MBB.
/8/. Letter #6/150 КП "Gorarhbiuro" dated 21/07/2009.
/9/. Letter #219 to the director OJSC "Tis Eco" T.N. Klymenko dated 03/08/2009.
/10/. Letter of clarification. Construction of biogas collection and utilization system from the MSW landfill.
/11/. Annex #1 to the Contract #2001/2009 Technical targets for development of the design estimates "Power-generating unit based on reciprocating modules for electricity production by butilization of gas from MSW landfills, Mariupol".
/12/. Annex #1 to the Contract #8. Protocol #1 of the agreed price dated 10/07/2009.
/13/. Annex #1. Analysis of the revenue from the service sales PUC "Polygon TBO" for 2007-2008.
/14/. Annex #2 to the Contract #2001/2009 Work schedule.
/15/. Annex #2 to the Contract #8. Cost estimate dated 10/07/2009.
/16/. Annex #3 to the Contract. Technical targets to the execution of engineer and geological surveys dated 10/07/2009.
/17/. Annex to the Contract #2571. Cost estimate dated 15/04/2009.
/18/. Protocol #5 of the competitive commission meeting for selection of proposals investment of biogas collection and utilization at the MSW landfills in Mariupol dated 24/02/2009.
/19/. Protocol of agreement of the selection and organization of the sites survey of MSW formation at the residential buildings in Mariupol.
/20/. Framework agreement #1/2009 on providing with consulting service dated 03/02/2009.
/21/. Results of calculation of pollutant dispersion in programme EOL.
/22/. Resolution on conducting the competitive selection of investment projects #5/23-4148 from 29.07.2008.
/23/. Resolution on amendments to resolution of the administrative board #407 from 13.11.2008.
/24/. Resolution on conducting the competitive selection of investment proposals concerning landfill gas extraction MSW in Mariupol #345 from 17.09.2008.
/25/. Decree #89 of the head of administrative board of Mariupol of the fire extinguishing measures at the municipal solid waste landfill Krasnoflotska st. dated 21/02/2007.
/26/. Composition of the competitive commission of the organization and conducting the competitive selection of investment proposals concerning biogas extraction in the frame of Kyoto Protocol at the MSW landfills in Mariupol.
/27/. Technical specifications #6 dated 17/07/2009.
/28/. Technical specifications # 26-08/ИС-5077 to joining to the grid of cogeneration device dated 27/08/2009.
/29/. Technical documentation #119/27/07/2009 of the Land Management for drafting that certify the right to land.
/30/. Technical requirements for energy conservation and energy efficiency to develop design documents for objects construction, reconstruction, and extention #06-02/30П dated 24/06/2009.

**Persons interviewed:**

# DETERMINATION REPORT

List persons interviewed during the determination or persons that contributed with other information that are not included in the documents listed above.

/1/ Nina Isaeva – project coordinator

/2/ Tatiana Klymenko – Director TisEco

/3/ Vladimir Globin - Chief Project Engineer

/4/ Yuri Matveev - Deputy Director, Head of Department of Biogas Technologies

/5/ Valeriy Zamikula – Director StoyTeh

/6/ Oleksandra Krasnolutskaya - Leading engineer of the municipal engineering management Mariupol city

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## APPENDIX A: DETERMINATION PROTOCOL

BUREAU VERITAS CERTIFICATION HOLDING SAS



## JI PROJECT DETERMINATION PROTOCOL

**Table 1 Mandatory Requirements for Joint Implementation (JI) Projects**

| REQUIREMENT | REFERENCE | CONCLUSION | Cross Reference to this protocol |
|---|---|---|---|
| 1. The project shall have the approval of the Parties involved | Kyoto Protocol Article 6.1 (a) | CAR1:<br>After finishing of project determination report, the PDD and Determination Report will be presented to National Environmental Investments Agency of Ukraine for receiving of the Letter of Approval. The Letter of Approval from the country - | Table 2, Section A.5 |

| REQUIREMENT | REFERENCE | CONCLUSION | Cross Reference to this protocol |
|---|---|---|---|
| | | investor will be provided after approval of project by Ukraine.<br>National Environmental Investment Agency of Ukraine<br>35, Urytskogo str.<br>03035 Kiev<br>Ukraine<br>Email: info.neia@gmail.com<br>**Mr. Igor Lupaltsov**<br>**Head**<br>National Environmental Investment Agency of Ukraine<br>Phone: +380 44 594 9111<br>Fax: +380 44 594 9115<br>Email: lupaltsov@ukr.net | |
| 2. Emission reductions, or an enhancement of removal by sinks, shall be additional to any that would otherwise occur | Kyoto Protocol Article 6.1 (b) | OK | Table 2, Section B |
| 3. The sponsor Party shall not acquire emission reduction units if it is not in compliance with its obligations under Articles 5 & 7 | Kyoto Protocol Article 6.1 (c) | CAR2: There is no information about sponsor Party in PDD. | |

| REQUIREMENT | REFERENCE | CONCLUSION | Cross Reference to this protocol |
|---|---|---|---|
| 4. The acquisition of emission reduction units shall be supplemental to domestic actions for the purpose of meeting commitments under Article 3 | Kyoto Protocol Article 6.1 (d) | OK | |
| 5. Parties participating in JI shall designate national focal points for approving JI projects and have in place national guidelines and procedures for the approval of JI projects | Marrakech Accords, JI Modalities, §20 | National Environmental Investment Agency of Ukraine | |
| 6. The host Party shall be a Party to the Kyoto Protocol | Marrakech Accords, JI Modalities, §21(a)/24 | The Ukraine is a Party (Annex I Party) to the Kyoto Protocol and has ratified the Kyoto Protocol at April 12th, 2004. | |
| 7. The host Party's assigned amount shall have been calculated and recorded in accordance with the modalities for the accounting of assigned amounts | Marrakech Accords, JI Modalities, §21(b)/24 | This issue cannot be answered finally as it is out of the influence of the project participants. In the Initial Report submitted by Ukraine on 29. Dec. 2006 the AAUs are quantified with: 925 362 174.39 (x 5) tCO2-e. (compare http://unfccc.int/national_reports/initial_reports_under_the_kyoto_protocol/items/3765.php ) | |
| 8. The host Party shall have in place a national registry in accordance with Article 7, paragraph 4 | Marrakech Accords, JI Modalities, | The designed system of the national registry has been outlined in the Initial Report | |

| REQUIREMENT | REFERENCE | CONCLUSION | Cross Reference to this protocol |
|---|---|---|---|
| | §21(d)/24 | (see link above). This issue is out of the influence of the project owner.<br>The National Registry is not a direct requirement for project registration. | |
| 9. Project participants shall submit to the independent entity a project design document that contains all information needed for the determination | Marrakech Accords, JI Modalities, §31 | OK | |
| 10. The project design document shall be made publicly available and Parties, stakeholders and UNFCCC accredited observers shall be invited to, within 30 days, provide comments | Marrakech Accords, JI Modalities, §32 | 16 July 09 - 16 Aug 09 | |
| 11. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, in accordance with procedures as determined by the host Party shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out | Marrakech Accords, JI Modalities, §33(d) | Environmental Impact Assessment legislative requirements are defined by Clause 36 of the Law of Ukraine "On Environmental Expertise". Requirements for the EIA structure is contained in the state construction norms of Ukraine DBN A.2.2-1-2003. Requirements for the documentation of the state EE are set in the “Instruction on realization of the state | Table 2, Section F |

| REQUIREMENT | REFERENCE | CONCLUSION | Cross Reference to this protocol |
|---|---|---|---|
| | | environmental expertise". Requirements for the conclusions of the EE are defined by the Clause 43 of the Law of Ukraine "On Environmental Expertise ". Design documentation including the EIA is submitted for execution of environmental expertise to the Ministry of Environment and Natural Resources Protection of Ukraine (MENRPU) or its regional bodies. The State EE is undertaken by the MENRPU who then issues an official response. | |
| 12. The baseline for a JI project shall be the scenario that reasonably represents the GHG emissions or removal by sources that would occur in absence of the proposed project | Marrakech Accords, JI Modalities, Appendix B | OK | Table 2, Section B |
| 13. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances | Marrakech Accords, JI Modalities, Appendix B | OK | Table 2, Section B |
| 14. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to | Marrakech Accords, | OK | Table 2, Section B |

| REQUIREMENT | REFERENCE | CONCLUSION | Cross Reference to this protocol |
|---|---|---|---|
| force majeure | JI Modalities, Appendix B | | |
| 15. The project shall have an appropriate monitoring plan | Marrakech Accords, JI Modalities, §33(c) | OK | Table 2, Section D |
| 16. Are project participants authorized by a Party involved | JISC "Modalities of communication of Project Participants with the JISC" Version 01, Clause A.3 | See CAR 1 and CAR2. Conclusion is pending until Letters of Approval authorizing the project participants by Parties involved will be issued. | Table 2, Section A |

**Table 2 Requirements Checklist**

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| ***A. General Description of the project*** | | | | | |
| **A.1 Title of the project** | | | | | |
| A.1.1. Is the title of the project activity presented? | 1,2,3,4 | DR | "Landfill methane capture and utilisation at Mariupol landfills, Ukraine"<br><br>Please provide sectoral scope of the project | CAR3 | OK |
| A.1.2. Is the current version number of the document presented? | 1,2,3,4 | DR | version 1.2 | OK | OK |
| A.1.3. Is the date when the document was completed presented? | 1,2,3,4 | DR | Dated January 18, 2010 | OK | OK |
| **A.2. Description of the project** | | | | | |
| A.2.1. Is the purpose of the project activity included? | 1,2,3,4 | DR | See section A.2 of the PDD.<br><br>Please provide more detailed implementation schedule for both landfills. | CL1 | OK |
| A.2.2. Is it explained how the proposed project activity reduces greenhouse gas emissions? | 1,2,3,4 | DR | See section A.2 of the PDD.<br>The Project consists of developing a Landfill Gas ("LFG") collection and flaring system with an opportunity of its further energy utilization in order to avoid emissions of methane being released into the atmosphere. LFG production results from waste decay in the anaerobic conditions created in the landfill body. LFG contains approximately 50% | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| | | | methane (“CH4”), which is a powerful greenhouse gas (“GhG”) contributing to global warming. Additionally, LFG is a fire hazard and causes bad odours in the vicinity of the site. By capturing the LFG, GhG emissions are reduced, local environmental impacts are mitigated and the operational safety of the site is increased. | | |
| **A.3. Project participants** | | | | | |
| A.3.1. Are project participants and Party(ies) involved in the project listed? | 1,2,3,4 | DR | Ukraine (Host Country)<br>• TisEco<br>Ukraine (Host Country)<br>• Municipality of Mariupol city<br>Ukraine (Host Country)<br>• SEC Biomass | OK | OK |
| A.3.2. Are project participants authorized by a Party involved? | 1,2,3,4 | DR | Please provide evidence of written project approvals by the Parties involved. | CAR4 | - |
| A.3.3. The data of the project participants are presented in tabular format? | 1,2,3,4 | DR | See section A.3 of the PDD. | OK | OK |
| A.3.4. Is contact information provided in annex 1 of the PDD? | 1,2,3,4 | DR | See Annex 1 of the PDD | OK | OK |
| A.3.5. Is it indicated, if it is the case, if the Party involved is a host Party? | 1,2,3,4 | DR | Ukraine (Host Party) | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| **A.4. Technical description of the project** | | | | | |
| A.4.1. Location of the project activity | | | | | |
| A.4.1.1. Host Party(ies) | 1,2,3,4 | DR | Ukraine | OK | OK |
| A.4.1.2. Region/State/Province etc. | 1,2,3,4 | DR | Donetsk Region. | OK | OK |
| A.4.1.3. City/Town/Community etc. | 1,2,3,4 | DR | Mariupol, Primorsky and Ordzhonikidze districts | OK | OK |
| A.4.1.4. Detail of the physical location, including information allowing the unique identification of the project. (This section should not exceed one page) | 1,2,3,4 | DR | The two landfills are located approximately 12 km apart within the city board. The Sites are highlighted in the Fig. 2. The Primorsky landfill site is located at the following coordinates: 47º05'12''N and 37º28'20''E. The Ordzhonikidze landfill site is located at the following coordinates: 47º08'05''N and 37º37'46''E. | OK | OK |
| A.4.2. Technology(ies) to be employed, or measures, operations or actions to be implemented by the project | | | | | |
| A.4.2.1. Does the project design engineering reflect current good practices? | 1,2,3 | DR | See section A.4.2 of the PDD | OK | OK |
| A.4.2.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country? | 1,2,3 | DR | See sections A.4.2 and B.2 of the PDD.<br>The project use state of the art technology. | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| A.4.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period? | 1,2,3 | DR | Please, clarify if the project technology is likely to be substituted by other or more efficient technologies within the project period. | CL2 | |
| A.4.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period? | 1,2,3 | DR | Please, clarify if the project requires extensive initial training and maintenance efforts in order to work as presumed during the project period. | CL3 | |
| A.4.2.5. Does the project make provisions for meeting training and maintenance needs? | 1,2,3 | DR | Please, clarify if the project makes provisions for meeting training and maintenance needs | CL4 | |
| 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 | | | | | |
| A.4.3.1. Is it stated how anthropogenic GHG emission reductions are to be achieved? (This section should not exceed one page) | 1,2,3,4,5,6 | DR | See section A.2.2 of the PDD | OK | OK |
| A.4.3.2. Is it provided the estimation of emission reductions over the crediting period? | 1,2,3,4 | DR | See section A.4.3.1 of the PDD. | OK | OK |
| A.4.3.3. Is it provided the estimated annual reduction for the chosen credit period in $tCO_2e$? | 1,2,3,4 | DR | Please, provide the estimated annual reduction for the chosen credit period in tCO2e | CAR5 | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| A.4.3.4. Are the data from questions A.4.3.2 to A.4.3.4 above presented in tabular format? | 1,2,3,4 | DR | See section A.4.3.1 of the PDD.<br>Please, clarify crediting period and over crediting period in table. | CL5 | |
| **A.5.** Project approval by the Parties involved | | | | | |
| A.5.1. Are written project approvals by the Parties involved attached? | 1,2,3,4 | DR | See CAR1 above. | - | - |
| ***B. Baseline*** | | | | | |
| **B.1. Description and justification of the baseline chosen** | | | | | |
| B.1.1. Is the chosen baseline described? | 1,2,3,4,6,7 | DR | The baseline and monitoring methodology to be applied for the proposed project activity is the approved consolidated baseline methodology ACM0001, version 11, May 2009: ***"Consolidated baseline and monitoring methodology for landfill gas project activities"***.<br><br>There is no key information and data used to establish the baseline provided in this section. Please include this information to Section B.1. of the PDD<br><br>Please provide proper transparent description of the baseline chosen and included in the list of the considered alternatives. | CL6<br><br>CAR6<br><br>CAR7 | OK |
| B.1.2. Is it justified the choice of the applicable | 1,2,3 | DR | See section B.1 of the PDD. | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| baseline for the project category? | ,4,6, 7 | | | | |
| B.1.3. Is it described how the methodology is applied in the context of the project? | 1,2,3 ,4,6, 7 | DR | See section B.1 of the PDD.<br>ACM0001 is applicable to this Project since the Project baseline is total atmospheric release of LFG and the Project Activities are gas capture and flaring and possible energy generation. | OK | OK |
| B.1.4. Are the basic assumptions of the baseline methodology in the context of the project activity presented (See Annex 2)? | 1,2,3 ,4,5, 6 | DR | See Annex 2 of the PDD.<br>Basic assumptions of the baseline methodology in the context of the project activity presented. | OK | OK |
| B.1.5. Is all literature and sources clearly referenced? | 1,2,3 ,4 | DR | Please provide references for all Methodologies and Tools used, including their versions, throughout of the PDD text | CAR8 | OK |
| **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** | | | | | |
| B.2.1. Is the proposed project activity additional? | 1,2,3 ,4,6, 7 | DR | **Step 2 investment analysis.**<br>Approach selected for determination of appropriate analysis method is correct. Benchmark analysis is the proper method for the present project.<br>The project developer derives the benchmark using USD bank rates which is not correct as all calculations for the project are made in EUR. The benchmark also lacks references to the sources and justification currently. The proper benchmark | | |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| | | | shall be established using EUR rates which are slightly (usually by 1%) lower than those in USD. Foreign currency (EUR and USD) average bank deposit rates in Ukraine were at 11.4% during July 2009. Source: http://bank.gov.ua/Statist/Statist_data/Inter_r_term_dep.xls (web site of the National Bank of Ukraine). This value shall be adjusted for risk factor associated with implementation of new technology with inherent technical and financial risks. Due to the lack of the data for the similar projects in the country the risk factor adjustment may be identified only on the basis of expert opinion. Using conservative approach we can estimate the risk factor adjustment to be at 8% following the official Methodological recommendations on evaluation of investment projects efficiency 21.06.1999 N ВК 477 adopted in Russia. Unfortunately Ukraine misses similar officially adopted methodology. So now we have 11.4+8 = 19,4% curb rate.<br><br>Note that the developer is apparently using fixed prices in Euro for its financial calculations. At the same time IRR benchmark calculated based on the nominal values (bank deposit rate + risk premium) contradicting with fixed prices of the financial model. In such instance not nominal but real discount rate or IRR (i.e. rate cleared of inflation) shall be applied in order to account for financial | CL7<br><br>CL8 | |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| | | | calculations made in fixed prices.<br>We can calculate real IRR in the following way: IRRr = (IRRn+1)/(I+1)-1, where IRRr- is real IRR, IRRn – nominal IRR, I – inflation rate.<br>12 years average inflation index for EuroZone (we apply EuroZone inflation because financial calculations are made in Euros) for the period of 1997-2008 is 2,1%. Source is Eurostat http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1.<br>Using the formula above we can calculate IRRn = 1.194/1.021 - 1= 0.1694 = 16.94% Thereby **17%** is the proper IRR benchmark value which shall be used for estimation of the additionality of the project.<br><br>The developer uses the period of 15 years for financial analysis of the project which is in lines with the Guidance for the Assessment of Investment analysis (hereinafter referred as the Guidance) recommending period of 10-20 years. Additionally the Guidance article 4 requires the fair value of the assets at the end of the end of assessment period to be included in the cash flow for the final year. In our case the liquidation value of the assets for 2024 is indicated as 0. Please add short justification for such liquidation value. | CL9 | |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| | | | IRR, NPV values, annual operating costs indicated in the table on the page 15 of the PDD and PDD_Mariupol_Veritas Excel file are different. Please correct the discrepancy. I would also suggest eliminating any reference to NPV on the pages 14-15 and in the Excel tables as it is not used as the benchmark and confusing.<br><br>Please add the clear definition of the project scenario. I assume that the statement in the **Summary** on the page 19 "Alternative 2/3 has been chosen as the Project activity" is not fully correct. It seems that we are going to produce the energy at both landfills so we are following Alternative 3. Please clarify. The statement that the project is additional in the same paragraph is highly welcome.<br>If we are following Alternative 3 no calculations for alternative 2 are required while using benchmark approach. I recommend eliminating any calculations for Alternative 2 in order not to mislead the reader.<br><br>Tax calculations do not account for the tax credit obtained due to the losses accumulated at the early stage of the project thereby overestimating profit tax obligations. Table on the page 54 indicates the income tax 20% while 25% is correct value used in your calculations. Please clarify/correct. | CL10<br><br>CL11<br><br>CL12 | |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| | | | Depreciation rate used in financial calculations is 6.75% quarterly using declining balance method. I assume doing so developer is trying to follow the articles of the Income Tax Law of Ukraine. Please note that this law adopts 6.00% depreciation rate for similar plant and equipment. Please clarify/correct the issue as it provides impact on project cash flow. | CL13 | |
| | | | Table PDD_Mariupol_Veritas-2 is using "green tariff" of 137,5 EUR/MWh for financial calculations, PDD_Mariupol_Veritas – 110 EUR/MWh, table on the page 54 indicates 130 EUR/MWh. It contradicts with requirement (9) of the Sub-step 2c of the Methodological Tool *Assumptions and input data for the investment analysis shall not differ across the project activity and its alternatives, unless differences can be well substantiated*. Please clarify/correct this discrepancy. | CL14 | |
| | | | The developer provides the results of sensitivity analysis in comprehensive manner but the absence of formulas and references prevents the reader from reproducing results of the analysis. It contradicts with article 8 of the Guidance. Please provide Excel formulas/tables illustrating how IRR for deviation scenarios has been calculated. | CL15 | |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| | | | In order to facilitate the reading investment and operational expenses in Excel tables shall be indicated as two separate lines instead of single line "total costs". | CL16 | |
| | | | Please supplement the Excel tables with proper headers clearly indicating the landfill it is referring to (Primorsky or Ordzhenikidze or both sites combined). References currently used Mariupol-I and –II are sometimes wrong and generally misleading as these names are not used in text.<br>It would be beneficial to unite both Excel files in one in order to avoid unnecessary switching between the files, inter-file links and unnecessary calculations (for example separate IRR calculations for Primorsky and Ordzhenikidze). | CL17 | |
| | | | Please, provide references for the Tool used to demonstrate additionality. | L18 | |
| | | | Please provide outcomes for step1a, sub-step 1b, step 2 and sub-step 3a as required by the Tool. Without conducting those steps project can not be proceeded to the next part and considered additional | CAR9 | |
| B.2.2. Is the baseline scenario described? | 1,2,3,4 | DR | The baseline is the atmospheric release of the gas with no capture and destruction. | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| B.2.3. Is the project scenario described? | 1,2,3,4 | DR | Please clarify which project scenario is chosen | CAR10 | OK |
| B.2.4. Is an analysis showing why the emissions in the baseline scenario would likely exceed the emissions in the project scenario incluede? | 1,2,3,4,5 | DR | Please explain why the emissions in the baseline scenario would likely exceed the emissions in the project scenario | CL19 | OK |
| B.2.5. Is it demonstrated that the project activity itself is not a likely baseline scenario? | 1,2,3,4,6 | DR | See section B.2 of the PDD. | OK | OK |
| B.2.6. Are national policies and circumstances relevant to the baseline of the proposed project activity summarized? | 1,2,3,4 | DR | See section B.2 of the PDD. | OK | OK |
| **B.3. Description of how the definition of the project boundary is applied to the project activity** | | | | | |
| B.3.1. Are the project's spatial (geographical) boundaries clearly defined? | 1,2,3,4 | DR | See section B.3 (figure 2, 3) of the PDD | OK | OK |
| **B.4. Further baseline information, including the date of baseline setting and the name(s) of the person(s)/entity(ies) setting the baseline** | | | | | |
| B.4.1. Is the date of the baseline setting presented (in DD/MM/YYYY)? | 1,2,3,4 | DR | Please present the date of completing in the DD/MM/YYYY format. | CAR11 | OK |
| B.4.2. Is the contact information provided? | 1,2,3,4 | DR | Scientific Engineering Centre "Biomass"<br>Contact person: Yuri Matveev<br>P.O. Box 66, Kiev-67, 03067, UKRAINE<br>Tel: (+380 44) 453 2856; 456 9462 | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| | | | Fax: (+380 44) 453 2856; 456 9462<br>E-mail: mtv@biomass.kiev.ua<br>http://www.biomass.kiev.ua<br>See annex 1 of the PDD | | |
| B.4.3. Is the person/entity also a project participant listed in Annex 1 of PDD? | 1,2,3,4 | DR | See annex 1 of the PDD | OK | OK |
| ***C. Duration of the small-scale project and crediting period*** | | | | | |
| **C.1. Starting date of the project** | | | | | |
| C.1.1. Is the project's starting date clearly defined? | 1,2,3,4,5 | DR | Please define the starting date of the project activity | CAR12 | OK |
| **C.2. Expected operational lifetime of the project** | | | | | |
| C.2.1. Is the project's operational lifetime clearly defined in years and months? | 1,2,3,4 | DR | Please, provide the project's operational lifetime in years and months | CAR13 | OK |
| **C.3. Length of the crediting period** | | | | | |
| C.3.1. Is the length of the crediting period specified in years and months? | 1,2,3,4 | DR | Please, provide the length of the crediting period in years and months | CAR14 | OK |
| ***D. Monitoring Plan*** | | | | | |
| **D.1. Description of monitoring plan chosen** | | | | | |
| D.1.1. Is the monitoring plan defined? | 1,2,3,4,6 | DR | Refer to section D.1 of PDD.<br>Please provide appropriate references for all documents you use. | CL20 | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| D.1.2. Option 1 – Monitoring of the emissions in the project scenario and the baseline scenario. | 1,2,3 ,4,7 | DR | Refer to section D.1 of PDD.<br>The section was left blank on purpose. Option 2 was selected. | OK | OK |
| D.1.3. Data to be collected in order to monitor emissions from the project, and how these data will be archived. | 1,2,3 ,4,7 | DR | N/A | OK | OK |
| D.1.4. Description of the formulae used to estimate project emissions (for each gas, source etc,; emissions in units of CO2 equivalent). | 1,2,3 ,4 | DR | N/A | OK | OK |
| D.1.5. 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. | 1,2,3 ,4 | DR | N/A | OK | OK |
| D.1.6. Description of the formulae used to estimate baseline emissions (for each gas, source etc,; emissions in units of CO2 equivalent). | 1,2,3 ,4,9, 11 | DR | N/A | OK | OK |
| D.1.7. Option 2 – Direct monitoring of emissions reductions from the project (values should be consistent with those in section E) | 1,2,3 ,4 | DR | See section D.1.2 of the PDD. | OK | OK |
| D.1.8. Data to be collected in order to monitor emission reductions from the project, and how these data will be archived. | 1,2,3 ,4 | DR | See section D.1.2.1 of the PDD. | OK | OK |
| D.1.9. Description of the formulae used to calculate emission reductions from the | 1,2,3 | DR | See section D.1.2.2 of the PDD. | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| project (for each gas, source etc,; emissions/emission reductions in units of CO2 equivalent). | ,4 | | | | |
| D.1.10. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project. | 1,2,3 ,4,6 | DR | N/A | OK | OK |
| D.1.11.Description of the formulae used to estimate leakage (for each gas, source etc,; emissions in units of CO2 equivalent). | 1,2,3 ,4 | DR | No leakage effects have to be accounted for under the applied methodology. | OK | OK |
| D.1.12. Description of the formulae used to estimate emission reductions for the project (for each gas, source etc,; emissions in units of CO2 equivalent). | 1,2,3 ,4 | DR | See section D.1.2.2 of the PDD. | OK | OK |
| D.1.13.Is information on the collection and archiving of information on the environmental impacts of the project provided? | 1,2,3 ,4 | DR, I | N/A | OK | OK |
| D.1.14. Is reference to the relevant host Party regulation(s) provided? | 1,2,3 ,4 | DR, I | N/A | OK | OK |
| D.1.15. If not applicable, is it stated so? | 1,2,3 ,4 | DR, I | See section D.1.5 of the PDD. | OK | OK |
| **D.2. Qualitative control (QC) and quality assurance (QA) procedures undertaken for data monitored** | | | | | |
| D.2.1. Are there quality control and quality | 1,2,3 | DR | See section D.2 of the PDD | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| assurance procedures to be used in the monitoring of the measured data established? | ,4 | | | | |
| **D.3. Please describe of the operational and management structure that the project operator will apply in implementing the monitoring plan** | | | | | |
| D.3.1. Is it described briefly the operational and management structure that the project participants(s) will implement in order to monitor emission reduction and any leakage effects generated by the project activity | 1,2,3 ,4 | DR | See section D.3 of the PDD | OK | OK |
| **D.4. Name of person(s)/entity(ies) establishing the monitoring plan** | | | | | |
| D.4.1. Is the contact information provided? | 1,2,3 ,4 | DR | Scientific Engineering Centre "Biomass"<br>Contact person: Yuri Matveev<br>P.O. Box 66, Kiev-67, 03067, UKRAINE<br>Tel: (+380 44) 453 2856; 456 9462<br>Fax: (+380 44) 453 2856; 456 9462<br>E-mail: mtv@biomass.kiev.ua<br>http://www.biomass.kiev.ua<br>See Annex 1 of the PDD | OK | OK |
| D.4.2. Is the person/entity also a project participant listed in Annex 1 of PDD? | 1,2,3 ,4 | DR | See Annex 1 of the PDD | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| ***E. Estimation of greenhouse gases emission reductions*** | | | | | |
| **E.1. Estimated project emissions** | | | | | |
| E.1.1. Are described the formulae used to estimate anthropogenic emissions by source of GHGs due the project? | 1,2,3,4,7 | DR | See sections D.1.2.2 and E.1 of the PDD. | OK | OK |
| E.1.2. Is there a description of calculation of GHG project emissions in accordance with the formula specified in for the applicable project category? | 1,2,3,4,7 | DR | See sections D.1.2.2 and E.1 of the PDD. | OK | OK |
| E.1.3. Have conservative assumptions been used to calculate project GHG emissions? | 1,2,3,4 | DR | Please clarify if conservative assumptions are used to calculate project GHG emissions | CL21 | OK |
| **E.2. Estimated leakage** | | | | | |
| E.2.1. Are described the formulae used to estimate leakage due to the project activity where required? | 1,2,3,4,7 | DR | Leakage is not expected. | OK | OK |
| E.2.2. Is there a description of calculation of leakage in accordance with the formula specified in for the applicable project category? | 1,2,3,4 | DR | Refer to E.2.1 above. | - | - |
| E.2.3. Have conservative assumptions been used to calculate leakage? | 1,2,3,4,7 | DR | Refer to E.2.1 above. | - | - |
| **E.3. The sum of E.1 and E.2.** | | | | | |
| E.3.1. Does the sum of E.1 and E.2 represent the project activity emissions? | 1,2,3,4 | DR | See sections E.3 and E.6 of the PDD. | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| **E.4. Estimated baseline emissions** | | | | | |
| E.4.1. Are described the formulae used to estimate the anthropogenic emissions by source of GHGs in the baseline using the baseline methodology for the applicable project category? | 1,2,3,4 | DR | See sections E.3 and E.6 of the PDD. | OK | OK |
| E.4.2. Is there a description of calculation of GHG baseline emissions in accordance with the formula specified in for the applicable project category? | 1,2,3,4,10 | DR | See sections E.3 and E.6 of the PDD. | OK | OK |
| E.4.3. Have conservative assumptions been used to calculate baseline GHG emissions? | 1,2,3,4 | DR | Please clarify methodology of assessment amount of waste for Primorsky landfill and for Ordzhonikidze landfill and why data about waste amount in various documents that were presented on site visit are different. | CL22 | |
| **E.5. Difference between E.4. and E.3. representing the emission reductions of the project** | | | | | |
| E.5.1. Does the difference between E.4. and E.3. represent the emission reductions due to the project during a given period? | 1,2,3,4 | DR | Refer to E.5 of the PDD. | OK | OK |
| **E.6. Table providing values obtained when applying formulae above** | | | | | |
| E.6.1. Is there a table providing values of total $CO_2$ abated? | 1,2,3,4 | DR | Table presented in section E.6 of the PDD | OK | OK |
| ***F. Environmental Impacts*** | | | | | |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| **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** | | | | | |
| F.1.1. Has an analysis of the environmental impacts of the project been sufficiently described? | 1,2,3,4 | DR, I | Section F.1 of PDD gives sufficient environment impact analysis description. | OK | OK |
| F.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is and EIA approved? | 1,2,3,4 | DR, I | Please provide evidences that the project activities as for the environmental impacts are in conformity with *the* National Focal Point requirements. | CAR15 | OK |
| F.1.3. Are the requirements of the National Focal Point being met? | 1,2,3,4 | DR, I | The National Focal Point issued Letter of Endorsement. | OK | OK |
| F.1.4. Will the project create any adverse environmental effects? | 1,2,3,4 | DR, I | Adverse environmental effects are not expected. | OK | OK |
| F.1.5. Are transboundary environmental considered in the analysis? | 1,2,3,4 | DR, I | Please, explain whether there are transboundary environmental impacts considered in the analysis | CAR16 | OK |
| F.1.6. Have identified environmental impacts been addressed in the project design? | 1,2,3,4 | DR, I | See section F of the PDD.<br>Adverse environmental effects are not expected. | OK | OK |
| ***G.* Stakeholders' comments** | | | | | |
| **G.1. Information on stakeholders' comments on the project, as appropriate** | | | | | |
| G.1.1. Is there a list of stakeholders from whom comments on the project have been | 1,2,3,4,8 | DR | Section G.1 of PDD | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| received? | | | | | |
| G.1.2. The nature of comments is provided? | 1,2,3,4 | DR | Section G.1 of PDD | OK | OK |
| G.1.3. Has due account been taken of any stakeholder comments received? | 1,2,3,4 | DR | Section G.1 of PDD | OK | OK |

**Table 3**

**Baseline and Monitoring Methodologies: ACM0001 version 11**

| CHECKLIST QUESTION | Ref. | MoV* | | | |
|---|---|---|---|---|---|
| 1 Applicability | | | | | |
| 1.1 Is the project a gas capture activity? | 1,2 | DR | Yes, the project is methane capture activity. It is reflected in the project title ""Landfill methane capture and utilisation at Mariupol landfills, Ukraine" | OK | OK |
| 1.2 Is the baseline scenario the partial or total atmospheric release of the landfill gas? | 1,2 | DR | Yes, baseline scenario is the total atmospheric release of the landfill gas (LFG). | OK | OK |
| 1.3 Does the project meet the conditions of ACM0001 applicability? | 1,2 | DR | Yes, the project belongs to the situation b) envisaged by ACM0001, namely the captured gas is used to produce electricity energy. | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | | | |
|---|---|---|---|---|---|
| 2 Baseline Methodology | | | | | |
| 2.1 Project boundary | | | | | |
| 2.1.1 Does the project boundary enclose the project activity, where the gas is captured and destroyed with allowance for electric grid? | 1,2 | DR | The Project will contain the following activities:<br>• installation of wells and a piping network for LFG collection,<br>• installation of a flaring system including gas booster, flare and monitoring system, and<br>• commissioning of an engine-generator set for power production with connection to the power grid | OK | OK |
| 2.1.2 Is the summary of gases and sources included in the project boundary presented (cf. ACM0001 Table1). | 1,2 | DR | Refer to PDD Section B.3 | OK | OK |
| 2.2 Selection of baseline scenario & additionality | | | | | |
| 2.2.1 Is the four-step procedure to select the most plausible baseline scenario followed? | 1,2 | DR | Refer to PDD Section B.2 | OK | OK |
| 2.2.2 Are alternative scenarios defined as per Step 1? | 1,2 | DR | Yes, four alternatives are defined | OK | OK |
| 2.2.3 Is the fuel for the baseline choice of energy source defined as per Step 2? | 1,2 | DR | See item B.2.1 (CL7-CL17) above | - | - |
| 2.2.4 Is investment analysis carried out as per Step 2 with reference to the “Tool for demonstration and assessment of additionality”? | 1,2,3 | DR | Yes, investment analysis carried out as per Step 2 with reference to the “Tool for demonstration and assessment of additionality”. | OK | OK |
| 2.2.5 Is the baseline scenario defined as credible and plausible alternative scenario? | 1,2 | DR | Yes, the Project baseline defined as credible and plausible alternative scenario. | OK | OK |
| 2.2.6 Is the additionality demonstrated and assessed using the latest version of the “Tool for demonstration and assessment of additionality”? | 1,2,3 | DR | Please, clarify version of “Tool for demonstration and assessment of additionality” | CL23 | |

| CHECKLIST QUESTION | Ref. | MoV* | | | |
|---|---|---|---|---|---|
| 2.2.7 Is the project additional? | 1,2 | DR | See section B.2 of the PDD | OK | OK |
| **2.3 Baseline and project emissions** | | | | | |
| 2.3.1 Are baseline emissions defined according to equation (1) with allowance for equations (8) – (10)? | 1,2 | DR | See section D.1.2.2 of the PDD. | OK | OK |
| 2.3.2 Are project emissions defined according to equation (16)? | 1,2 | DR | See section D.1.2.2 of the PDD. | OK | OK |
| **2.4 Leakage** | | | | | |
| 2.4.1 Does the project have a leakage? | 1,2 | DR | Leakage is not expected. | OK | OK |
| **2.5 Methane generation from landfill** | | | | | |
| 2.5.1 Is methane generation from landfill in the absence of the project activity calculated as per the latest version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site"? | 1,2,7 | DR | Please, clarify version of "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" | CL24 | |
| **3 Monitoring methodology** | | | | | |
| 3.1 Does the Monitoring Plan in PDD with measuring points conform to ACM0001? | 1 | DR | See section D.1.2.1 of the PDD. | OK | OK |
| 3.2 Does the QA/QC procedure for the calibration of the equipment for monitoring is defined with accordance of the ACM0001? | 1 | DR | See section D.2 of the PDD. | OK | OK |
| 3.2.1 Are the monitoring points organised as per ACM0001 monitoring methodology? | 1,2 | DR | See section D.1.2.1 of the PDD. | OK | OK |
| 3.2.2 Are all the parameters to be monitored included | 1,2 | DR | See section D.1.2.1 of the PDD. | OK | OK |

| CHECKLIST QUESTION | Ref. | MoV* | | | |
|---|---|---|---|---|---|
| in the monitoring plan? | | | | | |
| 3.2.3 Are quality control and quality assurance procedures regarding maintenance of metering equipment envisaged as per ACM0001? | 1,2 | DR | See section D.2 of the PDD. | OK | OK |

**Table 4 Legal requirements**

| CHECKLIST QUESTION | Ref. | MoV* | COMMENTS | Draft Concl | Final Concl |
|---|---|---|---|---|---|
| **1. Legal requirements** | | | | | |
| 1.1. Is the project activity environmentally licensed by the competent authority? | 1,2 | DR, I | Please clarify in PDD is the project activity environmentally licensed by the competent authority | CL25 | OK |
| 1.2. Are there conditions of the environmental permit? In case of yes, are they already being met? | 1,2 | DR, I | See section F.2 of the PDD. | OK | OK |
| 1.3. Is the project in line with relevant legislation and plans in the host country? | 1,2 | DR, I | See items 1.1 (CL19) above | - | - |

**Table 5 Resolution of Corrective Action and Clarification Requests**

| Draft report clarifications and corrective action requests by determination team | Ref. to checklist question in tables 2, 3 and 4 | Summary of project owner response | Determination team conclusion |
|---|---|---|---|
| **Corrective Action Request (CAR) 1**<br>There is no evidence of written project approvals by the Parties involved.<br>Please, provide # and date of LoE. | Table 1, question 1 | The Letter of Approval from the country - investor will be provided after approval of project by Ukraine.<br>National Environmental Investment Agency of Ukraine<br>35, Urytskogo str.<br>03035 Kiev<br>Ukraine<br>Email: info.neia@gmail.com<br>**Mr. Igor Lupaltsov**<br>**Head**<br>National Environmental Investment Agency of Ukraine<br>Phone: +380 44 594 9111<br>Fax: +380 44 594 9115<br>Email: lupaltsov@ukr.net<br>See section A.5 and Annex 4, version 1.2. | After finishing of project determination report, the PDD and Determination Report will be presented to National Environmental Investments Agency of Ukraine for receiving of the Letter of Approval.<br>Corrective Action Request is pending untill second Party will be defined and letters of approval obtained. |
| **Corrective Action Request (CAR) 2**<br>There is no information about | Table 1, question 3 | Project costs will be partially covered by “TisEco” company and rest will be covered by loan capital; currently negotiations with few | PDD version 1.2 was checked. Corrective Action Request is pending untill second Party will be |

| | | | |
|---|---|---|---|
| sponsor Party in PDD. | | banks are in the process, in particular with European Bank of Reconstruction and Development. Also the option of partial project financing by ERUs buyer is under consideration. Page 4 of PDD, version 1.2. | defined and letter of approval obtained. |
| **Corrective Action Request (CAR) 3**<br>Please provide sectoral scope of the project | Table 2, question A 1.1 | Sectoral scope: Waste handling and disposal<br>See section A.1 of PDD, version 1.2. | PDD version 1.2 was checked. Corrective Action Request is closed. Number of sectoral scope is not indicated |
| **Corrective Action Request (CAR) 4**<br>Please provide evidence of written project approvals by the Parties involved. | Table 2, question A.3.2. | Letter of Endorsement for Primorsky and Ordzhonikidze LFG project # 907/23/7 from 12/08/2009 from the Ministry of Environmental Protection of Ukraine can be provided on request.<br>Documents for Letter of Approval obtainment will be applied after determination process completing. LoA from Host Party is expected to be obtained in January 2010. LoA from Sponsor Party will be gained after Sponsor Party definition.<br>See section A.5 and Annex 4, version 1.2. | Corrective Action Request is pending untill second Party will be defined and letters of approval obtained. |
| **Corrective Action Request (CAR) 5**<br>Please, provide the estimated annual reduction for the chosen credit period in tCO2e | Table 2, question A.4.3.3. | The emission reduction estimates for Primorsky and Ordzhonikidze landfills for crediting period were provided in tables, section A.4.3.1 of the PDD, version 1.2 in accordance with GUIDELINES FOR USERS OF THE JI PDD FORM, Version 03. | PDD version 1.2 was checked. Corrective Action Request is closed. |
| **Corrective Action Request (CAR) 6** | Table 2, question | All key information and data used to establish the baseline provided in Annex 2 of the PDD, | PDD version 1.2 was checked. Corrective Action Request is |

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| There is no key information and data used to establish the baseline provided in this section.<br>Please include this information to Section B.1. of the PDD | B.1.1. | version 1.2. In section B.1 was provided relevant reference to Annex 2. | closed. |
| **Corrective Action Request (CAR) 7**<br>Please provide proper transparent description of the baseline chosen and included in the list of the considered alternatives. | Table 2, question B.1.1. | In section B.2 of the PDD, version 1.2 was provided description of the baseline chosen and list of the alternatives:<br>1. The continuation of the current situation: no landfill gas extraction<br>2. Extraction of landfill gas and combustion of the gas in a flaring stack for methane emission reduction only (as non-JI project);<br>3. Landfill owner invests in the landfill gas extraction system and LFG power and heat generation facility for electricity supply to the public network and heat providing to consumer (as non-JI project);<br>4. A different use of biogas offsite is proposed.. | PDD version 1.2 was checked. Corrective Action Request is closed. |
| **Corrective Action Request (CAR) 8**<br>Please provide references for all Methodologies and Tools used, including their versions, throughout of the PDD text. | Table 2, question B.1.5. | Throughout of the PDD text<br>Reference on methodology and tools: http://cdm.unfccc.int/goto/MPappmeth | PDD version 1.2 was checked. Corrective Action Request is closed. |

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| **Corrective Action Request (CAR) 9**<br>Please provide outcomes for step1a, sub-step 1b, step 2 and sub-step 3a as required by the Tool. Without conducting those steps project can not be proceeded to the next part and considered additional | Table 2, question B.2.1. | Outcome of step 1a: The above analysis shows that alternative **Ошибка! Источник ссылки не найден.** is not plausible. Alternatives **Ошибка! Источник ссылки не найден.** and **Ошибка! Источник ссылки не найден.** are plausible, but not probable. The only reasonable alternative to the project activity is the continued uncontrolled release of landfill gas to the atmosphere as part of the "business-as-usual" scenario at the site. Alternative **Ошибка! Источник ссылки не найден.** and alternative **Ошибка! Источник ссылки не найден.** will be analysed further below.<br><br>Outcome of step 1b: Even if Alternative 1 does not comply with the existing regulation it is considered a plausible baseline scenario. All other alternatives are consistent with aforementioned legislation.<br><br>Outcome of step 2: The project IRR without ERU sale remains low even in the case where these parameters change in favour of the Project. Even though these numbers are closer to the risk free returns of government bonds, these are still too low for a risky enterprise such as the construction and operation of a landfill gas-to-energy project, and fairly lower than private equity investments such as 17%. Consequently, the Project cannot be considered as financially | PDD version 1.2 was checked. Corrective Action Request is closed. |

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| | | attractive without ERU sale.<br>Outcome of step 3a: The above analysis shows that there exist significant investment and technological barriers that may prevent the proposed project activity implementation. | |
| **Corrective Action Request (CAR) 10**<br>Please clarify which project scenario is chosen | Table 2, question B.2.3. | The above analysis shows that Alternative **Ошибка! Источник ссылки не найден.** and Alternative **Ошибка! Источник ссылки не найден.** do not represent the baseline scenario. Since a PPA has yet to be secured, Alternative **Ошибка! Источник ссылки не найден.**/3 has been chosen as the Project activity.<br>See section B.2 of PDD, version 1.2. | PDD version 1.2 was checked. Corrective Action Request is closed. |
| **Corrective Action Request (CAR) 11**<br>Please present the date of the baseline setting in DD/MM/YYYYformat. | Table 2, question B.4.1. | 28/08/2009<br>See section B.4 of PDD, version 1.2. | PDD version 1.2 was checked. Corrective Action Request is closed. |
| **Corrective Action Request (CAR) 12**<br>Please define the starting date of the project activity | Table 2, question C.1.1. | 01/01/2010<br>See section C.1 of PDD, version 1.2. | PDD version 1.2 was checked. Corrective Action Request is closed. |
| **Corrective Action Request (CAR) 13**<br>Please, provide the project's operational lifetime in years and | Table 2, question C.2.1. | 15 years/180 months (start operation in January 2010, finish in December 2024 with possible prolongation until 2039, as CHP service life period is meant for 30 years) | PDD version 1.2 was checked. Corrective Action Request is closed. |

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| months | | See section C.2 of PDD, version 1.2. | |
| **Corrective Action Request (CAR) 14**<br>Please, provide the length of the crediting period in years and months | Table 2, question C.3.1. | **During the first commitment period:**<br>3 years/36 months (January 2010-December 2012)<br><br>**Beyond the first commitment period:**<br>Within the second commitment period to be established under Kyoto Protocol, and further but not exceeding the project operational lifetime.<br>See section C.3 of PDD, version 1.2. | PDD version 1.2 was checked. Corrective Action Request is closed. |
| **Corrective Action Request (CAR) 15**<br>Please provide evidences that the project activities as for the environmental impacts are in conformity with the National Focal Point requirements. | Table 2, question F.1.2. | In the Ukraine, both an Environmental Impact Assessment (EIA) and a State Environmental Expertise (EE) are used for estimation of environmental impact of the project activity.<br>An EIA estimates impact the levels a project may have on the environment, development of actions on prevention or reduction of these influences, and acceptability of design decisions from the environmental point of view. An EIA is a compulsory part of the design documentation of any economic activity and is carried out under strictly established requirements. | PDD version 1.2 was checked. Corrective Action Request is closed. |
| **Corrective Action Request (CAR) 16**<br>Please, explain whether there are transboundary environmental impacts considered in the analysis | Table 2, question F.1.5. | Transboundary impact is not considered within the project because the project activity is located in the territory of Ukraine, wastes are received from Ukrainian consumers, adverse effects on any territory especially of | PDD version 1.2 was checked. Corrective Action Request is closed. |

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| | | other states are not expected and produced electricity will be supplied to Ukrainian grid. | |
| **Clarification Request (CL) 1**<br>Please provide more detailed implementation schedule for both landfills | Table 2, question A.2.1 | Planned Project Implementation is presented below (for Prymorsky landfill).<br>13. August – September 2009 – Project Design Document (PDD) prepared and project business plan finalized.<br>14. December 2009 – Obtaining Letter of Approval from Ukrainian Government.<br>15. December 2009 – Complete drilling on all wells in Prymorsky landfill. Installation of pipes. Purchase of flaring plant and monitoring equipment.<br>16. January 2010 – Flaring project testing, trials and fully operational in Prymorsky landfill.<br>17. March 2010 – Feasibility study on power generation.<br>18. April 2010 - Decision making on CHP purchase and capacity selection.<br>19. September 2010 – engine installation and start-up in Prymorsky landfill.<br>20. September – December 2010 – Wells drilling in Ordzhonikidze landfill. | PDD version 1.2 has been checked. Clarification Request is closed. |

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| | | Installation of pipes. Purchase of flaring plant and monitoring equipment.<br>21. January 2010 – Flaring project testing, trials and fully operational in Ordzhonikidze landfill.<br>22. March 2010 – Feasibility study on power generation.<br>23. April 2010 - Decision making on CHP purchase and capacity selection<br>24. September 2010 – engine installation and start-up in Ordzhonikidze landfill<br><br>Page 4 of PDD, version 1.2. | |
| **Clarification Request (CL) 2**<br>Please, clarify if the project technology is likely to be substituted by other or more efficient technologies within the project period. | Table 2, question A.4.2.3. | The project applies conventional technological decision, that is used on many landfill sites. This is state of the art technology, which can not be substituted by other or more efficient technologies within the project period.<br>See section A.4.2 of PDD, version 1.2. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 3**<br>Please, clarify if the project requires extensive initial training and maintenance efforts in order to work as presumed during the project period. | Table 2, question A.4.2.4. | The facility will be operated in the frame of maintenance service. The training is planned to be held by equipment manufacturer before start-up. Personnel will be provided be all necessary instructions for proper technique operation. Project doesn't require extensive | PDD version 1.2 has been checked. Clarification Request is closed. |

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| | | initial training and maintenance efforts to work as presumed during the project period.<br>See section A.4.2 of PDD, version 1.2. | |
| **Clarification Request (CL) 4**<br>Please, clarify if the project makes provisions for meeting training and maintenance needs | Table 2, question A.4.2.5. | The facility will be operated in the frame of maintenance service. The training is planned to be held by equipment manufacturer before start-up. Personnel will be provided be all necessary instructions for proper technique operation. Project doesn't require extensive initial training and maintenance efforts to work as presumed during the project period.<br>See section A.4.2 of PDD, version 1.2. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 5**<br>Please, clarify crediting period and over crediting period in table. | Table 2, question A.4.3.4. | The emission reduction estimates for Primorsky and Ordzhonikidze landfills for every period were provided in separate tables. See section A.4.3.1 of the PDD, version 1.2. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 6**<br>The baseline and monitoring methodology to be applied for the proposed project activity is the approved consolidated baseline methodology ACM0001, version 11, May 2009: "Consolidated baseline and monitoring methodology for landfill gas project activities".<br><br>Please provide references at the | Table 2, question B.1.1. | Reference on methodology and tools: http://cdm.unfccc.int/goto/MPappmeth. | PDD version 1.2 has been checked. Clarification Request is closed. |

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| bottom of the page on where this Methodology, as well as all Tools used with indication of their versions could be found | | | |
| **Clarification Request (CL) 7**<br>Step 2 investment analysis.<br>The project developer derives the benchmark using USD bank rates which is not correct as all calculations for the project are made in EUR. The benchmark also lacks references to the sources and justification currently. The proper benchmark shall be established using EUR rates which are slightly (usually by 1%) lower than those in USD. Foreign currency (EUR and USD) average bank deposit rates in Ukraine were at 11.4% during July 2009. Source: http://bank.gov.ua/Statist/Statist_data/Inter_r_term_dep.xls (web site of the National Bank of Ukraine). This value shall be adjusted for risk factor associated with implementation of new technology with inherent technical and financial risks. Due to the lack of the data for the similar projects in the country the risk factor adjustment may be identified only on | Table 2, question B.2.1 | The likelihood of development of either Alternative, as opposed to the continuation of current activities (i.e., no collection and combustion of landfill gas), will be determined by comparing the respective IRR values with the benchmark of interest rates available to a local investor. In 2009, commercial interest rates at local banks in Ukraine were 11.4% for EUR deposits (Source: *http://bank.gov.ua/Statist/Statist_data/Inter_r_term_dep.xls*). See section B.2 of PDD, version 1.2. | PDD version 1.2 has been checked. Clarification Request is closed. |

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| the basis of expert opinion. Using conservative approach we can estimate the risk factor adjustment to be at 8% following the official Methodological recommendations on evaluation of investment projects efficiency 21.06.1999 N BK 477 adopted in Russia. Unfortunately Ukraine misses similar officially adopted methodology. So now we have 11.4+8 = 19,4% curb rate. | | | |
| **Clarification Request (CL) 8**<br>Note that the developer is apparently using fixed prices in Euro for its financial calculations. At the same time IRR benchmark calculated based on the nominal values (bank deposit rate + risk premium) contradicting with fixed prices of the financial model. In such instance not nominal but real discount rate or IRR (i.e. rate cleared of inflation) shall be applied in order to account for financial calculations made in fixed prices.<br>We can calculate real IRR in the following way: IRRr = (IRRn+1)/(I+1)-1, where IRRr- is real IRR, IRRn – nominal IRR, I – inflation rate.<br>12 years average inflation index for | Table 2, question B.2.1 | 17% is the proper IRR benchmark value was used for estimation of the project additionality.<br>See section B.2 and Appendix A of PDD, version 1.2. | PDD version 1.2 has been checked. Clarification Request is closed. |

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| EuroZone (we apply EuroZone inflation because financial calculations are made in Euros) for the period of 1997-2008 is 2,1%. Source is Eurostat http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&language=en&pcode=tsieb060&tableSelection=1&footnotes=yes&labeling=labels&plugin=1.<br><br>Using the formula above we can calculate IRRn = 1.194/1.021 - 1= 0.1694 = 16.94% Thereby 17% is the proper IRR benchmark value which shall be used for estimation of the additionality of the project. | | | |
| **Clarification Request (CL) 9**<br><br>The developer uses the period of 15 years for financial analysis of the project which is in lines with the Guidance for the Assessment of Investment analysis (hereinafter referred as the Guidance) recommending period of 10-20 years. Additionally the Guidance article 4 requires the fair value of the assets at the end of the end of assessment period to be included in the cash flow for the final year. In our case the liquidation value of the assets for 2024 is indicated as 0. Please add | Table 2, question B.2.1 | See section B.2 and Appendix A of PDD, version 1.2. | PDD version 1.2 has been checked. Clarification Request is closed. |

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| short justification for such liquidation value. | | | |
| **Clarification Request (CL) 10**<br>IRR, NPV values, annual operating costs indicated in the table on the page 15 of the PDD and PDD_Mariupol_Veritas Excel file are different. Please correct the discrepancy. I would also suggest eliminating any reference to NPV on the pages 14-15 and in the Excel tables as it is not used as the benchmark and confusing. | Table 2, question B.2.1 | IRR and NPV values are corrected and now them are same in PDD and in Excel file (Appendix A). Also were provided all necessary references on Excel file. See section B.2 and Appendix A of PDD, version 1.2. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 11**<br>Please add the clear definition of the project scenario. I assume that the statement in the Summary on the page 19 "Alternative 2/3 has been chosen as the Project activity" is not fully correct. It seems that we are going to produce the energy at both landfills so we are following Alternative 3. Please clarify. The statement that the project is additional in the same paragraph is highly welcome.<br>If we are following Alternative 3 no calculations for alternative 2 are required while using benchmark | Table 2, question B.2.1 | In section B.2 and Appendix A of PDD, version 1.2 were provided calculations for each of Alternatives 2 and 3. The above analysis shows that Alternative **Ошибка! Источник ссылки не найден.** and Alternative **Ошибка! Источник ссылки не найден.** do not represent the baseline scenario. Since a PPA has yet to be secured, Alternative **Ошибка! Источник ссылки не найден.**/3 has been chosen as the Project activity. An opportunity of CHP unit installation (Alternative **Ошибка! Источник ссылки не найден.**) will depend on the experience and monitoring data of the first months of operation and negotiations with the potential power and heat consumers; so the decision will be taken after a trial | PDD version 1.2 has been checked. Clarification Request is closed. |

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| approach. I recommend eliminating any calculations for Alternative 2 in order not to mislead the reader. | | period of methane capture system operation and a feasibility analysis. | |
| **Clarification Request (CL) 12**<br>Tax calculations do not account for the tax credit obtained due to the losses accumulated at the early stage of the project thereby overestimating profit tax obligations. Table on the page 54 indicates the income tax 20% while 25% is correct value used in your calculations. Please clarify/correct. | Table 2, question B.2.1 | In Annex 2 of the PDD, version 1.2 income tax was corrected on 25%. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 13**<br>Depreciation rate used in financial calculations is 6.75% quarterly using declining balance method. I assume doing so developer is trying to follow the articles of the Income Tax Law of Ukraine. Please note that this law adopts 6.00% depreciation rate for similar plant and equipment. Please clarify/correct the issue as it provides impact on project cash flow. | Table 2, question B.2.1 | In Annex 2 of the PDD, version 1.2 depreciation rate used in financial calculations is 6.00%. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 14**<br>Table PDD_Mariupol_Veritas-2 is using "green tariff" of 137,5 EUR/MWh for financial calculations, PDD_Mariupol_Veritas – 110 | Table 2, question B.2.1 | In PDD, version 1.2 was used "green tariff" of 134,5 EUR/MWh for financial calculations. | PDD version 1.2 has been checked. Clarification Request is closed. |

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| EUR/MWh, table on the page 54 indicates 130 EUR/MWh. It contradicts with requirement (9) of the Sub-step 2c of the Methodological Tool Assumptions and input data for the investment analysis shall not differ across the project activity and its alternatives, unless differences can be well substantiated. Please clarify/correct this discrepancy. | | | |
| **Clarification Request (CL) 15**<br>The developer provides the results of sensitivity analysis in comprehensive manner but the absence of formulas and references prevents the reader from reproducing results of the analysis. It contradicts with article 8 of the Guidance. Please provide Excel formulas/tables illustrating how IRR for deviation scenarios has been calculated. | Table 2, question B.2.1 | The calculations of sensitivity analysis were provided in Appendix A of PDD, version 1.2. Relevant reference was provided in section B.2 of PDD, version 1.2. | PDD version 1.2 and Appendix A have been checked. Clarification Request is closed. |
| **Clarification Request (CL) 16**<br>In order to facilitate the reading investment and operational expenses in Excel tables shall be indicated as two separate lines instead of single line “total costs”. | Table 2, question B.2.1 | In Excel file was indicated as two separate lines instead of single line “total costs”. | Excel tables have been checked. Clarification Request is closed. |
| **Clarification Request (CL) 17** | Table 2, | Both Excel files provided in Appendix A. All | PDD version 1.2 and Appendix A |

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| Please supplement the Excel tables with proper headers clearly indicating the landfill it is referring to (Primorsky or Ordzhenikidze or both sites combined). References currently used Mariupol-I and –II are sometimes wrong and generally misleading as these names are not used in text.<br>It would be beneficial to unite both Excel files in one in order to avoid unnecessary switching between the files, inter-file links and unnecessary calculations (for example separate IRR calculations for Primorsky and Ordzhenikidze). | question B.2.1 | necessary references provided in PDD version 1.2. | have been checked. Clarification Request is closed. |
| **Clarification Request (CL) 18**<br>Please, provide references for the Tool used to demonstrate additionality. | Table 2, question B.2.1. | Identification of baseline scenario is made using the *"**Tool for the demonstration and assessment of Additionality"** (Version 05.2)*[*].and *"**Combined tool to identify the baseline scenario and to demonstrate Additionality"**(Version 02.2)*[†] agreed by the CDM Executive Board. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 19**<br>Please explain why the emissions in the baseline scenario would likely exceed the emissions in the project | Table 2, question B.2.4. | The major source of greenhouse gas emissions in the baseline scenario are methane emissions from decomposition of waste at the landfill site which would | PDD version 1.2 has been checked. Clarification Request is closed. |

[*] Reference: http://cdm.unfccc.int/goto/MPappmeth
[†] Reference: http://cdm.unfccc.int/goto/MPappmeth

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| scenario | | evidently exceed the project emissions from electricity consumption; this is proved by calculation of emission reduction.<br>See section B.2 of PDD, version 1.2. | |
| **Clarification Request (CL) 20**<br>Please provide appropriate references for all documents you use. | Table 2, question D.1.1. | Referebces were corrected throughout of the PDD, version 1.2 text | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 21**<br>Please clarify if conservative assumptions are used to calculate project GHG emissions | Table 2, question E.1.3. | Project GHG emissions are the emissions from grid electricity import and have been calculated using conservative assumptions as accounts highest possible electricity consumption. | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 22**<br>Please clarify methodology of assessment amount of waste for Primorsky landfill and for Ordzhonikidze landfill and why data about waste amount in various documents that were presented on site visit are different. | Table 2, question E.4.3. | The statistical data on the waste delivery to Primorsky and Ordzhonikidze landfills through the whole period of landfills operation (back to 1967 and 1976 respectively) is not available at municipalities. The only reported data for the period of 2003-2008 are based on the amount of waste trucks and have big spread and therefore low reliability.<br>Recently established scale measurements show that during three months (June-August 2009) at Ordzhonikidze landfill were delivered 44.04 tones of waste. That time Primorsky landfill was already closed.<br>Therefore the approximation approach for the calculation of the annual amount of waste delivered to landfill throughout the period of | PDD version 1.2 has been checked. Clarification Request is closed. |

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| | | landfill operation based on the average recent data on waste delivery and the value for total waste accumulated at the sites was applied. It is based on several assumptions:<br>• The total amount of waste is 2.56 million tonnes for Primorsky landfill and 2.54 million tonnes for Ordzhonikidze landfill by the end of 2008;<br>• Amount of waste grows constantly during all landfill life period (the calculated yearly growth factor is 2%).<br>• About 180 thousand tones of waste were delivered to Ordzhonikidze landfill in 2009.<br>The tables providing the calculated values of yearly waste delivery to the landfills are given in Annex 2. | |
| **Clarification Request (CL) 23**<br>Please, clarify version of the "Tool for demonstration and assessment of additionality" | Item 2.2.6. of Table 3 of the Protocol | "Tool for the demonstration and assessment of Additionality" (Version 05.2) | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 24**<br>Please, clarify version of the "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site" | Item 2.5.1. of Table 3 of the Protocol | "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" (Ver. 04) | PDD version 1.2 has been checked. Clarification Request is closed. |
| **Clarification Request (CL) 25** | Item 1.1. of | In the Ukraine, both an Environmental Impact | PDD version 1.2 has been |

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| Please clarify in PDD is the project activity environmentally licensed by the competent authority | the Table 4 of the Protocol | Assessment (EIA) and a State Environmental Expertise (EE) are used for estimation of environmental impact of the project activity.<br><br>An EIA estimates impact the levels a project may have on the environment, development of actions on prevention or reduction of these influences, and acceptability of design decisions from the environmental point of view. An EIA is a compulsory part of the design documentation of any economic activity and is carried out under strictly established requirements. | checked. Clarification Request is closed. |

Appendix B: Verifiers CV's

**Nadiya Kaiiun, M. Sci. (environmental science)**
Climate Change Lead Verifier
Bureau Veritas Ukraine HSE Department project manager.
She has graduated from National University of Kyiv-Mohyla Academy with the Master Degree in Environmental Science. She is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered). She performed over 15 audits since 2008. She has undergone intensive training on Clean Development Mechanism /Joint Implementation and she is involved in the determination/verification of 9 JI projects.

**Kateryna Zinevych, M. Sci. (environmental science)**
Climate Change Verifier
Bureau Veritas Ukraine Health, Safety and Environmental Project Manager
She has graduated from National University of Kyiv-Mohyla Academy with the Master Degree in Environmental Science. She is a Lead Auditor of Bureau Veritas Certification for Environment Management System. She has undergone a training course on Clean Development Mechanism /Joint Implementation and she is involved in the determination/verification of 26 JI projects.

**Oleg Skoblyk, Specialist (Power Management)**
Climate Change Verifier
Bureau Veritas Ukraine HSE Department project manager.
He has graduated from National Technical University of Ukraine 'Kyiv Polytechnic University" with specialty Power Management. He is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered). He performed over 10 audits since 2008. He has undergone intensive training on Clean Development Mechanism /Joint Implementation and he is involved in the determination/verification of 9 JI projects.

Report was reviewed by:

**Ivan G. Sokolov, Dr. Sci. (biology, microbiology)**
Climate Change Lead Verifier.
Bureau Veritas Ukraine HSE Department manager.
He has over 25 years of experience in Research Institute in the field of biochemistry, biotechnology, and microbiology. He is a Lead auditor of Bureau Veritas Certification for Environment Management System (IRCA registered), Quality Management System (IRCA registered), Occupational Health and Safety Management System, and Food Safety Management System. He performed over 140 audits since 1999. Also he is Lead Tutor of the IRCA registered ISO 14000 EMS Lead Auditor Training Course, and Lead Tutor of the IRCA registered ISO 9000 QMS Lead Auditor Training Course. He has undergone intensive training on Clean Development Mechanism /Joint Implementation and he is involved in the determination/verification of 26 JI projects.