



VALIDATION REPORT

BRAZIL NOVA GERAR LANDFILL GAS TO ENERGY PROJECT

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DET NORSKE VERITAS



VALIDATION REPORT

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Summary:

Det Norske Veritas Certification Ltd. (DNV Certification) has made a validation of the Brazil NovaGerar Landfill Gas to Energy Project (hereafter called "the project") located in Nova Iguaçu, State of Rio de Janeiro, Brazil, 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 rules and modalities and the subsequent decisions by the CDM Executive Board.

The validation consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan (December 2002 to February 2004), ii) follow-up interviews with project stakeholders (February 2003) and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion (February 2003 to August 2004).

In summary, it is DNV Certification's opinion that the Brazil NovaGerar Landfill Gas to Energy Project, as described in the revised and resubmitted project design documentation of February 2004, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria. DNV Certification thus requests the registration of the Brazil NovaGerar Landfill Gas to Energy Project under the CDM.

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Abbreviations

ABES	Associacao Brasileira de Engenharia Sanitaria e Ambiental
BLS	Baseline Study
CDM	Clean Development Mechanism
CAR	Corrective Action Request
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CL	Clarification
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
CH ₄	Methane
DNA	Designated National Authority (for the CDM)
DNV	Det Norske Veritas
EMLURB	Empresa Municipal de Limpeza Urbana
EPA	Environmental Protection Agency
FEEMA	State authority responsible for environmental licences
GHG	Greenhouse gas(es)
GJ	Giga joule
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IBRD	International Bank for Reconstruction and Development (IBRD)
LFG	Landfill gas
LoA	Letter of Approval
MP	Monitoring Plan
MSW	Municipal Solid Waste
MWh	Mega watt hour
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PCF	Prototype Carbon Fund
PDD	Project Design Document
tC	Tonnes of carbon, units for carbon calculations
tCO ₂	Tonnes of carbon dioxide, units for carbon calculation
WB NCDF	World Bank Netherlands Clean Development Facility



1 INTRODUCTION

The World Bank's Carbon Finance Unit has commissioned Det Norske Veritas Certification Ltd. (DNV Certification) to validate the Brazil NovaGerar Landfill Gas to Energy Project (hereafter called "the project") in Nova Iguaçu, Rio de Janeiro, Brazil.

This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation team consists of the following personnel:

Ms Mari Grooss Viddal	DNV Norway	Team Leader, GHG auditor
Mr Luis Filipe Aboim Tavares	DNV Brazil	GHG auditor
Mr Michael Lehmann	DNV Norway	GHG auditor
Dr. Tsuyoshi Nakao	DNV Japan	GHG auditor, landfill expert
Mr Einar Telnes	DNV Norway	Internal verifier

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 Validation 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 rules and modalities as agreed in the Marrakech Accords and the relevant decisions by the CDM Executive Board. The validation team has, based on the recommendations in the Validation and Verification Manual /8/, employed a risk-based approach, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is based on the information made available to DNV Certification and the engagement conditions detailed in this report. However, DNV Certification can not guarantee the accuracy or correctness of third party information used as references in the PDD or used by DNV Certification to verify information contained in the PDD. Hence, DNV Certification can not be held liable by any party for decisions made or not made based on the validation opinion.

The validation is not meant to provide any consulting towards World Bank's Carbon Finance Unit. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the project design.



1.3 Brazil NovaGerar Landfill Gas to Energy Project

In 2001, S.A. Paulista was granted a 20-year concession by the Empresa Municipal de Limpeza Urbana (EMLURB - Municipal Waste Collection Company, a Nova Iguaçu municipality government agency responsible for waste collection and disposal) to manage the Marambaia and Adrianópolis landfills (officially called 'Lixão de Marambaia' and 'Aterro Sanitário de Adrianópolis') in the state of Rio de Janeiro, and to explore the landfill gas potential of these sites. As part of this concession, S.A. Paulista is contractually obliged to decommission and rehabilitate the Lixão Marambaia site, which opened in 1986 and ceased operation in late 2002 with approximately 2 million tonnes of waste deposited. The Adrianópolis site commenced operation in early 2003 and it is anticipated that it will receive an average of 2,000 tonnes of municipal waste per day.

The objective of Brazil NovaGerar Landfill Gas to Energy Project is to explore the landfill gas (LFG) collection and utilization activities of the landfills managed by S.A. Paulista. This will involve investing in a gas collection system, leachate drainage system and a modular electricity generation plant at each landfill site (with expected final total capacity of 12 MW), as well as a generator compound at each site. The generators will combust LFG to produce electricity for export to the grid. Excess LFG, and all gas collected during periods when electricity is not produced, will be flared.

The project intends to avoid methane emissions by collection and combustion or flaring of LFG captured at the Marambaia and Adrianópolis Landfills and is expected to reduce emissions of 14,072 million tonnes of CO_{2e} over a 21 years crediting period. In addition, the project will lead to emission reductions attributable to the displacement of grid electricity, but these will not be claimed by NovaGerar.

The project participants for the project are NovaGerar EcoEnergia Ltda, a joint venture between EcoSecurities and S.A. Paulista, and the World Bank Netherlands Clean Development Facility (WB NCDF). The International Bank for Reconstruction and Development (IBRD) is the Trustee of the WB NCDF and purchases certified emissions reductions on behalf of and for the Government of the Netherlands.



2 METHODOLOGY

The validation of the project was started in December 2002 and was concluded in August 2004. The validation consisted of the following three phases:

- I a desk review of the project design and the baseline and monitoring methodology (December 2002 to February 2004)
- II follow-up interviews with project stakeholders (February 2003)
- III the resolution of outstanding issues and the issuance of the validation report and opinion (February 2003 to August 2004).

In April 2003 the baseline and monitoring methodology employed by the project was submitted to CDM Executive Board (EB) for review. After first requesting changes to the proposed methodology, resulting in a resubmission of the methodology in July 2003, the EB eventually approved the methodology at its 11th meeting 16-17 October 2003.

Following the approval of the baseline and monitoring methodology and its publication in its final form (AM0003) on the CDM website, the project design documents were finalized and in February 2004 submitted to DNV Certification for final review.

Following DNV Certification's accreditation for sectoral scope 13 (Waste handling and disposal), Parties, stakeholders and UNFCCC accredited NGOs were invited on 5 April 2004 to comment on the validation requirements until 5 May 2004.

Finally, based on DNV Certification's preliminary validation report of 16 February 2004 (version 02), the Brazilian DNA and subsequently the Dutch DNA approved the project on 2 June 2004 and 31 August 2004, respectively.

2.1 Desk Review

The initial and revised versions of the project documents submitted by the World Bank's Carbon Finance Unit, i.e. the Project Design Document (PDD) /1/, the Baseline Study /2/, the Monitoring Plan (MP) /3/ and the Monitoring Workbook /4/ for the Brazil NovaGerar Landfill Gas to Energy Project, were reviewed. Additional background documents /5/-/10/ related to the project design and the baseline were also consulted.

The project design documents underwent several revisions. To address DNV Certification's corrective action and clarification requests, the World Bank's Carbon Finance Unit revised the project design documents of December 2002 and resubmitted on February 2003 a new set of project design documents. An again slightly revised version of the project design documents was in April 2003 submitted to the CDM Executive Board for review of the proposed new baseline and monitoring methodologies employed by the project. To address changes to the baseline and monitoring methodologies requested by the CDM Executive Board, the project design documents were further revised and resubmitted in July 2003. Eventually, final versions of the PDD, MP and Monitoring Workbook were submitted to DNV Certification in February 2004 for final review.

The final validation findings presented in this report relate to the project as described in the project design documents of February 2004.



In order to ensure transparency, a validation protocol has been customised and used for the project, according to the Validation and Verification Manual /8/. The protocol shows, in a 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 validation 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.

Findings established during the validation can either be seen as a non-fulfilment of validation 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) CDM or host Party 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* may be used where additional information is needed to fully clarify an issue.

2.2 Follow-up Interviews

On 11 February 2003, DNV Certification performed interviews with Brazilian project stakeholders to confirm selected information and to resolve issues identified in the document review. Representatives of EcoSecurities /11/, Nova Iguaçu Municipality /12/ and S.A. Paulista /13/ were interviewed. The main topics of the interviews were:

- the GHG calculations,
- the monitoring and management system, and
- the assumptions for the baseline.

The results from the follow-up interviews are documented in the validation protocol in Appendix A to this report.

2.3 Resolution of Outstanding Issues and Final Validation Opinion

The objective of this phase of the validation was to resolve *Corrective Actions Requests* and requests for *Clarification* and any other outstanding issues which needed to be clarified for the validation team's positive conclusion on the project design.

The six *Corrective Action Requests* and six requests for *Clarification* raised by the validation team were resolved through communications with the project participants, i.e. the World Bank's Carbon Finance Unit, EcoSecurities and S.A. Paulista. To guarantee the transparency of the validation process, the concerns raised by DNV Certification and the response provided by the project participants are documented in Table 3 of the Validation Protocol in Appendix A.



Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities			
Requirement	Reference	Conclusion	Cross reference
<i>The requirements the project must meet.</i>	<i>Gives reference to the legislation or agreement where the requirement is found.</i>	<i>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.</i>	<i>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.</i>

Validation Protocol Table 2: Requirement Checklist				
Checklist Question	Reference	Means of verification (MoV)	Comment	Draft and/or Final Conclusion
<i>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.</i>	<i>Gives reference to documents where the answer to the checklist question or item is found.</i>	<i>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.</i>	<i>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.</i>	<i>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.</i>

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

Figure 1 Validation protocol tables



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 validation findings relate to the project design as documented and described in the revised and resubmitted project design documentation of February 2004.

The findings are structured to reflect the main parts of the validation scope:

- Participation Requirements
- Project design
- Contribution to sustainable development,
- Baseline and additionality of project,
- Monitoring plan,
- Calculation of GHG emissions,
- Environmental impacts,
- Comments by local stakeholders

3.1 Participation Requirements

Both participating Parties, Brazil as the host Party and the Netherlands as the Annex-I Party meet all relevant participation requirements. The Brazilian DNA approved the project on 2 June 2004. The LoA of the Brazilian DNA identifies NovaGerar Ltda as the project participant and thus implicitly authorizes NovaGerar Ltda. to participate in the proposed CDM project activity. The Dutch DNA approved the project on 31 August 2004 and authorized IBRD, the Trustee of the WB NCDF, to participate in the proposed CDM project activity.

3.2 Project Design

The objective of the NovaGerar joint venture is to collect landfill gas (LFG) of the Marambaia and Adrianópolis landfills (officially called 'Lixão de Marambaia' and 'Aterro Sanitário de Adrianópolis') in the state of Rio de Janeiro and to utilize the LFG for electricity generation or flare the LFG. The project plans to implement a gas collection system, leachate drainage and treatment system and a modular electricity generation plant at each landfill site (with expected final total capacity of 12 MW).

The proposed landfill gas collection system and electricity generation technology represent leading edge technology for landfill management in Brazil, and the project design represents good practise. This includes landfill cells coated with an impermeable high-density polyethylene membrane and water residues will be channelled and treated in a wastewater treatment plant. Landfill gas will be collected by a gas collection system, and channelled to the electricity generation units. Excess gas will be flared. Advice will be provided by EnerG, a British specialist landfill gas-to-energy company.

The project design is sound and the geographical (Marambaia and Adrianópolis Landfills) and temporal boundaries (21 years-crediting period) of the project are clearly defined. The project consists of two components:



1. Collection and combustion or flaring of LFG, reducing the uncontrolled release of methane
2. Generation of electricity from LFG, reducing CO₂ emissions associated with the use of grid electricity.

Emission reductions from the latter, i.e. emission reductions attributable to the displacement of grid electricity, will not be claimed by the project.

3.3 Contribution to Sustainable Development

By collecting and combusting landfill gas, the sanitary landfills will reduce emissions from uncontrolled releases and reduce risks of toxic effects. In addition, some jobs will be created for operation and management. Moreover, ca. 10% of the electricity generated from the landfills will be donated to the municipality.

In its LoA of 2 June 2004, the Brazilian DNA confirmed that the project will assist in achieving sustainable development.

3.4 Baseline and Additionality of the Project

The project applies the baseline methodology “Simplified Financial Analysis for Landfill Gas Capture Projects” (AM0003), which was specifically developed for this project. The methodology is applicable to landfill gas capture project activities where:

- The captured gas is flared; or
- The captured gas is used to generate electricity, but no emission reductions are claimed for displacing or avoiding electricity generation by other sources.

The project falls under the latter case.

The methodology is further applicable where the only plausible outcomes are a business-as-usual scenario (with minor changes and modifications) and the proposed project. In other words, the methodology is inapplicable where a plausible outcome is a substantial change in practice or technology different from the proposed technology. The analysis of three possible baseline alternatives shows that the most likely baseline scenario is the continued non-utilization of LFG. In the opinion of the validation team, the selected baseline scenario, i.e. the continued non-utilization of LFG, is reasonable for the first 7 years crediting period of 2004-2010.

The baseline scenario is determined based on an analysis of current practices and current and foreseeable regulations in the waste management sector. Current Brazilian legislation does not require that landfills collect and dispose landfill gas. The Ministry of the Environment has no immediate plans to introduce legislation requiring the collection and flaring of landfill gas from landfill sites. A new waste management policy (National Policy for Solid Waste) is discussed. However, the policy does not consider landfill gas control.

An analysis of the economic attractiveness of the project alternative without the revenue from carbon credits using an IRR calculation and comparison of the results with a reasonable expected return on investment in Brazil is used to demonstrate that the project is not an economically attractive course of action. The IRR of the project without CER revenues is negative. Due to the above investment barriers, the project is thus not a likely baseline scenario.



The project is part of a large program initiated by the Municipality of Nova Iguaçu for collection of urban waste in the municipality. The second phase of this program is based on the construction of a state-of-the-art Waste Treatment Plant, of which these landfills are a central component, together with units to treat hospital and construction waste, as well as a wastewater treatment plant. The program has already obtained the necessary environmental licenses from FEEMA (the state authority responsible). Hence, DNV Certification requested further information on the requirements in the environmental licenses and the content of the program to assess whether LFG capture and electricity generation are required by the Environmental License and/or the Municipality Program.

There are no contractual/concession requirements on venting or flaring gas in the concession for the Adrianópolis site. For the Marambaia landfill, the contract foresees remediation of the existing dump and installation of a rudimentary gas drain net and some flares for safety reasons as a part of the bidding documents. However, it contains no specification with regard to the percentage of gas that needs to be collected and flared to meet this contractual requirement. DNV Certification acknowledges that LFG collection and flaring at the Adrianópolis landfill is not likely to be implemented in absence of the project and that the LFG collection efficiency at the Marambaia landfill is likely to be low in absence of the project. Given that the Marambaia site is away from any human settlements, it is reasonable to assume that no more than 20% of gas would need to be flared to sufficiently mitigate the risk of explosions. Therefore, the 20% discount on ERs claimed by the project for the Marambaia landfill is deemed sufficient to allow for potential flaring of LFG in the baseline scenario to meet the requirements of the Marambaia concession/bidding documents. For the Adrianópolis site, it is reasonable to not discount ERs as there are no regulatory nor concession/contract requirements to vent or flare gas.

The baseline will need to be revalidated prior to the start of a new 7 years crediting period to ensure that the assumptions made still hold true. The introduction of Brazilian legislation regarding the collection and flaring of LFG will be monitored annually as part of the monitoring plan.

3.5 Monitoring Plan

The project applies the monitoring methodology “Simplified Financial Analysis for Landfill Gas Capture Projects” (AM0003), which was developed based on the Brazil NovaGerar Landfill Gas to Energy Project. This monitoring methodology can be used for project activities that reduce greenhouse gas emissions through landfill gas capture and destruction of the methane by flaring and/or generation of electricity. This is the case for the project.

The monitoring methodology directly measures methane emissions avoided by the project. The choice of the indicators LFG collected and flared/ combusted, electricity generated (although no emission reductions attributable to the displacement of grid electricity are claimed) and methane fraction of LFG are appropriate for determining the methane emissions avoided by the project. Moreover, the generator heat rate and flare efficiency will be monitored to ensure efficient combustion and flaring, respectively, of LFG and in particular the methane contained in the LFG.

Sustainability development indicators are defined (i.e. remediation of the Marambaia site, job creation, health care of workers, working conditions, ground water quality in Marambaia and



Adrianópolis, native forest restoration and biodiversity) and the monitoring plan provides for the monitoring of these indicators.

The management system necessary for consistent project operations, monitoring and reporting, i.e. responsibilities and procedures for monitoring of emission reductions, procedures for training of staff, calibration of measurement equipment, internal audits and corrective actions are sufficiently described.

3.6 Calculation of GHG Emissions

The methodologies for calculating emission reductions are transparently documented and comply with existing good practice. The project intends to avoid methane emissions by collection and combustion or flaring of LFG captured at the Marambaia and Adrianópolis landfills and is expected to reduce emissions of 14,072 million tonnes of CO_{2e} over a 21 years crediting period. In addition, the project will lead to emission reductions attributable to the displacement of grid electricity, but these will not be claimed.

CO₂ emissions resulting from flaring of methane can be considered as carbon neutral in line with the IPCC Good Practise Guidance which states that “CO₂ emissions from landfill gas recovery combustion are of biogenetic nature and should not be included” /6/.

The only potential significant source of leakage, i.e. the emissions resulting from generating the electricity used to pump the landfill gas in the additional collection equipment, is identified and discussed. As sufficient electricity is generated from the recovered LFG to operate the collection system, the project is unlikely to cause any significant leakage effects.

The baseline methane emissions avoided by the project, i.e. the emission reductions achieved by the project, will be determined *ex-post* by monitoring the LFG collected and combusted or flared and consequently the methane emissions avoided by the project.

For the *ex-ante* estimation of emission reductions the expected LFG generation of the Marambaia and Adrianópolis were estimated using the first order decay model equation from the US EPA manual “Turning a Liability into an Asset: A Landfill Gas to Energy Handbook for Landfill Owners and Operators” /7/. The US EPA model is a common model and useful for the estimation of gas emitted from landfill. Because of the uncertainty in estimating the theoretical amount of LFG generated (L_0) and the rate of LFG generation (k), the US EPA suggests that gas flow estimates should be bracketed by a range of plus or minus 50 percent /7/. Estimated methane emissions are discounted by 25% for uncertainties in this project, but for a more conservative estimate, LFG predictions should be discounted by 50% as recommended by the US EPA.

Moreover, the US EPA indicates that gas collection efficiency of 75 – 85 percent is a reasonable assumption. Similar projects have used 75% or 80% as assumed gas collection efficiency. For estimating methane emissions from the proposed project, a LFG collection efficiency of 85% is used. However, for a more conservative estimation of the methane emissions a lower LFG collection efficiency should be used.

Currently contracted waste volumes and anticipated growth in waste were assumed. For the Adrianópolis landfill it was assumed that it will receive an average of 2,000 tonnes of waste per day over the licence period, gradually increasing to over 3,000 tonnes per day.



3.7 Environmental Impacts

Social and environmental impacts of the project have been sufficiently addressed. An Environmental Impact Assessment was conducted and approved as a requirement to obtain the environmental licenses to operate the new Adrianópolis landfill.

The project is not expected to create any significant adverse environmental effects. On the contrary, by collecting and combusting landfill gas, the project's sanitary landfills will reduce emissions from uncontrolled releases and reduce the risks of toxic effects on the local community and local environment. Leachate treatment will be carried out through evaporator facilities. To monitor the efficiency of the leachate collection and treatment system, ground water quality data will be collected.

3.8 Comments by Local Stakeholders

A Stakeholder Consultation process for the NovaGerar project was carried out by an independent organisation, i.e. ABES (Associação Brasileira de Engenharia Sanitária e Ambiental). The process was based on meetings and interviews and was concluded by the end of 2002. The conclusions from the consultation were made available to the public.

A summary of the comments received and how due account was taken of the comments received is included in the PDD. All organisations agreed with the project concept. 50% of the contacted stakeholders recognised the project's contribution to mitigate climate change.



4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

According to the modalities for the validation of CDM projects, the validator shall make publicly available the project design document and receive, within 30 days, comments on the validation requirements from Parties, stakeholders and UNFCCC accredited non-governmental organisations (NGOs) and make them publicly available.

DNV Certification published the initial project design documents of December 2002 on the DNV Climate Change web site* on 21 December 2002 and stakeholders were through the Climate-L Info Mailing List invited to provide comments within 20 January 2003. One comment was received in this period. The comment (in unedited form) and DNV Certification's response is given the below text box.

After approval of the baseline and monitoring methodology applied by the project, comments on the final project documents were once more invited. The final project documents of February 2004 were on 5 April 2004 published on the DNV Climate Change web site and Parties, stakeholders and UNFCCC accredited NGOs were, through the UNFCCC CDM web site, invited to provide comments during a 30 days period until 5 May 2004. No comment was received in this period.

Comment by: Gilles Goepfert, Carbol

Inserted on: 2002-12-27

Subject: NovaGerar-Baseline

Comment:

In appendix 3 of the baseline document since the organic content is known as 77% a more conservative approach would have been to use a factor of 22.36 (i.e. $23 \cdot 77 + 20.25 \cdot 23$) to account for the possible degradation of non organic content into methane.

To increase the project benefits, would it not be possible to convert the trucks used to bring waste to the facility to methane so as to reduce the CO₂ emissions from fuel use. This possibly could accounted for as additional CER.

DNV Certification's response:

Although only 77% of the waste is of organic nature, methane in LFG is almost to 100% biogenic. This is confirmed by the IPCC Guidelines which state that "CO₂ emissions from landfill gas recovery combustion are of biogenetic nature and should not be included" (Good Practise Guidance and Uncertainty Management in National Greenhouse Gas Inventories, p. 5.9).

Conversion of trucks is seen as an improvement suggestion, but will not affect the conclusions of the validation as long as the transportation and landfill management comply with existing requirements.

* <http://www.dnv.com/certification/ClimateChange>



5 VALIDATION OPINION

Det Norske Veritas Certification Ltd. (DNV Certification) has made a validation of the Brazil NovaGerar Landfill Gas to Energy Project (hereafter called “the project”) located in Nova Iguaçu, State of Rio de Janeiro, Brazil, 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 rules and modalities and the subsequent decisions by the CDM Executive Board.

The validation consisted of the following three phases: i) a desk review of the project design and the baseline and monitoring plan (December 2002 to February 2004), ii) follow-up interviews with project stakeholders (February 2003) and iii) the resolution of outstanding issues and the issuance of the final validation report and opinion (February 2003 to August 2004). The validation of the initial project design documentation raised several concerns and changes to the proposed new baseline and monitoring methodology were requested by the CDM Executive Board. To resolve DNV Certification's concerns and to address the request made by the CDM Executive Board, the project design documentation was revised and resubmitted for validation.

The new baseline and monitoring methodology proposed for the project was approved by the CDM Executive Board (AM0003). The determination of the baseline is well elaborated, transparent and sufficiently supported with facts. The selected baseline scenario, i.e. the continued non-utilization of LFG, is reasonable for the first 7 years crediting period of 2004-2010. Moreover, an analysis of the economic attractiveness of the project alternative without the revenue from carbon credits demonstrates that project is not a likely baseline scenario.

The project is likely to mitigate GHG emissions by a) collection and combustion or flaring of landfill gas (LFG) captured at the Marambaia and Adrianópolis landfills and b) generating electricity from LFG partly displacing fossil-fuel based grid electricity. However, potential emission reductions resulting from the supply of electricity to the regional grid will not be claimed by the project. The project results in the reduction of methane emissions that are real, measurable and give long-term benefits and that are additional to what would have occurred in the absence of the project.

By collecting and combusting LFG, the project will reduce emissions from uncontrolled releases and reduce risks of toxic effects. In addition, some jobs will be created for operation and management. Moreover, ca. 10% of the electricity generated from the landfills will be donated to the municipality. In its Letter of Approval of 2 June 2004, the Brazilian DNA confirmed that the project will assist Brazil in achieving sustainable development.

In summary, it is DNV Certification's opinion that the Brazil NovaGerar Landfill Gas to Energy Project, as described in the revised and resubmitted project design documentation of February 2004, meets all relevant UNFCCC requirements for the CDM and all relevant host country criteria. DNV Certification thus requests the registration of the Brazil NovaGerar Landfill Gas to Energy Project under the CDM.



REFERENCES

Category 1 Documents:

Documents provided by the project proponents that relate directly to the GHG components of the project. These have been used as direct sources of evidence for the determination conclusions.

- /1/ EcoSecurities: *Brazil NovaGerar Landfill Gas to Energy Project, Project Design Document*, February 2004 (First version: December 2002, Revisions: April and July 2003).
- /2/ EcoSecurities: *Evaluation of the emission reductions potential of the Brazil NovaGerar Landfill Gas to Energy Project, Final Baseline Report*. April 2003 (First version: December 2002)
- /3/ EcoSecurities: *Brazil NovaGerar Landfill Gas to Energy Project, Monitoring Plan*. February 2004 (First version: December 2002, Revisions: April and July 2003).
- /4/ EcoSecurities: *Emission Reduction Monitoring Workbooks for Marambaia and Adrianópolis Landfill*. February 2004 (First version: December 2002).

Category 2 Documents:

Background documents related to the design and/or methodologies employed in the design or other reference documents. Where applicable, Category 2 documents have been used to check project assumptions and confirm the validity of information given in the Category 1 document.

- /5/ DNV: *Pilot Validation of the Liepaja solid waste management project* http://www.prototypecarbonfund.org/docs/Latvia_validation_opinion.doc
- /6/ IPCC: *Third Assessment Report*, <http://www.unfccc.int/ipcc>
- /7/ US EPA: *Turning a Liability into an Asset: A Landfill Gas to Energy Handbook for Landfill Owners and Operators*. <http://epa.gov/warmingclimate>
- /8/ International Emissions Trading Association (IETA) & the World Bank's Prototype Carbon Fund (PCF): *Validation and Verification Manual*. <http://www.vvmanual.info>
- /9/ Energy Information Administration: *Country Analysis Brief - An overview of the energy situation in this country, An Energy Overview of Brazil, and Brazil: Environmental Issues*. <http://www.eia.doe.gov/>. August 12, 2002.
- /10/ F. Kreith: *Handbook of Solid waste management*. 1994.

Persons interviewed:

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

- /11/ Eco Securities, 11 February 2003:
 - Nuno de Faria Cunha e Silva
 - Paulo Braga



- /12/ Nova Iguaçu Municipality, 11 February 2003:
- Paulo Castro Saldanha, Municipal Secretary
 - Gertrudes Nogueira, Msc Environmental Assessor
- /13/ S.A.Paulista, 11 February 2003:
- Arthur César Oliveira, Oper. Manager
 - Jofif Melamed, Ind. Director
 - Adriana V. M. Felipetto, Env. Engineer
 - Henrique Soares, Plant Engineer

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APPENDIX

A

VALIDATION PROTOCOL

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, Marrakesh Accords, CDM Modalities §40a	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, Marrakesh Accords, CDM Modalities §40a	OK	Brazil: Letter of Approval (LoA) of 2 June 2004. Netherlands: Declaration of Approval of 31 August 2004.
5. Private and/or public entities shall have the authorization to participate in the CDM by the Designated National Authority of the Party in which the entity is a legal entity	CDM Modalities and Procedures § 33	OK	The LoA of the Brazilian DNA identifies NovaGerar Ltda as the project participant and thus implicitly authorizes NovaGerar Ltda. to participate in the proposed CDM project activity. In its letter of authorization of 31 August 2004 the Dutch DNA authorized the IBRD, the Trustee of the WB NCDF, to participate in the proposed CDM project activity.
6. The emission reductions shall 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

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference / Comment
7. Reduction in GHG emissions shall 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. 12.5c, Marrakesh Accords, CDM Modalities §43	OK	Table 2, Section B.2
8. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance	Marrakech Accords	OK	In its Declaration of Approval of 31 August 2004, the Dutch DNA declares that for the purchase of CERs from this project public funding from the State of the Netherlands is involved. It confirms that this funding does not result in a diversion of official development assistance and is separate from and not counted towards the financial obligations of the State of Netherlands in that respect.
9. Parties participating in the CDM shall designate a national authority for the CDM	Marrakech Accords, CDM Modalities §29	OK	The Brazilian DNA for the CDM is the Comissão Interministerial de Mudança Global do Clima. The Dutch DNA is the Ministry of Housing, Spatial Planning and the Environment (VROM).
10. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	Marrakech Accords, CDM Modalities §30	OK	Brazil ratified the Kyoto Protocol on 23 August 2002. The Netherlands ratified the Kyoto Protocol on 31 May 2002.
11. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	OK	The Netherlands' assigned amount is 92% of the emission in 1990.

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference / Comment
12. 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 Netherlands have in place a national registry and reported on 1 April 2004 its national GHG inventory for the years 1990-2002.
13. Comments by local stakeholders shall be invited, a summary of these provided and how due account was taken of any comments received	Marrakech Accords, CDM Modalities §37b	OK	Table 2, Section G
14. Documentation on the analysis of the environmental impacts of the project activity, including transboundary impacts, shall be submitted, and, if those impacts are considered significant by the project participants or the Host Party, an environmental impact assessment in accordance with procedures as required by the Host Party shall be carried out.	Marrakech Accords, CDM Modalities §37c	OK	Table 2, Section F
15. Baseline and monitoring methodology shall be previously approved by the CDM Executive Board	Marrakech Accords, CDM Modalities §37e	OK	Table 2, Section B.1.1 and D.1.1
16. 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	Marrakech Accords, CDM Modalities §37f	OK	Table 2, Section D
17. 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	Marrakech Accords, CDM Modalities, §40	OK	The PDD was published on 5 April 2004 on http://www.dnv.com/certification/ClimateChage . Parties, stakeholders and NGOs were through the CDM website invited to provide comments until 5 May 2004 on the validation requirement. No comment was received during this period.

REQUIREMENT	REFERENCE	CONCLUSION	Cross Reference / Comment
18. A baseline shall be established on a project-specific basis, in a transparent manner and taking into account relevant national and/or sectoral policies and circumstances	Marrakech Accords, CDM Modalities, §45c,d	OK	Table 2, Section B.2
19. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure	Marrakech Accords, CDM Modalities, §47	OK	Table 2, Section B.2
20. The project design document shall be in conformance with the UNFCCC CDM-PDD format	Marrakech Accords, CDM Modalities, Appendix B, EB Decisions	OK	The PDD is in conformance with version 01 of the CDM-PDD.

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	The NovaGerar Marambaia and Adrianopolis Landfill in Nova Iguaçu, Rio de Janeiro, Brazil confines the project's spatial boundaries.		OK
A.1.2. Are the project's system (components and facilities used to mitigate GHGs) boundaries clearly defined?	/1/ /2/	DR	The project's system boundaries are clearly defined. The components and facilities used to mitigate GHGs are the collection and combustion or flaring of the landfill gas captured at the Marambaia and Adrianópolis Landfills. The electricity generated from landfill gas will be used for the combustion and replace CO2 emissions associated with the use of grid electricity. Emission reductions resulting from replacing grid electricity will not be claimed by the NovaGerar project.		OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
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 I	Yes, the proposed landfill gas collection technology and energy generation technology represent leading edge technology for landfill management and the project design represents good practise. The technology for leachate treatment needs to be further explained, as there have been problems with similar technology in other landfills in Brazil.	CL1	OK
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 I	The landfill will be managed according to the latest technology, with additional advice provided by EnerG, a British specialist landfill gas-to-energy company. The waste disposal in Brazil is mainly dumps (lixões) or controlled landfills.		OK
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR I	The landfill gas capture and combustion technology to produce electric energy will not likely be substituted by other more efficient technologies.		OK
A.2.4. Does the project require extensive initial training and maintenance efforts in order to work as presumed during the project period? If yes, does the project make provisions for meeting training and maintenance needs?	/1/ /3/	DR	The necessary provisions related to maintenance are established in the MP. Training systems related to the new technology should be addressed in the MP.	CL2	OK

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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/	DR	The project has obtained the necessary operating licence and is in line with relevant legislation. An EIA was conducted for the new Adrianopolis landfill.		OK
A.3.2. Is the project in line with host-country specific CDM requirements?	/1/	DR	The project is in line with Brazil requirements for CDM projects. In its Letter of Approval of 2 June 2004, the Brazilian DNA approved the project.		OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/	DR	In its LoA of 2 June 2004, the Brazilian DNA confirmed that the project will assist in achieving sustainable development. Moreover, the project is in line with sustainable development policies according to an IBAMA paper.		OK
A.3.4. Will the project create other environmental or social benefits than GHG emission reductions?	/1/ /2/ /3/	DR	By collecting and combusting landfill gas, the sanitary landfills will reduce emissions from uncontrolled releases and reduce risks of toxic effects. The collection and treatment of contaminated leachate and surface run-off will result in environmental improvements. Leachate treatment technology will be further investigated. In addition, some jobs will be created for operation and management. Ca. 10% of the electricity generated from the landfills will be donated to the municipality.		OK

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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/	DR	The project applies baseline methodology AM0003: Simplified Financial Analysis for Landfill Gas Capture Projects.		OK
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	/1/	DR	<p>Baseline methodology AM0003 was specifically developed for this project.</p> <p>The methodology is applicable to landfill gas capture project activities where:</p> <ul style="list-style-type: none"> - The captured gas is flared; or - The captured gas is used to generate electricity, but no emission reductions are claimed for displacing or avoiding electricity generation by other sources. <p>The project falls under the latter case.</p> <p>The methodology is further applicable only where the only plausible outcomes are a business-as-usual scenario (with minor changes and modifications) and the proposed project. In other words, the methodology is inapplicable where a plausible outcome is a substantial change in practice or technology different from the proposed technology.</p>		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			The analysis in section B.3. of the PDD shows this to be the case for the project.		
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/ /2/	DR	<p>The methodology is applied in the following way:</p> <p>1. Analysis of the economic attractiveness of the project alternative without the revenue from carbon credits using an IRR calculation and comparison of the results with a reasonable expected return on investment in Brazil. The results show that the project is not an economically attractive course of action.</p> <p>2. The only other plausible scenario is continued non-utilization of landfill gas. This scenario is determined as the baseline scenario based on an analysis of current practices and current and foreseeable regulations in the waste management sector.</p>		OK
B.2.2. Has the baseline been determined using conservative assumptions where possible?	/1/ /2/	DR	The approach and methodology considers three alternatives and chooses the most probable and conservative alternatives.		OK
B.2.3. Has the baseline been established on a project-specific basis?	/1/ /2/	DR	<p>The baseline scenario is determined on a project-specific basis, considering the specific circumstances of the Marambaia and Adrianópolis landfills.</p> <p>The project is part of a large program initiated by</p>	CL-3	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			the Municipality of Nova Iguaçu, for collection of urban waste in the municipality. The second phase of this program is based on the construction of a state-of-the-art Waste Treatment Plant, of which these landfills are a central component. SA Paulista was granted a 20-year concession. DNV would like to clarify whether LFG capture and electricity generation are required by the program and/ or the concession. However, DNV request a clarification on whether LFG capture and electricity generation are required by the Environmental License and/or the Municipality Program.		
B.2.4. Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /2/	DR	A new waste management policy (National Politic for Solid Waste) is under discussion. However, this does not consider landfill gas control. The baseline will be revisited every 7 years to ensure that the assumptions made still hold true. In addition, the introduction of Brazilian legislation regarding the collection and flaring of LFG will be monitored annually as part of the monitoring plan.		OK
B.2.5. Is the baseline determination compatible with the available data?	/1/ /2/	DR	The baseline scenarios for the methane destruction and the electricity production are supported by available data.		OK
B.2.6. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/ /2/	DR	The continued business as usual practise of not collecting and flaring LFG is the most likely baseline scenario.		OK
B.2.7. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario	/1/ /2/	DR	Barriers for investment are demonstrated by using IRR calculations. When considering current	CL-5	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
(e.g. through (a) a flow-chart or series of questions that lead to a narrowing of potential baseline options, (b) a qualitative or quantitative assessment of different potential options and an indication of why the non-project option is more likely, (c) a qualitative or quantitative assessment of one or more barriers facing the proposed project activity or (d) an indication that the project type is not common practice in the proposed area of implementation, and not required by a Party's legislation/regulations)?			energy price and real currency, the IRR is very low compared to a reasonable expected IRR in Brazil. However, a review of the financial calculations used to derive at the presented financial values is necessary. Moreover, the presented IRR should be compared with IRR's that are typically expected from waste management projects in Brazil in order to conclude on this.		
B.2.8. Have the major risks to the baseline been identified?	/1/ /2/	DR	Variations in energy price may have an impact on the project baseline.		OK
B.2.9. Is all literature and sources clearly referenced?	/1/ /2/	DR	The PDD and the baseline study are sustained by well elaborated references.		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 expected starting date of the project is 1 July 2004.		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 renewable crediting period of 7 years in selected starting on 1 July 2004.		OK

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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/	DR	The project applies monitoring methodology AM0003: Simplified Financial Analysis for Landfill Gas Capture Projects.		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	/1/	DR	Methodology AM0003 was developed based on the NovaGerar Landfill Gas to Energy Project. This monitoring methodology can be used for project activities that reduce greenhouse gas emissions through landfill gas capture and destruction of the methane by flaring and/or generation of electricity. This is the case for the NovaGerar Project.		OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	/1/ /3/	DR	The baseline methodology will, when correctly applied, enable conservative calculations of emission reductions.		OK
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	/1/ /3/ /4/	DR	The MP presents the monitoring and reporting of the main project components in a clear and transparent manner and is supported by the Marambaia and Adrianopolis monitoring and		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			reporting spreadsheets workbook.		
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/ /3/ /4/	DR	CO ₂ emissions from flaring landfill gas are of biogenetic nature and must hence not be accounted for. The monitoring methodology directly measures methane emissions avoided by the project.		OK
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/ /3/ /4/	DR	The only source of leakage is the emissions resulting from generating the electricity used to pump the landfill gas in the additional collection equipment. However, sufficient electricity is generated from the recovered LFG to operate the collection system. Hence, there is no leakage.		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/ /3/ /4/	DR	Monitoring of LFG collected and flared/ combusted and electricity generated (although CERs from energy are not claimed) is reasonable. However, waste disposed at the Adrianopolis landfill should be included in the MP.	CAR-1	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			Moreover, the methane content should be measured to determine the methane emissions from the landfill in the baseline scenario. Other similar projects plan to measure methane contents in LFG using gas analyser. If NovaGerar plans not to measure the methane content, a more conservative value should be used. The generator heat rate and flare efficiency will be monitored to ensure efficient combustion and flaring, respectively, of LFG and in particular the CH ₄ contained in the LFG.	CAR-2	
D.4.2. Is the choice of baseline indicators, in particular for baseline emissions, reasonable?	/1/ /3/ /4/	DR	The indicators will provide for monitoring captured and flared methane emissions that would otherwise be released to the atmosphere.		OK
D.4.3. Will it be possible to monitor the specified baseline indicators?	/1/ /3/ /4/	DR	Yes, it will be possible to monitor/ measure the specified indicators according to methodology description given in MP.		OK
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?	/3/	DR	The MP section on sustainable development provides for the monitoring of the remediation of the Marambaia site, job creation, health care of workers, working conditions, ground water quality in Marambaia and Adrianopolis, native forest restoration and biodiversity. However, procedures for monitoring and management	CL-5	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			of leachate should be further explained in the MP.		
D.5.2. Is the choice of indicators for sustainability development (social, environmental, economic) reasonable?	/3/	DR	The choice of the socio-economic and environmental indicators is reasonable.		OK
D.5.3. Will it be possible to monitor the specified sustainable development indicators?	/3/	DR	Yes		OK
D.5.4. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/3/	DR	The indicators are in line with sustainable development policies according to an IBAMA paper.		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/ /3/ /11/	DR I	Yes, project will be implemented by Nova Gerar		OK
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/ /3/ /11/	DR I	Yes, Nova Gerar will be responsible for monitoring and reporting.		OK
D.6.3. Are procedures identified for training of monitoring personnel?	/1/ /3/ /11/	DR I	Responsibility is defined for the Training and Health & Safety coordinator		OK
D.6.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/ /3/ /11/	DR I	Emergency preparedness procedures are mentioned but not fully described in the MP.	CAR-3	OK
D.6.5. Are procedures identified for calibration of monitoring equipment?	/1/ /3/ /11/	DR I	Procedures for calibration of measurement equipment (gas analyser, gas flow meter, electricity meter, etc.) are mentioned but not	CAR-4	OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			described.		
D.6.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/ /3/ /11/	DR I	Yes		OK
D.6.7. Are procedures identified for monitoring, measurements and reporting?	/1/ /3/ /11/	DR I	Yes		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 performance documentation)	/1/ /3/ /11/	DR I	Storage of records and back-up systems are defined in the MP and spreadsheet.		OK
D.6.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/ /3/ /11/	DR I	Yes, internal audits will be performed by Engineer Manager, Operation Manager and Training and Health & Safety coordinator.		OK
D.6.10. Are procedures identified for review of reported results/data?	/1/ /3/ /11/	DR I	Yes, internal audits will be performed by Engineer Manager, Operation Manager and Training and Health & Safety coordinator.		OK
D.6.11. Are procedures identified for internal audits of GHG project compliance with operational requirements where applicable?	/1/ /3/ /11/	DR I	Yes, internal audits will be performed by Engineer Manager, Operation Manager and Training and Health & Safety coordinator.		OK
D.6.12. Are procedures identified for project performance reviews before data is submitted for verification, internally or externally?	/1/ /3/ /11/	DR I	Yes		OK
D.6.13. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/ /3/ /11/	DR I	Not yet identified.		(OK)

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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.Predicted Project GHG Emissions <i>The validation of predicted 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	<p>CO₂ emissions resulting from flaring of methane can be considered as carbon neutral as long as the carbon derives from biomass.</p> <p>The only source of project emissions identified within the project boundaries are fugitive CH₄ emissions from the landfill. It has been assumed that the LFG collection system will have an efficiency of 85%. Therefore, 15% of generated CH₄ will continue to escape as fugitive emissions. However, as emission reductions are determined directly and will be monitored <i>ex post</i>, these project emissions do not need to be quantified.</p>		OK
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.</i>					
E.2.1. Are potential leakage effects beyond the chosen	/1/	DR	The only potential significant source of leakage is		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
project boundaries properly identified?			the emissions resulting from generating the electricity used to pump the landfill gas in the additional collection equipment. However, sufficient electricity is generated from the recovered LFG to operate the collection system. Hence, there is no leakage.		
E.3.Baseline Emissions <i>The validation of predicted 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/ /11/	DR I	CH ₄ emissions avoided by the project are directly determined by determining the LFG collected and flared/combusted and the CH ₄ of the LFG.		OK
E.3.2. Are the baseline boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	/1/ /11/	DR I	The calculations include calculations of CH ₄ which is combusted in electricity generators and in flares. The variables used will be confirmed periodically.		OK
E.3.3. Are the GHG calculations documented in a complete and transparent manner?	/1/ /7/ /11/	DR I	The emission reduction calculations are based on the first order decay model from the EPA manual "Turning a Liability into an Asset: Landfill Gas to Energy Handbook, and consider 2,63cf/lb MSW, decay rate 0,10, Methane concentration in landfill gas = 50% and collection efficiency of project = 85%. The ER related to electric energy fuel displacement was not considered for CER. However, the expected amount of electricity generated was calculated using a generator heat rate = 10.000 GJ/MWh and a calorific value of	CAR-5	OK

* MoV = Means of Verification, DR= Document Review, I= Interview

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			methane = 0,0357 GJ/m ³ CH ₄ . The Global Warming Potential (GWP) of methane was considered 23, based on IPCC Third Assessment Report (TAR), although it is not formally approved by UNFCCC. The project is advised to use GWP of 21 until 23 is formally adopted by UNFCCC.		
E.3.4. Have conservative assumptions been used when calculating baseline emissions?	/1/ /11/	DR I	US EPA indicates that gas collection efficiency of 75 – 85 percent is a reasonable assumption. For estimating methane emissions, a LFG collection efficiency of 85% is used. However, for a more conservative estimation of the methane emissions a lower LFG collection efficiency should be used. A methane content of 50% is reasonable.	CAR-6	OK
E.3.5. Are uncertainties in the GHG emission estimates properly addressed in the documentation?	/1/ /11/	DR I	Yes, the main uncertainties are related to the projection of waste disposal at the landfills and the amount of methane. This will be measured according to the MP. The concentration of methane in LFG will be measured daily and the average updated yearly, as well as generator efficiency and flare efficiency.		OK
E.3.6. Have the project baseline(s) and the project emissions been determined using the same appropriate methodology and conservative assumptions?	/1/ /11/	DR I	Yes, both the baseline and the project emissions are determined based on the amount of methane collected and flared/combusted.		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
E.4.Emission Reductions Validation of baseline GHG emissions will focus on methodology transparency and completeness in emission estimations.					
E.4.1. Will the project result in fewer GHG emissions than the baseline scenario?	/1/	DR	The project intends to avoid CH ₄ emissions by collection and combustion or flaring of LFG captured at the Marambaia and Adrianópolis Landfills and is expected to reduce emissions of 14,072 million tonnes of CO _{2e} over a 21 years crediting period. In addition, the project will lead to emission reductions attributable to the displacement of grid electricity, but these will not be claimed by NovaGerar.		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	Social and environmental impacts of the project have been sufficiently addressed.		OK
F.1.2. Are there any Host Party requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved?	/1/	DR	An Environmental Impact Assessment (EIA-RIMA, in Brazil) was conducted and approved as a requirement to obtain the environmental licenses to operate the new Adrianópolis landfill.		OK
F.1.3. Will the project create any adverse environmental effects?	/1/	DR	The project is not expected to create any significant adverse environmental effects. On the contrary, by collecting and combusting landfill gas, the NovaGerar project's sanitary landfills will reduce emissions from uncontrolled releases and reduce the risks of toxic effects on the local		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			community and local environment.		
F.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR	The project is not likely to cause any transboundary environmental impacts.		OK
F.1.5. Have identified environmental impacts been addressed in the project design?	/1/	DR	Contaminated leachate and surface run-off from landfills can affect down-gradient ground and surface water quality consequently affecting the local environment. By managing the Marambaia and Adrianopolis landfill sites properly, the environmental and health risks and the potential for explosions is reduced. The project will close and remediate the Marambaia open dump.		OK
F.1.6. Does the project comply with environmental legislation in the host country?	/1/	DR	An Environmental Impact Assessment (EIA-RIMA, in Brazil) was conducted as a requirement to obtain the environmental licenses to operate the new Adrianópolis landfill.		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	The EIA was subject to a stakeholder consultation process which culminated in an official public hearing in 2001. The concerns of stakeholders are recorded in the official minutes of this hearing (Ata de Reunião de Audiência Pública), kept by FEEMA, the environmental agency responsible. A new stakeholder consultation process for the NovaGerar project, concluded by the end of 2002, includes both sites, Adrianopolis and Marambaia and is being carried out by an independent		OK

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CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			organization specializing in sanitary engineering and environmental issues, Associacao Brasileira de Engenharia Sanitaria e Ambiental - ABES.		
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/	DR	The consultation process with the main target groups is based on meetings and interviews. Other interest groups have been contacted personally or by mail.		OK
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	The target groups were divided in 5 interest groups. (i) public sector representatives, including environmental agencies, municipalities, federal and state government and local universities; (ii) non-governmental organizations, including relevant local and national organizations specializing on climate change; (iii) private sector representatives (local electric power supplier and gas distributor); (iv) international climate change organization (IETA); and (v) scavengers.		OK
G.1.4. Is a summary of the stakeholder comments received provided?	/1/	DR	As required by the modalities and procedures for the CDM, a summary of the comments received during local stakeholder consultations must be provided to the validator.	CL-6	OK
G.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR	A report indicating how due account was taken of any comments received must be provided to the validator.	CL-6	OK

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Table 3 Resolution of Corrective Action and Clarification Requests

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
CAR 1: Waste disposed at the Adrianopolis landfill should be included in the MP.	D.4.1	The amount and contents of waste disposed at the Adrianapolis landfill site will be monitored as a part of the normal operation of the landfill and in particular in the context of collection of the tipping fees for waste. However, we do not see the relevance of including monitoring of waste disposal in the MP as the relevant for the purposes of ERs is to monitor methane gas combusted in the engines and/or flared in the flares. Therefore, NCDMF suggests not to include this in the CDM MP for the project.	The validation team acknowledges that monitoring of waste disposal is not necessary for determining ERs. However, records on the amount of waste disposed at the site may be requested by the verifier of ERs for cross-checking purposes. The project developers should hence ensure that records on the amount of waste, which is monitored as a part of the normal operations, can be made available upon request by the verifier.
CAR 2: The methane content should be measured to determine the methane emissions from the landfill in the baseline scenario.	D.4.1	NovaGerar and the operator EnerG has reviewed the monitoring plan and will establish a measurement system. A gas analyser will be installed in order to enable accurate measurement of the methane content of the landfill gas sent to flares (see revised MP).	Monitoring the methane content of LFG with a gas analyser as proposed by NovaGerar will represent best practise and result in a sufficiently accurate determination of ERs. The corrective action request is closed.
CAR 3: Emergency preparedness procedures are mentioned but not fully described in the MP.	D.6.4	NovaGerar will prepare an Operational Manual which will include procedures for training, capacity building, proper handling of equipment, emergency plans, reforestation plans and work security. NovaGerar will also ensure that NovaGerar staff, EPC operator staff and Paulista (landfill operator) staff will receive appropriate training on the implementation of the MP and of the project. (Ref. section 3.3. of the revised MP).	OK, but emergency procedures will need to be developed prior to project start as part of the Operational Manual.
CAR 4: Procedures for calibration of measurement equipment (gas analyser, gas flow meter,	D.6.5	Calibration of the measurement equipments is to be done monthly, in accordance with the requirements of the National Measurement Regulation Agency	The information given and the revised MP are deemed sufficient, and the corrective action request is closed.

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
electricity meter, etc.) are mentioned but not described.		<p>INMETRO (Instituto Nacional de Metrologia). See appendix A of the revised MP.</p> <p>Calibration of measurement equipment will be done monthly. The quality assurance measures include procedures to handle and correct non-conformities in the implementation of the Project or this Monitoring Plan.</p> <p>In addition, NovaGerar will prepare an Operational Manual which will include procedures for training, capacity building, proper handling of equipment, emergency plans, reforestation plans and work security. NovaGerar will also ensure that both NovaGerar staff, EPC operator staff and Paulista (landfill operator) staff will receive appropriate training on the implementation of the MP and of the project. See section 3.3. of the revised MP.</p>	
<p>CAR 5:</p> <p>The project is advised to use GWP of 21 until 23 is formally adopted by UNFCCC.</p>	E.3.3	<p>It is correct that the Conference of the Parties of the UNFCCC has not yet adopted GWP 23 (the latest GWP figure approved by IPCC) as the basis for national inventories.</p> <p>We have been informed that the Methodology Panel of the Executive Board has had some discussions on this issue.</p> <p>Therefore, we suggest forwarding this question to the Methodology Panel of the Executive Board in the context of the review and approval process for a new baseline and monitoring methodology.</p> <p>(Meth Panel /EB requested use of GWP of 21).</p>	<p>The validation team acknowledges that a GWP of 23 as suggested by the TAR may be formally adopted by the COP and/or the CDM Executive Board. The GWP of methane should hence be monitored and the GWP adjusted when necessary. Verification and certification of ERs will need to verify whether a GWP of 21 or 23 can be used at the time of verification. Nevertheless, the validation teams would like to highlight that the prevailing GWP of methane of 21 is currently recommended by the COP, using a GWP of 23 does not result in a conservative estimate of expected ERs. The corrective action request is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
<p>CAR 6:</p> <p>For estimating methane emissions, a LFG collection efficiency of 85% is used. However, for a more conservative estimation of the methane emissions a lower LFG collection efficiency should be used.</p>	E.3.4	<p>NovaGerar has reviewed the calculations and technical design of Marambaia and for Adrianópolis and has concluded that given the state of the art design of the collection systems using 85% as LFG collection efficiency is warranted.</p> <p>It should also be pointed out, that the 85% collection efficiency assumption is used only in estimation/forecasting of expected Emission Reductions. This collection efficiency assumption is not used in any way in the Monitoring Plan. The actual ERs are accurately measured based on:</p> <ul style="list-style-type: none"> - Electricity produced and generator heat rate for the gas combusted in the engines and - Measurement of methane content of landfill gas sent to the flares (see below for explanation of what kind of measurement instrumentation will be installed) <p>Therefore, as the use of 85% collection efficiency assumption has no impact on the environmental integrity of the project, NCDMF suggest sticking to 85% based on the technical design of the project.</p>	<p>The validation team acknowledges that the actual ERs are measured and that the collection efficiency of 85% is only used for estimating expected ERs. Moreover, we acknowledge that a 85% collection efficiency may be achieved. Nevertheless, the validation team would like to highlight that the current estimate is not conservative and that the project may result in less ERs than estimated. The corrective action request is closed.</p>
<p>CL 1:</p> <p>The leachate treatment will be carried out through evaporator facilities. Similar facilities in Brazil have problems and are not working. More information is therefore needed about the effectiveness and alternative technology for leachate treatment.</p>	A.2.1	<p>The intention is to treat 100% of leachate on both sites. Leachate produced will be collected and driven to the storage tanks and to the treatment equipment. To monitor efficiency of collection and treatment, ground water quality data will be collected. In addition, in case flow exceeds 1.2l/ second, treatment capacity increased or excess treated in a waste water treatment plant. This procedure is included in as one of the Sustainable Development indicators in section 4 of the revised MP.</p>	<p>The response is deemed sufficient, and the request for clarification is closed.</p>
<p>CL 2:</p> <p>Training systems related to the new technology should be addressed in the MP.</p>	A.2.4	<p>NovaGerar will also ensure that NovaGerar staff, EPC operator staff and Paulista (landfill operator) staff will receive appropriate training on the implementation of</p>	<p>The additional information and the revised MP are deemed sufficient, and the request for clarification is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		the MP and of the project. See section 3.3. of the revised MP.	
<p>CL 3: DNV requests a clarification with regard to whether LFG capture and electricity generation are required by the Environmental License and/or the Municipality Program.</p>	B.2.3	<p><u>Adrianapolis:</u> There are no contractual/concession requirements on venting or flaring gas in the concession for the Adrianapolis site.</p> <p><u>Marambaia:</u> For the Marambaia landfill, the contract foresees remediation of the existing dump and installation of a rudimentary gas drain net and some flares for safety reasons as a part of the bidding documents.</p> <p>The bidding document requires installation of passive drainage wells only in 50 m intervals and reaching 2 m in depth and to flare the gas captured by the system. While the exact volume of gas such a system would capture is uncertain, it is highly likely that the volume captured would be very low given that most of the methane is generated in the deeper layers of the landfill (the dump is estimated to be 50-70m deep). The flow of gas from the top layer of the dumps (where decomposition is mostly aerobic) could actually be so low that no flaring would be possible and only venting would occur.</p> <p>The bidding documents contain no specification as to the percentage of gas that needs to be collected and flared to meet this contractual requirement. Given that the Marambaia site is away from any human settlements, it is reasonable to assume that no more than 20% of gas would need to be flared (as opposed to mere venting) to sufficiently mitigate the risk of explosions. It is also very likely that not even close to 20% could actually be captured and flared by the required system.</p> <p>Therefore, it is argued that the 20% discount on ERs</p>	<p>The validation team acknowledges that LFG capture efficiency in the baseline scenario is likely to be low. Hence, discounting ERs by 20% is deemed sufficient to allow for potential flaring of LFG at the Marambaia landfill in the baseline scenario. The clarification request is closed.</p>

Draft report clarifications and corrective action requests by validation team	Ref. to table 2	Summary of project owner response	Validation team conclusion
		claimed by the NovaGerar Project (included in the baseline study and monitoring plan to account for regulatory changes and improvements in waste management practices) more than sufficiently covers the volume of gas that would be flared to meet the requirements of the Marambaia concession/bidding documents.	
CL 4: Additional information regarding the financial calculations and IRRs from typical waste management projects in Brazil is needed in order to verify the presented investment barrier for the project.	B.2.7	The IRR calculations have been provided. There is no similar project in Brazil with LFG recovering and requesting CER.	The financial calculations resulted in a low IRR and the investment barrier of the project seems appropriate.
CL 5: Procedures for monitoring and management of leachate should be further explained in the MP.	D.5.1	The intention is to treat 100% of leachate on both sites. Leachate produced will be collected and driven to the storage tanks and to the treatment equipment. To monitor efficiency of collection and treatment, ground water quality data will be collected. In addition, in case flow exceeds 1.2l/ second, treatment capacity increased or excess treated in a waste water treatment plant. This procedure is included in as one of the Sustainable Development indicators in section 4 of the revised MP.	The response is deemed sufficient, and the request for clarification is closed.
CL 6: A summary of the comments received during local stakeholder consultations must be provided to the validator together with a report indicating how due account was taken of any comments received.	G.1.4 G.1.5	The stakeholder consultation was carried out and several stakeholders approved of the project. The summary has been sent to the validator and has been included in the PDD.	The summary of the stakeholder consultation has been reviewed by the validation team. The stakeholder consultation process has identified the relevant stakeholders and comments received have been incorporated in the project design.

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