Validation opinion

Combined notification / request for approval of changes from the project activity as described in the registered project design document and request for revision of the monitoring plan

Title of project activity:			
Durban Landfill-gas-to-electricity project – Mariannhill and La Mercy Landfills			
CDM reference number:		DNV project No.:	
0545		PRJC-217312-2010-CCS-NOR	
Type of request of changes from the project activity as described in the registered PDD:	☒ Notification of changes from project activity as described in the registered PDD (i.e. changes do not raise any concerns with regard to i) additionality, ii) the scale of CDM project activity and/or iii) the applicability and application of baseline methodology ☐ Request for approval of changes from project activity as described in the registered PDD		
Type of revision for revision of monitoring plan:	☐ Proposed revision only includes the request by the CDM EB ☐ Proposed revision includes not only the request by the CDM EB but also additional revisions proposed by the PP/DOE ☒ Proposed revision includes revisions proposed by the PP/DOE		
Date	Work carried out by:	Work verified by:	Approved by:
3 April 2012	Marlene Fischer Michael Lehmann	Chandrashekara Kumaraswamy	Edwin Aalders

1 Description of the changes as compared to the description in the registered PDD and description of the changes to the monitoring plan

a) Changes to the project design as compared to the description in the registered PDD:

The 'Durban Landfill-gas-to-electricity project – Mariannhill and La Mercy Landfills' was registered as a CDM project activity on 15 December 2006, with a first renewable crediting period from 15 December 2006 to 14 December 2013. The project applies the approved baseline and monitoring methodology AM0010 (version 1).

The project involves the installation of a landfill gas collection and treatment as well as electricity generation and flaring system at the Mariannhill and La Mercy landfill sites, located in the municipality of Durban, South Africa. Within the project boundary, landfill gas will be extracted from the landfill sites and used to generate electricity to be supplied to the municipal grid. Excess biogas is being flared.

It is described in the registered PDD* that the project will install 0.5 MW of power generation capacity at each site for export of electricity to the municipal grid. Flaring systems with a capacity of 1 000 Nm^3/h each† have been installed at both landfill sites as described.

During the site visit performed for the 2nd monitoring period (from 2 November 2007 to 28 February 2010) on 19-20 May 2010, DNV identified that the actual project design is different compared to the description in the registered PDD. The changes are as follows:

1a. Change of total installed capacity:

The total installed capacity of the project at the start of the crediting period was 1.5 MW, as the engine at Mariannhill landfill has been installed with a higher capacity. The capacity to be installed changed from the initially planned 0.5 MW to a Jenbacher 320 engine, with a capacity of 1 MW. This was confirmed during the site visit and the engine's specification‡ has been provided. *2a. Decommissioning of project equipment at La Mercy in June 2009:*

The La Mercy landfill site was facing difficulties to sufficiently extract landfill gas from the project wells. The presence of (a) high levels of leachate in the landfill body as well as (b) significant quantities of fine sand, used as cover material when the site was operational, caused a systematic blocking of gas pipes. As a consequence of this insufficient gas supply, the engine, installed at the project site in December 2006§ could never be run at maximum output.

The flare was commissioned at the La Mercy site in November 2006§ with initial gas flows of around 183 Nm^3/h, which were declining to approximately 90 Nm^3/h, as stated in the site investigation report issued by SLR Consulting in September 2007**. DNV is able to confirm the limited gas flow by cross-checking the SCADA data for the 2nd monitoring period, where gas flows to the flare during the period November 2007 to June 2009 were on average 60 Nm^3/h. Therefore, the flaring system and the engine have been de-commissioned at the La Mercy landfill site in June 2009 and since then the situation on site represents the pre-project scenario, which is the passive venting of landfill gas to the atmosphere. After the decommissioning of the project equipment at La Mercy, the total installed capacity of the project is 1 MW.

Project participants provided a revised PDD and a formal statement, explaining the differences between the project design as stated in the registered PDD and the actual status of project implementation as verified during the site visit.

b) Changes to the monitoring plan:

The DOE has deemed necessary to communicate to the UNFCCC several changes in the monitoring plan (MP) of the registered PDD for the project activity 'Durban Landfill-gas-to-electricity project – Mariannhill and La Mercy Landfills' (0545), covering the second monitoring period from 02 November 2007 to 28 February 2010. Relevant sections have been revised in the MP of the PDD and were found in accordance with paragraph 35 (a) of the EB65 meeting report.

The revision points are described in more detail in the section below, as well as an assessment is provided of the reason(s) for changes made to the registered MP. At the same time, impacts of the revision on accuracy, conservativeness and compliance with the methodology (AM0010) are described.

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* Registered PDD, dated 2006-05-04 available at: http://cdm.unfccc.int/UserManagement/FileStorage/XM04ZW0DZ09G543FEOS2HIO5JU91PJ
† Organics Group PLC: Flare specification Mariannhill and La Mercy Landfills
‡ GE Jenbacher: Technical Description Genset-Container, JGC 320 GS-L.L.
§ DSW: Technical overview of the eThekwini Gas to Electricity CDM project, April 2004
** SLR consulting: Site Investigation Report, September 2007

2 Assessment of the changes to the project design

Assessment of when the changes occurred

A supply and commissioning tender (contract WS 5608) of landfill gas generators and equipment at the La Mercy and Mariannhill landfill sites was issued in November 2004, specifying the delivery of two 0.5 MW engines for both landfills. However, this contract was amended by a letter from Wilson Pass Singh jv, sub consulting to Enviros Consulting UK[††] dated 7 March 2006, confirming the possibility of a change in engine configuration. This letter was followed by a variation order of the same issuing entity and dated 27 March 2006[‡‡], comprising a revised generation package of one Jenbacher 312 engine with net export capacity of 0.5 MW and one Jenbacher 320 engine with a net export capacity of 1 MW.

Changes in project design at the La Mercy landfill occurred in June 2009, which is the date when the project equipment has been de-commissioned from the site. DNV was able to confirm during the site visit carried out on 19-20 May 2010 that all installations have been removed from the landfill.

Assessment of the reasons for these changes taking place

The change of engine capacity at the Mariannhill landfill was undertaken as flexibility wanted to be maintained by the project participant to allow for more energy production if the gas was available, and the Jenbacher 320 engine was sufficiently flexible to provide power outputs between 500 kW and 1000 kW.

At the La Mercy landfill site, a site investigation was carried out by SLR Consulting in 2007[**] confirming that the site suffers from high levels of leachate as well as the presence of significant quantities of fine Red Berea Sand, leading to a blocking of gas extraction wells and thus preventing the engine and flare from operation.

To efficiently operate the gas engine, a gas flow to the engine of typically 300 Nm^3/h would be necessary. The flaring system had an installed capacity of 1 000 Nm^3/h with a turn down ratio of 5:1, leading to a minimum flow rate of 200 Nm^3/h. However, due to an insufficient gas feed to the project equipment, the decision was taken to remove the engine and flare infrastructure in June 2009. Since then, the situation at the La Mercy landfill represents the pre-project scenario, which is the passive venting of landfill gas to the atmosphere.

DNV compared the SCADA data[§§] for the actual landfill gas flow monitored at the La Mercy landfill with the minimum requirements as per the site investigation report and is able to confirm that not enough gas was available to effectively operate the project equipment.

Assessment of whether the changes would have been known to the project participants prior to registration of the project activity

The intention of having more than 0.5 MW of capacity installed at Mariannhill was always present. This was reflected in the registered PDD, making provisions to augment the combined capacity up to 2 MW. Furthermore, the KwaZulu-Natal Department of Agriculture and Environmental Affairs authorised the upgrade of the existing facilities at the Mariannhill landfill site, by including further facilities such as engine generators with a combined capacity of 1.5 MW[***]. In addition, minutes of site handover meeting held on 17 January 2006[†††] were provided, including discussions of a potential upgrade of installed capacity to 1 MW. A letter

[††] Wilson Pass Singh jv, sub consulting to Enviros Consulting Ltd.: Supply and Commissioning of Landfill Gas Generators and Equipment at the La Mercy and Mariannhill Landfill Sites (Contract WS 5608), letter dated 7 March 2006

[‡‡] Wilson Pass Singh jv, sub consulting to Enviros Consulting Ltd.: Variation order Nr. 1: Contract WS 5608, dated 27 March 2006 (provisions of a revised generation package of two Jenbacher engines of 0.5 MW and 1 MW).

[§§] SCADA data for electricity generation during the monitoring period, La Mercy landfill.

[***] Department of Agriculture and Environmental Affairs, KwaZulu-Natal: Record of Decision (ROD) in terms of Regulation 10 of Government Notice No. R. 1183, dated 9 July 2004.

[†††] eThekwini Municipality: Minutes of site handover meeting, held on 17 January 2006.

issued by Wilson Pass Singh jv dated 8 January 2007[‡‡‡] has been provided, indicating contract completion on 28 February 2007.

However, it was also documented that the upgrade of engine capacity depends on the availability of gas, and there was no certainty on the quantity of gas prior to construction (essentially it was the same situation as that of La Mercy landfill site, that because of the unknown gas availability eventually led to its decommissioning), and consequently the changes to the engine would have not been known to the project participants prior to registration, implementation and monitoring of the project.

No pumping trial was carried out at the La Mercy landfill site, and therefore the difficulties in extracting gas from the site as well as changes required would not have been known to the project participants prior to registration of the project activity.

Assessment of how the changes may impact the overall operation/ability of the project activity to deliver emission reductions as stated in the PDD

The actual installed engine capacity at Mariannhill landfill as well as the de-commissioning of the project equipment at La Mercy resulted in a change of combined installed capacity from 1.5 MW to 1 MW. As a consequence, annual estimation of emission reductions declined as compared to the numbers in the registered PDD. Changes have been correctly addressed in the revised project documentation.

3 Assessment of the impact of the changes to the project design

Do the changes raise concerns with regard to any of the following aspects?	☐ Additionality ☐ Scale of CDM project activity ☐ Applicability and application of baseline methodology ☒ Not applicable (the changes do not raise any concerns)

Assessment of impacts of the changes on additionality

As per methodology AM0010, Additionality is determined in 4 steps.

No regulation exists in the host country that mandates the capture and destruction of landfill gas and the baseline scenario would thus be the continuation of passive venting at both the Mariannhill and La Mercy landfill site. This was confirmed in the registered PDD* dated 4 May 2006. During the site visit for the 2nd verification of the project activity, DNV performed an interview with a representative of IMBEWU and a letter[§§§] has been provided by the same, confirming that environmental regulations did not change since the registration of the project under CDM. Thus, convincing justification has been provided that there is no plausible baseline scenario except the project and the business as usual scenario.

A re-assessment was done for the expected cost of electricity generation in accordance with the calculation performed in the registered PDD. Two scenarios have been calculated to assess the impacts of the changes on additionality. Scenario 1 has been calculated to account for the decommissioning of the La Mercy site by taking into account the Mariannhill landfill only and keeping the same conditions and input parameters as during the validation of the project activity. Scenario 2 has been calculated by reflecting the actual implementation of the project, accounting also for the change of the energy generation at the Mariannhill site, and well configuration, which differs from the original financial analysis, given that the first 4

[‡‡‡] Wilson Pass Singh j.v.: Certificate of Completion of the Work and Payment Certificate No 11

[§§§] IMBEWU Sustainability Legal Specialists (Pty) Ltd: Letter to confirm the status of environmental regulations in the host country, dated June 2010.

Phases have been implemented on a different time frame, as described below and including the following assumptions:

- *Actual installed engine capacity at the Mariannhill landfill:* The actual installed capacity at Mariannhill is 1 MW (Jenbacher 320 engine), as described in the section above.
- *Number of wells operating at the Mariannhill landfill:* the registered PDD makes provisions for the installation of 33 wells, with an expected schedule of implementation over a period of a "5 phased restoration of the site" from 2005 to 2024. This has been confirmed by the document 'Record of Decision' (ROD)[***], issued by the Provincial Department of Agriculture and Environmental Affairs (DAEA) on 9 July 2004. In the initial spreadsheet submitted for registration, only 25 wells were included for the Mariannhill landfill, as the complete 33 wells were to be installed over a larger period of time than the assessed period of the financial analysis. The actual configuration as of March 2011 includes 29 wells, as construction was faster and in a shorter period of time than initially expected. The actual number of wells has been confirmed against the documents SLR Consulting audit report dated September 2007[****] as well as the Mariannhill landfill well layout plan record drawing by SLR Consulting Ltd. & DSW dated March 2011[††††], confirming that the actual number of wells consists of 11 vertical wells (in cell 1, 3 and 4), 9 gas riser pipe wells (in cell 4) as well as 9 horizontal wells (in cell 5).
- *CAPEX Engines for Mariannhill landfill:* The engine capital cost per installed MW in the original investment analysis of the registered PDD is 2 325 600 ZAR/MW_e as confirmed during validation of the project. The number given in scenario 2 changed only due to the change of installed capacity from 0.5 to 1 MW, subject to this notification. Hence the cost available at the time of decision making has been applied.

  Furthermore, the project participant has provided evidence for the actual cost of the engines bought in 2006 which was substantially higher than the one estimated in the financial analysis at the time of registration[‡‡].
- *'PCF Reclaimed Preparation Costs', 'Supervision, Monitoring, Verification Costs and capitalised development cost – EIA and project preparation':* The PCF reclaimed preparation costs referred to studies that were made by PCF for the informed decision to go ahead with the CDM project. These studies did not depend on the size, LFG extraction and/or generation capacity of the project. However, to address the concern of the secretariat and to account for the size of the project, the project participant prorated these cost by the amount of annual CERs expected to be produced on each site (see scenario 2). The same goes for the supervision, monitoring and verification cost which are assumed to be the same regardless of the project size, as well as for the capitalised development cost. However, the project participant decided to prorate the cost in order to be conservative.
- *Electricity kWh – total cost:* in the initial spreadsheet submitted for registration, the assumption made for electricity cost was 8 million ZAR per 1 MW installed capacity. Hence, scenario 1 reflects the cost taking into consideration the decommissioning of project equipment at the La Mercy site, whereas scenario 2 represents the actual project implementation, with twice the installed capacity at Mariannhill landfill than initially planned.

[****] SLR Consulting: Durban Solid Waste Mariannhill Site Audit, SLR Ref. 406-439-00001, dated September 2007.
[††††] SLR Consulting Ltd. & DSW: Mariannhill landfill well layout plan record drawing, dated March 2011.

The result of this re-assessment is that for both scenarios, the expected cost of electricity generation would be higher than the estimated LRMC as per the registered PDD. The results are summarized in the following table:

	Estimated cost of electricity generation [US$/kWh]	*LRMC* [US$/kWh]*
Scenario 1	0.0476	0.0365
Scenario 2	0.0377	

* As per the registered PDD

As a result, also with only one gas engine to generate electricity generation for the grid at the Mariannhill landfill, the project remains financially less attractive than the baseline of electricity generation by the grid and hence the project remains to be additional. Thus, DNV is able to confirm that the de-commissioning of project equipment at La Mercy as well as the different installed capacity at Mariannhill does not impact the additionality of the project.

Assessment of impacts of the changes on the scale of the CDM project activity

The changes as described above will lead to an overall reduction of the total installed capacity of the project from 1.5 MW to 1 MW. Furthermore, by assessing the revised emission reduction calculations as attached to this request, DNV is able to confirm that the changes do not impact the scale of the CDM project activity.

Assessment of impacts of the changes on the applicability and application of baseline methodology

DNV is able to confirm that the de-commissioning of project equipment at the La Mercy landfill site as well as the change in installed engine capacity at the Mariannhill landfill do not affect the applicability of the methodology AM0010 (version 1) as:

- *Landfill gas will be captured and used for electricity generation and landfill gas capture is not mandated by law:* as confirmed during the site visit, the Mariannhill landfill site is still operational. A letter has been provided by IMBEWU Sustainability Legal Specialists (Pty) Ltd.[‡‡‡‡] confirming that no regulations exist in the host country that mandate the capture of landfill gas;
- *The captured gas is used to generate electricity and the CO_2 emissions intensity of this electricity is lower than the emissions intensity of the electricity displaced:* The emission factor will remain unchanged and is not affected by the changes in project design at La Mercy and Mariannhill;
- *The electricity generation capacity of the project shall not exceed 15 MW:* The total installed capacity of the project decreases from 1.5 MW to 1 MW and is not exceeding 15 MW.

Emission reductions are calculated by applying baseline methodology AM0010 (version 1) *'Landfill gas capture and electricity generation projects where landfill gas capture is not mandated by law'*. Calculations are based on the amount of methane destroyed/combusted during the year plus the electricity displaced in the national electric grid. The de-commissioning of project equipment at La Mercy as well as the change in installed capacity at

[‡‡‡‡] IMBEWU Sustainability Legal Specialists (Pty) Ltd: Letter to confirm the status of environmental regulations in the host country, June 2010

Mariannhill will lead to a decrease in the overall emission reductions but do not impact the application of baseline methodology.

The revised PDD and additional documentation such as revised investment analyses and emission reduction calculations have been provided by the project participant and are attached to this request.

4 Assessment of the revision of the monitoring plan

The proposed revision of the monitoring plan ensures that the level of accuracy or completeness in the monitoring and verification process is not reduced as a result of the revisions

An assessment of the proposed revision of the monitoring plan has been performed by the DOE and is described for each parameter separately:

- *Amount of landfill gas collected from the project wells ($MV_{project,y}$):* monitoring is changed from 'measured' to 'measured and calculated'.

  At the Mariannhill site, landfill gas (LFG) collected from project wells is calculated as per the following three continuous measurement points: amount of LFG for power generation plus LFG sent to the flare minus the LFG collected from baseline wells. At the La Mercy site, during its operation, LFG collected from project wells was measured as LFG flow to the engine and LFG flow to the flare. The revision of the MP is in accordance with the request for deviation I-DEV0082, submitted by JCI on 27 March 2007 and approved by the EB[§§§§]. Thus, this change in the monitoring plan is deemed acceptable.
- *Methane content of the landfill gas:* monitoring is changed from 'measured' to 'measured and calculated'; the recording frequency is changed from 'periodic' to 'continuous and periodic'.

  The monitoring of methane content of LFG combusted and used to calculate emission reductions shall be continuous. Furthermore, the monitoring of the methane content in the baseline, for crosschecking purposes, will be periodic. Changing the monitoring frequency from periodic to continuous measurement of methane content of LFG combusted is more accurate and hence deemed reasonable.
- *Amount of net electricity sold to the grid (ES_y):* inclusion of the parameter 'electricity consumed from the grid'.

  In order to calculate the net amount of electricity sold to the grid, the parameter 'electricity consumption' has been added to ID 4 of the revised MP. This is conservative and in accordance with the request for deviation, I-DEV0082, submitted by JCI on 27 March 2007 and approved by the EB[§§§§].
- *Combustion efficiency:* the monitoring frequency is changed from 'semi-annually' to 'annually'.

  It is confirmed that this parameter is actually not required for ER calculations, and as such does not impact the project's ERs. However, as this parameter is stipulated in AM0010, it will yet be monitored for cross-checking reasons, but at a lower frequency. The reduction in frequency has no impact on the monitoring accuracy nor the completeness, as the parameter is not used in the ER calculations. Based on its sectoral competence, the DOE is of the opinion that an annual measurement of the combustion efficiency sufficiently allows for confirming the efficiency of the conversion of methane

[§§§§] I-DEV0082 available at: http://cdm.unfccc.int/Projects/deviations/96737

(CH_4) into carbon dioxide (CO_2). This reduction in frequency is also justified for reasons of cost efficiency and operational feasibility.

- *LFG temperature and pressure:* the proportion of data to be monitored is changed from 'statistically significant samples delivering confidence level of 95%' to '100%'. This change brings the monitoring plan in line with current monitoring practice and is hence deemed accurate.
- *Flare working hours:* Flare working hours will not be recorded in particular; however when the flare temperature is below 500 ºC it is assumed that the flare is not operating and therefore during that time no ERs are claimed. This is common practise as per the tool to determine project emissions from flaring gases containing methane, where the flare efficiency is deemed 'zero' for any given hour when temperatures are below 500 ºC. As indicated in the revised monitoring plan, this parameter is not monitored separately, which is deemed reasonable since the operation of the flare is determined by monitoring the flare temperature. Refer to the parameter below.
- *Flare temperature:* the monitoring practise changed from 'measured and calculated' to 'measured'.

  Flare temperature will be measured continuously by a thermocouple. It has been specified that if there is no record of the temperature of the exhaust gas of the flare or if the recorded temperature is less than 500 °C for any given hour, it shall be assumed that during that hour the flare efficiency is zero. This is in accordance with the practise described in the tool to determine project emissions from flaring gases containing methane.
- *Heat rate of the generator (H_{ry}):* the monitoring frequency is changed from 'semi-annually' to 'annually'.

  The proposed change is intended to bring the monitoring plan in line with the operational practice for the generators. There are no indications that the decrease in monitoring frequency will impact the accuracy or the completeness of the monitoring. In general, heat rate values are known to increase with time due to wear and tear of the engines. No heat rate testing is available for the current monitoring period (which will be subject to a request for deviation), however the project owner has measured the heat rate values of the combustion engines in May and December 2010 respectively[*****]. The conclusions of these tests were that the heat rate values had not yet deteriorated much (+0.56% for May 2010 and +1.41%% for December 2010) compared to the value mentioned in the letter from the technology provider upon delivery of the engines[†††††]. From the tests it can furthermore be concluded that the expected increase in heat rate value occurs slowly. As such, a decrease in monitoring frequency from 'semi-annually' to 'annually' is deemed justified, and the DOE is of the opinion that the level of accuracy and completeness is not impacted. The reduction in frequency is also justified for reasons of cost efficiency and operational feasibility.

  NB: the project owner will continue to monitor the evolution of the heat rate values measured, and will report this in the next monitoring reports in order to assess and confirm the conservativeness of the future emission reductions claimed.

Furthermore, in accordance with the outcome of the EB65 meeting, a calculation of theoretical methane emissions using the first order decay (FOD) model will be conducted for

[*****] Envitech Solution (Pty) Ltd.: Heat rate test – GE Jenbacher 320 Series (Mariannhill), dated May 2010 and December 2010.

[†††††] GE Jenbacher GmbH & CO OHG: Generator Heat Balance of GE Jenbacher gas engines.

each monitoring period as a quality assurance method, to confirm the methane calculated by using the proposed approach for the monitoring and determination of the parameter "amount of landfill gas collected from the project wells". Necessary parameters to calculate the FOD model have been included in the revised monitoring plan. To calculate the FOD decay model, the project participant follows the latest version of the tool to calculate 'Emissions from solid waste disposal sites'[‡‡‡‡‡]. The following parameters have been added to be monitored:

- *Total amount of waste disposed in year y (W_x):* the total amount of waste disposed will be derived from measurements undertaken by using a calibrated weighbridge, amounts of waste will be recorded daily and data will be aggregated monthly. Records will be kept electronically;
- *Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x ($W_{j,x}$):* measured daily and aggregated monthly by the following categories: 1- Domestic Solid Waste (DSW); 2- General Solid Waste; 3- Garden Refuse; 4- Builders Rubble; 5- Mixed Loads; 6- Sand and Cover Material; 7- Purchased Cover Material; ; 8- Tyres; 9-Light Refuse; 10- Other; and 11- recyclables; and
- *Waste composition in the year ($p_{j,x}$):* this parameter will be calculated annually by $W_{j,x}/W_x$.

Instead of calculating the amount of solid waste type j disposed based on the waste composition as required by *Application B* of the tool "Emissions from solid waste disposal sites", the waste composition is calculated from the amount of solid waste type j disposed. This is due to the fact that existing practise of the landfill is to monitor the volume of waste received individually for 11 defined waste categories. Given that the project is the capture and destruction of landfill gas at an existing landfill (i.e. the La Mercy and Mariannhill landfill sites) and hence meets the applicability criteria of *Application A*, which does not require the ex-post monitoring of the three parameters indicated above, and the FOD model is applied as quality assurance only, it is in DNV's opinion appropriate that the monitoring of the waste and its composition builds upon the current practise of monitoring the volume of waste received individually for these 11 defined waste categories.

The amount of methane generated from disposal of waste at the SWDS is calculated for year y using equation (1) of the tool, and emissions are adjusted for the fraction of methane captured (f_y). The time period under which waste disposal is to be considered in the calculation begins since the start of operations of the landfill; this has been specified in the revised PDD.

Parameters not monitored are determined as follows, which is in accordance with the tool to calculate 'Emissions from solid waste disposal sites'[‡‡‡‡‡]:

- Model correction factor to account for model uncertainties for year y (φ_y): default value of 0.75;
- Fraction of methane captured at the SWDS and flared, combusted or used in another manner that prevents the emissions of methane to the atmosphere in year y (f_y): determined as 0 because the amount of LFG that would have been captured and destroyed is already accounted for by monitored parameter $MVbaseline_{,y}$. This is acceptable;
- Global Warming Potential of methane (GWP_{CH4}): 21;
- Oxidation factor (OX): default value of 0.1;
- Fraction of methane in the SWDS gas (F): default value of 0.5;

- Fraction of degradable organic carbon that decomposes under the specific conditions occurring in the SWDS for year y ($DOC_{f,y}$): default value of 0.5;
- Methane correction factor for year y (MCF_y): default value of 1.0;
- Fraction of degradable organic carbon in the waste type j (DOC_j): default values range from 0.07 to 0.4 based on type of waste (% wet waste);
- Decay rate for the waste type j (k_j): default values selected based on type of waste and temperature at the project site (identified as wet, tropical[§§§§§]).

To calculate the FOD model, the 11 waste categories have been allocated to a respective DOC_j and K_j, as reflected in the revised monitoring plan. It is assumed that waste in category 1 (Domestic Solid Waste, i.e. all domestic municipal waste streams transported by DSW vehicles) and 2 (General Solid Waste, i.e. all domestic private waste streams from transporters other than DSW) is entirely organic. A study on solid waste management options for Africa[******] has been provided, stating that *'the organic content of the MSW in the typical African city may exceed 70% (wet basis)'*. DNV reviewed historical waste records provided for the Mariannhill landfill site for the period December 2002 to December 2011 and confirms that during this period the amount of waste in category 1 and 2 amounts 55.45% of total waste. In light of the study provided, DNV is of the opinion that it is unlikely that within these two categories the inorganic amount would be significant. Hence, it is reasonable to assume that waste category 1 and 2 are organic, and this assumption is appropriate for the purpose of applying the FOD model as quality assurance only.

In summary, DNV confirms that the revised monitoring plan includes sufficient information to allow for the calculation of the FOD model for the relevant monitoring period.

The proposed revision of the monitoring plan is in accordance with the approved monitoring methodology applicable to the project activity whilst ensuring the conservativeness of the emission reductions calculation

As stated above, the revised monitoring plan provides for calculating the amount of LFG from the project wells while AM0010 requires measuring the same continuously by a flow meter. It has to be noted that this approach is in accordance with the request for deviation, submitted for the project deviation I-DEV0082, submitted by JCI on 27 March 2007 and approved by the EB[§§§§]. Furthermore, the combustion efficiency and heat rate are intended to change from semi-annual to annual. It is thus acknowledged that the revised monitoring plan is not fully in accordance with the requirements of AM0010. However, the revised monitoring plan for the project activity accomplishes the requirements of conservativeness as well as represents good industry practises. It is DNV's opinion that monitoring the combustion efficiency annually instead of semi-annual is conservative, as this parameter is in fact not used for ER calculations (cf. primary method). For the heat rate, in order to remove any doubt on the conservativeness in the emission reduction calculations, the project owner has decided to use systematically the initial heat rate value, as stated on the letter delivered by the technology provider upon delivery[††††]. Calculating ER with the initial – lower – heat rate value is indeed assumed to be conservative, as the conversion formulas depart from electricity produced to ultimately methane required to generate this electricity (backward calculation). This assumption will be substantiated by monitoring annually the evolution of the heat rate value.

[§§§§§] Durban Climate Guide to the Average Weather & Temperatures" found online at http://www.climatetemp.info/south-africa/durban.html

[******] Richard J. Palczynski: Study on solid waste management options for Africa, prepared for the African Development Bank, July 2002.

For the other parameters, the proposed revision of the MP is in accordance with AM0010 as follows: the methane fraction in the LFG, as it is both continuously and periodically monitored; the amount of electricity sold to the grid, as the electricity consumption is considered to calculate the net amount of electricity which is more conservative; the flare working hours as well as flare temperature & pressure, as the operation of the flare will determined through the continuous measurement of flare temperature and determination of flare efficiency, as described above. The monitoring of total amount of waste disposed in year y (W_x) and the Amount of solid waste type j disposed or prevented from disposal in the SWDS in the year x ($W_{j,x}$) have been included in the monitoring plan of the revised PDD in accordance with paragraph 35 (a) of the EB65 meeting report.

The revision of the monitoring plan thus ensures the conservativeness of the emission reduction calculations.

The findings of previous verification reports, if any, have been taken into account

Findings identified during the first verification of the project activity are related to the reporting procedure in the Management Manual, the flare efficiency and the net electricity production. These findings have been taken into account during this assessment.

5 Validation opinion

DNV verified complementary data and related information used to justify the changes made in the project activity and the impact of such changes on the project's implementation, emissions reductions, additionality, scale as well as applicability and application of baseline methodology AM0010 (version 1). Furthermore, the revision of the monitoring plan is in accordance with paragraph 35 (a) of the EB65 meeting report. The revised project documentation transparently identifies the changes from the project activity as described in the registered PDD. Formulae and equations are in accordance with AM0010 (version 1). It was confirmed that no emission reductions will be claimed for electricity generation from the decommissioned La Mercy site and thus the changes with regard to the real installed capacity will lead to lower emission reductions than initially estimated.

Hence, it is DNV's opinion that the changes do not raise any concerns with regard to i) Additionality, ii) the scale of CDM project activity and/or iii) the applicability and application of the baseline methodology.

With regard to the revision of monitoring plan, DNV recommends the approval of the revised monitoring plan submitted by the project participants.

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