



VALIDATION REPORT

EL PANUL – ECOMETHANE LANDFILL GAS PROJECT IN CHILE

REPORT No. 6106-0633

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DET NORSKE VERITAS



VALIDATION REPORT

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Summary:

Det Norske Veritas Certification AS (DNV) has performed a validation of the “El Panul – EcoMethane Landfill Gas Project” on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, and the subsequent decisions by the CDM Executive Board. This validation report summarizes the findings of the validation.

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

In summary, it is DNV’s opinion that the project, as described in the project design document version 9 dated 18 September 2009, meets all relevant UNFCCC requirements for the CDM and correctly applies the consolidated baseline and monitoring methodology ACM0001 version 8.1. Hence, DNV requests the registration of the “El Panul – EcoMethane Landfill Gas Project” as CDM project activity.

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Abbreviations

CAR	Corrective Action Request
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification request
CONAM	Consejo Nacional del Ambiente (National Council for Environment)
CO ₂	Carbon dioxide
tCO _{2e}	Tonnes of Carbon dioxide equivalent
DIGESA	Dirección General de Salud Ambiental (General Administration of Environmental Healthy)
DNV	Det Norske Veritas
DNA	Designated National Authority
EIA	Environmental Impact Assessment
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LFG	Landfill gas
MP	Monitoring Plan
N ₂ O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
UNFCCC	United Nations Framework Convention on Climate Change



1 INTRODUCTION

Biogas Technology Ltd. has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the “El Panul – EcoMethane Landfill Gas Project” (hereafter called “the project”). This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation team consisted of the following personnel:

Role/Qualification	Last Name	First Name	Country	Type of involvement					
				Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Expert input
CDM validator / technical team leader	Tavares	Luis Filipe	Brazil	x	x				
GHG auditor	Godinez	Gustavo	Mexico	x	x				
GHG auditor	Lara	Barbara	Mexico		x	x			
GHG auditor	Molin	Peter	Norway			x			
Methodology expert	Lehmann	Michael	Norway				x		
Technical reviewer (Draft report)	Viddal	Mari	Norway					x	
Technical reviewer (Final report ver.1)	Chaudhary	Anu	India					x	
Technical reviewer (Final report ver.1)	Kumaraswamy	Chandra-shekara	India					x	
Technical reviewer (Final report ver.3).	Sharma	Anjana	India					x	

The qualification of each individual validation team member is detailed in Appendix B to this report.

1.1 Validation Objective

The purpose of a validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and the project's compliance with relevant UNFCCC and host Party criteria are validated in order to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. Validation is a



requirement for all CDM projects and is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of certified emission reductions (CERs).

1.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD). The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology ACM0001 version 8.1.

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

1.3 Description of Proposed CDM Project

“El Panul – EcoMethane Landfill Gas to Energy Project” developed by Biogas Technology Ltd is a landfill gas (LFG) collection and destruction project in El Panul Landfill in the region of Coquimbo in Elqui Province in Chile.

The project name was changed from “El Panul – EcoMethane Landfill Gas to Energy Project” to “El Panul – EcoMethane Landfill Gas Project” as the electricity component was taken out from the project activity. The project was initially designed to include a power generation component, provided that the landfill gas flow was sufficient and that the project participant could secure a Power Purchase Agreement. However, due to different hurdles faced during the project’s implementation, the project developer finally decided to abandon the electricity component and only develop the flaring aspect of the project.

The main problem faced by the project developer was to obtain a Host Nation Approval Letter. The process of obtaining the LoA started in October 2006, when the project developer approached the Chilean DNA to approve the project. The DNA required the project developer to present either all relevant sectoral permits or a Resolution of Environmental Approval for the project in order to issue the LoA /27/. The project developer then turned to the Chilean environmental authorities to obtain a Resolution of Environmental Approval for the project /28/. This Resolution was issued in December 2007 /29/, however without considering the electricity generation component of the project, as detailed information of the electricity generation was missing. According to Biogas, this detailed information would only be possible to provide after the start of operation of the first phase of the project (LFG collection and flaring), and before this the information would be based on estimates.

The documents referenced above have been provided to DNV for validation from the project proponent.

A second attempt to obtain the LoA was made in February 2008, but due to the lack of a Resolution of Environmental Impact including the electricity component the process was put on hold. Meanwhile, the Chilean DNA changed its procedures to require the final validated PDD to be provided before they could issue a LoA. At this point of time the project was in operation and turned out to produce much less landfill gas than estimated and too small amounts to make electricity generation reasonable /30/. In August 2008, the project developer decided to leave out the electricity component due to the lengthy process of obtaining the LoA



and the low production of landfill gas. It should be noted that according to the project proponent, the electricity generation was considered as an option only, subject to the performance of the landfill, a possible power purchase agreement etc. DNV got confirmed from the project proponent that the electricity component is now permanently dismissed as a planned activity, and will never happen. A final submission of the project to the DNA was made in October 2008 and the LoA for the project without the electricity generation component was issued in January 2009 /2/.

DNV would also like to confirm that other projects in Chile validated by DNV have experienced a similar situation as for the proposed project, and have decided to remove the electricity generation component from their project.

El Panul consists of two main areas; a closed dumpsite and an engineered sanitary landfill which recently started its operation. The older segment of the site started as an open dump, operated later as a controlled dumpsite and finally closed by the end of 2005. The new sanitary landfill area started operations in 2006, currently receives 350 tonnes of municipal waste daily, and will be operational until 2014. The landfill includes a leachate collection system, a lined leachate basin, and a passive vent system to partially collect and flare the landfill gas.

The objective of the project is to replace the existing ineffective passive venting system by an active gas collection system in order to destroy the LFG from this landfill, thus minimising gaseous emissions. An annual average of 20 129 tCO₂e is estimated to be reduced during the 10 years crediting period. The project expects to be operational for approximately 15 years and a fixed crediting period was selected for the CDM project activity starting from 15 June 2009.

2 METHODOLOGY

The validation consisted of the following three phases:

- I a desk review of the project design documents
- II follow-up interviews with project stakeholders
- III the resolution of outstanding issues and the issuance of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customised for the project. The protocol shows in transparent manner criteria (requirements), means of verification and the results from validating the identified criteria. The validation protocol serves the following purposes:

- It organises, details and clarifies the requirements a CDM project is expected to meet;
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The validation protocol consists of three tables. The different columns in these tables are described in Figure 1.

The completed validation protocol for the “El Panul – EcoMethane Landfill Gas Project” is enclosed in Appendix A to this report.



Findings established during the validation can either be seen as a non-fulfilment of validation protocol criteria or where a risk to the fulfilment of project objectives is identified. Corrective action requests (CAR) are issued, where:

- i) mistakes have been made with a direct influence on project results;
- ii) validation protocol requirements have not been met; or
- iii) there is a risk that the project would not be accepted as a CDM project or that emission reductions will not be certified.

The term Clarification (CL) may be used where additional information is needed to fully clarify an issue.



Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities			
Requirement	Reference	Conclusion	Cross reference
The requirements the project must meet.	Gives reference to the legislation or agreement where the requirement is found.	This is either acceptable based on evidence provided (OK), a Corrective Action Request (CAR) of risk or non-compliance with stated requirements or a request for Clarification (CL) where further clarifications are needed.	Used to refer to the relevant checklist questions in Table 2 to show how the specific requirement is validated. This is to ensure a transparent Validation process.

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

Validation Protocol Table 3: Resolution of Corrective Action Requests and Requests for Clarification			
Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
If the conclusions from the draft Validation are either a Corrective Action Request or a Clarification Request, these should be listed in this section.	Reference to the checklist question number in Table 2 where the Corrective Action Request or Clarification Request is explained.	The responses given by the project participants during the communications with the validation team should be summarised in this section.	This section should summarise the validation team's responses and final conclusions. The conclusions should also be included in Table 2, under "Final Conclusion".

Figure 1: Validation protocol tables



2.1 Review of Documents

The PDD /1/ (version 1 dated 19 September 2006, final version 9 dated 18 September 2009 and mid versions during the process) submitted by TASUI Norte Sur SA, Biogas Technology Ltd, EcoSecurities Carbon I Ltd and EcoSecurities Group PLC and additional background documents related to the project design and baseline /2/-/10/ were assessed as a part of the validation.

2.2 Follow-up Interviews

On 9 to 10 November 2006, DNV performed a site visit and interviews with project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of different organizations and projects participants were interviewed. The main topics of the interviews are summarised in Table 1.

Table 1 Interview topics

Interviewed organisation	Interview topics
TASUI	- Overview of the project - Collation of information (Landfill operation – partial venting-, waste composition, disposal capacity on site and frequency. Controls for waste incoming; Electricity generation component- legal and operation requirements). - Assumptions for CER calculations and reviews. - Stakeholders consultation process
CONAMA/COREMA	- Status of letters of approval (Chile and UK) - EIA requirement - Legal compliance - Sustainable development criteria
EcoMethane	- Baseline, environment and consultation results, and monitoring plan - Criteria for project development - Environmental impacts - Agreements - Monitoring Plan (MP)
Coquimbo Municipality	- Legal compliance / Regulatory requirements - Permits (construction, operation) - Licenses - Regulatory requirements for landfill and electricity components

2.3 Resolution of Clarification and Corrective Action Requests

The objective of this phase of the validation was to resolve any outstanding issues which needed to be clarified for DNV's positive conclusion on the project design. The corrective



action requests and requests for clarification raised by DNV, presented to the project participants in DNV's draft validation report of 18 December 2006 (rev. 0) and in the final summary of corrective action request presented in January 2008, were resolved during communications between the project participants and DNV. To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.

Since modifications to the project design were necessary to resolve DNV's concerns, the client decided to revise the PDD and based on the final PDD version 8, dated 22 September 2008, and version 9 dated 18 September 2009 revised in accordance to the request from EB49, DNV issued this final validation report and opinion.

2.4 Internal Quality Control

The draft validation report including the initial validation findings underwent a technical review before being submitted to the project participants. The final validation report underwent another technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3 VALIDATION FINDINGS

The findings of the validation are stated in the following sections. The validation criteria (requirements), the means of verification and the results from validating the identified criteria are documented in more detail in the validation protocol in Appendix A.

The final validation findings relate to the project design as documented and described in the revised and resubmitted PDD version 9, dated 18 September 2009.

3.1 Participation Requirements

The project participants are: TASUI Norte Sur S.A., Biogas Technology Ltd., EcoSecurities Carbon I Ltd and EcoSecurities Group PLC. The host Party Chile and the participating Annex I Party the United Kingdom of Great Britain and Northern Ireland meet the requirements to participate in the CDM. Letters of Approval, including authorization of the project participants by the DNA of Chile and the DNA of United Kingdom have been obtained /2/ /3/. The DNA of Chile provided confirmation that the project assists in achieving sustainable development.

TASUI Ltda. was listed as one of the project participants in the published PDD version 1 dated 19 September 2006. However, the entity no longer exists in Chile. The entity changed its name formally and the project participant is now TASUI NORTE SUR S.A. DNV was able to verify a certificate of validity for the society extended by an official curator /6/ and also an official letter explaining the change of project participant has been received /5/.

The validation did not reveal any information that indicates that the project can be seen as a diversion of official development assistance funding towards Chile.



3.2 Project Design

The objective of the project is to replace the existing ineffective passive venting system by an active gas collection system in order to flare the LFG of this landfill, thus minimising gaseous emissions. The project activity involves the installation of vertical gas wells drilled into the waste to extract the LFG and a gas collection pipe network that connect groups of gas wells. An annual average of 20 129 tCO₂e is estimated to be reduced during the crediting period.

The project's operational lifetime is expected to be approximately 15 years and a fixed crediting period of 10 years has been selected for the CDM project activity, starting on 15 June 2009 (or the date of registration, whichever occurs later).

The starting date of the project activity has been identified as 1 August 2006 as the earliest date when the real action regarding the project activity took place. This date has been set as the date when the project participants Biogas technology Ltd and Tasui Ltda signed a contract to develop the project as a CDM project /7/. Biogas commits to design, supply, install and operate the flaring equipment within a reasonable timeline. The contract has been submitted to DNV, and DNV can confirm that this contract fulfils the requirements set for the project starting date.

The project description is to the consideration of DNV complete and accurate.

3.3 Baseline Determination

The project applies the approved baseline and monitoring methodology ACM0001 version 8.1 "Consolidated baseline methodology for LFG project activities" /10/, including the methodological tools referred to in the methodology

Its applicability is justified as the project fulfils the following criteria: i) the captured gas is flared, ii) the gas to be flared contains no other combustible gases than methane, carbon dioxide and hydrogen and iii) the residual gas stream to be flared is obtained from decomposition of organic waste from a landfill. The applicability of the methodology has been checked through the site visit, and by checking evidences provided by the project proponent /1/ /2/ /5/ /7/ /8/ /22/.

DNV can confirm that the baseline scenario was selected in accordance with the methodology ACM0001 version 8.1. All relevant alternative scenarios were discussed as described in section 3.4 below. The most likely baseline scenario was demonstrated to be the continuation of the current situation, i.e. the partial collection and flaring of the LFG, which barely occurs at landfills in Chile. Most of the landfills in Chile do not have any type of venting system, but release LFG uncontrolled to the atmosphere. The selected baseline scenario was selected as per the methodology.

The project is based on the collection and flaring of LFG, thus converting its methane content into CO₂, reducing its greenhouse gas emissions. The baseline scenario thus can be considered as the release of landfill gas to the atmosphere, or partial capture of landfill gas and destruction to comply with regulations or contractual requirements, or to address safety and odour concerns.

The project boundary of the project is the site where the gas will be captured and destroyed. The quantity of LFG captured and flared by the project is estimated using a model based on the *Tool to determine methane emissions avoided from dumping waste at a solid waste*



disposal site, /17/ using a first order decay model. It is assumed that only 60% of the LFG generated will be collected, and a 90% default value for the flare efficiency is considered for the *ex-ante* estimations of emission reductions. However the efficiency of the flare will be continuously monitored (ex post and the value of 90% used for the estimation of the emission reductions will not be taken into account) if and when the equipment is installed.

3.4 Additionality

The additionality of the proposed project is demonstrated by applying the “Tool for the demonstration and assessment of additionality” /11/.

3.4.1 CDM consideration and continued action to secure CDM status

The proposed project activity started in August 2006 and started operating in February 2008. The project starting date was selected as the date on which the Biogas Technology Ltd and Tasui Ltd signed a contract to develop the project /7/, constituting the first commitment regarding the project activity. In the contract, Biogas commits to deliver and operate the flaring system to the landfill operated by TASUI. Furthermore, the contract mentions that emission reduction will be generated from the project. The project participant has provided the contract to DNV for validation. DNV considers this as an appropriate evidence for the project starting date as defined in the *Glossary of CDM terms*.

The project proponent has provided DNV with several email conversations between Biogas, EcoMethane and EcoSecurities dated January and February 2006 /31/, where the proposed project is discussed as a potential CDM project. EcoMethane is a joint venture working exclusively with EcoSecurities and Biogas on the development of LFG projects under the CDM. The email conversations and the contract of 1 August confirm in DNV’s opinion the CDM consideration prior to the project start date. DNV has furthermore verified the minutes of a number of meetings conducted from 2005 to 2006 in which the proposed CDM project was discussed and it was decided that the project activity was not feasible if not undertaken as a CDM activity /8/.

The first version of the PDD was made publically available on the DNV’s webpage on 22 September 2006. Due to a revision of the methodology, a second version of the PDD was published on 30 March 2007, and the final version without the electricity generation component was published on 8 April 2008. DNV can hence confirm that continued and real actions have been made to secure the CDM status of this project.

3.4.2 Identification of alternatives

The project proponent listed four alternatives to the project activity:

Alternative 1: The landfill operator would invest in an active high-efficiency LFG capturing and flaring system. Alternative 1 represents the proposed project activity without CDM.

Alternative 2: Atmospheric release of the LFG or partial capture and destruction of LFG to comply with regulations or contractual requirements, or to address safety and odour concerns.

Alternative 3: Utilization of landfill gas for generation of electricity

Alternative 4: Utilization of landfill gas for heat generation.

DNV considers the list of realistic and credible alternatives to be complete.



DNV was able to verify that the Resolution No 2444 from 1980 did not consider landfills at this time and does not contain any requirements concerning LFG management, while Regulation RSS 189 is still in a draft stage. Hence, none of the resolutions should be considered in the baseline scenario. This was also verified from the website of the environmental authority /25/. Considering the regulations above and the Statute No 19300 of 1994, installing systems for LFG collection, control and monitoring is recommended, but not mandatory in Chile. Hence, all four alternatives are in line with the applicable laws and regulations.

Utilization of the landfill gas for heat generation was ruled out of the analysis due to the lack of potential users for the heat energy, and the high costs related to development of a purification and distribution system. DNV was able to confirm the lack of potential users during the site visit, and accepts that this alternative was not further assessed due to the remote location of the proposed project.

As explained in Section 1.3, the project developer was not able to obtain a Host country LoA if electricity production was included in the project design. The project produced furthermore much less biogas than estimated, and would not be able to sustain electricity production /30/. Hence, this part of the project was excluded. However, utilization of the landfill gas for electricity generation was listed as an alternative in the baseline selection, and an investment analysis was performed for this alternative using parameters provided from Biogas and from other similar registered CDM activities (projects 1435 and 2028) as no feasibility study was made for this alternative. The IRR analysis shows that utilization of the landfill gas for electricity generation would result in a negative IRR, and not be an economically attractive alternative. DNV has reviewed the data and can confirm that the IRR based on these parameters would turn out negative. DNV can also confirm the severe problems in obtaining LoA for the project when including electricity generation, and can confirm that this alternative is not a likely baseline scenario.

Continuation of the current situation represents the business as usual practice for the project developer. Some of the more recent landfills do partially collect and burn the LFG, but most of the existing landfills do not collect and control LFG at all. Existing regulations do provide recommendations, but do not detail specific requirements regarding the construction of gas collection systems or the technique which shall be applied to collect, control and monitor the LFG. The regulation notwithstanding, common practice demonstrates that existing landfills in the country do not adequately capture and utilise the LFG.

3.4.3 Financial analysis

As discussed in Section 3.4.2 above, alternative 3 “utilization of the landfill gas for electricity production” can be excluded as a realistic baseline alternative due to the low performance of the project and the hurdles of obtaining the necessary environmental approvals and the negative IRR. As neither of the remaining alternatives (“project activity undertaken without being registered as a CDM project” and the business-as-usual situation) would generate any revenue except from the sales of CERs, a simple cost analysis was performed, as in accordance with the “Tool for the demonstration and assessment of additionality”. The input values to the simple cost analysis were estimated by the project proponent, and evidences for the actual costs have later been provided to and verified by DNV /22/ /23/ /24/. The actual values confirm the estimates used in the analysis. The situation prior to the proposed project, i.e. passive venting of the landfill gas, was confirmed during the on-site visit. The costs of this



very simple system were verified to be close to zero. The simple costs analysis shows that the proposed project activity has clearly higher costs than the situation prior to the proposed project. As neither of the two alternatives generate any revenue, the proposed project activity was demonstrated to be less financially or economically attractive than the prior situation, and the project participant continued to the common practice analysis. By checking the sources for the parameters used in the simple cost analysis, DNV can confirm that the investment analysis was done correctly and in accordance with the methodology.

3.4.4 Common practice analysis

The common practice analysis presented in the PDD claims that the advanced methane collection and flaring is not common practice in Chile. DNV finds the country Chile as an appropriate geographical region for the common practice analysis. Through interviews with the national environmental authorities CONAMA/COREMA, DNV was able to confirm that collection and flaring of landfill gas is not common practice in Chile. This is also in accordance with the regulations described above. There were however identified seven projects similar to the proposed project activity applying for CDM, but as per the *Tool for the demonstration and assessment of additionality* these projects should not be considered in the analysis. In conclusion, DNV find that the common practice analysis show that the project activity is not common practice in Chile.

DNV can hence confirm that the project proponent has demonstrated that the project is additional as per the *Tool for the demonstration and assessment of additionality*.

3.5 Monitoring Plan

The project applies the approved consolidated monitoring methodology ACM0001 version 8.1 “Consolidated baseline methodology for LFG project activities” /10/

The monitoring parameters proposed in the PDD version 9 dated 18 September 2009 /1/ are fully consistent with ACM0001 version 8.1, and the monitoring plan is in accordance with the methodology. The monitoring plan will give opportunity for real measurements of achieved emission reductions. A Flow meter for the measurements of the amount of LFG flared will be used. The meter will be calibrated according to the manufacturer’s requirements, by the manufacturer themselves. DNV was able to verify that the manufacturer is ISO accredited for this kind of calibration /26/. In addition, regulatory requirements relating to landfill gas projects will be recorded annually in line with ACM0001 version 8.1.

Monitoring of sustainable development indicators is not required by the Chilean DNA.

The authority for project management is described in Annex 4 of the PDD. The responsibilities for collection of project related data, entering data into spreadsheets, data analysis, archive data, monthly and annual reports as well as calibration/maintenance of monitoring equipment have been addressed.

Continuous monitoring *ex-post* of flare efficiency is considered when the entire equipment will be installed according to the *Tool to determine project emissions from flaring gases containing methane*. Until this is in place, the 90% default value is applied and continuous monitoring of compliance with manufacturer’s specification of flare (temperature, flow rate of residual gas at the inlet of the flare) will be performed. If in a specific hour any of the parameters are out of the limit of manufacturer’s specifications, a 50% default value for the flare efficiency should be used for the calculations for this specific hour. In both cases, if there is no record of the temperature of the exhaust gas of the flare or if the recorded



temperature is less than 500 °C for any particular hour, it shall be assumed that during that hour the flare efficiency is zero.

The application of the monitoring methodology is transparent and DNV considers the project participants able to implement the monitoring plan.

3.6 Calculation of GHG Emissions

The project boundary is the site of the project activity where the gas will be captured and destroyed. Sources and gases for the baseline as well as for the project activity were identified. It is estimated that only 60% of LFG generated will be captured (40% will be released as fugitive emission).

The baseline emissions have been calculated with the formula below, as per the methodology:

$$BE_y = (MD_{project,y} - MD_{BL,y}) \cdot GWP_{CH_4}$$

The amount of methane destroyed by the project $MD_{project,y}$ will be determined *ex-post* by metering the actual amount of methane captured and destroyed. It will, in accordance with the methodology, be determined as the quantity of methane fed to the flare. The *ex-ante* estimation of $MD_{project,y}$ for the estimation of the emission reductions, is in DNV's opinion determined as per the *Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site* /17/ in accordance with ACM0001 version 8.1. As the El Panul landfill consist of two different areas, one previously operated as a dump with some passive vents, while the other area has a leachate collection system, a lined leachate basin and a passive venting and flaring system, none of the alternatives for the *MCF* listed in the *Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site* match the project precisely. As the dump had a depth of more than 5 metres, the alternatives "anaerobic managed solid waste disposal site" and "unmanaged-shallow solid waste disposal site" could clearly be ruled out.

As the dump had some passive flares, were covered with soil and had a primitive leachate system draining leachate from the dump, the alternative "semi-aerobic managed solid waste disposal sites" was deemed to better represent the landfill as a whole than "unmanaged solid waste disposal sites – deep and/or with high water table". The design of the two parts of the landfill was confirmed during DNV's site visit and in a site visit report made by EcoSecurities, dated February 2006. It is hence in DNV's opinion more appropriate to use $MCF = 0.5$ than $MCF = 0.8$.

According to monitored data from the landfill in 2008, provided by the project proponent /30/, the estimated emission reductions are closer to the actual values generated when using the value $MCF = 0.5$ than $MCF = 0.8$. The value MCF can then be considered more correct and conservative.

DNV would also like to emphasize that the MCF value is used for the estimation of the emission reduction only, and will not affect the emission reductions generated, and monitored *ex-post*.

All other parameters were checked by DNV and found to be in accordance with the *Tool*. The amount of methane that would have been destroyed in the absence of the project $MD_{BL,y}$ is determined as the amount of methane destroyed by the project $MD_{project,y}$ multiplied with an adjustment factor AF . As there are no available data of the amount of methane destroyed before the project, a procedure for the estimation of the adjustment factor has been described



in the PDD as per Step 1 b) in the methodology. DNV can confirm that the estimation of the adjustment factor is properly justified and results in an *AF* of 5%. This value is reasonable and on the conservative side when comparing with similar projects validated by DNV in Chile.

The project emissions consist of emissions from the flare and emissions from electricity consumption. The emissions from the flare $PE_{flare,y}$ were calculated as per the *Tool to determine project emissions from flaring gases containing methane* /12/ in order to find the *ex-post* values of the $MD_{project,y}$. The project emissions from electricity consumption $PE_{EC,y}$ is calculated as per the *Tool to calculate baseline, project and/or leakage emissions from electricity consumption* /13/. According to the methodology, the project participant uses the Scenario A as the project uses electricity from the national grid only, and Option A1, calculation of a combined margin emission factor is chosen. The combined margin emission factor is correctly calculated in accordance to the *Tool to calculate the emission factor for an electricity system* /14/. The combined margin emission factor was calculated as 0.5230 tCO₂/MWh. The project proponent have used data vintages from 2005 – 2007 in the calculation of the combined emission factor. As per the methodology, the most recent data vintages available at the time of the first publication of the PDD should have been used. For this project, this would have meant 2003 – 2005 data. DNV has validated that using these data vintages would result in a grid emission factor of 0.264 tCO₂/MWh, hence DNV accepts the use of the more recent data as this leads to a higher value for the electricity consumption and is thus more conservative.

As recent and reliable values were not available from the host country, the default value 20% was selected for the grid transmission and distribution loss parameter TDL_y .

DNV was able to verify that the information was properly taken from the CDEC-SIC and the National Energy Council, CNE /19/.

No leakage effects need to be accounted under the methodology used.

The forecasted emission reductions of 201 294 tCO₂e during its ten years of the crediting period are deemed within reasonable limits. However, experiences with other landfills have shown that the methane generation and collection efficiency of the landfills projected by the first order decay model has an inherent uncertainty of almost 50% and hence the amount of CERs, which will be monitored *ex-post*, might vary from the projected amount.

3.7 Environmental Impacts

Through the installation of the project activity significant negative health and safety implications will be removed, such as risk of explosion, fires, toxic effects as well as odour. However, a Declaration of Environmental Impact was carried out in accordance with the regulatory requirements, given that the Regional Commission of Environment needs to be informed about any kind of construction or modification made at the existing landfill in accordance with the Resolution of the Environmental Qualification (RCA), article 17. The Declaration of Environmental was presented and approved on 07 December 2007 /19/.

3.8 Comments by Local Stakeholders

A local stakeholder consultation process took place on 07 September 2006 at the locality of Coquimbo, nearby the project site. The event was announced in the main national newspapers “El Dia” and “Las ultimas noticias”; members of the community participated in the event. All participants were registered.



The stakeholder consultation included a brief description of the project and its benefits by the landfill operator as well as presentations by the project developer including topics such as climate change; how this project is mitigating climate change through the Clean Development Mechanism of the Kyoto Protocol; the technical details of the project; and a session aimed at addressing questions posed by the stakeholders. No formal comments were received, only questions regarding the project activity in specific as well as LFG capture in dump sites and landfills in general, as well as about risk management in LFG projects. No further actions were necessary in order to take due account of comments received.

DNV considers the local stakeholder consultation carried out adequate.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD version 1 of 19 September 2006 was made publicly available on DNV's climate change website¹ and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 22 September 2006 to 21 October 2006.

Due to a change in the methodology ACM0001 "Consolidated baseline methodology for LFG project activities" the PDD of 15 March 2007 version 3, was made publicly available through DNV's website from 30 March 2007 to 28 April 2007 also the PDD version 6 dated 18 March 2008, was made publicly available from 08 April 2008 to 01 May 2008.

No comments were received for any of these publications.

¹ <http://cdm.unfccc.int/Projects/Validation/DB/ERHL2Y0JLXDXMRI3SA3XO83RM5DKQQ/view.html>



5 VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the “El Panul – EcoMethane Landfill Gas Project”. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host Party criteria as well as criteria given to provide for consistent project operations, monitoring and reporting.

The review of the project design documentation and the subsequent follow-up interviews have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The project participants are Tasui Norte Sur SA on behalf of the Host Party Chile, and Biogas Technology Ltd., Ecoscurities Carbon I Ltd and Ecoscurities Group PLC on behalf of the Annex I Party the United Kingdom. Both the Parties meet the requirements to participate in the CDM. Letters of Approval, including authorization of the project participants, by the DNA of Chile and the United Kingdom have been obtained.

The project will contribute to sustainable development through reducing odour, reducing health risk, providing employment opportunities and reducing the risk associated with explosions. The DNA of Chile provided confirmation that the project assists in achieving sustainable development.

The project applies the approved consolidated baseline methodology ACM0001, “Consolidated Baseline Methodology for landfill gas project activities” version 8.1 /10/.

The additionality of the project activity has been established using the “Tool for the demonstration and assessment of additionality” version 5. It is sufficiently demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The monitoring parameters proposed in the PDD are fully consistent with the approved consolidated monitoring methodology ACM0001 version 8.1.

The total emission reductions from the project are estimated to be 201 294 tCO₂e during over ten years crediting period. The emission reduction forecast has been checked, and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

Environmental impacts have been sufficiently addressed and controls are in place. A Declaration of Environmental Impact for landfill operation was carried out to comply with all the applicable regulations at the State and Federal level in Chile.

In summary, it is DNV’s opinion that the project as described in the project design document of 18 September 2009 meets all relevant UNFCCC requirements for the CDM and all host Party requirements and correctly applies the consolidated baseline and monitoring methodology ACM0001 version 8.1. Hence, DNV requests the registration of the “El Panul – EcoMethane Landfill Gas Project” as a CDM project activity.



REFERENCES

- /1/ EcoSecurities Ltd.: *CDM PDD for El Panul – EcoMethane Landfill Gas Project* version 1 dated 19 September 2006, version 8 dated 22 September 2008 and final version 9 dated 18 September 2009.
- /2/ Chilean *Letter of Approval* issued by the Chilean DNA, National Environmental Commission on 21 January 2009.
- /3/ Department of Energy and Climate Change (United Kingdom DNA): *Letter of Approval*, 7 April 2009.
- /4/ EcoSecurities Ltd: *Spreadsheets Financial analysis and Calculation of Emission Reductions*, 08 January 2008 and final version for PDD version 8 dated 22 September 2008.
- /5/ Mario Burle Delva Curator and Archivist Court, Validity Certificate for the society Sociedad de Transportes Tasui Ltd. And change to Tasui Norte Sur SA, 18 January 2008.
- /6/ Tasui Norte Sur SA, Letter of PP change of name, 18 January, 2008.
- /7/ TASUI Ltda and Biogas Technology Ltd, Contract for the development of the project as a CDM project, 01 August 2006.
- /8/ Tasui Ltd, Biogas technology Ltd and EcoSecurities, Minutes of meeting regarding the CDM project, 2005 – 2006.
- /9/ CDM Executive Board: *Validation and Verification Manual*. Version 01
- /10/ CDM Executive Board ACM0001 *Consolidated baseline methodology for LFG project activities*, Version 8 and version 8.1.
- /11/ CDM Executive Board: “*Tool for the demonstration and assessment of additionality*” version 5 (EB 36)
- /12/ CDM executive Board: “*Tool to determine project emissions from flaring gases containing methane*” (EB 28)
- /13/ CDM executive Board: “*Tool to calculate baseline, project and/or leakage emissions from electricity consumption*” (EB 39)
- /14/ CDM Executive Board: *Tool to calculate the emission factor for an electricity system* (EB 35)
- /15/ CDM executive Board: “*Tool to calculate project or leakage CO2 emissions from fossil fuel combustion*” Version 1, EB32
- /16/ CDM executive Board: “*Combined tool to identify the baseline scenario and demonstrate additionality*” Version 02.1, EB28
- /17/ CDM executive Board: “*Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site*” Version 2, EB 35.
- /18/ Approval of Declaration of Environmental Impact No. 223 of 07 December 2007.
- /19/ National Energy Commission CNE and Annual Report 2006 from the Load Economic Dispatch Centre – Central Interconnected System (CDEC-SIC).
- /20/ Law No. 19 300 “*Ley de bases del medio ambiente*”, publicly available on the Official Diary on 09 March 1994.



- /21/ IPCC Guidelines, 2006.
- /22/ Statement from Biogas to EcoSecurities, dated 20 March 2009, confirming the fieldwork costs related to the installation of the gas collecting system on El Panul.
- /23/ Packing lists for the flaring equipment from Biogas, dated 11 May 2007.
- /24/ Detailed simple cost analysis, spreadsheet provided by Biogas' Chilean accountant, January 2009.
- /25/ Chilean DNA, Comisión Nacional del Medio Ambiente (CONAMA):
<http://www.conama.cl/portal/1301/channel.html>
- /26/ <http://www.uk.endress.com/>
- /27/ Letter from Gobierno de Chile to Tasui S.A. dated 29 December 2006
- /28/ Letter from EcoSecurities to CONAMA, Chile, dated 26 July 2007
- /29/ Republica de Chile, Comision Regional Del Medio Ambiente, Region de Coquimbo: Resolution of Environmental Approval No. 223, dated 7 Dec 2007
- /30/ Monitored data for the landfill in 2008, provided by the PP
- /31/ Email conversations between EcoSecurities and Biogas, dated January and February 2006.

Main changes between the PDD of 15 March 2007 version 3 that was published and the PDD submitted for registration are;

- Electricity generation component removed from the project.
- The methodology was changed from ACM0001 ver.8 to ACM0001 ver.8.1.
- Change of the name of the project participant Tasui Ltd to Tasui Norte Sur SA.
- Parameters to be monitored (Included the flare efficiency).
- Update on the sensitivity analysis as per the EB 39 Annex 35.
- Inclusion of response to requests for review, after EB49. The validation report revised in accordance to the corrections requested at EB49 refers to the PDD version 9, dated 18 September 2009. DNV can confirm that the only changes between the PDD version 8 and version 9 are those requested by EB49.

Persons interviewed during the validation, or persons who contributed with other information that are not included in the documents listed above:

- /32/ Ina Ballik – EcoMethane
- /33/ Lorena Lobos – Healt Service La Serena
- /34/ Sergio Troncoso – Coquimbo Municipality
- /35/ Guillermo Saá – La Serena University
- /36/ Alvaro Sapag – CONAMA – Comisión Nacional del Medio Ambiente
- /37/ Francisco Blanco – Biogas

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APPENDIX A

VALIDATION PROTOCOL FOR CDM PROJECT ACTIVITIES

Table 1: Mandatory Requirements for Clean Development Mechanism (CDM) Project Activities

Requirement	Reference	Conclusion	Cross Reference/ Comment
1. The project shall assist Parties included in Annex I in achieving compliance with part of their emission reduction commitment under Art. 3	Kyoto Protocol Art. 12.2	OK	Table 2, Section E.4.1
2. The project shall assist non-Annex I Parties in achieving sustainable development and shall have obtained confirmation by the host country thereof	Kyoto Protocol Art. 12.2, Simplified Modalities and Procedures for CDM Project Activities §23a	OK	Table 2, Section A.3
3. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC	Kyoto Protocol Art. 12.2.	OK	Table 2, Section E.4.1
4. The project shall have the written approval of voluntary participation from the designated national authority of each party involved	Kyoto Protocol Art. 12.5a, Simplified Modalities and Procedures for CDM Project Activities §23a	CAR 1 OK	DNA of Chile: Letter of approval, 21 January 2009. Department of Energy and Climate Change. Letter of Approval, 7 April 2009.
5. The emission reductions should be real, measurable and give long-term benefits related to the mitigation of climate change	Kyoto Protocol Art. 12.5b	OK	Table 2, Section E.1 to E.4
6. Reduction in GHG emissions must be additional to any that would occur in absence of the project activity, i.e. a CDM project activity is additional if anthropogenic emissions of greenhouse gases by sources are reduced below those that would have occurred in the absence of the registered CDM project activity	Kyoto Protocol Art. 12.5.c, Simplified Modalities and Procedures for CDM Project Activities §26	OK	Table 2, Section B.2.1
7. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not	Decision 17/CP.7, CDM Modalities and Procedures Appendix B,	OK	There is no evidence of public funding from parties included in

Requirement	Reference	Conclusion	Cross Reference/ Comment
result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	§ 2		Annex 1.
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures § 29	OK	DNA of Chile: National Council for Environment DNA of UK: Department for Environmental, Food and Rural Affairs
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities and Procedures § 30, 31b	OK	UK has ratified Kyoto Protocol on 31 May 2002 Chile: has ratified Kyoto Protocol on 26 August 2002.
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	OK	The United Kingdom assigned amount is 92% of the emissions in 1990.
11. The participating Annex I Party shall have in place a national system for estimating GHG emissions and a national registry in accordance with Kyoto Protocol Article 5 and 7	CDM Modalities and Procedures §31b	OK	The UK reports on an annual basis its GHG inventory to the UNFCCC
12. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received	CDM Modalities and Procedures §37b	OK	Table 2, Section G
13. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are	CDM Modalities and Procedures §37c	OK	Table 2, Section F

Requirement	Reference	Conclusion	Cross Reference/ Comment
considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.			
14. Baseline and monitoring methodology shall be previously approved by the CDM Executive Board	CDM Modalities and Procedures §37e	OK	Table 2, Section B.1.1 and D.1.1
15. Provisions for monitoring, verification and reporting shall be in accordance with the modalities described in the Marrakech Accords and relevant decisions of the COP/MOP	CDM Modalities and Procedures §37f	OK	Table 2, Section D
16. Parties, stakeholders and UNFCCC accredited NGOs shall have been invited to comment on the validation requirements for minimum 30 days, and the project design document and comments have been made publicly available	CDM Modalities and Procedures §40	OK	The PDD version 1 dated 19 September 2006 has been published on DNV's Climate Change website. Parties, stakeholders and NGOs were through the UNFCCC CDM website invited to provide comments on the validation requirement during a period of 30 days from 22 September 2006 to 21 October 2006. Due to a change in the methodology version 3 of the PDD dated 15 March 2007 was published for 30 days from 30 March 2007

Requirement	Reference	Conclusion	Cross Reference/ Comment
			to 28 April 2007. As the electricity generation component was removed from the project activity, the PDD was published a third time, using ACM0001 ver.8, between 8 April 2008 and 7 May 2008. No comments were received for any of the periods.
17. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances	CDM Modalities and Procedures §45c,d	OK	Table 2, Section B.2
18. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure	CDM Modalities and Procedures §47	OK	Table 2, Section B.2
19. The project design document shall conform with the CDM Project Design Document format	Simplified Modalities and Procedures for CDM Project Activities, Appendix A	OK	PDD in accordance with version 03.1 of the CDM-PDD template

Table 2 Requirements Checklist

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A. General Description of Project Activity <i>The project design is assessed.</i>					
A.1. Project Boundaries <i>Project Boundaries are the limits and borders defining the GHG emission reduction project.</i>					
A.1.1. Are the project's spatial (geographical) boundaries clearly defined?	/1/	DR	Yes. The PDD defines the geographical boundaries clearly. The Project is located at the south of Coquimbo in a region named "Altas de Panul", 3 km easterly of the principal road "Ruta 5 Norte" and 18 km from the city La Serena. The geographical coordinates are 30°01'10" southern Latitude and 71°21'31" eastern Longitude.		OK
A.1.2. Are the project's system (components and facilities used to mitigate GHGs) boundaries clearly defined?	/1/	DR	The project system boundaries include mainly the collection and flaring systems, an electricity component and the Chilean grid.		OK
A.2. Technology to be employed <i>Validation of project technology focuses on the project engineering, choice of technology and competence/ maintenance needs. The validator should ensure that environmentally safe and sound technology and know-how is used.</i>					
A.2.1. Does the project design engineering reflect current good practices?	/1/	DR	The project reflects good practice for the collection of LFG, flaring and combustion of LFG. The technology used in the project activity will be imported from the UK.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A.2.2. Does the project use state of the art technology or would the technology result in a significantly better performance than any commonly used technologies in the host country?	/1/	DR	The technology includes the installation of a skid/base mounted and mobile gas flare system to capture methane and flare it which would have otherwise been vented passively to the atmosphere,.		OK
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR	It is unlikely that the project technology will be substituted by other more efficient technologies within the project crediting period.		OK
A.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period?	/1/	DR I	Biogas Technology Ltd will provide training to all the operators and site manager for the adequate operation, maintenance and monitoring, once all the equipment is installed on site. The training will be provided at the project site by technicians from the UK specialised in the operation of the equipments to be installed. In addition, the operational manuals for the equipment consider detailed maintenance procedures to ensure the adequate operation of the flare, collection system and monitoring equipment during the project period.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/	DR I	Yes. Training is programmed once the equipment is installed and before the project starts. In addition, training is considered during the project period in order to keep operators up to date of maintenance and monitoring procedures.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
A.3. Contribution to Sustainable Development <i>The project's contribution to sustainable development is assessed.</i>					
A.3.1. Is the project in line with relevant legislation and plans in the host country?	/1/ /2/	DR I	This is confirmed through the letter of approval from the DNA of Chile. Relevant permits and authorizations were revised during site interviews.	CAR-1 CAR-2	OK
A.3.2. Is the project in line with host-country specific CDM requirements?	/1/	DR	As above		OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/	DR	This is confirmed through the letter of approval from the DNA of Chile.		OK
A.3.4. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	Yes. The project is expected to contribute to sustainable development through: • Reducing odour • Reducing health risk • Providing employment opportunities and • Improves the overall management practices of the landfill		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B. Project Baseline <i>The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.</i>					
B.1. Baseline Methodology <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
B.1.1. Is the baseline methodology previously approved by the CDM Executive Board?	/1/ /10/	DR	The project applies the approved baseline methodology ACM0001 version 8.1.		OK
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	/1/ /10/	DR	ACM0001 version 8.1 is applicable to landfill projects where the captured gas is flared.		OK
B.2. Baseline Determination <i>The choice of baseline will be validated with focus on whether the baseline is a likely scenario, whether the project itself is not a likely baseline scenario, and whether the baseline is complete and transparent.</i>					
B.2.1. Is the application of the methodology and the discussion and determination of the chosen baseline transparent?	/1/	DR I	Yes, the discussion and application of the chosen baseline is transparent. The selected baseline scenario is the continuation of the current practice of passive venting the LFG. Most of the landfills in Chile do not have venting system and release LFG uncontrolled to the atmosphere, although there are some		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			regulations calling to LFG control management but there is not specific details about this management. This was verified during site interviews. The project activity is the partial collection and flaring of the LFG.		
B.2.2. Has the baseline been determined using conservative assumptions where possible?	/1/	DR I	The applied adjustment factor (AF) for the project is 5%. It has been determined considering that the regulatory requirements do not indicate any specific amount of gas collection and utilization or flaring, and in practice minimal amount of LFG are actually flared. 90% of efficiency for the flare is assumed and an emission factor of 0.5230	CAR-3 CAR-4 CAR-5	OK
B.2.3. Has the baseline been established on a project-specific basis?	/1/	DR I	Yes		OK
B.2.4. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/	DR I	The baseline has been determined taking into consideration all the policies / legislations related to landfill operations in Chile. Statute N° 19300 "Ley de bases del medio ambiente" from March 1994 and Resolution N° 244 "Normas Sanitarias Mínimas para la Operación de Basurales" from 31 July 1980 and a draft for a new landfill regulation "RSS 189", define responsibilities regarding waste management.	CAR-6 CAR-7	OK
B.2.5. Is the baseline determination compatible with the available data?	/1/	DR	Waste historically delivered to the landfill is available. The spreadsheet containing the calculations of foreseen emissions from the landfill in the absence of the project has been provided.	CAR-8	OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
B.2.6. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/	DR	In the absence of the project activity, it is likely that the existing practice of passive venting of methane gas released from landfill would have continued.		OK
B.2.7. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario?	/1/ /11/	DR	The additionality of the project activity has been established using the "Tool for the demonstration and assessment of Additionality" Version 05		OK
B.2.8. Have the major risks to the baseline been identified?	/1/	DR	A risk to the baseline is the possibility of changes in the regulations. Regulatory requirements relating to landfill gas projects will be monitored and the baseline, if necessary, updated annually. It will be reflected in the adjustment factor (AF).		OK
B.2.9. Is all literature and sources clearly referenced?	/1/	DR	Yes		OK
C. Duration of the Project/ Crediting Period <i>It is assessed whether the temporary boundaries of the project are clearly defined.</i>					
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	/1/	DR	The crediting period will start on 01/01/2009, or on the date of registration of the CDM project activity, whichever is later.	CAR-2	OK
C.1.2. Is the assumed crediting time clearly defined (renewable crediting period of seven years with two possible renewals or fixed crediting period of 10 years with no renewal)?	/1/	DR	A fixed crediting period of 10 years has been chosen.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D. Monitoring Plan <i>The monitoring plan review aims to establish whether all relevant project aspects deemed necessary to monitor and report reliable emission reductions are properly addressed ((Blue text contains requirements to be assessed for optional review of monitoring methodology prior to submission and approval by CDM EB).</i>					
D.1. Monitoring Methodology <i>It is assessed whether the project applies an appropriate baseline methodology.</i>					
D.1.1. Is the monitoring methodology previously approved by the CDM Executive Board?	/1/ /10/	DR	The project applies the approved monitoring methodology ACM0001 version 8.1 EB 39 "Consolidated methodology for LFG project activities".		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	/1/ /10/	DR	The project activity fulfils the applicability criteria of the approved methodology		OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	/1/ /10/	DR	Monitoring parameters proposed in the PDD are fully consistent with ACM0001 version 8.1.	CAR-4	OK
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	/1/ /10/	DR	Yes		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.2. Monitoring of Project Emissions <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
D.2.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for estimation or measuring the greenhouse gas emissions within the project boundary during the crediting period?	/1/ /10/	DR	All relevant data necessary for the estimation of GHG emissions within the project boundary have been included in the monitoring plan, among others: - Total amount of landfill gas captured. - Amount of landfill gas fed to the flare. - Temperature in the exhaust gas of the flare. - Methane fraction in the landfill gas. - Total amount of electricity imported to meet project requirements. - Regulatory requirements relating to landfill gas projects - Project emissions from flare.		OK
D.2.2. Are the choices of project GHG indicators reasonable?	/1/	DR	Yes, the above mentioned indicators are reasonable.		OK
D.2.3. Will it be possible to monitor / measure the specified project GHG indicators?	/1/	DR	Yes. It will be possible to monitor the specified project GHG indicators.		OK
D.2.4. Will the indicators give opportunity for real measurements of project emissions?	/1/	DR	The parameters to be monitored to evaluate the emissions due to the project activities are measurable.		OK
D.2.5. Will the indicators enable comparison of project data and performance over time?	/1/	DR	Yes		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.3. Monitoring of Leakage <i>It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.</i>					
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/ /10/	DR	No leakage affects needs to be accounted under this methodology ACM0001 version 8.1.		OK
D.4. Monitoring of Baseline Emissions <i>It is established whether the monitoring plan provides for reliable and complete project emission data over time.</i>					
D.4.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining baseline emissions during the crediting period?	/1/	DR	All relevant data necessary for the monitoring and calculation of GHG emissions within the project boundary have been included in the monitoring plan. For the landfill gas component, no specific baseline indicators are included as the actual emission reductions are monitored ex-post.		OK
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/	DR	Yes, the above mentioned indicators are reasonable.		OK
D.4.3. Will it be possible to monitor / measure the specified baseline indicators?	/1/	DR	Yes. It will be possible to monitor the specified indicators.		OK
D.4.4. Will the indicators give opportunity for real measurements of baseline emissions?	/1/	DR	The parameters to be monitored give opportunity for real measurement of emission reductions.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
D.5. Monitoring of Sustainable Development Indicators/ Environmental Impacts <i>It is checked that choices of indicators are reasonable and complete to monitor sustainable performance over time.</i>					
D.5.1. Does the monitoring plan provide the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/ /10/	DR	The monitoring of sustainable development indicators is not required by the DNA of Chile nor ACM0001 Version 8.1.		OK
D.5.2. Is the choice of indicators for sustainability development (social, environmental, economic) reasonable?	/1/	DR	As mentioned above		OK
D.5.3. Will it be possible to monitor the specified sustainable development indicators?	/1/	DR	As mentioned above		OK
D.5.4. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	As mentioned above		OK
D.6. Project Management Planning <i>It is checked that project implementation is properly prepared for and that critical arrangements are addressed.</i>					
D.6.1. Is the authority and responsibility of project management clearly described?	/1/	DR I	The authority for project management is described in Annex 4 of the PDD. The responsibilities for collection of project related data, entering data into spreadsheet, making monthly and annual report, achieve data and reports, calibration/ maintenance/rectify data and GHG calculations have been allocated.		OK
D.6.2. Is the authority and responsibility for	/1/	DR	The authority for project monitoring,		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
registration, monitoring, measurement and reporting clearly described?		I	measurement and reporting is described in Annex 4, table: operational procedures and responsibilities for monitoring and quality assurance of emission reductions from the project activity.		
D.6.3. Are procedures identified for training of monitoring personnel?	/1/	DR I	Training is programmed once the equipment is installed and before the project starts operation. In addition, additional training is considered during the project period in order to keep operators up to date of maintenance and monitoring procedures.		OK
D.6.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR I	The operating hours of the flare are monitored and emission reductions are thus only claimed if LFG is flared. In addition operation training will provide awareness regarding emergencies which can cause unintended emissions. There are no likely cases of emergencies leading to unintended emissions.		OK
D.6.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR I	Carbon credit data controller is responsible for calibration of monitoring equipments.		OK
D.6.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR I	Carbon credit process manager is responsible for calibration of monitoring equipments.		OK
D.6.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR I	Carbon credit process manager is responsible for monitoring, measurements and reporting.		OK
D.6.8. Are procedures identified for day-to-day records handling (including what records to keep, storage area of records and how to process	/1/	DR I	Yes, as per table in Annex-4 of PDD. Most of the data is archived in electronic format which is in accordance with standard		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
performance documentation)			procedures established by the organisation.		
D.6.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR I	No such procedures are yet described and need to be developed and implemented at the latest prior to the start of the crediting period. This will then need to be verified during first periodic verification.		OK
D.6.10. Are procedures identified for review of reported results/data?	/1/	DR I	Quality management of operation is addressed in table of Annex 4 of PDD.		OK
D.6.11. Are procedures identified for internal audits of GHG project compliance with operational requirements where applicable?	/1/	DR I	Quality management of operation is addressed in table of Annex 4 of PDD. ISO 9001 will be used as base for the quality system.		OK
D.6.12. Are procedures identified for project performance reviews before data is submitted for verification, internally or externally?	/1/	DR I	Quality management of operation is addressed in table of Annex 4 of PDD. ISO 9001 will be used as base for the quality system.		OK
D.6.13. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR I	Quality management of operation is addressed in table of Annex 4 of PDD. ISO 9001 will be used as base for the quality system.		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
E. Calculation of GHG Emissions by Source <i>It is assessed whether all material GHG emission sources are addressed and how sensitivities and data uncertainties have been addressed to arrive at conservative estimates of projected emission reductions.</i>					
E.1. Project GHG Emissions <i>The validation of ex-ante estimated project GHG emissions focuses on transparency and completeness of calculations.</i>					
E.1.1. Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR	Relevant direct and indirect GHG emissions have been captured in the project design and through the application of the methodology. The amount of electricity used at the landfill itself will be monitored and accounted for in the project emissions.		OK
E.1.2. Are the GHG calculations documented in a complete and transparent manner?	/1/ /4/	DR	Yes.		OK
E.1.3. Have conservative assumptions been used to calculate project GHG emissions?	/1/ /4/	DR	Yes. The adjustment factor (AF) for the project is fixed at 5%.		OK
E.1.4. Are uncertainties in the GHG emissions estimates properly addressed in the documentation?	/1/	DR	No major uncertainties related to project GHG emissions are foreseen.		OK
E.1.5. Have all relevant greenhouse gases and source categories listed in Kyoto Protocol Annex A been evaluated?	/1/	DR	Yes mainly CH ₄ and CO ₂		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
E.2.Leakage <i>It is assessed whether there leakage effects, i.e. change of emissions which occurs outside the project boundary and which are measurable and attributable to the project, have been properly assessed and estimated ex-ante.</i>					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	/1/	DR	No leakage affects need to be accounted for under this methodology ACM0001.		OK
E.3.Baseline Emissions <i>The validation of ex-ante estimated baseline GHG emissions focuses on transparency and completeness of calculations.</i>					
E.3.1. Have the most relevant and likely operational characteristics and baseline indicators been chosen as reference for baseline emissions?	/1/	DR	Yes. Methane content in the LFG = 50%. Gas collection efficiency = 60%. Flare efficiency = 90%. Adjustment factor = 5% For the calculation of the grid emission factor in order to determine emission by the project activity an emission factor of 0.5230 was calculated.		OK
E.3.2. Are the baseline boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	/1/	DR	Yes, the baseline boundaries are clearly defined.		OK
E.3.3. Are the GHG calculations documented in a complete and transparent manner?	/1/	DR	Yes		OK
E.3.4. Have conservative assumptions been used	/1/	DR	Yes		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
when calculating baseline emissions?					
E.3.5. Are uncertainties in the GHG emission estimates properly addressed in the documentation?	/1/	DR	Actual emissions reductions will be calculated ex post and the baseline estimates are based on a consolidated methodology and experience. However, experiences with other landfills have shown that the methane generation and collection efficiency of the landfills projected by the first order decay model has an inherent uncertainty of almost 50% and hence the amount of CERs, which will be monitored ex-post, might vary from the projected amount.		OK
E.3.6. Have the project baseline(s) and the project emissions been determined using the same appropriate methodology and conservative assumptions?	/1/	DR	Yes		OK
E.4.Emission Reductions <i>Validation of ex-ante estimated emission reductions.</i>					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	/1/	DR	The average annual emission reduction forecast is 20 129 tCO ₂ e per year.		OK
F. Environmental Impacts <i>Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.</i>					
F.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/	DR	Yes the project will mainly have positive impacts, as it will reduce the: • Risk of explosion • Risk of emission of toxic gas release		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
			Risk of odour nuisances		
F.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/ /19/	DR I	Declaration of Environmental Impact was carried out in accordance with regulatory requirements, given that the Regional Commission of Environment needs to be informed about any kind of construction or modification made at the existing LF in accordance with the Resolution of the Environmental Qualification (RCA), article 17. The Declaration of Environmental was presented and approved on 07 December 2007	CAR-6	OK
F.1.3. Will the project create any adverse environmental effects?	/1/	DR	No adverse environmental impacts are expected to occur.		OK
F.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR	No significant transboundary impacts are expected to occur due to the project activity		OK
F.1.5. Have identified environmental impacts been addressed in the project design?	/1/	DR	Impacts have been sufficiently addressed and controls in place.		OK
F.1.6. Does the project comply with environmental legislation in the host country?	/1/	DR	Yes		OK
G. Stakeholder Comments <i>The validator should ensure that a stakeholder comments have been invited and that due account has been taken of any comments received.</i>					
G.1.1. Have relevant stakeholders been consulted?	/1/	DR I	The stakeholder consultation took place on 07 September 2006 nearby the project site at the locality of Coquimbo.		OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	The event was announced in the main national newspapers "El Dia" and "Las		OK

Checklist Question	Ref.	MoV*	Comments	Draft Concl	Final Concl
		I	ultimas noticias”; members of the community participated in the event. All participants were registered.		
G.1.3. If a stakeholder consultation process is required by regulations/laws in the host country, has the stakeholder consultation process been carried out in accordance with such regulations/laws?	/1/	DR I	Stakeholder consultation process for the project is not required by the legal regulations in Chile.		OK
G.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR I	No formal comments were received, only questions regarding the project activity in specific as well as LFG capture in dump sites and landfills in general, as well as about risk management in LFG projects.		OK
G.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR I	No actions were necessary in order to take due account of comments received.		OK

Table 2b: Additional requirements checklist for VVM version 1 (EB 44)

A.1. Letter of approval					
G.1.6. A.1.1 Is the LoA received directly from the DNA or through the project participant.	/1/ /2/ /3/	DR	The LoAs are received from the project participants.		OK
A.2. Project design					
A.2.1 Does the PDD describe the CDM project activity with all relevant elements in a transparent and accurate way?	/1/	DR	Yes, the PDD gives an accurate and sufficient description of the proposed project activity.		OK
A.2.2 Has the CDM project activity at the start of the validation been constructed or does the CDM project activity use existing	/1/	DR,	The starting date of the proposed project activity started is 1 August 2006, while the		OK

facilities or equipment?		I	PDD was published 22 September 2006. The project is a new project, not using existing equipment.		
A.2.3 Is the project a large scale project, a small scale project with average annual emission reductions above 15 000 tonnes or a bundled small scale project? Has on-site visit been carried out?	/1/ /10/	DR, I	The project is a large scale project, using the approved methodology ACM0001 version 8.1. A site-visit was carried out 9-10 November 2006.		OK
A.2.4 Does the project activity involved alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR I	No, the project activity will install new equipment that will completely replace old inadequate equipment.		OK
A.3. Project emissions not addressed by the methodology					
A.3.1 Does the methodology describe all project emission source for the project activity that contributes all 1% of the emission reductions? Sources that the methodology considers not to take into account are not relevant (e.g. cement and iron consumption for building hydropower plants).	/1/	DR	No other relevant project emission sources are identified.		OK
A.4. Documentation of baseline emissions					
A.4.1 Documentation of the baseline determination: - All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. - All documentation is relevant as well as correctly quoted and interpreted. - Assumptions and data can be deemed reasonable - Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. - The methodology has been correctly applied to	/1/	DR I	- All assumptions and data have been properly listed and referenced in the PDD - All documentation has been correctly interpreted, and is relevant for the project activity - All data and assumptions have been deemed reasonable by DNV - The relevant resolutions and policies are listed in the PDD - The baseline selection has been carried out in accordance with the methodology		OK

identify what would occurred in the absence of the proposed CDM project activity					
A.5. Documentation of the calculations					
A.5.1 Algorithms and/or formulae used to determine emission reductions - All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced - All documentation is correctly quoted and interpreted. - All values used can be deemed reasonable in the context of the project activity - The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be submitted for registration.	/1/ /4/	DR I	- All assumptions and data have been properly listed and referenced in the PDD - All documentation has been correctly interpreted, and is relevant for the project activity - All data and assumptions have been deemed reasonable by DNV - The emission reductions are calculated in accordance with the methodology		OK
A.6. Implementation of the monitoring plan					
A.6.1 How were the plans for implementation of the monitoring plan, data management, QA/QC procedures assessed? To what extent can the emission reductions achieved by the project be monitored ex-post and verified later by a DOE?	/1/	DR I	Plans for implementation of the monitoring plan, data management, QA/QC procedures are well described in the PDD and was found to be in accordance with the methodology. The emission reductions should be well documented and verifiable given that the monitoring plan is fulfilled.		OK
A.7. CDM consideration prior to starting date					
A.7.1 The prior consideration of CDM for the project activity complies with EB41 annex 46	/1/ /8/	DR	The prior consideration of CDM has been evidenced by a number of minutes of meeting prior to the project starting date, and complies with EB41 annex 46.		OK

Table 3 Resolution of Corrective Action and Clarification Requests

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
CAR 1 There is not evidence of the letter of approval of Chile and Annex I Country	Table 1	Letters of approval have been provided during follow up	The letters of approval from Chile and United Kingdom have been provided. The CAR is closed.
CAR 2 Crediting period should be revised in order not to start before the registration date	Table 1	It was stated to start on 01 January 2009 or on the date of registration whichever is later	The crediting period is revised to start on 15 June 2009 or the date of registration whichever is later. The CAR is closed.
CAR 3 Emission factor and CER calculations are still under revision. These two figures should be updated and send again for revision.		Presented in a new version in January 2008	OK. DNV has checked the updated CER calculations and was able to verify that the calculations are reasonable. The CAR is closed.
CAR 4 The annex 4 "Monitoring information" does not include in a consistent manner the information to be monitored through the life of the project according to section B.7.1 of the PDD. For instance the parameter related to electricity imported should be included as it is mentioned in section B.6.1 "Project emissions"		Modification into the PDD version 5	OK. The revised PDD takes into account the parameters to be monitored. The CAR is closed.
CAR 5 Percentage of LFG to be captured is not consistent between page 12 (section B.3) and page 22 (section B.6.3) of the PDD		Modification into the PDD version 5	OK. The percentage of LFG captured has been consistently applied in the revised PDD. The CAR is closed.
CAR 6		A Declaration of Environmental Impact	OK

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
There is not any reference to the requirements of point 17 of RCA (Resolución de calificación ambiental- resolution for Environmental Qualification) in order to clarify if is needed to notify to the authority about this project		was required. Actually it was presented and approved on 07 December 2007. reference to this point is done in section D.1 of PDD	The Declaration of Environmental Impact was verified and found appropriate. The CAR is closed.
CAR 7 Into page 15 of PDD section B.5 Sub-step 1b, is mentioned that law 19300 is not in force, however after the site visit was confirmed that the law which is not in force is the rule 189 instead of law 19300.		It was corrected into the section B.5	OK The legal requirements and enforcement have been updated in the revised PDD. The CAR is closed.
CAR 8 All references under section B.7.1 in PDD version 4 are wrong as they refer to section B.5 instead of B.6 as reference for the expected emission reductions.		Modification into the PDD version 5	OK. The revised PDD is found appropriate. The CAR is closed.
CAR 9 The project starting date must be in accordance to the glossary of CDM terms, i.e., the date on which the project participant has committed to expenditures related to the implementation or the construction of the project activity.		As per EB 41, the definition of projects start date is the following: "the earliest date at which either the implementation or construction or real action of a project activity begins". The EB added the following: "In light of the above definition, the start date shall be considered to be the date on which the project participant has committed to expenditures related to the implementation or related to the construction of the project activity." Therefore, taking the above into	Ok. The contract has been provided from the project proponent and verified by DNV. It states that Biogas commits to design, supply, install and operate the flaring system within a reasonable timeline. This CAR is closed.

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		account, the date when the contract between Biogas and TASUI was signed (August 2006) is deemed appropriate and should be accepted as the project start date. Extract of the contract can be found in the attached Pdf document.	
CAR 10 The alternatives for the baseline selection must include the utilization of LFG for heat generation.		The methodology ACM0001 vers 08.1 states :” If LFG is used for generation of electric or heat energy for export to a grid and/or to a nearby industry or used on-site, realistic and credible alternatives should also be separately determined for: • Power generation in the absence of the project activity; • Heat generation in the absence of the project activity. As there is no Heat exportation in this Project, the Heat alternatives shouldn't be included in the alternatives for the baseline selection. However, we have mentioned them in Step 1 and explained why those alternatives are not realistic credible alternatives.	OK. The alternative is included in the analysis. This CAR is closed.
CAR 11 As alternative 3, the utilization of LFG for electricity generation, is not prohibited by applicable laws or regulations, it must be included in the investment analysis. An appropriate analysis method must be		As DNV should know, the project faced severe delay in the past because it was not possible to get a LOA from the Chilean DNA, under the initial PDD design, including the power generation.	OK. DNV is aware of the severe delays caused by the difficulties in obtaining a Chilean LoA for the project including power generation, makes this

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
selected, and the calculations must be provided to DNV.		Therefore the project participant agreed to exclude the power generation of the PDD and develop the project as a flaring only landfill gas project (see Memo DNV 16Sept). <u>LFG 3</u> (power generation) has been rolled out and eliminated in sub-Steps 1a as it is NOT a realistic and credible alternative scenario. This is clearly explained with the barriers that the project developer faced (see PDD and Memo) and through a Financial analysis (see the attached Excel file). The Financial Analysis shows that the IRR is negative and therefore demonstrates that power generation is not an economically attractive solution. The remaining alternatives in Step 1 are LFG 1 and LFG 2, which both do not generate any revenue, therefore simple Cost Analysis is carried out in step 2. The additionality Tool indeed states: "If the CDM project activity generates no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I)." The aim of the Simple Cost Analysis is to prove that the project activity is less economically or financially less	alternative impossible. Furthermore, DNV accepts that the cost estimates have been provided by the technology provider, and the calculations clearly show that the IRR is negative, implying that that this alternative would have been unlikely even without the difficulties in obtaining the LoA. This CAR is closed.

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		attractive than at least one other alternative, identified in step 1. Finally, the result of the simple cost analysis shows that project activity is indeed at least less economically attractive than the baseline scenario (LFG1) and therefore the project is additional.	
CL 1 A project participant name "TASUI" has changed		Explanation and evidence will be provided to DNV to justify this change.	A letter from the withdrawn project participant confirming its voluntary withdrawal from the proposed project activity is received and will be submitted with the request for registration. The CL is closed.
CL 2 The PP must clarify how the representative sample of similar projects in the common practice analysis were selected.		The common Practice analysis was conducted back in 2006 when the validation started. A large sample of landfills in Chile was identified and most of the landfill at the time were not collecting/flaring LFG and simply vented LFG through the atmosphere. The identified landfills that were collecting and flaring LFG were actually projects developed under the CDM and therefore excluded of the common practice analysis. Some landfills that were identified in the	DNV can confirm that no similar activities have been observed in Chile, except from projects that are being developed as CDM projects. This CL is closed.

Draft report corrective action requests and requests for clarifications	Ref. to Table 2	Summary of project participants' response	Final conclusion
		common practice back in 2006 are now developed under the CDM, therefore excluded of the common practice. This clearly shows that installing a proper LFG capture/collection and flaring system IN Chile require the revenue of the CDM .	

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APPENDIX B

CERTIFICATES OF COMPETENCE



CERTIFICATE OF COMPETENCE

Mari Grooss Viddal

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-CDMJi-i1)

GHG Auditor:	Yes		
CDM Validator:	Yes	JI Validator:	--
CDM Verifier:	--	JI Verifier:	--
Industry Sector Expert for Sectoral Scope(s):	--		
Technical Reviewer for (group of) methodologies:			
ACM0001, AM0002, AM0003, AM0010, AM0011, AM0012, AMS-III.G	Yes		
ACM002, AMS-IA-D, AM0019, AM0026, AM0029, AM0045	Yes		

Høvik, 26 September 2007

Michael Lehmann

Michael Lehmann

Technical Director, International Climate Change Services

Technical Director



CERTIFICATE OF COMPETENCE

Barbara Lara

Qualification in accordance with DNV's Qualification scheme for CDM/JI (ICP-9-8-i1-
CDMJi-i1)

<i>GHG Auditor:</i>	Yes		
<i>CDM Validator:</i>		<i>JI Validator:</i>	--
<i>CDM Verifier:</i>	--	<i>JI Verifier:</i>	--
<i>Industry Sector Expert for Sectoral Scope(s):</i>	--		

Høvik, 2 May 2008

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Peter Molin

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas					
Hydro power	Jan 2009				
Renewables					
Wind power					
Other renewable					
Biomass					
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery					
Efficiency of thermal power plants					
Coal mine methane					
Fuel switch					
Manure management					
Waste / wastewater treatment					
Energy efficiency					
N ₂ O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO ₂ recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF ₆					

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Gustavo Godinez-Martinez

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
<i>Landfill gas</i>					
<i>Hydro power</i>					
<i>Renewables Wind power</i>					
<i>Other renewable</i>					
<i>Biomass</i>					
<i>Grid connection of isolated system</i>					
<i>Cement</i>					
<i>Waste-heat / waste-gas recovery</i>					
<i>Efficiency of thermal power plants</i>					
<i>Coal mine methane</i>					
<i>Fuel switch</i>					
<i>Manure management</i>					
<i>Waste / wastewater treatment</i>					
<i>Energy efficiency</i>					
<i>N₂O</i>					
<i>HFCs</i>					
<i>Flare reduction</i>					
<i>PFCs</i>					
<i>Charcoal</i>					
<i>CO₂ recovery</i>					
<i>Transport</i>					
<i>Non-renewable biomass</i>					
<i>Biofuel</i>					
<i>Pipeline leakage reduction</i>					
<i>SF₆</i>					

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann

Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Michael Lehmann

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Hydro power	Jan 2009	Jan 2009	Jan 2009		
Renewables Wind power	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Other renewable	Jan 2009	Jan 2009			
Biomass	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Grid connection of isolated system	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Cement	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste-heat / waste-gas recovery	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Efficiency of thermal power plants	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Coal mine methane	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Fuel switch	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Manure management	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste / wastewater treatment	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Energy efficiency	Jan 2009	Jan 2009		Jan 2009	Jan 2009
N ₂ O	Jan 2009	Jan 2009		Jan 2009	Jan 2009
HFCs	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Flare reduction	Jan 2009	Jan 2009		Jan 2009	Jan 2009
PFCs	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Charcoal	Jan 2009	Jan 2009		Jan 2009	Jan 2009
CO ₂ recovery	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Transport	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Non-renewable biomass	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Biofuel	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Pipeline leakage reduction	Jan 2009	Jan 2009		Jan 2009	Jan 2009
SF ₆	Jan 2009	Jan 2009		Jan 2009	Jan 2009

Høvik, 9 January 2009

Michael Lehmann

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Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Kumaraswamy Chandrashekara

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Hydro power	Jan 2009	Jan 2009			
Renewables Wind power	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Other renewable	Jan 2009	Jan 2009			
Biomass	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Grid connection of isolated system	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Cement	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste-heat / waste-gas recovery	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Efficiency of thermal power plants	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Coal mine methane	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Fuel switch	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Manure management	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Waste / wastewater treatment	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Energy efficiency	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
N ₂ O	Jan 2009	Jan 2009		Jan 2009	Jan 2009
HFCs	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Flare reduction	Jan 2009	Jan 2009		Jan 2009	Jan 2009
PFCs	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Charcoal	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
CO ₂ recovery	Jan 2009	Jan 2009	Jan 2009	Jan 2009	Jan 2009
Transport	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Non-renewable biomass	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Biofuel	Jan 2009	Jan 2009		Jan 2009	Jan 2009
Pipeline leakage reduction	Jan 2009	Jan 2009		Jan 2009	Jan 2009
SF ₆	Jan 2009	Jan 2009		Jan 2009	Jan 2009

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Anu Chaudhary

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas				Jan 2009	Jan 2009
Hydro power					
Renewables Wind power				Jan 2009	Jan 2009
Other renewable					
Biomass					
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery					
Efficiency of thermal power plants					
Coal mine methane					
Fuel switch					
Manure management					
Waste / wastewater treatment					
Energy efficiency					
N ₂ O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO ₂ recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF ₆					

Høvik, 9 January 2009

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CERTIFICATE OF COMPETENCE

Filipe Tavares

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas	Jan 2009	Jan 2009			
Hydro power	Jan 2009	Jan 2009			
Renewables					
Wind power					
Other renewable					
Biomass	Mar 2009	Mar 2009			
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery	Jan 2009				
Efficiency of thermal power plants					
Coal mine methane					
Fuel switch					
Manure management	Jan 2009	Jan 2009	Jan 2009		
Waste / wastewater treatment	Jan 2009	Jan 2009	Jan 2009		
Energy efficiency					
N ₂ O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO ₂ recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF ₆					

Høvik, 24 March 2009

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Services



CERTIFICATE OF COMPETENCE

Anjana Sharma

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-9-8-i1-CDMJ1-i1)

GHG Auditor:	Yes				
Technical Area	CDM Validator	CDM Verifier	Sector Expert	Methodology Expert	Technical Reviewer
Landfill gas				Jan 2009	Jan 2009
Hydro power	Jan 2009				
Renewables				Jan 2009	Jan 2009
Wind power					
Other renewable					
Biomass					
Grid connection of isolated system					
Cement					
Waste-heat / waste-gas recovery					
Efficiency of thermal power plants					
Coal mine methane					
Fuel switch					
Manure management					
Waste / wastewater treatment					
Energy efficiency					
N ₂ O					
HFCs					
Flare reduction					
PFCs					
Charcoal					
CO ₂ recovery					
Transport					
Non-renewable biomass					
Biofuel					
Pipeline leakage reduction					
SF ₆					

Høvik, 9 January 2009

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Services