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Validation Report

VALIDATION OF THE RENEWAL OF CREDITING PERIOD OF AN EXISTING CDM-PROJECT: Loma Los Colorados Landfill Gas Project

(UNFCCC REGISTRATION REF. No. 0822)

REPORT NO. 10134ME

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Project Participant (contractor): KDM S.A. URBASER S.A. The Kansai Electric Power Co., Inc.		Project Site(s): Village: Montenegro. District: "Comuna", Til-Til Province: Chacabuco Country: Republic of Chile Host Country: Chile	
Applied Methodology / Version: ACM0001 / Version 15.0.0		Scope(s): 13	
		Technical Area(s): 13.1	
First PDD Version: PDD completion date: 15-09-2013 Version No.: 01		Final PDD version: PDD completion date: 01-09-2014 Version No.: 1.3	

VALIDATION OPINION

TÜV SÜD has performed a validation of the request for renewal of the crediting period of the aforementioned existing CDM project activity.

Standard auditing techniques have been used for the validation process.

The validation has been performed following the requirements of the latest version of the CDM VVS.

The review of the project design documentation, subsequent follow-up interviews, and further verification and validation of references have provided TÜV SÜD with sufficient evidence to determine the validity of the original baseline and to confirm that the estimated emission reductions are in line with the applied methodology. In our opinion, the project meets all relevant UNFCCC requirements and hence TÜV SÜD recommends the renewal of the crediting period of this project.

Considering that the project is implemented as designed, the project is likely to achieve the estimated amount of annual emission reductions of 1,338,452 tCO₂e and a total estimated of 9,369,161 tCO₂e as specified within the final PDD version for the second crediting period. The List of Findings describes total of 9 findings which include: Three (3) Corrective Action Requests (CARs); Six (6) Clarification Request (CR); the findings raised during this validation have been closed satisfactorily.

The single purpose of this report is its use during the registration process as part of the CDM project cycle. Based on the work described in this report, nothing has come to our attention that causes us to believe that any project component or issue has not been covered by the validation process.

Pune, 31/03/2015



Name of the signatory

Member

Certification Body "Environment and Energy"
TÜV SÜD South Asia

Abbreviations

ACM	Approved Consolidated Methodology
AM	Approved Methodology
BM	Build Margin
CAR	Corrective Action Request
CB	Certification Body
CDM	Clean Development Mechanism
CDM EB	CDM Executive Board
CER	Certified Emission Reduction
CM	Combined Margin
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CL/CR	Clarification Request
CO₂e	Carbon dioxide equivalent
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission Factor
EIA / EA	Environmental Impact Assessment / Environmental Assessment
ER	Emission Reduction
FAR	Forward Action Request
GHG	GreenHouse Gas(es)
GSP	Global Stakeholder Consultation / Process
IPCC	Intergovernmental Panel on Climate Change
IRL	Information Reference List
KP	Kyoto Protocol
LFG	Landfill Gas
MP	Monitoring Plan
OM	Operating Margin
PDD	Project Design Document
PP	Project Participant
PS	Project Standard
TÜV SÜD	TÜV SÜD South Asia Pvt Ltd
UNFCCC	United Nations Framework Convention on Climate Change
VVS	Clean Development Mechanism Validation And Verification Standard

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1 INTRODUCTION

1.1 Objective

The objective of the validation of the renewal of crediting period process of an existing project is to determine whether the project participants have updated the PDD in the sections related to the baseline, estimated emission reductions and monitoring plan using the most recent version of the baseline and monitoring methodology applicable for the project activity.

The ultimate decision on the acceptance to renew the crediting period of a proposed project activity rests with the CDM-EB.

1.2 Scope

The scope of any assessment is defined by the underlying legislation, regulation and guidance given by relevant entities or authorities. In the case of CDM project activities, the scope is set by:

- The Kyoto Protocol, in particular § 12 and modalities and procedures for the CDM
- Decision 2/CMP1 and Decision 3/CMP.1 (Marrakech Accords)
- Further COP/MOP decisions with reference to the CDM (e.g. decisions 4 – 8/CMP.1)
- Clean Development Mechanism Validation And Verification Standard (VVS) published under <http://cdm.unfccc.int>
- Decisions and specific guidance outlined by the EB which are published under <http://cdm.unfccc.int>
- Guidelines for Completing the Project Design Document (CDM-PDD) and the Proposed New Baseline and Monitoring Methodology (CDM-NM)
- Baselines and monitoring methodologies (including GHG inventories)
- Management systems and auditing methods
- Environmental issues relevant to the applicable sectoral scope
- Applicable environmental and social impacts and aspects of CDM project activity
- Sector specific technologies and their applications
- Current technical and operational knowledge of the specific sectoral scope and information on best practice

The validation process is not meant to provide any form of consulting for the project participant (PP). However, stated requests for clarifications, corrective actions, and/or forward actions may provide input for improvement of the project design.

The purpose of a validation related to the renewal of the crediting period of a project is an assessment according to the VVS and includes an assessment of an updated PDD in accordance with the relevant sections of the PS related to the renewal of crediting period and in particular to:

- (a) Consistency of the names of the Project Participants;
- (b) The impact of new relevant national and/or sectoral policies and circumstances on the baseline taking into account relevant guidance from the Board with regard to renewal of the crediting period at the time of requesting renewal of crediting period;
- (c) The correctness of the application of an approved baseline methodology for the determination of the continued validity of the baseline or its update, and the estimation of emission reductions for the applicable crediting period.

2 VALIDATION METHODOLOGY

The information provided by the project participants is assessed by applying the means of validation specified in the VVS and where appropriate standard auditing techniques.

Before the assessment begins, a competent team is selected to perform the process. The team is selected to cover the technical area(s), sectoral scope(s), and relevant host country experience for evaluating the CDM project activity. The members of the team carry out a desk review, follow-up actions, resolution of identified issues, and the preparation of the validation report. The prepared validation report and other supporting documents then undergo an internal quality control by the CB "Environment and Energy" before being submitted to the CDM-EB.

In case the validation team identifies issues that require further elaboration, research or expansion in order to determine whether the project activity meets the CDM requirements, and can achieve credible emission reductions findings are raised as specified in the VVS.

To requests the renewal of the crediting period of the project activity, all CARs and CRs must be resolved.

All CARs, CLs and FARs are found in Annex 1 to this validation report including the responses provided by the project participants, the means of validation of the responses and references to any resulting changes in the PDD or supporting annexes.

2.1 Appointment of the Assessment Team

According to the technical scopes and experiences in the sectoral or national business environment, TÜV SÜD has composed a project team in accordance with the appointment rules of the TÜV SÜD certification body "Environment and Energy".

The composition of an assessment team has to be approved by the Certification Body (CB) to assure that the required skills are covered by the team. The CB TÜV SÜD operates the following qualification levels for team members that are assigned by formal appointment rules:

- Assessment Team Leader (ATL);
- Validator (V);
- Validator Trainee (T);
- Technical Experts (TE);
- Country expert (CE);
- Technical reviewer (TR).

It is required that the sectoral scope(s) and the technical area(s) (TA) linked to the methodology and project has to be covered by the assessment team.

A technical review is conducted to perform a check on quality and completeness.

Assessment Team:

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect	Host country experience	Conducted On-site visit
Kumud Ranjan	ATL/T E/V	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-

Technical Reviewer:

Name	Qualification	Coverage of scope	Coverage of technical area	Coverage of financial aspect
Eswar Murty	TR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Shivraj Sharma ¹	TR	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Appointment certificates are attached to this report in Annex 3.

2.2 Review of Documents

The first version of the updated PDD and additional background documents, related to the project design and baseline have been reviewed to verify the correctness, credibility, and interpretation of the presented information and their compliance to the applicable requirements for requesting the renewal of crediting period. Furthermore, a cross-check between information provided and information from other sources has been done as an initial step of the validation process. A complete list of all documents and evidence material reviewed is attached as Annex 2 to this report.

2.3 Follow-up Interviews

TÜV SÜD performed interviews, telephone conferences during 01/07/2014 and 15/08/2014 with project developer to confirm relevant information and to resolve issues identified in the first document review. A list of all persons interviewed in this process is presented in Annex 2 to this report.

2.4 Cross-check

During the validation process the team has made reference to available information related to similar projects or technologies as this CDM project activity. Project documentation has also been reviewed against the approved methodology applied to confirm the appropriateness of formulae and correctness of calculations.

2.5 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation is to resolve the requests for corrective actions, clarifications, and any other outstanding issues which need to be clarified for TÜV SÜD's conclusion on the project design. The CARs and CLs raised by TÜV SÜD are resolved during communication between the client and TÜV SÜD. To guarantee the transparency of the validation process, the concerns raised and responses that have been given are documented in more detail in Annex 1 to this report.

2.6 Internal Quality Control

Internal quality control within the team is assured by means of a technical review process that takes place after the on-site assessment and after closure of findings. The internal quality control in the validation process is given by the final decision (Validation Opinion) made by the CB "Environment and Energy".

¹ Shivraj Sharma has left the organization in January 2015

3 REPORTING REQUIREMENTS

The assessment work and the main results are described below in accordance with the Clean Development Mechanism Validation and Verification Standard (VVS). The reference documents indicated in this section and Annex 1 are stated in Annex 2 of this report.

3.1 Project design document

The PDD is compliant with relevant form and guidance as provided by UNFCCC. The most recent version of the PDD form was used.

3.2 Description of project activity

The information presented in the PDD on the technical design has been assessed for accuracy and completeness using standard auditing techniques including:

(a) Document review including

- A review of data and information;
- Cross checks between information provided in the PDD and information from sources other than those used, the DOE's sectoral or local expertise. If necessary, independent background investigations were performed.

(b) Follow-up actions including:

- Interviews with relevant stakeholders in the host country, personnel with knowledge of the project design and implementation;
- Cross checks between information provided by interviewed personnel (i.e. by checking sources or other interviews) to ensure that no relevant information has been omitted.

(c) Reference to available information relating to projects or technologies similar to the proposed project activity under validation;

The name of the project participant (KDM S.A.) included in the request for renewal of crediting period is consistent with the name stated at UNFCCC website (<http://cdm.unfccc.int/Projects/DB/DNV-CUK1166695034.41/view>) the same has been validated by the DOE through UNFCCC website and final PDD.

In opinion of TÜV SÜD the project description, as included in the PDD, is accurate and complete; and it provides a correct understanding of the proposed project activity.

3.3 Validity of the selected baseline and monitoring methodology

The project was originally registered based on version 04 of the approved CDM methodology ACM0001 'Consolidated methodology for landfill gas project activities' and version 06 of CDM methodology ACM0002 'Consolidated methodology for grid-connected electricity generation from renewable sources'. The CDM-PDD of the 2nd crediting period (version 1.3, dated 01-09-2014) applies version 15 of the consolidated methodology ACM0001 "Flaring or use of landfill gas". This is appropriate as version 15 is the most recent version at the time of submission of the revised PDD for the renewal of the crediting period as per the UNFCCC website: <https://cdm.unfccc.int/methodologies/DB/D44X8FH8SFCXREE6037AXJSBGGFVDO>.

3.3.1 Applicability of the selected baseline and monitoring methodology to the project activity

The project applies the approved consolidated baseline and monitoring methodology AM0001 (version 15) "Flaring or use of landfill gas" in combination with several Tools as follows:

- Emissions from solid waste disposal sites (version 06.0.1, EB66) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-04-v6.0.1.pdf>);
- Tool to calculate baseline, project and/or leakage emissions from electricity consumption (version 1, EB39) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v1.pdf>);
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (version 02, EB41) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf>);
- Project emissions from flaring (version 02.0.0, EB 68) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-06-v2.0.pdf>);
- Tool to determine the mass flow of a greenhouse gas in a gaseous stream (version 02.0.0, EB 61) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-08-v2.0.0.pdf>);
- Tool to calculate the emission factor for an electricity system (version 04.0, EB 75) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf>);
- Combined tool to identify the baseline scenario and demonstrate additionality (version 05.0.0, EB 70) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v5.0.0.pdf>);
- Methodological tool "Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period" (version 03.0.1, EB66) (<http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf>).

Compliance with each applicability condition as listed in the chosen baseline and monitoring methodology and relevant tools has been demonstrated in the PDD.

The validation team assessed, by checking the UNFCCC webpage that the baseline and monitoring methodology selected by the project participant is the valid version approved by the Board.

Applicability criterion as per the applied methodology:

3. The methodology is applicable under the following conditions:
 - (a) Install a new LFG capture system in a new or existing SWDS where no LFG capture system was installed prior to the implementation of the project activity; or
 - (b) Make an investment into an existing LFG capture system to increase the recovery rate or change the use of the captured LFG, provided that:
 - (i) The captured LFG was vented or flared and not used prior to the implementation of the project activity; and
 - (ii) In the case of an existing active LFG capture system for which the amount of LFG cannot be collected separately from the project system after the implementation of the project activity and its efficiency is not impacted on by the project system: historical data on the amount of LFG capture and flared is available;
 - (c) Flare the LFG and/or use the captured LFG in any (combination) of the following ways:
 - (i) Generating electricity;
 - (ii) Generating heat in a boiler, air heater or kiln (brick firing only) or glass melting furnace; and/or
 - (iii) Supplying the LFG to consumers through a natural gas distribution network;
 - (iv) Supplying compressed/liquefied LFG to consumers using trucks;
 - (d) Do not reduce the amount of organic waste that would be recycled in the absence of

the project activity.

4. The methodology is only applicable if the application of the procedure to identify the baseline scenario confirms that the most plausible baseline scenario is:
 - (a) Atmospheric release of the LFG or capture of LFG and destruction through flaring to comply with regulations or contractual requirements, to address safety and odour concerns, or for other reasons; and
 - (b) In the case that the LFG is used in the project activity for generating electricity and/or generating heat in a boiler, air heater, glass melting furnace or kiln;
 - (i) For electricity generation: that electricity would be generated in the grid or in captive fossil fuel fired power plants; and/or
 - (ii) For heat generation: that heat would be generated using fossil fuels in equipment located within the project boundary.
5. This methodology is not applicable:
 - (a) In combination with other approved methodologies. For instance, ACM0001 cannot be used to claim emission reductions for the displacement of fossil fuels in a kiln or glass melting furnace, where the purpose of the CDM project activity is to implement energy efficiency measures at a kiln or glass melting furnace;
 - (b) If the management of the SWDS in the project activity is deliberately changed during the crediting in order to increase methane generation compared to the situation prior to the implementation of the project activity.
6. The applicability conditions included in the tools referred to below also apply.

Information from PDD:

3. As per the CDM Project Standard, in the context of the renewal of crediting period for a previously registered CDM project activity, the PDD valid for the additional new and 2nd 7-year crediting period should be completed by applying the latest version of the CDM baseline and monitoring methodology which was previously applied or, if applicable, the latest version of the CDM baseline and monitoring methodology of which the previously applied CDM methodology was consolidated into.

The project activity was previously registered as a CDM project activity by applying the CDM baseline and monitoring methodology ACM0001 (version 4). While ACM0001 (version 15.0) is the latest valid version of ACM0001 baseline and monitoring methodology, it is thus the one to be applied in the context of the renewal of crediting period for the registered CDM project activity.

In the context of the previous registration of the project activity under the CDM, as described in the latest version of the registered PDD valid for the 1st 7-year crediting period (PDD version 5.3, dated 02/08/2012), the project design encompasses the installation/improvement of an active (forced) LFG capture and flaring/utilization system in an existing SWDS partially replacing a previously existent active LFG combustion system (encompassed by a total of 12 LFG extracting wells and a small scale active LFG collection and flaring system). Historical amount of LFG flared in the pre-project scenario is available and was considered in the context of baseline emissions. In this sense, condition (b) – (ii) of the quoted applicability criteria is met.

The pre-project practice for LFG management is outlined in the latest version of the registered PDD valid for the 1st 7-year crediting period.

The project design encompasses collection of LFG and its destruction by flaring and/or its utilization for electricity generation. The project design does not encompass any other utilization of collected LFG. Thus, the project activity meets condition (c) - (i).

As a result of the previously occurred implementation of the project activity, there were no quantitative, qualitative, procedural or regulatory change occurred in terms of MSW management activities and policies valid for the Loma Los Colorados Landfill or applicable in any other potential waste treatment or disposal facility under the area of influence of this landfill (that would be promoted or triggered by the project activity) in comparison with what would occur in the absence of the project activity (baseline scenario). The situation is expected to remain the same during the 2nd 7-year crediting period.

It is crucial to note that, mainly by taking into consideration the nature of the project activity and aspects related to recycling of organic fraction of MSW in the region of landfill and in the rest of Chile, the implementation and operation of the project activity per se are not expected to promote any quantitative change in waste disposal activities undertaken at the Loma Los Colorados Landfill. Furthermore, no quantitative or qualitative changes in terms of waste management practices are expected to occur in any other existent or potential waste disposal or waste treatment facility (located or to be located in the region of the project site) as a direct outcome or consequence of the operation of the project activity during the 2nd 7-year crediting period. Thus, the mere previously occurred implementation of the project and its continuous operation during the 2nd 7-year crediting period are not expected to promote or trigger any reduction (or prevention) of the amount of organic type of MSW (or any other type of solid waste) that would eventually be recycled or utilized in the region (e.g. no prevention by the project activity of the implementation or and non-promotion of any reduction of activity in an existent or hypothetical waste composting facility that would promote utilization/recycling of waste in the region (for example)).

As demonstrated in construction, design and operational requirements valid for the Loma Los Colorados Landfill (as defined by KDM S.A. and confirmed in the environmental permits for the construction and operation of this landfill), the Loma Los Colorados Landfill is not expected to include any activity or initiative promoting recycling or utilization of organic fraction of waste to be disposed in this landfill (such as implementation of a large scale waste sorting or waste composting facility for example).

Without any organic waste recycling activity being under operation within the limits of the Loma Los Colorados Landfill, it is thus clearly not expected that the implementation of the project activity could eventually reduce organic waste recycling activities in the Loma Los Colorados Landfill.

The design, construction and operational aspects for the Loma Los Colorados Landfill were defined in accordance with the commercial agreements that the project participant KDM S.A. currently holds and is expected to hold in the position of operator and owner of the Loma Los Colorados Landfill and regional waste management company (service provider) providing MSW disposal services for Santiago and other municipalities located within its Metropolitan Region.

Furthermore, it is also crucial to take into account that currently there is not even any existent or planned large scale MSW sorting, recycling or utilization facility for organic fraction of MSW (e.g. a large scale waste composting plant) with comparable size/capacity and located in the region of influence of the Loma Los Colorados Landfill. As a matter of fact, recycling and utilization of organic fraction of MSW is not a common practice in the whole country of Chile.

In this sense, the implementation and operation of the project activity thus does not represent any perverse incentive or driver for the promotion of any supposed quantitative or qualitative reduction or prevention of waste recycling related activities or initiatives for any type of organic fraction of solid waste or solid residues that would occur in the absence of the project activity at the Loma Los Colorados Landfill or in the region of influence of this landfill.

The same is actually also applicable for recycling of inert waste material.

Furthermore, regardless of the non-existence of any MSW recycling or utilization facility with comparable capacity that could eventually somehow compete with the Loma Los Colorados Landfill for organic fraction of MSW waste, aspects and actions related to promotion of recycling or utilization of organic fraction of solid waste are to be seen as fully dependent on public service policies in the case of Chile (including policies, laws, regulations and programmes) and are to be defined/triggered by competent governmental authorities (under a regional and national level) and/or to be eventually implemented/operated by practitioners of waste recycling.

In Chile, the administrations of municipalities are the entities responsible for all MSW management services. Waste management companies such KDM S.A. normally acts as service providers, providing MSW collection and disposal services as per directives and contractual requirements set by the municipalities from where generated MSW are to be managed.

In this sense, in the position of a MSW management company operating a LFG collection and destruction initiative in the landfill it operates, KDM S.A. is not under a position to trigger, establish or promote any promotion of reduction or prevention of organic waste recycling in the region where it operates.

Finally, the implementation and operation of the project activity has never represented any incentive or driver for involved municipalities, any other public entity or any other relevant recycling practitioner for the promotion of changes in the policies and practices related to recycling of inert or organic solid waste in the region (or even outside the region) of influence of the Loma Los Colorados Landfill. No change in this sense is expected to occur during the 2nd 7-year crediting period either. As outlined in Section B.6.1, so far, there is still no legal restriction or requirement for LFG gas collection and its destruction or utilization using high temperature enclosed flares or any other device/equipment in Chile. Actually, there is no applicable regulation that deals with LFG management in Chile at all. Thus, the implementation of more appropriate and environmentally safe management of LFG at the Loma Los Colorados Landfill (as a direct outcome of the implementation and operation of the project activity) *per se* does not represent any driver or incentive to dispose incremental amount of MSW in the Loma Los Colorados Landfill (when compared to the situation that would occur in the absence of the project).

In this sense, under no circumstance the project activity *per se* potentially promote any displacement of volumes of organic waste stream from eventual treatments/utilization in an existent or hypothetical MSW recycling/utilization facilities (e.g. a MSW composting plant for example) to be disposed at the Loma Los Colorados Landfill because of the implementation and continuous operation of the project activity.

Therefore condition (d) is also satisfied.

4. As further demonstrated in Section B.4, the most plausible baseline scenario remains being the partial release of LFG from the SWDS into the atmosphere (with a small share of generated LFG being flared at the small scale active LFG collection and flaring system). Since the project activity will generate electricity of which equivalent amount would otherwise be generated by existing grid connected power plants and new additions, the application of the procedure to identify the baseline scenario falls into (b) (i).

The pre-project practice for LFG management is outlined in the latest version of the registered PDD valid for the 1st 7-year crediting period (PDD version 5.3, dated 02/08/2012).

The quoted applicability condition is thus satisfactory met

Neither options (a) and/or (b) occur.

5. The only GHG emission reductions claimed are due to destruction of methane through com-

bustion in high temperature enclosed flares and in the engine-generator sets and the emission reductions associated with electricity generation using LFG as fuel (which would otherwise be generated by existing grid connected power plants and new additions).

After the implementation of the project activity in year 2007, the landfill operator has continued with MSW disposal activities at the Loma Los Colorados Landfill as per its normal and previously planned/defined operation conditions and practices (as per the practice prior to the implementation of the project activity). MSW disposal practices and management at the Loma Los Colorados Landfill are not expected to change during the 2nd 7-year crediting period.

The quoted applicability condition is thus satisfactory met.

Tool to calculate baseline, project and/or leakage emissions from electricity, V01

6.

Tool:

“Project emissions from flaring”, V02

Applicability:

This tool provides procedures to calculate project emissions from flaring of a residual gas. The tool is applicable to enclosed or open flares and project participants should document in the CDM-PDD the type of flare used in the project activity. This tool is applicable to the flaring of flammable greenhouse gases where: Methane is the component with the highest concentration in the flammable residual gas; and

The source of the residual gas is coal mine methane or a gas from a biogenic source (e.g. biogas, landfill gas or wastewater treatment gas).

The tool is not applicable to the use of auxiliary fuels and therefore the residual gas must have sufficient flammable gas present to sustain combustion. For the case of an enclosed flare, there shall be operating specifications provided by the manufacturer of the flare.

This methodology refers to the latest approved version of the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. The applicability conditions of this tool also apply.”

Compliance:

As part of the project activity, all collected LFG (whose component with the highest concentration is methane) is combusted in the high temperature enclosed flares and/or used for electricity generation.

LFG is a flammable gas generated from the anaerobic decomposition of organic waste material disposed in the Loma Los Colorados landfill. LFG is thus a gas from a biogenic source. Methane is the component with the highest concentration in LFG.

No auxiliary fuel is required to make the flammability of LFG sufficiently enough to be combusted in the project flares.

As demonstrated above, the applicability conditions for the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” are sufficiently met.

Thus, the quoted applicability criteria defined in the methodological tool are sufficiently met.

Tool:

"Tool to calculate baseline, project and/or leakage emissions from electricity", V01

Applicability:

This tool provides procedures to estimate the baseline, project and/or leakage emissions associated with the consumption of electricity.(...)

The tool is only applicable if one out of the following three scenarios applies to the sources of electricity consumption:

Scenario A: Electricity consumption from the grid. The electricity is purchased from the grid only. Either no captive power plant is installed at the site of electricity consumption or, if any on-site captive power plant exists, it is not operating or it can physically not provide electricity to the source of electricity consumption.

Scenario B: Electricity consumption from (an) off-grid fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants are installed at the site of the electricity consumption source and supply the source with electricity. The captive power plant(s) is/are not connected to the electricity grid.

Scenario C: Electricity consumption from the grid and (a) fossil fuel fired captive power plant(s). One or more fossil fuel fired captive power plants operate at the site of the electricity consumption source. The captive power plant(s) can provide electricity to the electricity consumption source. The captive power plant(s) is/are also connected to the electricity grid."

Compliance:

The electricity demand of the project activity is met by electricity generated in the CLLC-1 and CLLC-2 powerplants as part of the normal operation of the project activity. In cases of interruption of the power plants, the electricity demand of the project is met by imports of electricity sourced by the grid (SIC) and/or by electricity generated by the backup captive off-grid electricity generators (fuelled by Diesel). Thus, Scenario C of the tool is applicable

Tool:

"Emissions from solid waste disposal sites", V06.0.1

Applicability:

This tool provides stepwise approach to calculate baseline, emissions of methane from solid waste disposed or prevented from disposal at a SWDS. Application A is adopted. As per the tool: if "(...) the CDM project activity mitigates methane emissions from a specific existing SWDS.", application A should be used"

Compliance:

The project mitigates methane emissions from a landfill. The applicability of the methodological tool is thus met. Application A in the methodological tool is selected and applied.

Tool:

"Tool to calculate the emission factor for an electricity system", V04

Applicability:

This tool is also referred to in the "Tool to calculate project emissions from electricity consumption" for the purpose of calculating project and leakage emissions in case where a project activity consumes electricity from the grid or results in increase of consumption of electricity from the grid outside the project boundary."

Compliance:

Project emissions due to the consumption of grid electricity by the project activity and emission reductions associated with electricity generation using LFG as fuel (which would otherwise be generated by existing grid connected power plants and new additions) are determined by applying applicable guidance of "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (of which ACM0001 version 15.0 refers to). The "Tool to calculate the emission factor for an electricity system" is referred to in the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" for the purpose of calculating baseline and project emissions in cases where a project activity sources or consumes electricity from the grid, respectively.

The CO₂ emission factor for the electricity grid which sources electricity to the project activity is determined as the combined margin CO₂ emission factor. The relevant applicability condition of the methodological tool is thus fully met.

Tool:

Combined tool to identify the baseline scenario and demonstrate additionality", V05

Applicability:

This tool is only applicable to methodologies for which the potential alternative scenarios to the proposed project activity available to project participants cannot be implemented in parallel to the proposed project activity"(...)

For example, in the following situations a methodology could refer to this tool:

- For an energy efficiency CDM project where the identified potential alternative scenarios are: (a) retrofit of an existing equipment, or (b) replacement of the existing equipment by new equipment, or (c) the continued use of the existing equipment without any retrofits;
- For a CDM project activity related to the destruction of a greenhouse gas in one site where the identified potential alternative scenarios are: (a) installation of a thermal destruction unit, or (b) installation of a catalytic destruction system, or (c) no abatement of the greenhouse gas.

In these cases, the project proponents could not implement the three alternatives in parallel but they could only implement one of them."

However, the tool is, for example, not applicable in the following situation: the CDM project activity is the installation of a Greenfield facility that provides a product to a market (i.e. electricity, cement, etc.) where the output could be provided by other existing facilities or new facilities that could be implemented in parallel with the CDM project activity."

Compliance:

As established by ACM0001 (version 15.0), this methodological tool is applied as per the methodology for the demonstration of the continuation of the baseline scenario.

The continuation of the baseline scenario is demonstrated by applying the stepwise procedure of ACM0001 (version 15.0) for the determination of the baseline scenario. Baseline emissions are also determined by applying methodological approach also established by ACM0001 (version 15.0) and applicable methodological tools.

As established by applicable CDM rules, the additionality of the project is not required to be demonstrated for the 2nd 7-year crediting period.

The previously derived baseline scenario for the project activity is presented in the latest version of the registered PDD valid for the 1st 7-year crediting period

The applicability condition of the methodological tool is thus met.

Tool:

“Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion”, V02

Applicability:

This tool provides procedure to determine and calculate project and/or leakage CO₂ emissions from the combustion of fossil fuels. It is used in cases where CO₂ emissions from fossil fuel combustion (for use other than for electricity generation) are calculated based on the quantity of fuel combusted and its properties.

Compliance:

As established by ACM0001 (version 15.0), this methodological tool is applied for the determination of project emissions due to the consumption of fossil fuel by the project activity (with fossil fuel being used for purposes other than for electricity generation). In the particular case of the project activity, Liquefied Petroleum Gas (LPG) has been used to ignite the flares. The applicability condition of the methodological tool is thus met.

Tool:

“Tool to determine the mass flow of a greenhouse gas in a gaseous stream”, V02

Applicability:

This tool is used to determine the mass flow of greenhouse gas *i* (CO₂, CH₄, N₂O, SF₆ or a PFC) in the time interval *t*.”

This tool provides procedures to determine *F_{i,t}* (kg/h). The mass flow of a greenhouse gas (CO₂, CH₄, N₂O, SF₆ or a PFC) in the gaseous stream in time interval *t*. based on measurements of:

- (a) the total volume flow or mass flow of the gas stream,
- (b) the volumetric fraction of the gas in the gas stream and
- (c) the gas composition and water content.

Typical applications of this tool are methodologies where the flow and composition of residual or flared gases or exhaust gases are measured for the determination of baseline or project emissions, which is the case of the present project activity”

Compliance:

As established by ACM0001 (version 15.0), this tool is applied as per the methodology for determining the mass flow of CH₄. The applicability condition of the methodological tool is thus met.

Tool:

Methodological tool “Assessment of the validity of the original/current baseline and to update the baseline at the renewal of a crediting period” V03.0.1

Applicability:

This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period, as required by paragraph 49 (a) of the modalities and procedures of the clean development mechanism. The tool consists of two steps. The first step provides an approach to evaluate whether the current baseline is

still valid for the next crediting period. The second step provides an approach to update the baseline in case that the current baseline is not valid anymore for the next crediting period.”

Compliance:

The application of this tool in the context of the renewal of the 7-year crediting period is required as per the CDM Project Standard. The applicability condition of the methodological tool is thus met.

Tool:

“Tool to determine the remaining lifetime of equipment” V01

Applicability:

The tool provides guidance to determine the remaining lifetime of baseline or project equipment. The tool may, for example, be used for project activities which involve the replacement of existing equipment with new equipment or which retrofit existing equipment as part of energy efficiency improvement activities.

Methodologies referring to this tool should clearly specify for which equipment the remaining lifetime should be determined. The remaining lifetime of relevant equipment shall be determined prior to the implementation of the project activity. Project participants using this tool shall document transparently in the CDM-PDD how the remaining lifetime of applicable equipment has been determined, including (references to) all documentation used.

Under this tool, impacts on the lifetime of the equipment due to policies and regulations (e.g. environmental regulations) or changes in the services needed (e.g. increased energy demand) are not considered. Methodologies referring to this tool shall, where applicable, provide specific guidance on how regulations that warrant the replacement of the equipment before it has reached the end of its technical lifetime should be addressed.”

Compliance:

As per ACM0001 (version 15.0), “For each item of equipment which was in operation prior to the implementation of the project activity and in which the captured LFG is used after the implementation of the project activity, project participants shall estimate its remaining lifetime by applying the “Tool to determine the remaining lifetime of equipment”. These items of equipment and their remaining lifetime shall be recorded in the CDM-PDD.

Depending on the project activity, relevant items of equipment may include power plants, boilers, air heaters, glass melting furnace, or kilns.”

Since there was no installed equipment prior the implementation of the project activity in which captured LFG was still used after the implementation of the project activity, this methodological tool is thus not applied.

Assessment:

The assessment team compared the text of the applicable version of the methodology with the information stated in the PDD.

3. The project activity involves renewal of crediting period of a registered project activity that encompass capture and use of LFG from an existing and operational SWDS replacing in part an existing active LFG combustion system (with total 12 LFG extraction wells and a small scale active LFG collection and flaring system). In line with the criterion b) – (ii) an investment was done into an existing LFG capture system for change in use of the captured LFG for electricity generation and or flaring. Historical data on amount of LFG captured and flared in the pre-project scenario is available and was considered in the context of baseline emissions. Thus compliance of project activity to criterion b) – (ii) is justified.

The project activity would collect LFG for its destruction by flaring and or for its use to generate power. With no other use of collected LFG from the project activity compliance to applicability condition (c) - (i) is justified.

In Chile, municipalities manage municipal solid waste and the project promoter receives MSW from the municipalities as per the contractual agreement. Thus it is impossible for KDM S.A to alter the content of MSW in its interest. In January 2006, the MSW disposal service contract was signed between the affected municipalities and KDM that was valid until 2011 and was renewed in 2009 with a commitment of MSW disposal until 2027. Furthermore, DoE with its secondary data assessment could not find any evidence that suggests otherwise.

Review of certain publicly available articles referred below also reveal that recycling of biomass is not a prevalent practice in Chile. It is done on a miniscule scale and as a result composts are prepared. In Chile most of the MSW is sent to landfills without any pretreatment, however paper, cardboard and metals are recovered from waste dumps by unorganized local rag pickers (herein after referred as informal sector). About 374,000 tons of waste, mainly paper, cardboard and metals are collected and separated by the informal sector. A recycling rate of about 14% is achieved only due to the high contribution of the informal sector. Usually, MSW left in bags or containers at the streets is collected by the formal sector. But formal sector contribution to overall recycling scenario is almost negligible [IRL#29].

Chapter 13 of Municipal Solid Waste Management in Santiago de Chile: Challenges and Perspectives towards Sustainability, by Klaus-Rainer Brautigam, Tahnee Gonzalez, Marcel Szanto, Helmut Seifert and Joachim Vogdt, in Table 13.2 'Quantities of municipal solid waste in RMS in the years 1995–2007 and calculated recycling rate' clearly reinstates PPs claim of poor recycling rate in Metropolitan Region of Santiago de Chile while showing maximum achieved recycling rate until 2007 at 13.94% [IRL#28].

<http://202.154.59.182/mfile/files/Economics/Risk%20Habitat%20Megacity/Chapter%2013%200%20Municipal%20Solid%20Waste%20Management%20in%20Santiago%20de%20Chile%203B%20Challenges%20and%20Perspectives%20towards%20Sustainability.pdf>

Furthermore the report states "...there are three main alternatives for publicly organized recycling: drop-off systems, and the segregated collection of inorganics and bio-waste. Their contribution to recycling, however, is negligible. Drop-off systems amounted in 2007 to about 21,000 t (less than 1%). The segregated collection of bio-waste amounts to about 10,000 t per year, from which roughly 3,300 t of compost is produced, while the segregated collection of recyclable materials amounts to approximately 4,000 t per year, half of which can be sold as secondary raw materials." Thus it is clear that recycling of organic waste or pre-treatment of organic contents is not a prevalent practice in Chile and it has been so for many years now.

The site began receiving sludge from the largest wastewater treatment plant in Santiago in 2004. Although the older version of PDD (Valid for first crediting period) mentions that the contract for sludge disposal would terminate in 18 months; the contract continued beyond that period with the landfill receiving sludge at an approximate rate of 150 ton each day ever since 2004. Although the maximum acceptable capacity of sludge at landfill is assessed at 380 ton per day, as stated in the PDD, latest contract signed in 2014 specified average sludge availability of 150 ton per day [IRL#39]. The scenario is likely to continue in the second crediting period with a possible increase in sludge quantity by 1% each year. The same reflects in the emission reduction calculation sheet. This sludge data was verified from the logs provided by the PP.

The first contract came into being on 1-08-2004 valid for a period of 18 months and it was

renewed on 01-02-2006 another 18 months. The contract was renewed once again on 01-08-2007 but when contract ended in 01-02-2014, it was renewed for 3 another years. As per PP now sludge contract would be renewed every 3 years [IRL#39]. The contract copies were provided by PP to our assessment. The dates and the fine prints of the contract were assessed against the claims made in the revised PDD and the older version of the PDD and found correct. It was also found that the original contract for sludge supply was with largest waste water treatment plant in the region (as stated in the version of PDD) but now the contract does not specify any one plant but all plants that belong to the Aguas Andinas group [IRL#39]. However as the sludge amount received at site remains approximately the same (with a minimal 1% increase each year) it does not suggest reduction in the amount of organic waste that would be recycled in the absence of the project activity; this is acceptable.

Furthermore, Sludge use did not reflect in the GHG estimations in the PDD valid in the earlier crediting period as it applied the older versions methodology 'ACM0001' where there was no need to calculate separately the LFG generated from each type of waste deposited at the landfill. However, for the renewed crediting period corresponding LFG generation for each waste type has been estimated separately to comply with the revised version of ACM 0001 (V15). Thus, representation of sludge as one of the waste types in the revised PDD applicable for the renewed crediting period do not suggest change is sludge use scenario at the landfill in any which way but compliance with the methodological requirements. It is thus concluded that KDM S.A in its capacity by its activities or influence cannot cause reduction in the amount of organic waste that would be recycled in the absence of the project activity because of two prime reasons explained above, one that the collection of waste and its supply to the landfill is not controlled by KDM S.A and second that recycling of organic matter alone is not a prevalent practice in the region of Chile. Thus applicability of project activity to criterion d) is justified.

4. The assessment of baseline scenario confirms that the most plausible baseline scenario in project case is electricity equivalent to amount generated by LFG in project activity being generated in the grid or in captive fossil fuel fired power plants in the baseline, where baseline scenario as defined in Section B.4, is the partial release of LFG from the SWDS into the atmosphere with a small share of generated LFG being flared at the small scale active LFG collection and flaring system. Thus project activity confirms to applicability criterion (b) (i).
5. The project is destruction of LFG by utilizing it of electricity generation or otherwise flaring it. Furthermore, the management in Loma Los Colorados Landfill has not changed over 7 years of its earlier crediting period and is not likely to change for the renewed crediting period. Landfill practices after project implementation is same as its normal and previously planned/defined operation conditions and practices. The site began receiving sludge from the largest wastewater treatment plant in Santiago in 2004. Although the older version of PDD (Valid for first crediting period) mentions that the contract for sludge disposal would terminate in 18 months; the contract continued beyond that period with the landfill receiving sludge at an approximate rate of 150 ton each day ever since 2004. The scenario is likely to continue in the second crediting period with a possible increase in sludge quantity by 1% each year. The same reflects in the emission reduction calculation sheet. This sludge data was verified from the logs provided by the PP.

Furthermore, Sludge use did not reflect in the GHG estimations in the PDD valid in the earlier crediting period as it applied the older versions methodology 'ACM0001' where there was no need to calculate separately the LFG generated from each type of waste deposited at the landfill. However, for the renewed crediting period corresponding LFG generation for each waste type has been estimated separately to comply with the revised version of ACM 0001 (V15). Thus, representation of sludge as one of the waste types in the revised PDD applica-

6.	<p>ble for the renewed crediting period do not suggest change is landfill practices at the landfill in any which way but compliance with the methodological requirements alone. Thus criterion 5 (a) and 5 (b) do not apply to the project activity. This is acceptable.</p> <p>Project activity complies with applicability criteria of additionally applied tools (listed above). The applicability to these tools is justified in the PDD and is acceptable.</p>
<p>Validation opinion:</p> <p>The documentation content is correctly quoted and interpreted in the PDD. The applicability criterion is met by the project activity.</p>	

TÜV SÜD confirms that the chosen baseline and monitoring methodology is applicable to the project activity.

3.3.2 Validity of Baseline

The baseline scenario identified at the validation of the project activity as per registered PDD was 'the baseline scenario for LFG production being emitted into the atmosphere by the Loma los Colorados landfill (minus the historical flow rate of LFG burnt at the pre-project flaring station) and the baseline scenario for the project's renewable energy component is equivalent amount of electricity being generated by the operation of grid-connected thermal power plants consuming fossil fuel and by the addition of new generation sources in the absence of the project activity'.

According to the methodological tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of crediting period" (Version 03.0.1) the following procedure was applied to assess the validity of the baseline.

Step 1: Assess the validity of the current baseline for the next crediting period

The impact of new relevant national and/or sectoral policies and circumstances on the baseline was assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

The latest approved Chilean decree n°189 regulates Landfill's design and management was published in 2005 establishes in Article 16 "Every landfill needs to include a Landfill Gas Management System that guarantees the security conditions inside the installations and its surroundings. The design of this management system should consider the highest possible extraction of landfill gas generated during the operation and close phases". Furthermore, the last section of that article states "Notwithstanding the foregoing, the landfills with a total height smaller than six meters would not be obliged to consider a Landfill Gas Management System".

'Health Conditions and Regulation on Basic Safety in Landfill', decree No. 189. Santiago, August 18, 2005 is accessible at <http://www.leychile.cl/Navegar?idNorma=268137>. This link is valid. PP also provided an English translation of the documents posted at above links for DoEs perusal.

PP has secured Environment clearance for project "THE COLOURED CENTRAL LOMA" Vide Exempt Resolution No. 344/2010 on 10-05-2010 under the provisions of Law No. 19,300, on General Environmental Framework, published in the Official Gazette on March 9, 1994 and 95/01 Supreme Decree of the Ministry General Secretariat of the Presidency, which approved the text consolidated, coordinated and Regulation System of Environmental Impact Assessment, published in the Official Gazette on December 7, 2002; Resolution No. 1600/2008 of the Comptroller General of the Republic, which sets standards exemption process Making Reason and other legal rules governing the matter.

The environmental permits are available at:

http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=3997973

http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1220419
http://seia.sea.gob.cl/seia-web/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1033

The links are valid and accessible. PP also provided an English translation of the documents posted at above links for DoEs perusal.

It was established from the assessment of documents listed above that Chilean law regulating landfills only establishes general conditions for operation and proper closure of landfills for better health and safety of those affected. In general terms, it establishes requirements for all operational aspects of the landfill, including biogas and leachate treatment, installation of wells to release biogas etc. Lately the Ministry of the Environment is trying to recover recyclable wastes to reduce the amount of landfill waste. According to the Ministry, “more than 50% of municipal waste could be reused or recycled, which would substantially reduce the amount that ends up in landfills –or is dumped illegally” [IRL#7, 13].

Loma Los Colorados landfill voluntarily entered into the Environmental Impact Evaluation System (Sistema de Evaluación de Impacto Ambiental, SEIA) in 1995 with a commitment of collecting the landfill gas and venting it with no flaring with prime objective to prevent the migration of landfill gas to the ground water, and polluting it with the soluble parts of LFG. Moreover, the Resolution of Environmental Qualification issued by the environmental authorities required LFG monitoring at key points of the landfill (e.g. the perimeter and the vent wells what has been done regularly every three months) [IRL#10]. In 1998 KDM installed a limited active flaring system and started its operation on a non-regular basis.

In current times there is no regulation in Chile that mandates recovery and destruction of landfill gas. Recovery and use of landfill gas is at operator’s/ owner’s discretion. Thus the baseline scenario for LFG production ‘LFG production being emitted into the atmosphere’ is still valid and in line with requisite law and decree.

Baseline for power generation ‘equivalent amount of electricity being generated by the operation of grid-connected thermal power plants consuming fossil fuel and by the addition of new generation sources in the absence of the project activity’ complies with all the applicable laws of Chile. Today law in Chile permits supply and sale of power to grid from non-conventional renewable energy sources (ERNC) vide following regulations:

- Decree N° 244 – Bylaw for non-conventional and small-scale electricity generation sources. This bylaw established regulations for law N°19,940. Establishes requirements for grid connection as well as options for commercialization of electricity at a stabilized price and some fee exemptions for using the main transmission system.
- Law N° 20,257 - Introduces modifications to the General Electrical Services law, establishing as mandatory for the electric generation companies to comply with a minimum of 5% of their energy injections to be supplied by non-conventional renewable energy sources (ERNC), either directly or indirectly. This percentage will be gradually increased to reach 10% by year 2024.
- Resolution N° 1,278 – ERNC Law regulation. This resolution normalizes the implementation of Law N° 20,257, which requires power generation companies to inject in the grid a determined share of electricity being generated from non-conventional renewable energy sources.

TÜV SÜD by assessing the aforementioned policy/law/degree confirms that the current baseline complies with mandatory national, regional and/or sectoral requirements.

Step 1.2: Assess the impact of circumstances

As discussed above there are no new national/sectoral policies/legislation/circumstances that could possibly affect the baseline scenario during the renewal of the crediting period. TÜV confirms that

the circumstances considered in determining the baseline in the previous crediting period are still valid. There is still no law in Chile that mandates use and destruction of LFG from a landfill clearly indicating that in absence of the project activity LFG from landfill would have been partially flared while the rest would have been vented out. Secondly for electricity; the amount of electricity produced by the project displaces electricity from the grid, thus in any case baseline for electricity would be electricity generation from the grid.

TUV concludes that the baseline holds good against the current scenario as 'the baseline scenario for LFG production is the LFG being emitted into the atmosphere by the Loma los Colorados landfill (minus the historical flow rate of LFG burnt at the pre-project flaring station) and the baseline scenario for the project's renewable energy component is equivalent amount of electricity being generated by the operation of grid-connected thermal power plants consuming fossil fuel and by the addition of new generation sources in the absence of the project activity'. Thus there is no need for any updation to the existing baseline.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.

Baseline scenario at the validation of the project activity was not identified as "the continuation of use of the current equipment(s) without any investment and, the projects proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology", this step is not applicable.

Step 1.4: Assessment of the validity of the data and parameters

Some of data and parameters presented in the registered PDD are no longer valid as the earlier used applied methodologies, version 04 of the approved CDM methodology ACM0001 'Consolidated methodology for landfill gas project activities' and version 06 of CDM methodology ACM0002 'Consolidated methodology for grid-connected electricity The CDM-PDD for the 2nd crediting period (version 1.3, dated 01-09-2014) applies version 15 of the consolidated methodology ACM0001 "Flaring or use of landfill gas". Thus data and parameters used in the earlier version of the PDD have been updated to meet the requirements of the latest applied methodology referred above and related methodological tools.

All applicable and required ex-ante determined parameters valid for the 2nd 7-year renewable crediting period are presented in Sections B.6.1 and B.6.2 of the PDD. While section B.7.1 of PDD presents all applicable monitoring parameters based on the updated methodology. All updated parameters have been presented in section 2.2 below.

Global Warming Potential of Methane is updated to '25' in line with IPCC Fourth Assessment Report 2007 Working Group I: 'The Physical Science Basis', table 2.14 "Global Warming Potential for Given Time Horizon" www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14 [IRL#38]. This is also in line with the "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol". This is a valid assumption.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline

The baseline scenario for the project activity has not changed for the 2nd 7-year renewable crediting period as highlighted above, however, the applied methodological tool for the determination of baseline scenario and baseline emissions (as per ACM0001 (version 15.0)) is different than the one required by ACM0001 (version 4) and ACM0002 (version 6). Thus, to ensure completeness PP determined the baseline scenario and baseline emissions as per the related requirements of ACM0001 (version 15.0) as below:

As project is not First-of-its-kind, this step was not considered.

Following alternatives for destruction of LFG was considered as per the methodology:

LFG1: The project activity (i.e. capture of landfill gas and its flaring and/or its use) undertaken without being registered as a CDM project activity. This is a plausible alternative scenario, however involves significant investment and additional costs of landfill operations with no associated revenues in the case of flaring of collected LFG.

LFG2: Atmospheric release of the landfill gas or partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and odour concerns. This scenario corresponds to the continuation of the current situation (the proposed project activity or any other alternatives are not implemented).

LFG3: LFG is partially not generated because part of the organic fraction of the solid waste is recycled and not disposed in the SWDS;

LFG4: LFG is partially not generated because part of the organic fraction of the solid waste is treated aerobically and not disposed in the SWDS;

LFG5: LFG is partially not generated because part of the organic fraction of the solid waste is incinerated and not disposed in the SWDS.

Alternatives LFG3, LFG4 and LFG5 was omitted because reduction in the amount of organic waste through recycling of organic matter, or pre-treatment of waste is not a prevalent practice in the Chile. Sorting of waste is done informally at source and for mainly metal scraps, plastics but at a scale that would impact the composition of the MSW. This is valid and justified.

Following alternatives for destruction of LFG was considered as per the methodology:

E1: Electricity generation from LFG, undertaken without being registered as CDM project activity;

E2: Electricity generation in existing or new renewable or fossil fuel based captive power plant(s);

E3: Electricity generation in existing and/or new grid-connected power plants.

Scenario E2 is excluded. Since all electricity demand of the landfill has been historically met by a reliable supply of grid electricity (since the start of operations of the landfill), the utilization of a captive electricity generator to supply electricity for the landfill site (using renewable or fossil energy sources) never occurred and it is not foreseen to occur in the project scenario either. This is acceptable.

Heat generation scenarios using LFG collected at the landfill as fuel are not part of the project activity as there are no heat requirements at the landfill and the project activity does not encompass use of collected LFG for heating or thermal purposes

The alternatives for baseline and additionality assessment were determined as LFG1, LFG2, E1 and E3.

As the project activity applies for renewal of crediting period, therefore assessment of additionality is not required as per the procedures stated under VVS, project standard and project cycle procedure. The whole assessment and demonstration of additionality for the given registered CDM project activity is included in the latest version of the PDD and validation report valid for the 1st 7-year renewable crediting period. Thus Step 3: Investment analysis and Step 4: Common practice analysis was ignored.

Identified baseline alternatives correspond to the baseline alternative defined in the registered PDD. The approach is valid and conforms to CDM requirements, thus acceptable to the DoE.

Step 2.2: Update the data and parameters

Some conditions, data and parameters which were determined *ex ante* at the start of the 1st crediting period as per then applicable methodologies [ACM0001, Version 04](#) and [ACM0002, Version 06](#) are no longer valid/applicable during the 2nd 7-year crediting period with application of latest version of

methodology ACM0001 (version 15.0.0) and methodological tools associated to it. All such parameters were assessed for their suitability in the project scenario and the correctness of their values as below:

In line the revised methodology $F_{CH_4,PJ,y}$ i.e. the amount of methane in the LFG which is flared and/or used in the project activity in year y (in tCH_4), is determined *ex ante* by multiplying the efficiency of LFG capture system (η_{PJ}) with the amount of methane that is generated from Loma Los solid waste disposal site ($BE_{CH_4,SWDS,y}$). While $BE_{CH_4,SWDS,y}$ was appropriately determined using the methodological tool “Emissions from solid waste disposal sites”, η_{PJ} value was based on the technical paper “Measuring landfill gas collection efficiency using surface methane concentration” [IRL#21].

During the 2nd 7-year renewable crediting period, the PP intends to increase the efficiency of the LFG extraction keeping in mind the expected expansion of installed power of the plant from 21.8 MW to 27.4 MW, that will eventually require an expansion of the LFG collection system. This increase will eventually require increase in efficiency of the LFG extraction from the landfill. With aim to achieving 100% efficiency and the forecasted increase in the number of LFG collection wells and accumulated experience of PP in landfill operation, improvement in the efficiency of the current landfill is certain, thus PP finds it irrational to base its assumption of future landfill efficiency on actual collection efficiency achieved over last 7 years of landfill's operation. Thus basing its assumption (92.8 %) on a valid and publicly available technical paper is reasonable.

While determining $BE_{CH_4,SWDS,y}$ using First Order Decay Model (FOD) in line with methodological tool ‘Emissions from solid waste disposal sites’ ‘Application A: The CDM project activity mitigates methane emissions from a specific existing SWDS’ was correctly adopted and ‘yearly’ model was used. All default factors corresponding to ‘Application A’ was used. PDD in the first crediting period used a single-decay LFG model as per then applicable version of methodology.

In line with the applied methodology ACM0001 V15.0 and in contrary with methodological tool “Emissions from solid waste disposal sites” while determining $BE_{CH_4,SWDS,y}$ no sampling was done to determine the fractions of different waste types, but the characteristics of each waste type was taken into account. Also fraction of methane captured (f_y) assigned a ‘0’ for the reason that this factor is already accounted in another equation; this is in line with the applied methodological referred above. Furthermore, following default factors that were referred from the applied methodological tool “Emissions from solid waste disposal sites” and IPCC guidelines were aptly applied:

- Φ_{default} Default value for model correction factor to account for model uncertainties
- **OX** Oxidation factor (reflecting the amount of methane from the considered SWDS that is oxidized in the soil (or other material covering the waste))
- **F** Fraction of methane in the SWDS gas (volume fraction)
- **MCF_{default}** Methane correction factor.
- **DOC_j** Fraction of degradable organic carbon in the waste type j (weight fraction)
- **k_j** Decay rate for the waste type j

Value of parameter ‘F’ fraction of methane in the SWDS gas is the applicable default factor. Although a default factor could be applied as per the applied tool and methodology, PP chose to use the actual value calculated based on monitored data for the monitoring periods encompassed by year 2012. The applied value is determined as the average fraction of methane in collected LFG during the year of 2012. Thus the value applied was 0.4962 instead of the default factor 0.5. This was acceptable as the value applied was based on actual monitored data that was conservative than the default factor. Average CH_4 fraction in collected LFG during the year of 2012 data was cross checked from the KDM S.A logs. This aspect is further assessed in CR no. 05 of Annex 1.

In absence of any composition analysis of MSW disposed at the Loma Los Colorados landfill, regional default values of South-America was taken to determine MSW composition (W_j), which is ac-

ceptable. Fraction of degradable organic carbon (DOC_j) in the waste type j IPCC default factors was taken IPCC guidelines.

The values of Mean Annual Temperature and Mean Annual Precipitation have been taken from credible sources (BBC website [IRL 22] and have been cross checked from the direct web link provided by PP. This link is valid and working. PP's assessment was replicated taking the values of average monthly precipitation and Minimum and Maximum monthly temperature from the BBC web link above. Mean annual precipitation was then estimated as the sum of all monthly values of average rain fall and the mean annual temperature was calculated as the average of minimum and maximum monthly values. The resultant value of Mean Annual Temperature (MAT) and Mean Annual Precipitation (MAP) correspond to the figure provided by PP, establishing the correctness of assessment.

Global Warming Potential of Methane was updated to '25' as per the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, based on the effects of greenhouse gases over a 100-year time horizon (the former Global warming potential of CH₄, valid until 31/12/2012, was 21 tCO₂e/tCH₄. The applied value is in accordance with the "Standard for application of the global warming potential to clean development mechanism project activities and programmes of activities for the second commitment period of the Kyoto Protocol".

Parameter MD_{reg} (amount of LFG flared in the baseline scenario) was estimated as per methodologies applicable to the 1st 7 year renewable crediting period - ACM0001, V04, 'Consolidated methodology for landfill gas project activities' and ACM0002, V06 'Consolidated methodology for grid-connected electricity generation from renewable sources'. However, with application of the new methodology (ACM0001 ver. 15.0 - Flaring or use of landfill gas) for the renewed crediting period, the aforesaid parameter is referred as F_{CH₄,BL,y} in line with the latest applied methodology. Parameter has been aptly estimated in line with requirements of the applied methodology.

In line with para 5.4.1.3 of applicable methodology ACM0001 (V15), case 3 was aptly applied to determine F_{CH₄,BL,y} as in case of the project activity there is no regulatory requirement to destroy methane due to regulatory or contractual requirements to address safety and odour concerns etc. As stated in section 3.3.2 above Chilean law regulating landfills only establishes general conditions for operation and proper closure of landfills considering better health and safety of those affected. In general terms, it establishes requirements for all operational aspects of the landfill, including biogas and leachate treatment, installation of wells to release biogas etc with no compulsion to capture and destroy LFG.

Loma Los Colorados landfill voluntarily entered into the Environmental Impact Evaluation System (Sistema de Evaluación de Impacto Ambiental, SEIA) in 1995 with a commitment of collecting the landfill gas and venting it with no flaring with prime objective to prevent the migration of landfill gas to the ground water, and polluting it with the soluble parts of LFG and then in 1998 KDM voluntarily installed a limited active flaring system and started its operation on a non-regular basis. Thus categorization of project activity under 'Case 3' specified in section 5.4.1.3 is justified.

Furthermore, in line with para 46 and 47 of the applied methodology, in absence of the monitored data for 'amount of methane captured', 'historical amount of methane in the LFG' (F_{CH₄,hist,y}) was used to determine 'amount of methane in the LFG that would be flared in the baseline' (F_{CH₄,BL,sys,y}). Thus the algorithm used to determine F_{CH₄,BL,y} was appropriately defined in line with the applied methodology as $F_{CH_4,BL,y} = F_{CH_4,hist,y} = F_{CH_4,BL,x-1} / F_{CH_4,x-1} * F_{CH_4,PJ,y}$. This is thus acceptable.

Historical data on landfill gas captured and flared in the year of 2006 i.e. the year prior to the implementation of the project activity was used to determine F_{CH₄,BL,y}. For estimation of fraction of methane in collected LFG a percentage value of 60% was considered; same as the value

previously adopted for the estimation of methane that would be flared in the absence of the project activity during the previous 1st 7-year crediting period. This is valid.

LFG generated in the baseline was estimated for solid waste and sludge separately which was not a requirement in the earlier crediting period as it applied the older version methodology 'ACM0001' where there was no need to calculate separately the LFG generated from each type of waste deposited at the landfill. However, for the renewed crediting period corresponding LFG generation for each waste type was estimated separately to comply with the revised version of ACM 0001 (V15).

Default value of 0.1 was used against parameter ' OX_{top_layer} ', Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline in line with ACM 0001 (V15). This parameter is assumed applied in the baseline and not in the project scenario in line with the applied methodological tool "Emissions from solid waste disposal sites" and applied methodology ACM0001 (version 15.0). This is a valid assumption.

In line with ACM0002 version 06, the PDD applicable for 1st crediting period determined Operating Margin ex-ante using vintage data from the three 2003, 2004 and 2005 utilizing "Simple Adjusted Operating Margin" approach and the build margin was determined by the averaging emissions factor of a sample (five) of recently built power plants that add up to more than 20% of the total generation in the grid. Both OM and BM was assigned 50% weightage in line with the applied methodology. The estimation of CM (Combined Margin) was thus ex ante and was fixed for 7 years (1st crediting period).

Baseline emissions associated with electricity generation in a particular year ($BE_{EC,y}$) was calculated by applying applicable guidance of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption. Furthermore, Option A.1 of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" was selected for determining $EF_{EL,k,y}$. As per the chosen option combined margin emission factor was calculated using the procedures in the latest approved version of the "Tool to calculate the emission factor for an electricity system".

For estimation of Operating Margin grid emission factor, $EF_{grid,OM,y}$, Simple adjusted OM emission ($EF_{grid,OM-adj,y}$) method was considered as low-cost/must-run resources in the Interconnected Central System grid accounts for more than 50% of total grid generation. Furthermore the Operating Margin was calculated ex-ante (using option 1) and thus is fixed for the 2nd 7-year crediting period. As this is the second crediting period, build margin (BM) emission factor ($EF_{grid,BM,y}$) the build margin emission factor was updated, as per para 68 option 1 of the tool, based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. Power plants that started to supply electricity to the grid most recently and that comprised 20 per cent of grid generation (excluding power units registered as CDM project activities) was considered in the sample group to estimate build margin as $SET_{\geq 20\%}$ had a electricity production than $SET_{5-units}$. Weighting of Operating and Build Margin has been aptly considered at 25% and 75% respectively, applicable for second and third crediting period. Power plant electricity generation data and fuel data was verified from CDEC-SIC 2003-2012 OPERATION STATISTICS [IRL#33,35].

PPs approach is in line with the applicable tool. The values used against each parameter was checked and found valid at the time of project submission to the DoE.

Average technical transmission and distribution losses for providing electricity to the grid and for grid sourced electricity consumed by the project activity has been considered 20%, a default value given by 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption'. This is thus valid.

Generation capacity of engine-generators was verified from the technical specifications provided by the equipment suppliers [IRL #18, 19]. The value of conversion efficiency of the engine-generators is as specified by the manufacturer. energy conversion efficiency of 42% was cross verified from a PPT titled 'Equipment Considerations for Landfill Gas Generator Sets: Total Cost of Ownership'

prepared by Caterpillar Electric Power for '15th Annual LMOP Conference and Project Expo' available at Environment Protection Agency website [IRL#17]. This assumption is thus valid and acceptable.

Project emissions ($PE_{LPG,y}$) from the project activity is summation of Project emissions due to consumption of electricity sourced by backup captive off-grid electricity generators (fuelled by Diesel) Project emissions due to grid electricity consumption by the project activity (tCO_2) Project emissions due to LPG consumption by the project activity (tCO_2) and Project emissions due to LPG consumption ($PE_{LPG,y}$) by the project activity (tCO_2) i.e. $PE_y = PE_{EC,y} + PE_{LPG,y} + PE_{EC,captive,y}$. The formulae are aptly applied. Furthermore there would be project activity emissions from the LPG use in flare start up. PP has assumed usage of 0.2 ton of LPG per year based on actual monitored data (Also refer CR No.4). The NCV and Emission Factor of LPG has been taken from IPCC default values (at upper limit of uncertainty at 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories). The value is acceptable.

While estimating $PE_{EC,captive,y}$, $TDL_{captive,y}$ (Average technical transmission and distribution losses for electricity sourced by the the captive electricity generator) has been considered as zero for simplification in line with 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption'. Default value from the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" is the basis of emission factor for electricity generated by the backup captive off-grid electricity generators.

Furthermore, Algorithm and formulae used to determine the parameters above and default factors where ever applicable were assessed vis a vis the methodological requirements. The Algorithm and formulae used were found in sync with the methodology and applied tool. No errors or misstatements were found. With the assessment above is concluded that the ex ante estimation of emission reduction is thus in full compliance with the applied methodology and its associated tools.

Data and parameters fixed *ex ante* are as below:

- OX_{top_layer}** Fraction of methane that would be oxidized in the top layer of the SWDS in the baseline
- $F_{CH_4,BL,x-1}$** Historical amount of methane in the LFG which is captured and destroyed in the year prior to the implementation of the project activity (2006).
- GWP_{CH_4}** Global Warming Potential of CH_4
- η_{PJ}** Efficiency of the LFG capture system that will be installed in the project activity
- R_u** Universal ideal gases constant
- MM_k** Molecular mass of gas k
- MM_i** Molecular mass of greenhouse gas i
- P_n** Total pressure at normal conditions
- MM_{H_2O}** Molecular mass of water
- T_n** Temperature at normal conditions
- $TDL_{grid,y}$** Average technical transmission and distribution losses for providing electricity to the grid and for grid sourced electricity consumed by the project activity.
- w_{BM}** Weighting of build margin emissions factor
- w_{OM}** Weighting of operating margin emissions factor
- $\phi_{default}$** Default value for model correction factor to account for model uncertainties
- OX** Oxidation factor (reflecting the amount of methane from the considered SWDS that is oxidized in the soil (or other material covering the waste))

F Fraction of methane in the SWDS gas (volume fraction)

DOC_{f,default} Fraction of degradable organic carbon (DOC) in MSW that decomposes in the considered SWDS.

MCF_{default} Methane correction factor.

DOC_j Fraction of degradable organic carbon in the waste type *j* (weight fraction)

k_j Decay rate for the waste type *j*

W_j Weight fraction of the waste type *j*

SPEC_{flare} Manufacturer's flare specifications for temperature, flow rate and maintenance schedule interval.

EF_{grid,BM,y} Build margin CO₂ emission factor in year *y*

EF_{grid,OM,y} Operating margin CO₂ emission factor in year *y*

PP_{CP,Diesel-generator} Rated capacity of the installed captive backup electricity generators fuelled by diesel

TDL_{captive,y} Average technical transmission and distribution losses for electricity sourced by the the captive electricity generator

EF_{EL,captive,y} CO₂ emission factor for electricity sourced by the the captive off-grid electricity generators

The monitoring plan allows for collection and archiving of the following key parameters for determination of emission reductions resulting from the project activity:

Management of SWDS Management of the SWDS

V_{t,wb} Volumetric flow of LFG stream in time interval *t* on a wet basis

V_{t,db} Volumetric flow of LFG stream in time interval *t* on a dry basis

V_{CH4,t,db} Volumetric fraction of CH₄ in the collected LFG in time interval *t* on a dry basis

V_{CH4,t,wb} Volumetric fraction of CH₄ in the collected LFG in time interval *t* on a wet basis

M_{t,db} Mass flow of the LFG stream in time interval *t* on dry basis

T_t Temperature of the LFG stream in time interval *t*

P_t Pressure of the LFG stream in time interval *t*

p_{H2O,t,Sat} Saturation pressure of H₂O at temperature *T_t* in time interval *t*

E_{CPJ,grid,y} Amount of grid electricity consumed by the project activity during the year *y*

EC_{BL,y} Amount of electricity generated using LFG by the project activity in year *y*

Op_{j,h} Operation of the equipment that consumes LFG (engine-generator sets of the electricity generation facility).

F_{CH4,EG,t} Mass flow of methane in the exhaust gas of the flare on a dry basis at reference conditions in the time period *t*

T_{EG,m} Temperature in the exhaust gas of the enclosed flare in minute *m*

Flame_m Flame detection of flare in the minute *m*

Maintenance_y Calendar dates

FC_{LPG,y} Quantity of LPG consumed by the project activity in year *y*

NCV_{LPG,y} Net calorific value of the fuel LPG in year *y*

EF_{CO2,LPG,y} CO₂ emission factor of fuel LPG in year *y*

EC_{PJ,captive,y} Quantity of electricity generated in captive diesel backup generator during the year *y*

FC_{Diesel,y} Quantity of fuel Diesel combusted by the captive off-grid electricity generator

NCV_{Diesel,y} Net calorific value of the fuel Diesel in year *y*

EF_{CO2,Diesel,y} CO₂ emission factor of fuel Diesel in year *y*

EG_{Diesel-Generator,y} Quantity of electricity generated in captive diesel backup generator during the year *y*

All the parameters listed in the monitoring plan are valid and are in line with the applied methodology.

Additionally, PDD categorically states in footnote 30 and 31 respectively that during the monitoring period $F_{CH_4,flared,y}$ would be determined for each flare using applicable guidance of the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” and $F_{CH_4,EL,y}$ would be for each stream of collected LFG which is sent to each engine-generator set, using applicable guidance of the “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. This confirms compliance to the requirement in para 33 (a) of applied methodology ACM0001,V15.

With the assessment above, it is confirmed that the all requisite parameters has been aptly updated to suit the requirements of the newly applied methodology ACM0001, V15.0 'Flaring or use of landfill gas' and associated tools.

As the project activity applies for renewal of crediting period, therefore assessment of additionality is not required as per the procedures stated under VVS, project standard and project cycle procedure. The whole assessment and demonstration of additionality for the given registered CDM project activity is included in the latest version of the PDD and validation report valid for the 1st 7-year renewable crediting period.

3.3.3 Algorithm and/or formulae used to determine emission reductions

TÜV SÜD has assessed the calculations of project emissions, baseline emissions, leakage, and emission reductions. Corresponding calculations have been carried out based on calculation spreadsheets (IRL 24, 25, 26, 27). The parameters and equations presented in the PDD, as well as other applicable documents, have been compared with the information and requirements presented in the methodology and respective tools. Equation comparisons were made to ensure consistency between all the formulae presented in the calculation files and in the PDD, methodology, and associated tools. For example, Algorithm for baseline methane emissions from the anaerobic waste decomposition in the considered SWDS ($BE_{CH_4,y}$) was assessed for its correctness in the emission reduction excel sheet and was found as represented in the methodology & associated tools and the PDD. Further formulae used for parameters $F_{CH_4,PJ,y}$ i.e. the amount of methane in the LFG which is flared and/or used in the project activity in year y and $F_{CH_4,BL,y}$ i.e. the amount of methane in the LFG that would be flared in the baseline (absence of project activity) in year y were found were appropriately applied in the emission reduction excel sheet and was correctly stated in the PDD. Furthermore, it is confirmed that the formulae used for ex ante estimation of Baseline emissions associated with electricity generation $BE_{EC,y}$ are appropriate.

Algorithm used to determine parameters ex post for example, the amount of methane in the LFG which is flared and/or utilized by the project activity ($F_{CH_4,PJ,y}$) have been clearly stated in the PDD. Options available to determine mass flow of greenhouse gas has been transparently presented, with in the ambit of methodological requirement and requirements of “Tool to determine the mass flow of a greenhouse gas in a gaseous stream”. Formulae and assumptions used to determine the amount of methane in collected LFG which is used for electricity generation ($F_{CH_4,EL,y}$) and amount of methane in collected LFG which is destroyed by flaring ($F_{CH_4,flared,y}$) was found in line with “Tool to determine the mass flow of a greenhouse gas in a gaseous stream” and was appropriately presented in the PDD and in the excel sheet.

Where ever applicable choice of options to determine parameters was also assessed as stated in section 3.3.2.

The estimate of the baseline emissions and formulae and algorithm for ex-ante estimation of emission reduction are considered correct as sample calculations were reproduced by the audit team with the attainment of the same results. Whereas for parameters to be determined ex-post, the choice of options, formulae and algorithm are valid and appropriate vis a vis the methodological & associated tool requirements.

The assumptions and data used to determine the emission reductions are listed in the PDD and all the sources have been reviewed. Amongst others, the following sources of information were used for crosscheck the information contained in the PDD:

- British Broadcasting Corporation (BBC) <http://www.bbc.com/weather/3871336>: Accessed for Mean Annual Temperature (MAT) and Mean Annual Precipitation (MAP) data [IRL 22]
- CDSEC-SIC Operation Statistics Yearbook 2001-2010, pages 74-75 (http://www.cdec-sic.cl/datos/anuario2013/espanol/cdec_sic_12_esp.pdf), referred for parameter $FC_{i,m,y}$ [IRL 33]
- National Energy Balance, 2009 (<http://www.cne.cl/estadisticas/balances-energeticos>), referred for $NCV_{i,y}$ [IRL 34]
- CDEC-SIC Operation Statistics Yearbook 2003-2012, pages 52–66 (http://www.cdec-sic.cl/datos/anuario2013/espanol/cdec_sic_12_esp.pdf), referred for $EG_{m,y}$ [IRL 35]
- Registered project link on UNFCCC <http://cdm.unfccc.int/Projects/DB/DNV-CUK1166695034.41/view>, referred for historical monitoring data [IRL 02].
- National Energy Commission (CNE) website <http://www.cne.cl>, referred for electricity system in Chile [IRL 36].
- Central Interconnected System (SIC) website <http://www.cdec-sic.cl/datos/anuario2013/english/sic.php>, referred for share of low cost must run generating sources in SIC [IRL 36].
- Article “Measuring landfill gas collection efficiency using surface methane concentration” by Raymond L. Huitric and Dung Kong, Solid Waste Management Department, Los Angeles County Sanitation Districts, Whittier, California
http://www.arb.ca.gov/cc/ccea/comments/april/huitric_kong.pdf [IRL 21].

In conclusion, TÜV SÜD confirms the following statements in line with § 99 and § 100 of VVS

- (a) All assumptions and data used by the project participants are listed in the PDD, including their references and sources;
- (b) All documentation used by project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD;
- (c) All values used in the PDD are considered reasonable in the context of the proposed project activity;
- (d) The baseline methodology and corresponding tool(s) have been applied correctly to calculate project emissions, baseline emissions, leakage and emission reductions;
- (e) All estimates of the baseline emissions can be replicated using the data and parameter values provided in the PDD;
- (f) Any estimates for monitored data or parameter are reasonable for estimating the emission reductions in the PDD
- (g) Different options for equations and parameters are selected appropriately.
- (h) The data and parameters fixed ex-ante are conservative and appropriate.

3.4 Validity of Monitoring plan

The project applies the approved monitoring methodology within ACM0001. The original monitoring plan following the requirements of the CDM methodology ACM0001 was updated based on requirements of version 15.0.0 of the applied methodology.

The monitoring plan presented in the PDD complies with the requirements of the applicable methodology. The assessment team has verified all parameters in the monitoring plan against the requirements of the methodology and no deviations have been found. PP has appropriately mentioned

the maintenance and calibration frequency of monitoring equipment and monitoring frequency against each monitoring parameter.

The procedures have been reviewed by the assessment team through document review and/or interviews with the relevant personnel. The information provided has allowed the assessment team to confirm that the proposed monitoring plan is feasible within the project design. The relevant points of monitoring plan have been discussed with the PPs. Specifically; these points include the location of meters, data management, and the quality assurance and quality control procedures to be implemented in the context of the project. Therefore, TÜV SÜD confirms that the PP is able to implement the monitoring plan and the achieved emission reductions can be reported ex-post and verified.



South Asia

Annex 1

List of Findings

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Definitions contained in the Glossary of CDM terms and applied in the Standard	
Shall / Should / May	In addition to the definitions contained in the Glossary of CDM terms, the following terms apply in the VVS (VVS/10): <u>Shall</u> is used to indicate requirements to be followed; <u>Should</u> is used to indicate that among several possibilities, one course of action is recommended as particularly suitable; <u>May</u> is used to indicate what is permitted.
Credible	Information is credible if it is authentic and is able to inspire belief or trust, and the willingness of persons to accept the quality of evidence. (VVS/17)
Reliable	Information is reliable if the quality of evidence is accurate and credible and able to yield the same results on a repeated basis. (VVS/17)
CAR	The DOE shall raise a corrective action request (CAR) if one of the following situations occurs (VVS/27): (a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable, verifiable and additional emission reductions; (b) The applicable CDM requirements have not been met; (c) There is a risk that emission reductions cannot be monitored or calculated.
CL	The DOE shall raise a clarification request (CL) if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. (VVS/26)
FAR	The DOE shall raise a forward action request (FAR) during validation to identify issues related to project implementation that require review during the first verification of the project activity. The DOE shall not raise a FAR that relates to the CDM requirements for registration (VVS/27)

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Compilation and Resolutions of CARs, CRs and FARs

Corrective Action Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	As per the CDM requirements as referred below PP shall update specific sections of the PDD (Viz. Baseline, estimated GHG emission reduction, methodology) to support request for renewal of the crediting period of a registered CDM project activity. This implies that an updated PDD, instead of a new one, in track change mode highlighting changes shall be submitted to the DoE. Considering the fact that requirements have changes post 2012, PP shall use the latest version of the PDD template and fill its sections keeping the content exactly as the registered PDD, then making changes pertaining to renewal of the crediting period in track change.	<input checked="" type="checkbox"/> Finding Closed IRL 23
Requirement	PS (06) #275; VVS (06) #344, #345	
Corrective Action Request	<u>Corrective Action Request No.1</u> PP shall provide an updated PDD in track change mode highlighting the modifications from the registered PDD.	
Response	As a response to the raised CAR, an updated PDD in “track changes” mode was also created highlighting all the changes from the registered PDD.	
Assessment Means of validation	PP has now used the latest template (version 05) of the PDD updating only relevant sections (baseline, methodology and ER calculations) from the registered PDD. This is acceptable and in line with the requirements referred above. The CAR is closed.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	PP has submitted the PDD using the latest PDD template (version 05).	

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Corrective Action Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	<p>Facts and figures presented by PP for confirming validity of the original/current baseline or updating the baseline shall be backed by reliable evidences.</p> <p>For example:</p> <ol style="list-style-type: none"> 1) Footnote 22 that state "In December 2013, there was still no legal requirement for LFG gas collection and its destruction using active or passive high temperature enclosed flares in Chile. Actually, there is still no applicable regulation that deals with LFG management in Chile" shall be backed by third party publicly available evidence. 2) Footnote 18 that state "The operation of the Loma Los Colorados Landfill in terms of disposal of MSW (practices of waste disposal, covering, levelling, compacting, leachate management, etc.) has not changed after the implementation of the project activity and no change is expected to occur along the 2nd 7-year crediting period either. Thus there is no valid action promoting increase in methane generation (like e.g. through addition of liquids, pre-treating waste, changing the shape of the landfill) that was triggered or promoted by the project activity at the Loma Los Colorados Landfill when compared to the situation prior to the implementation of the project activity. This is confirmed in documented declaration issued by KDM S.A" shall be backed by third party publicly available evidence. <p>Similarly, all other facts shall be supported by reliable evidences.</p>	<input checked="" type="checkbox"/> Finding Closed IRL 7, 9, 10, 11, 13, 12, 20
Requirement	VVS (V06) #346	
Corrective Action Request	<p><u>Corrective Action Request No.2</u></p> <p>PP to confirm validity of the original/current baseline or to update the baseline at the renewal of a crediting period shall use specific data/figures supported with additional evidences (viz. govt. data, reliable website, articles and reliable third party reports) and shall present the references/ web links in the PDD for transparency.</p>	
Response	<p>As a response to the raised CAR, a reference to the currently in force regulation applicable for landfills in Chile (available at http://www.leychile.cl/Navegar?idNorma=268137) was added to footnote 23 in the PDD in order to further demonstrate that there is no applicable regulation that deals with LFG management in Chile.</p>	

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Corrective Action Requests by the assessment team		
	<p>Moreover, references to the currently available environmental permits for the landfill and the electricity generation facility (which includes the design and operation of the LFG capture system) were added to footnote 18 in the PDD in order to demonstrate that the operation of the landfill has not changed (after the implementation of the project activity) in order to promote any increase in methane generation. The environmental permits are available at:</p> <p>http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=3997973 http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1220419 http://seia.sea.gob.cl/seia-web/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1033</p> <p>Finally, a reference to an article about solid waste recycling in Chile (which further demonstrates that recycling of the organic fraction of municipal solid waste (MSW) has not been a common practice adopted in Chile) was also included in a footnote in the PDD. The document is available at http://hrd.apec.org/images/b/b3/65.2.pdf</p>	
Assessment Means of validation	<ol style="list-style-type: none"> 1. The latest approved Chilean decree n°189 regulates Landfill's design and management was published in 2005 establishes in Article 16 "Every landfill needs to include a Landfill Gas Management System that guarantees the security conditions inside the installations and its surroundings. The design of this management system should consider the highest possible extraction of landfill gas generated during the operation and close phases". Furthermore, the last section of that article states "Notwithstanding the foregoing, the landfills with a total height smaller than six meters would not be obliged to consider a Landfill Gas Management System". 'Health Conditions and Regulation on Basic Safety In Landfill', decree No. 189. Santiago, August 18, 2005 is accessible at http://www.leychile.cl/Navegar?idNorma=268137. This link is valid. PP also provided an English translation of the documents posted at above links for DoEs perusal. 2. PP has secured Environment clearance for project "THE COLOURED CENTRAL LOMA" Vide Exempt Resolution No. 344/2010 on 10-05-2010 under the provisions of Law No. 19,300, on General Environmental Framework, published in the Official Gazette on March 9, 1994 and 95/01 Supreme Decree of the Ministry General Secretariat of the Presidency, which approved the text consolidated, coordinated and Regulation System of Environmental Impact Assessment, published in the Official Gazette on December 7, 2002; Resolution No. 1600/2008 of the Comptroller General of the Republic, which sets standards exemption process Making Reason and other legal rules governing the matter. 	

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Corrective Action Requests by the assessment team		
	<p>The environmental permits are available at:</p> <p>http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=3997973</p> <p>http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1220419</p> <p>http://seia.sea.gob.cl/seia-web/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1033</p> <p>The links are valid and accessible. PP also provided an English translation of the documents posted at above links for DoEs perusal.</p> <p>It was established from the assessment of documents listed above that Chilean law regulating landfills only establishes general conditions for operation and proper closure of landfills for better health and safety of those affected. In general terms, it establishes requirements for all operational aspects of the landfill, including biogas and leachate treatment, installation of wells to release biogas etc. Lately the Ministry of the Environment is trying to recover recyclable wastes to reduce the amount of landfill waste. According to the Ministry, “more than 50% of municipal waste could be reused or recycled, which would substantially reduce the amount that ends up in landfills –or is dumped illegally” [IRL#7, 13]. However, in current times there is no regulation in Chile that mandates recovery of landfill gas. Recovery and use of landfill gas is at operator’s/ owner’s discretion. Thus the validity of the original/current baseline is confirmed for the renewed crediting period.</p> <p>With assessments above, CAR is closed.</p>	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	PP has made necessary updations to section B.4 of the revised PDD.	

Corrective Action Requests by the assessment team		
	Comments and Results	Conclusion and IRL

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Corrective Action Requests by the assessment team		
Issue	Calibration frequency of monitoring equipments is not specified in the PDD.	<input checked="" type="checkbox"/> Finding Closed IRL 23
Requirement	VVS (V06) #344, 348	
Corrective Action Request	<u>Corrective Action Request No.3</u> PP shall provide in the PDD calibration frequency of each monitoring equipment type used in the project activity	
Response	As a response to the raised CAR, the calibration frequency of all the monitoring equipment which was already in use during the 1 st 7-year crediting period was included in the PDD. No calibration frequency was specified for the respective monitoring equipment of the following parameters (as they were not monitored during the 1 st 7-year crediting period in accordance with the applicable methodology, tools and monitoring plan of the previously registered PDD); <ul style="list-style-type: none"> - Temperature of the LFG stream in time interval t (T_t) - Pressure of the LFG stream in time interval t (P_t) - Quantity of fuel Diesel combusted by the captive off-grid electricity generator ($FC_{\text{Diesel},y}$) - Quantity of electricity generated in captive diesel backup generator during the year y ($EG_{\text{Diesel-Generator},y}$) 	
Assessment Means of validation	PP has now provided calibration details of all the monitoring equipments. For equipments valid through 1-7 th crediting period to the renewed crediting period, specific calibration frequencies have been provided. This is acceptable. For parameters added to comply with the latest methodological requirements PP has specified that the calibration would be performed as per instrument specifications and/or instrument manufacturer's recommendations by a third party independent accredited calibration laboratory. This is a fair justification where specific calibration frequencies of certain could not be determined at this stage of the project. This acceptable. The CAR is closed.	
Adjustment on project design OR Changes in the monitoring report or	PP has updated section B.7.1 to incorporate calibration details of monitoring/ measuring equipments used to measure applicable parameters.	

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Project Title: Loma Los Colorados Landfill Gas Project

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Corrective Action Requests by the assessment team

supporting annexes

Clarification Requests by the assessment team

	Comments and Results	Conclusion and IRL
Issue	As per the requirements referred below the project participants shall notify the secretariat, by e-mail or through a dedicated interface on the UNFCCC CDM website, of their intention to request a renewal of crediting period of the registered CDM project activity by submitting an updated PDD informing the secretariat of their selection of a DOE to request the renewal of crediting period and to perform related tasks referred to in paragraph 265 below, within 270 to 180 days prior to the date of expiration of the current crediting period. The project crediting period ended on 16-03-2014.	<input checked="" type="checkbox"/> Finding Closed IRL 14
Requirement	PCP (V06) #260	
Clarification Request	<u>Clarification Request No. 1</u> PP to clarify if UNFCCC secretariat was notified of the intention to request a renewal of crediting period. If yes, provide evidence.	
Response	A copy of the email sent by KDM S.A. to the UNFCCC Secretariat (dated 16/09/2013) confirming the intention of the project participants KDM S.A. of renewing the crediting period of the registered project activity Loma Los Colorados Landfill Gas Project was provided to the DOE. A draft version of the PDD was attached to the email.	
Assessment Means of validation	PP has communicated to UNFCCC, (cdmregistration@unfccc.int) on 16/09/2013 through an email, of its intention of renewing the crediting period of the registered project activity Loma Los Colorados Landfill Gas Project. PP has submitted the email copy as evidence. This is acceptable. The CR is closed.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The CR does not require any change to any section of the PDD.	

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Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	Further evidences and documents to be provided for assessment. Please try providing documents in English. Provide both original and translated versions.	<input checked="" type="checkbox"/> Finding Closed IRL 2, 8, 9, 10, 11, 12, 17, 18, 19, 20
Requirement	VVS (V06) 346 (b)	
Clarification Request	<p><u>Clarification Request No. 2</u></p> <p>PP shall provide the following for further assessment of facts and figures presented in the updated PDD.</p> <ul style="list-style-type: none"> • Legal and regulatory clearances (if any) required for continued operation of project activity. • Purchase order and technical specifications of newly purchased and installed equipments (viz. Engine generator) • List of all landfills and their operation details (methane flared/methane captured etc) in the country. • Evidences to support the fact that there has been no regulatory change that would affect the earlier established baseline. • Documents to support assumptions, default factors and figures used in the emission reduction sheet. (For example availability for biogas engines as 85%, LFG flared, LPG consumed, standard energy conversion efficiency for engine-generator sets fuelled by LFG etc. shall be supported with evidence.) • Any other evidence to support the fact that the baseline would not change in the second crediting period. 	
Response	<p>The following documents were made available to the DOE:</p> <ul style="list-style-type: none"> - Legal and regulatory clearances (if any) required for continued operation of project activity. - Currently available environmental permits for the Loma Los Colorados landfill (as indicated in the response to CAR 2)Purchase order and technical specifications of newly purchased and installed equipments (viz. Engine generator) <p>The engine generators installed at the Loma Los Colorados Landfill Gas Project, are, as per the registered PDD of the first crediting period available at UNFCCC website, provided by GE Jen-</p>	

List of Findings - Compilation and Resolutions

Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team

bacher. The model provided is the GE Jenbacher J420. Technical specifications of the engine generators can be found at: <https://www.ge-distributedpower.com/products/power-generation/up-to-5mw/jenbacher-type-4> and http://site.ge-energy.com/prod_serv/products/ recip_engines/en/downloads/ETS_E_T4_10_screen_August2010.pdf

A Chronogram of the installed and predicted engine sets in the Loma Los Colorados Landfill Gas project activity is also available in the registered PDD of the first crediting period.

- List of all landfills and their operation details (methane flared/methane captured etc) in the country.

A list of all landfills and their operation details can be found at the document “Evidencia Catastro RISES”. This document is not available on line. As indicated in the document, in total, there are 96 operational landfills in Chile. Moreover, there are 17 landfills in Chile with active LFG collection system, all of them registered as CDM project activities. There are no landfills in Chile recovering methane without being registered as CDM a project activity.

- Evidences to support the fact that there has been no regulatory change that would affect the earlier established baseline.

Such evidences can be found at the operational licences provided as answer to CAR 2. None of the licences mentions obligation to flare/destroy the LFG generated at the landfill.

- Documents to support assumptions, default factors and figures used in the emission reduction sheet. (For example availability for biogas engines as 85%, LFG flared, LPG consumed, standard energy conversion efficiency for engine-generator sets fuelled by LFG etc. shall be supported with evidence.)

Availability for biogas engines, LFG Flared and LPG consumed are conservatively based on historical data of the first crediting period. More precisely in the data of the 3 last available monitoring reports for the project activity, MR#6, MR#7 and MR#8 available at:

<http://cdm.unfccc.int/Projects/DB/DNV-CUK1166695034.41/view>. As shown in the spreadsheet “Availability of the engine-generator sets” the availability was calculated based on historical data from the year 2012, the year that encompasses the last monitoring period verified and certified by a DOE. During that period, the availability was found to be 74,74%. This value was used in the re-

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Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team		
	<p>vised version of the PDD.</p> <p>Conversion efficiency for the installed engine-generator sets available at http://site.ge-en-ergy.com/prod_serv/products/recipe_engines/en/downloads/ETS_E_T4_10_screen_August2010.pdf</p> <p>Evidences related to the specifications of the flares are also provided in the Manual of the manufacturer.</p>	
Assessment Means of validation	<ul style="list-style-type: none"> Legal and regulatory clearances (if any) required for continued operation of project activity. The environmental permits are available at: http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=3997973 http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1220419 http://seia.sea.gob.cl/seia-web/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1033 The links are valid and accessible. PP also provided an English translation of the documents posted at above links for DoEs perusal. Purchase order and technical specifications of newly purchased and installed equipments (viz. Engine generator): The technical specifications of Waukesha engine-generator set, model APG 1000 of 1 MW installed capacity each were verified from the link below: http://dordtech.nl/en/waukesha_apg1000.pdf. The technical specifications of GE Jenbacher engine-generator sets, model J420 of 1.4 (1.41-1.42) MW installed capacity each were verified from the link below: https://www.ge-distributedpower.com/products/power-generation/up-to-5mw/jenbacher-type-4, http://site.ge-en-ergy.com/prod_serv/products/recipe_engines/en/downloads/ETS_E_T4_10_screen_August2010.pdf Although PDD mentions the nameplate capacity of GE Jenbacher engine-generator sets, model J420 as 1.4 MW; but the actual installed capacity ranges from 1.41 MW -1.42MW. List of all landfills and their operation details (methane flared/methane captured etc) in the country. 	

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Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team

	<p>PP has provided relevant extracts of the document “Evidencia Catastro RISES”, from which the list of landfills was validated.</p> <ul style="list-style-type: none"> Evidences to support the fact that there has been no regulatory change that would affect the earlier established baseline. <p>The latest approved Chilean decree n°189 regulates Landfill’s design and management was published in 2005 establishes in Article 16 “Every landfill needs to include a Landfill Gas Management System that guarantees the security conditions inside the installations and its surroundings. The design of this management system should consider the highest possible extraction of landfill gas generated during the operation and close phases”. Furthermore, the last section of that article states “Notwithstanding the foregoing, the landfills with a total height smaller than six meters would not be obliged to consider a Landfill Gas Management System”.</p> <p>‘Health Conditions and Regulation on Basic Safety In Landfill’, decree No. 189. Santiago, August 18, 2005 is accessible at http://www.leychile.cl/Navegar?idNorma=268137. This link is valid. PP also provided an English translation of the documents posted at above links for DoEs perusal.</p> <ul style="list-style-type: none"> Documents to support assumptions, default factors and figures used in the emission reduction sheet. (For example availability for biogas engines as 85%, LFG flared, LPG consumed, standard energy conversion efficiency for engine-generator sets fuelled by LFG etc. shall be supported with evidence.) <p>Availability for biogas engines, LFG Flared and LPG consumed are based on actual historical data of the first crediting period. The value was verified from the publicly available last three monitoring reports for monitoring period 06, 07 and 08 available at: http://cdm.unfccc.int/Projects/DB/DNV-CUK1166695034.41/view. Availability of the engine-generator sets was calculated based on historical data from the year 2012.</p> <p>The value of conversion efficiency of the engine-generators is as specified by the manufacturer. energy conversion efficiency of 42% was cross verified from a PPT titled ‘ Equipment Considerations for Landfill Gas Generator Sets: Total Cost of Ownership’ prepared by Caterpillar Electric Power for ‘ 15th Annual LMOP Conference and Project Expo’ available at Environment Protection Agency website: http://www.epa.gov/lmop/documents/pdfs/conf/15th/08Lopez.pdf.</p> <p>This thus valid and acceptable.</p>	
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Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team		
	The CR is closed.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	<p>Values of the following parameters were determined using past/ historical data</p> <ul style="list-style-type: none"> ▪ Availability for biogas engines, ▪ LFG Flared and ▪ LPG consumed, ▪ Availability of the engine-generator sets <p>Thus the Emission reduction value was appropriately updated in relevant sections of the PDD.</p>	

Clarification Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	For value of efficiency of the LFG capture system “Measuring landfill gas collection efficiency using surface methane concentration” was referred available at http://www.arb.ca.gov/cc/ccea/comments/april/huitric_kong.pdf that gives a range for efficiency of the LFG capture system. It is not clear that how the value of 92.80% determined? What is the efficiency based on the actual monitoring for last 7 years?	<input checked="" type="checkbox"/> Finding Closed IRL 21, 23, 25
Requirement	VVS (V06) #346 (b), PS (V06) #279	
Clarification Request	<p>Clarification Request No. 3</p> <p>PP to clarify the rationale behind using value of the efficiency of the LFG capture system as 92.80%. PP to also clarify why the actual monitored data of efficiency of the LFG capture system for last 7 years not used?</p>	
Response	<p>This value was obtained in the technical literature and also by taking into consideration the design and operational characteristics/aspects of the Loma los Colorados Landfill and the general construction, design and forecasted implementation of the project’s LFG collection network during the 2nd 7-year crediting period.</p> <p>Regarding the literature, PP based this assumption in the technical paper “<i>Measuring landfill gas collection efficiency using surface methane concentration</i>” (published by Raymond L. Huitric and Dung Kong, from</p>	

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Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team		
	<p>the Solid Waste Management Department of the Los Angeles County Sanitation Districts), which states the following regarding LFG collection efficiency for a well-managed LFG collection system:</p> <p><i>“Measuring landfill gas collection efficiency is important for gauging emission control effectiveness and energy recovery opportunities. Though researched for years, practical measures of collection efficiency are lacking. Instead, a default efficiency of 75% based on surveys of industry estimates is commonly used, for example, by the United States Environmental Protection Agency (US EPA). Though few, actual emission measurements indicate substantially higher efficiencies ranging from 85 to 98%.”</i></p> <p>This document also mentions that “(...) landfill gas collection efficiencies should routinely reach 100%.” Practical results, shown on table 4 of the study “Weighted average collection efficiency” show a collection efficiency of 92.8 to 96.1% on well-engineered landfills with vacuum systems to extract LFG.</p> <p>The paper “Measuring landfill gas collection efficiency using surface methane concentration” is available at http://www.arb.ca.gov/cc/ccea/comments/april/huitric_kong.pdf. The most conservative value of the study was used,</p> <p>The Loma los Colorados landfill is a well-engineered landfill and the PP has long experience with LFG extraction. This is shown by the high performance of the project during the 1st 7-year renewable crediting period.</p> <p>During the 2nd 7-year renewable crediting period, the PP intends to increase even more the efficiency of the LFG extraction as the installed power of the plant is expected to increase from 21.8 MW to 27.4 MW, which will require an expansion of the LFG collection system.</p> <p>This increase will require even more efficiency on the LFG extraction from the landfill, and efficiencies close to 100% are expected to occur, not only due to the forecasted increase on the number of LFG collection wells to be installed on the landfill, but also due to the accumulated experience in the collection of LFG of the PP.</p> <p>Thus, it would be inaccurate to use historical data from LFG collection from the 1st 7-year renewable crediting period, as the LFG extraction system will be upgraded in order to achieve higher efficiencies and higher LFG flows.</p> <p>Thus, the 92.80% value is regarded as conservative for the the 2nd 7-year renewable crediting period.</p>	
Assessment Means of validation	As per the technical paper “Measuring landfill gas collection efficiency using surface methane concentration” by Raymond L. Huitric and Dung Kong, Solid Waste Management Department, Los Angeles County	

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Clarification Requests by the assessment team		
	Sanitation Districts, Whittier, California, Weighted average collection efficiency of landfills under 'Urban' category would be 92.8%. PP intends to improve the efficiency of the current landfill further, thus PP finds it irrational to base its assumption of future landfill efficiency on actual collection efficiency achieved over last 7 years of landfill's operation. Thus basing its assumption on a valid and publicly technical paper is reasonable. The CR is closed.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The CR does not lead to any change in the PDD or the ER calculations.	

Clarification Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	Total LPG consumption by the project activity as per the MR for 7 years is 679.1 kg i.e. 97.01kg/year = 0.097ton. ER sheet considers a value of 0.2 ton per year	<input checked="" type="checkbox"/> Finding Closed IRL 2, 23, 25
Requirement	VVS (V06) #346 (b), PS (V06) #279	
Clarification Request	<u>Clarification Request No. 4</u> PP to clarify the rationale behind using value of 0.2 ton LPG consumption for flare start up.	
Response	This value was determined based on the consumption of LPG by the project activity during the latest monitoring period which its CERs had issued (8 th monitoring period of the 1 st 7-year crediting period). The rationale for only considering the latest monitoring period is that a third high temperature enclosed flare was installed as part of the project activity during this monitoring period, thus increasing the average consumption of LPG for flare start up. The 0.2 value was determined by taking into account the average yearly consumption of LPG by the project activity (147.3 kg/year, which is calculated based on the consumption of LPG during the 8 th monitoring period (49.1 kg) encompassing 4 months) + an additional 50kg/year of LPG	

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Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team		
	in order to be conservative.	
Assessment Means of validation	The flare consumed 49.1 kg is the last four month of the first crediting period, these amounts to 147.3 kg/year. Only last 4 month LPG consumption figure of the first crediting period was considered to incorporate LPG consumption by the latest installed flare no. 03. Moreover the configuration of the project activity in 2012 is the closest to the project activity's configuration for the 2 nd 7-year crediting period. To be more conservative and to take in to account the any possible variation. The assumption is realistic and is thus acceptable. The CR is closed.	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The CR does not lead to any change in the PDD or the ER calculations.	

Clarification Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	It is not clear that how energy conversion efficiency for engine-generator sets fuelled by LFG determined. ER sheet considers a value of 42%. Secondly fraction of methane in the LFG gas is used as 50%, a default value from the applied methodology. Similarly an estimate of electricity of grid electricity consumed by the project activity has been presented. It is however not clear if these assumptions are conservative to the actual data monitored for last 7 years of 1st crediting period and there is no overestimation of CERs.	<input checked="" type="checkbox"/> Finding Closed IRL 17, 23, 25
Requirement	VVS (V06) #346 (b), PS (V06) #279	
Clarification Request	<u>Clarification Request No. 5</u> PP to clarify the rationale behind using value of conversion efficiency for engine-generator and fraction of methane in LFG. PP shall also clarify if these assumptions are conservative to actual data monitored for last 7 years of 1st crediting period	
Response	The value of conversion efficiency of the engine-generators is specified by the manufacturer as demon-	

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Clarification Requests by the assessment team		
	<p>strated in the engine's manual / technical specification document. The value of fraction of methane in collected LFG by the project activity was corrected by considering the average fraction of methane in collected LFG during the year of 2012, since the project's configuration has changed significantly during the 1st 7-year crediting period and the configuration of the project activity in 2012 is the closest to the project activity's configuration for the 2nd 7-year crediting period. Moreover, 2012 is the last year with CERs issued for the project activity. The average value of methane fraction in collected LFG during year 2012 (49.62 %) is lower than the previously applied default value of 50%, thus, the application of the average value for year 2012 can be regarded as conservative. The calculation of the average content of CH₄ can be found on the attached spreadsheet "Average CH₄ content".</p> <p>Finally, grid electricity consumption by the project activity was estimated by considering that all electrical equipment of the project activity (3 centrifugal blowers with nameplate power of 56 kW each plus an additional 20 kW to account for ancillary equipment) will operate at maximum capacity during the entire period covered by the 2nd 7-year crediting of the project activity. The conservativeness of this approach can be demonstrated by comparing the resulted yearly value for the estimation of amount grid electricity consumed by the project activity with monitored data for the latest monitoring period (within the 1st 7-year crediting period of the project activity) with CERs issued (8th monitoring period, encompassing the months of September to December 2012):</p> <p>Annual amount of grid electricity consumed by the project activity (by considering the nameplate power of all electrical equipment of the project activity operating at maximum power 24 hours per day): 1,647 MWh / year</p> <p>Annual amount of grid electricity consumed by the project activity as per monitored data for the 8th monitoring period of the project activity: 489 MWh / year.</p>	
Assessment Means of validation	<p>The value of conversion efficiency of the engine-generators is as specified by the manufacturer. energy conversion efficiency of 42% was cross verified from a PPT titled ' Equipment Considerations for Landfill Gas Generator Sets: Total Cost of Ownership' prepared by Caterpillar Electric Power for ' 15th Annual LMOP Conference and Project Expo' available at Environment Protection Agency website: http://www.epa.gov/lmop/documents/pdfs/conf/15th/08Lopez.pdf.</p> <p>The value of fraction of methane in collected LFG by the project activity was corrected by considering the average fraction of methane in collected LFG during the year of 2012. PP has now considered a conservative value of 49.62 % based on actual monitored data of average fraction of methane in collected LFG dur-</p>	

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Project Title: Loma Los Colorados Landfill Gas Project

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Clarification Requests by the assessment team		
	<p>ing the year of 2012 as against the default value of 50% considered in registered. Value of fraction of methane was based on 2012 data alone as the project configuration has undergone changes over 1- 7 crediting period and 2012 values are the closest to the current project scenario. This is acceptable.</p> <p>PP has now estimated the annual amount of grid electricity consumed by the project activity by considering the nameplate power of all electrical equipment of the project activity operating at maximum power 24 hours per day which translates into a electricity consumption value of 1,647 MWh / year as against electricity consumption value of 489 MWh / year in the 8th monitoring period. This is conservative thus acceptable.</p> <p>The CR is closed</p>	
Adjustment on project design OR Changes in the monitoring report or supporting annexes	The value of fraction of methane in collected LFG by the project activity was corrected by considering the average fraction of methane in collected LFG during the year of 2012. PP has now estimated the annual amount of grid electricity consumed by the project activity by considering the nameplate power of all electrical equipment of the project activity operating at maximum power 24 hours per day which translates into a electricity consumption value of 1,647 MWh. These changes reflect in the revised emission reduction sheet and relevant sections of the PDD.	

Clarification Requests by the assessment team		
	Comments and Results	Conclusion and IRL
Issue	Web link http://www.bbc.com/weather does not give values of mean annual temperature and mean annual precipitation.	<input checked="" type="checkbox"/> Finding Closed IRL 22
Requirement	VVS (V06) #346 (b), PS (V06) #279	
Clarification Request	<p><u>Clarification Request No. 6</u></p> <p>PP shall justify the values of mean annual temperature and mean annual precipitation giving direct weblinks and direct references.</p>	
Response	This website presents average values of minimum temperature, maximum temperature and precipitation for every month of the year. The mean annual precipitation was calculated as the sum of all monthly values	

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Clarification Requests by the assessment team																																																																										
	<p>and the mean annual temperature was calculated as the average of minimum and maximum monthly values. The direct link for the average conditions in Santiago is http://www.bbc.com/weather/3871336. This web-link was also included in the revised PDD and ER calculation sheet.</p>																																																																									
Assessment Means of validation	<p>The values of Mean Annual Temperature and Mean Annual Precipitation have been taken from credible sources and have been cross checked from the direct web link provided above. This link is valid and working. PP's assessment was replicated (as shown in table below) taking the values of average monthly precipitation and Minimum and Maximum monthly temperature from the BBC web link above. Mean annual precipitation was then estimated as the sum of all monthly values of average rain fall and the mean annual temperature was calculated as the average of minimum and maximum monthly values. The resultant value of Mean Annual Temperature (MAT) and Mean Annual Precipitation (MAP) correspond to the figure provided by PP, establishing the correctness of assessment.</p> <table border="1"> <thead> <tr> <th>Month</th><th>Min Temp.</th><th>Max. Temp</th><th>Monthly Av. Temp.</th><th>Monthly Av. PPt</th></tr> </thead> <tbody> <tr><td>Jan</td><td>12</td><td>29</td><td>20.5</td><td>3</td></tr> <tr><td>Feb</td><td>11</td><td>29</td><td>20</td><td>3</td></tr> <tr><td>March</td><td>9</td><td>27</td><td>18</td><td>5</td></tr> <tr><td>April</td><td>7</td><td>23</td><td>15</td><td>13</td></tr> <tr><td>May</td><td>5</td><td>18</td><td>11.5</td><td>64</td></tr> <tr><td>June</td><td>3</td><td>14</td><td>8.5</td><td>84</td></tr> <tr><td>July</td><td>3</td><td>15</td><td>9</td><td>76</td></tr> <tr><td>August</td><td>4</td><td>17</td><td>10.5</td><td>56</td></tr> <tr><td>Sep</td><td>6</td><td>19</td><td>12.5</td><td>31</td></tr> <tr><td>Oct</td><td>7</td><td>22</td><td>14.5</td><td>15</td></tr> <tr><td>Nov</td><td>9</td><td>26</td><td>17.5</td><td>8</td></tr> <tr><td>Dec</td><td>11</td><td>28</td><td>19.5</td><td>5</td></tr> <tr><td>Annual</td><td></td><td></td><td>14.75</td><td>363</td></tr> </tbody> </table> <p>The CR is closed.</p>				Month	Min Temp.	Max. Temp	Monthly Av. Temp.	Monthly Av. PPt	Jan	12	29	20.5	3	Feb	11	29	20	3	March	9	27	18	5	April	7	23	15	13	May	5	18	11.5	64	June	3	14	8.5	84	July	3	15	9	76	August	4	17	10.5	56	Sep	6	19	12.5	31	Oct	7	22	14.5	15	Nov	9	26	17.5	8	Dec	11	28	19.5	5	Annual			14.75	363
Month	Min Temp.	Max. Temp	Monthly Av. Temp.	Monthly Av. PPt																																																																						
Jan	12	29	20.5	3																																																																						
Feb	11	29	20	3																																																																						
March	9	27	18	5																																																																						
April	7	23	15	13																																																																						
May	5	18	11.5	64																																																																						
June	3	14	8.5	84																																																																						
July	3	15	9	76																																																																						
August	4	17	10.5	56																																																																						
Sep	6	19	12.5	31																																																																						
Oct	7	22	14.5	15																																																																						
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Adjustment on pro-	The CR does not lead to any change in the PDD or the ER calculations.																																																																									

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South Asia

Clarification Requests by the assessment team		
ject design OR Changes in the monitoring report or supporting annexes		


Forward Action Requests by the assessment team		
	Comments and Results	
Issue	None	
Requirement		
Forward Action Request	<u>Forward Action Request No. 1</u>	
Response		
Means of verification		
Any resulting changes in the monitoring report or supporting annexes		



South Asia

Annex 2

Information Reference List

Information Reference List	Validation of CDM Project	Page 1 of 10	 South Asia
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Project Title: Loma Los Colorados Landfill Gas Project


TÜV Assessment Team:

Name	Function	Company
Kumud Ranjan	Validator (V)	TÜV SÜD South Asia Pvt. Ltd.


Interviews with project developer was performed through a no. of Telephone conferences during 01-07-2014 to 15-08-2014 by the auditing team of TÜV SÜD

Interviewed Persons during Assessment:


Name	Function	Company
Nuno Barbosa	Consultant	UniCarbo Energia e Biogás Ltda

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
1.	UNFCCC	UNFCCC CDM homepage: http://cdm.unfccc.int/	-	CDM methodology, guidelines & project history
2.	UNFCCC	Published PDD for project titled “Loma Los Colorados Landfill Gas Project “ http://cdm.unfccc.int/Projects/DB/DNV-CUK1166695034.41/view	Version 5.3, 02-08-2012	Referred for registered PDD, MoC and monitoring reports
3.	UNFCCC/ Ministry of Economy, Trade and Industry, Government of Japan.	Host party approval from Govt. of Japan http://cdm.unfccc.int/filestorage/G/D/N/GDNHM1NWLTMU36I4WXBJKTUET0RJ7V/LOA.pdf?t=YTR8bmN1enZzfDDISQBgc_x0YncMvEkIVLwV	18-07-2007	-
4.	UNFCCC/National Commission of Environment, Govt. of Chile (Comision Nacional del Medio Ambiente-CONAMA)	Host party approval from Govt. of Chile http://cdm.unfccc.int/filestorage/U/J/P/UJP7C567UQA1T6TKCHFRE7O8CQD26L/LOA.pdf?t=MDZ8bmN2c2R3fDCk4AcNDo2czmJJPGkVSIGQ	27-11-2006	-
5.	UNFCCC/ Environment, Rural & Marine Surroundings Ministry, Spaniard Office for	Host party approval from Govt. of Spain http://cdm.unfccc.int/filestorage/R/A/F/RAF8ZX62PBY9JUCW0TMHDOQ5KVE7GL/Untitled%20%28uploaded%2017%20Mar%2009%2017%3A09%3A18%29.pdf?t=bDR8bmN2cnZmfDCWCvGv	18-12-2008	-

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	Weather Change	pGpFfdWEuTL5zEWz		
6.	UNFCCC	Consolidated baseline and monitoring CDM methodology ACM0001 - "Flaring or use of landfill gas" (version 15.0) http://cdm.unfccc.int/methodologies/DB/D44X8FH8SFCXREE6037AXJSBGGFVDO	Version 15	-
7.	Gonzalo Velásquez Chief, Waste Management Dept., Comisión Nacional del Medio Ambiente, Chile	Article titled 'Solid Waste Recycling in Chile' by Gonzalo Velásquez Chief, Waste Management Dept., Comisión Nacional del Medio Ambiente, Chile http://hrd.apec.org/images/b/b3/65.2.pdf	Last assessed on 03-10-2014	-
8.	Biblioteca del Congreso Nacional de Chile	Aprueba Reglamento Sobre Condiciones Sanitarias Y De Seguridad Básicas En Los Rellenos Sanitarios http://www.leychile.cl/Navegar?idNorma=268137	Last assessed on 03-10-2014	Referred for currently in force regulation applicable for landfills in Chile
9.	Sistema de Evaluación de Impacto Ambiental, (SEIA)	Environmental Permits: Central Loma Los Colorados http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=3997973 Ampliación Del Sistema de Abatimiento de Biogas; Sistema de Captación, Termodegradación y Utilización Energética, En El Marco Del Mecanismo Para Un Desarrollo Limpio, En El Relleno	Last assessed on 04-10-2014	Ficha del Proyecto (Project file) published by Sistema de Evaluación de Impacto Ambiental, (SEIA)

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		<p>Sanitario Loma Los Colorados, Translation: "Increasing capacity of the LFG control system; capture system, thermal degradation and energy use, within the framework of the Clean Development Mechanism at Loma Los Colorados Sanitary Landfill". This permit was officially approved on July 28th, 2006. http://seia.sea.gob.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1220419</p> <p>Construcción de Sistema de Tratamiento Interno y Disposición Final de Residuos Sólidos Urbanos para la Región Metropolitana http://seia.sea.gob.cl/seia-web/ficha/fichaPrincipal.php?modo=ficha&id_expediente=1033</p> <p>http://www.e-seia.cl/documentos/documento.php?idDocumento=1506593</p>		
10.	National Commission of Environment, Govt. of Chile (Comision Nacional del Medio Ambiente-CONAMA)	EIA resolution copy: Lomas los Colorados Landfill Environmental Impact Assessment (EIA) approved by the local DNA (CONAMA) under Resolution N° 990/95 June 27th 1995 spanish language copy available at: www.e-seia.cl/seia-web/ficha/fichaProceso.php?id_expediente=1033&idExpediente=1033	27-06-1995	-
11.	Commission Regional	Consolidated Environmental Impact Assessment of the	06-06-2006	-

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	Environment from Santiago de Santiago republic of Chile	Environmental Impact Statement "Expansion System Lowering of Biogas Project Report; Capture System, and Use Energy Thermodegradation, under The clean development mechanism, in the LANDFILL LOMA COLORADOS " http://infofirma.sea.gob.cl/DocumentosSEA/MostrarDocumento?docId=86/53/a13f905cf5288383f1d8e543258934a30475		
12.	Commission Regional Environment from Santiago de Santiago republic of Chile	Environmental Approval to "Central Loma Los Colorados "through Exempt Resolution No. 344/2010. http://infofirma.sea.gob.cl/DocumentosSEA/MostrarDocumento?docId=5a/3d/ef892811b215005e0c0f50226b06f6aaec6c	10-05-2010	-
13.	Business Chile Magazine	Article titled 'Waste Management in Chile' http://www.businesschile.cl/en/news/special-report/waste-management-chile	22-05-2014	Artile not accessible on web now. Earlier it was accessioble on weblink below: http://www.businesschile.cl/en/news/special-report/waste-management-chile However the screen print of article is available for future reference.
14.	KDM-SA	Copy of the email sent by KDM S.A. to the UNFCCC Secretariat	16-09-2013	-

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
		(dated 16/09/2013) confirming the intention of the project participants of renewing the crediting period		
15.	Shaw, LFG Specialties. L.L.C	User Manual Relleno Sanitario Loma De Los Colorados	Model # EF1045112	-
16.	-	Extract of book titled Rellenos Sanitarios Y Vertederos (Landfills and Dumps)-	-	Extract of relevant pages available for reference
17.	Caterpillar Electric Power	PPT titled 'Equipment Considerations for Landfill Gas Generator Sets: Total Cost of Ownership' prepared by Caterpillar Electric Power for '15 th Annual LMOP Conference and Project Expo' available at Environment Protection Agency website: http://www.epa.gov/lmop/documents/pdfs/conf/15th/08Lopez.pdf .	Last assessed on 04-10-2014	Referred for conversion efficiency for the installed engine-generator sets
18.	Waukesha Power Systems, Waukesha Engine Dresser, INC.	The technical specifications of Waukesha engine-generator set, model APG 1000 of 1 MW installed capacity: http://dordtech.nl/en/waukesha_apg1000.pdf .	Last assessed on 04-10-2014	-
19.	GE Power & Water's Distributed Power	The technical specifications of GE Jenbacher engine-generator sets, model J420 of 1.4 (1.41-1.42) MW: https://www.ge-distributedpower.com/products/power-generation/up-to-5mw/jenbacher-type-4 , http://site.ge-energy.com/prod_serv/products/recipe_engines/en/downloads/ET_S_E_T4_10_screen_August2010.pdf	Last assessed on 04-10-2014	-
20.	Biblioteca del Congreso	Health Conditions and Regulation on Basic Safety in Landfill',	Last assessed	-

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	Nacional de Chile	decree No. 189. Santiago, August 18, 2005 is accessible at http://www.leychile.cl/Navegar?idNorma=268137 .	on 04-10-2014	
21.	Raymond L. Huitric and Dung Kong, Solid Waste Management Department, Los Angeles County Sanitation Districts, Whittier, California	“Measuring landfill gas collection efficiency using surface methane concentration” http://www.arb.ca.gov/cc/ccea/comments/april/huitric_kong.pdf	Last assessed on 04-10-2014	Referred for efficiency of the LFG capture system
22.	British Broadcasting Corporation (BBC)	http://www.bbc.com/weather/3871336	Last assessed on 04-10-2014	Accessed for Mean Annual Temperature (MAT) and Mean Annual Precipitation (MAP) data
23.	KDM SA	Final PDD for project titled “Loma Los Colorados Landfill Gas Project “	V1.3, 01-09-2014	-
24.	KDM SA	Grid Emission Factor calculation sheet	V1.3, 01-09-2014	-
25.	KDM SA	Emission Reduction Calculation sheet	V1.3, 01-09-2014	-
26.	KDM SA	Calculation of availability of engine generator set	V01, submitted on 02-09-2014	-
27.	KDM SA	Estimation of average CH ₄ fraction in collected LFG during the year of 2012 (based on monitored data for the project activity during this year)	V01, submitted on 02-09-2014	-
28.	Author: Klaus-Rainer	Chapter 13 of Municipal Solid Waste Management in Santiago de	Last assessed	-

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	Brautigam, Tahnee Gonzalez, Marcel Szanto, Helmut Seifert and Joachim Vogdt	Chile: Challenges and Perspectives towards Sustainability, by Klaus-Rainer Brautigam, Tahnee Gonzalez, Marcel Szanto, Helmut Seifert and Joachim Vogdt http://202.154.59.182/mfile/files/Economics/Risk%20Habitat%20Megacity/Chapter%2013%20%20Municipal%20Solid%20Waste%20Management%20in%20Santiago%20de%20Chile%3B%20Challenges%20and%20Perspectives%20towards%20Sustainability.pdf	on 07-10-2014	
29.	Klaus-Rainer Bräutigam, Tahnee Gonzalez Karlsruhe Institute of Technology (KIT)	Evaluation of Municipal Solid Waste Management in Santiago de Chile Regarding Sustainability http://www.iswa.org/uploads/tx_iswaknowledgebase/Braeutigam.pdf	Last assessed on 07-10-2014	-
30.	Paula Estevez An Advisor: Prof. Nickolas J. Themelis	Management of Municipal Solid Waste in Santiago, Chile: Assessing Waste-to-Energy Possibilities http://www.seas.columbia.edu/earth/wtert/sofos/Estevez_MStheses.pdf	Last assessed on 07-10-2014	-
31.	Von der Fakultät Energie-, Verfahrens- und Biotechnik der Universität Stuttgart zur Erlangung der Würde eines Doktors der Ingenieurwissenschaften	Analysis of Different Municipal Solid Waste Management Systems in Santiago de Chile http://elib.uni-stuttgart.de/opus/volltexte/2011/6331/pdf/Dissertation_Tahnee_Gonzalez_Martinez_Print2.pdf	Last assessed on 07-10-2014	-

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
	(Dr.-Ing.) genehmigte Abhandlung Hauptberichter: Prof. Dr.-Ing. Helmut Seifert, Mitberichter: Prof. Dr. Armin Grunwald Institut für Feuerungs- und Kraftwerkstechnik der Universität Stuttgart Institut für Technische Chemie, (Karlsruher Institut für Technologie)			
32.	National Commission of Environment, Govt. of Chile (Comision Nacional del Medio Ambiente-CONAMA)	http://www.e-seia.cl/documentos/documento.php?idDocumento=1506593	Last assessed on 07-10-2014	-
33.	CDEC-SIC	Source: 2003-2012 CDEC-SIC Operation Statistics Yearbook, pages 74-75 (http://www.cdec-sic.cl/datos/anuario2013/espanol/cdec_sic_12_esp.pdf).	Last assessed on 07-10-2014	FC _{i,m,y} is obtained from 2001-2010 CDSEC-SIC Operation Statistics Yearbook
34.	National Energy Commission	Source: National Energy Balance, 2009 (http://www.cne.cl/estadisticas/balances-energeticos	Last assessed on 07-10-2014	NCV _{i,y} is obtained from National Energy Balance

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Ref. No.	Author/Editor/ Issuer	Title/Type of Document/Publication/Place	Issuance and/or Submission date (dd/mm/yyyy)	Additional Information (Relevance in CDM Context)
				2009, National Energy Commission
35.	CDSEC-SIC	Source 2003-2012 CDEC-SIC Operation Statistics Yearbook, pages 52–66 (http://www.cdec-sic.cl/datos/anuario2013/espanol/cdec_sic_12_esp.pdf).	Last assessed on 07-10-2014	EG _{m,y} is obtained from 2001-2010 CDSEC-SIC Operation Statistics Yearbook
36.	National Energy Commission (CNE)	National Energy Commission (CNE) http://www.cne.cl	Last assessed on 07-10-2014	Referred for electricity systems in Chile
37.	Central Interconnected System (SIC)	Central Interconnected System (SIC) http://www.cdec-sic.cl/datos/anuario2013/english/sic.php ,	-	Referred for share of low cost must run generating sources in SIC.
38.	IPCC, Inter Governmental Panel on Climate Change	IPCC Fourth Assessment Report 2007 Working Group I: The Physical Science Basis, table 2.14 “Global Warming Potential for Given Time Horizon” www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html#table-2-14 .	Last assessed on 07-10-2014	-
39.	Grupo Aguas Andinas S.A. and KDM S.A	Contrato de Disposición Final de Biosolidos provenientes de las plantas de tratamiento de aguas servidas por el Grupo Aguas Andinas S.A	01-02-2014	-



South Asia

Annex 3

Appointment Certificates



South Asia

CERTIFICATE OF APPOINTMENT

Mr. Ranjan, Kumud fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.2, 3.1, 13.1					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area
1.2_Renewables
3.1_Energy demand
13.1_Solid waste and wastewater

This appointment is valid until 31.01.2016 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0037/006.

Date	Signature
01/01/2015	

IS-CMS-CB-POG-01/05, version 03

TUV®



South Asia

CERTIFICATE OF APPOINTMENT

Mr. Murty, Eswar fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.2, 3.1, 6.1, 13.1					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area
1.2_Renewables
3.1_Energy demand
6.1_Construction
13.1_Solid waste and wastewater

This appointment is valid until 31.01.2016 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0031/006.

Date	Signature
01/01/2015	

IS-CMS-CB-POG-01/05, version 03

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South Asia

CERTIFICATE OF APPOINTMENT

Mr. Sharma, Shivraj fulfills the requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd to participate in audits.

Qualification applicable to					
Standard	CDM	GS	VCS	ISO-14064-1: 2006	Other
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Qualification as						
Status	Validator	Verifier	ATL	Technical Reviewer	Financial Expert	Technical Expert
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
TA (s)	1.2, 3.1, 13.1					

Country Expertise						
Region	1	2	3	4	5	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Further countries						

Technical Area
1.2_Renewables
3.1_Energy demand
13.1_Solid waste and wastewater

This appointment is valid until 31.01.2016 and is bound by internal requirements of the Certification Body 'Environment and Energy' of TÜV SÜD South Asia Pvt Ltd.

In case of loss of validity of this certificate as per result of an assessment according to internal procedures or due to any other reason, it will be properly communicated to you.

Your Certificate has the internal reference no. CB-IND-CCP-0060/006.

Date	Signature
01/01/2015	

IS-CMS-CB-POG-01/05, version 03

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