VALIDATION REPORT

LIHIR GEOTHERMAL POWER PROJECT IN PAPUA NEW GUINEA

REPORT NO. 2006-0235

REVISION NO. 02

DET NORSKE VERITAS

VALIDATION REPORT

Date of first issue: 2005-03-17	Project No.: 28924574-07
Approved by: Einar Telnes Director	Organisational unit: DNV Certification, International Climate Change Services
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Summary:

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the "Lihir Geothermal Power Project" in Papua New Guinea on the basis of UNFCCC for CDM projects 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.

The validation consisted of the following three phases: i) a desk review of the project design, baseline and monitoring plan, 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 of 7 November 2005, meets all relevant UNFCCC requirements for the CDM and correctly applies the approved baseline and monitoring methodology ACM0002. Hence, DNV requests the registration of the "Lihir Geothermal Power Project" in Papua New Guinea as CDM project activity.

Report No.: 2006-0235	Subject Group: Environment	
Report title: Lihir Geothermal Power Project in Papua New Guinea		
Work carried out by: Simon Dawes		
Work verified by: Michael Lehmann		
Date of this revision: 2006-03-24	Rev. No.: 02	Number of pages: 13

Indexing terms

Key words Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area Verification Market Sector Process Industry

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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
CO_2	Carbon dioxide
CO_{2e}	Carbon dioxide equivalent
DNV	Det Norske Veritas
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
HFO	Heavy fuel oil
IPCC	Intergovernmental Panel on Climate Change
LGPP	Lihir geothermal power plant
MP	Monitoring Plan
MVP	Monitoring and Verification Plan
N_2O	Nitrous oxide
NGO	Non-governmental Organisation
ODA	Official Development Assistance
PDD	Project Design Document
PNG	Papua New Guinea
UNFCCC	United Nations Framework Convention on Climate Change

1 INTRODUCTION

Lihir Gold Ltd of Papua New Guinea has commissioned Det Norske Veritas Certification Ltd. to perform a validation of the "Lihir Geothermal Power Project" (hereafter called "LGPP") in Lihir, Papua New Guinea. This report summarises the findings of the validation of the project, performed on the basis of the UNFCCC and host party 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:

Mr Simon Dawes	DNV Sydney, Australia	Team Leader, GHG auditor
Mr Michael Lehmann	DNV Oslo, Norway	Internal verifier, Sector expert

1.1 Validation Objective

The purpose of the validation is to have an independent third party assess the project design. In particular, the project's baseline, monitoring plan, and 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 it is seen as necessary to provide assurance to stakeholders of the quality of the project and its intended generation of the emission reduction units (ERUs).

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 Kyoto Protocol criteria for Clean Development Mechanism (CDM) projects, the modalities and procedures for CDM project activities and relevant decisions by the CDM Executive Board, including the approved consolidated baseline and monitoring methodology ACM0002. The validation team has, based on the recommendations in the Validation and Verification Manual /9/, employed a risk-based approach in the determination process, focusing on the identification of significant risks for project implementation and the generation of CERs.

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

1.3 Description of Proposed CDM Project

The objective of the Lihir Geothermal Power Project is to establish a new geothermal power station to replace some of the capacity provided by the existing Putput Power Station. The Putput Power Station is comprised of twelve Wartsila reciprocating engine-generator sets operating on Heavy Fuel Oil (HFO). The project is located within the Lihir Gold Mine site on Lihir Island, which is situated in the Bismarck Archipelago, Papua New Guinea. The project participant is Lihir Gold Ltd.

The proposed project consists of the development and operation of a geothermal power station within the Luise caldera on the east coast of Lihir Island. The selected site is in an active geothermal area, and will have a final net capacity of 52.8 MW in 2007. The project was developed in two phases, with 31.7 MW installed in 2005 and a further 21.1 MW installed in

2006. The geothermal project is partially replacing an existing HFO fuelled power station with capacity of approximately 70MW. It is anticipated that the emission reductions as a result of this level of generation will be approximately 278,904 tonnes CO_2-e per year based on the ex ante determination of the grid emission factor of 0.678 tonnes CO_2-e/MWh.

2 METHODOLOGY

Validation of the project commenced in February 2005. The validation consisted of the following three phases:

i) a desk review of the project design, baseline and monitoring plan

ii) follow-up interviews with project stakeholders

iii) resolution of outstanding issues and issue of the final validation report and opinion.

In order to ensure transparency, a validation protocol was customised for the project, according to the Validation and Verification Manual /9/. 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 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 below.

The completed validation protocol for "Lihir Geothermal Power 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 clarifications and corrective action requests	***Ref. to checklist question in table 2***	***Summary of project participants' response***	***Validation 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 (version of February 2005 applying AM0019, revised version of August 2005 applying ACM0002 and the final Version 2 of 7 November 2005 applying ACM0002) /1/ for the Lihir Geothermal Power Project was assessed by DNV. Other documents, such as the project financial analysis /2/ and the official Environmental Inception Report /3/ were also assessed. In addition, licence requirements as well as documentation on the consultation process with local stakeholders were reviewed during the follow up interviews in order to ensure the accuracy of the information provided in the PDD.

2.2 Follow-up Interviews

On 22 February 2005 DNV performed interviews with LMC personnel and visited the Lihir mine site. A telephone interview was held with a senior Lihirian representative on 21 March 2005 and with a representative of the PNG DNA on 22 March 2005. The purpose of the interviews was to confirm the information on community consultation and environmental compliance found in the PDD.

Table 1 Interview topics

Interviewed organisation	Interview topics
Luke Kabariu – LMC (senior Lihir representative)	➢ Stakeholder and community consultation ➢ Explanation of the project provided to the community ➢ Environmental impact ➢ Sustainability
Bernard Suruman – PNG Department of Environment and Conservation	➢ Development of the DNA ➢ National sustainability requirements ➢ Feedback on the LGPP from local government

2.3 Resolution of Clarification and Corrective Action Requests

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

The initial validation of the project identified two *Corrective Action Request* and four requests for *Clarification*. These requests were presented to the project participants in DNV's final draft validation report of 3 October 2005 (rev. 01) and were resolved during communications between LMC and DNV and through the submission of a revised PDD (Final version 7 November 2005).

To guarantee the transparency of the validation process, the concerns raised and responses given are documented in the validation protocol in Appendix A.

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 in this section relate to the project design as documented and described in the final PDD of 7 November 2005 /1/.

3.1 Participation Requirements

The only project participant is Lihir Gold Ltd. The host Party Papua New Guinea meets all relevant participation requirements. No participating Annex I Party was identified for the project. The DNA of Papua New Guinea has provided written approval of voluntary participation /4/.

3.2 Project Design

The project is a renewable energy project with a final net capacity of 52.8 MW (as noted previously, the project was developed in two phases, with 31.7MW installed in 2005 and a further 21.1MW installed in 2007) using climate change neutral geothermal fluid released during mining operations as the energy source and supplying power to the Lihir Gold Mine and a small local grid. All electricity generated by the geothermal power plant will be supplied to the grid connection at the gold mine, replacing equivalent generation from the existing Putput Power Station. Approximately 80% of the electricity required by the mine and the grid will be generated by the new power plant. The remaining 20% of the electric power generation will be generated by the existing Putput power station. LMC have a license from the Papua New Guinea Electricity Commission to on sell power to grid customers.

The Lihir Gold Mine operates within the confines of the Luise caldera, which is geothermally active. In order to carry out mining operations geothermal discharge wells and shallow steam-relief wells are drilled in advance of mining to decrease geothermal hazards due to steam pressure build up, and to depressurize residual steam or gas pockets in the vicinity of the mine. Prior to installation of the project these geothermal fluids were simply vented to atmosphere. On this basis, the steam release infrastructure and release of geothermal steam is not an additional activity.

Two phase fluids will be released from the wellfield and piped to a separation unit, which will remove the liquid phase. Single phase steam will be passed through a scrubber to remove dissolved solids and then to five 11 MWe gross steam turbine-generator sets. Steam pressure controls are provided to maintain constant steam delivery pressure. The geothermal power turbines are robust marine units likely to be capable of prolonged service life. The applied technology essentially comprises steam collection, liquid separation, scrubbing and finally utilisation of the steam in a turbine-generator unit. Waste geothermal fluids are vented to atmosphere or discharged through the existing mine infrastructure.

A non-renewable crediting period of 10 years is selected, starting on 5 June 2006. The expected operational lifetime of the project is approximately 30 years.

The project is expected to bring social (employment), environmental and economic benefits, thus contributing to the sustainable development objectives of the Papua New Guinea Government. The DNA of Papua New Guinea confirmed that the project assists in achieving sustainable development /4/.

The validation did not reveal any information that indicates the project is a diversion of official development assistance (ODA) funding towards Papua New Guinea.

3.3 Baseline Determination

The project applies the approved consolidated baseline methodology ACM0002 *"Consolidated baseline methodology for grid-connected electricity generation from renewable sources"* /5/.

The project activity was found to comply with ACM0002, i.e. the project activity involves installation of a new grid-connected power generation project utilising geothermal sources. The project does not involve fuel switch activities at the site of the project activity and the geographic and system boundaries for the electricity grid can be clearly identified and characterised. Power generated by the project plant is fed into the grid or would in the absence of the project activity be purchased from the grid. The geothermal steam would in the absence of the project activity be vented freely to atmosphere without utilizing it for energy purposes.

The selected baseline scenario is that in absence of the CDM project activity LMC would continue using the existing Putput fossil fuel power station. This conventional HFO power plant design is business-as-usual for major remote industrial facilities and for large island electricity grids. Option (a) Simple Operating Margin was selected as the baseline option.

In accordance with ACM0002, a grid emission coefficient is calculated for the power generation baseline scenario as a combined margin emission coefficient. The combined margin emission coefficient is calculated as the weighted average of the simple operating margin (OM) emission coefficient and the build margin (BM) emission coefficient (using the default weighting of 0.5).

The Simple Operating Margin *ex ante* emission factor was calculated from the average fuel consumption and generation of the three most recent years for which full data was available (2002, 2003 and 2004). Generation is measured by the plant energy systems and fuel consumption from externally audited fuel consumption and inventory records. The *ex ante* OM factor was calculated to be 0.704 tonnes CO_2-e/MWh.

ACM0002 provides two options for calculation of the Build Margin. The project selected Option 1, an *ex ante* calculation based on information regarding the five most recently constructed grid connected power plants. In this case, the only three plants on the grid are the Putput power station, a backup generator and a 6MW geothermal pilot plant. The back up generator was excluded from the calculation and the build margin determined from the 2004 generation of the two remaining plants. The *ex ante* BM factor was calculated to be 0.653 tonnes CO_2-e/MWh.

The weighted *ex ante* combined margin was calculated to be 0.678 tonnes CO_2-e/MWh.

3.4 Additionality

In accordance with ACM0002, the additionality of the project is demonstrated through the "*Tool for the demonstration and assessment of additionality*" /6/, which includes the following steps:

Step 0 -Preliminary screening based on the starting date of the project activity: The crediting period starts at the date of registration.

Step 1 - Identification of alternatives to the project activity consistent with current laws and regulations: Alternatives to the project activity consistent with current laws and regulation were identified, these being to not undertake the 55 MW LGPP as a CDM project, and to continue the existing generation situation.

Step 2 - Investment analysis

a) *Determine appropriate analysis method:* A benchmark analysis (Option III) was selected, since the only plausible choices are between the proposed project and business as usual.

b) Option III – Apply Benchmark Analysis: The selected project financial indicator is Net Present Value considering project costs, fuel savings and cash flows. The benchmark discount rate was identified as the average 182 day Treasury Bill rate applying during the six month period (the first half of 2003) during which the decision was made. The rate at that time was 18.5%. No additional risk premium was added. DNV was able to confirm that this was an appropriate rate after review of publicly available Papua New Guinea Treasury documents and LMC documents, including public documents, relating to the project.

c) Calculation and comparison of financial indicators: A cash flow analysis model was used to determine the NPV of the project at the selected discount rate with and without the expected CDM revenues. Key assumptions are: Generation from the LGPP will avoid an equal amount of generation using HFO, capital costs associated with the LGPP and associated wellfield infrastructure are included, maintenance costs are included and care and maintenance costs associated with retention of the Putput Power Station as reserve generation are included. The calculated NPV without CDM revenues at the discount rate of 18.5% was approximately negative USD17.6 million. DNV was able to confirm the validity of the assumptions and correct functioning of the cash flow analysis model.

d) Sensitivity analysis: Sensitivity of the project to changes in energy generation, discount rate, HFO price and project costs was tested. In each case the NPV of the project remained negative. DNV was able to confirm the outcome of the sensitivity analysis.

Step 4 - Common practice analysis: It is the understanding of DNV that the project is the first of its kind in Papua New Guinea and the South Pacific.

Step 5 - Impact of CDM registration: It is demonstrated that the incentives from CDM will alleviate the economic and financial hurdles and the identified barriers.

Given the above and in particular the investment, technological and common practice barriers that the project faces, it is sufficiently demonstrated that the project is not a likely baseline scenario.

3.5 Monitoring Plan

The project correctly applies the approved consolidated monitoring methodology ACM0002 *"Consolidated baseline methodology for grid-connected electricity generation from renewable energy"* /5/.

Most of the data necessary to calculate baseline and project emissions will be directly monitored at regular intervals. The following parameters are to be monitored:

- Steam generation and steam quality;
- Greenhouse gases in steam vented to atmosphere;

- Steam wells in excess of those required for mining;
- Fossil fuels used for operation of the LGPP; and
- Electricity supplied to the grid by the LGPP.

The OM and BM emission coefficients are determined *ex ante* and fixed for the crediting period of the project.

Detailed responsibilities and authorities for project management, monitoring procedures and QA/QC procedures have been presented and were checked during follow-up interviews. The monitoring practices are considered appropriate.

3.6 Calculation of GHG Emissions

In accordance with ACM0002 geothermal emissions from wells additional to those required for mining (i.e., are additional to business as usual) are counted as project emissions.

No leakage risks are identified in ACM0002.

The project has a single baseline component, the emissions that would be produced by the grid when producing an equivalent amount of electricity to that generated by the project. For the displacement of grid electricity, the combined margin emission coefficient for the Lihir grid is determined *ex-ante* in accordance with the "simple adjusted OM" and BM calculated in accordance with ACM0002.

For the *ex-ante* calculation of the project's emission reductions for displacing grid electricity, actual data on plant specific electricity generation and plant specific fuel consumption factors were used to determine a combined margin emission factor. The OM was based on data from the years 2002, 2003 and 2004. The BM was calculated using data for the year 2004. The simple-adjusted OM emission coefficient was calculated to be 0.704 tCO_2e/MWh and the BM emission coefficient 0.653 tCO_2e/MWh, resulting in a combined margin emission coefficient of 0.678 tCO_2e/MWh (weighted average of the build and operating margin). The OM and BM emission coefficients are calculated in accordance with ACM0002 and were transparently presented in the PDD. Data associated with the OM and BM calculations were subject to verification by DNV during the on-site activities.

3.7 Environmental Impacts

As the LGPP is constructed within an approved mining operation an additional environmental impact analysis was not required. Papua New Guinea has revised its requirements for environmental review and approval subsequent to the approval and construction of the Lihir Gold Mine. LMC submitted a voluntary Environmental Inception Report (EIR), which included the LGPP, in December 2004 /3/ and received approval on 10 February 2005 /8/.

The environmental impacts of the project were identified in the EIR as discharge of steam to atmosphere and some geothermal liquids to Luise harbour. Liquid discharges pass through a sediment trap before release. This approach has been approved by the local authorities.

3.8 Comments by Local Stakeholders

The local stakeholders and land owners were invited to comment through direct communication, local media, community consultation, survey (to two key stakeholders) and during participation in opening of the 6MW pilot plant.

Local stakeholder comments are noted in the PDD.

All technical and environmental aspects were resolved in the Environmental Inception Report and approved by the environmental authorities.

4 COMMENTS BY PARTIES, STAKEHOLDERS AND NGOS

The PDD of August 2005 (applying ACM0002) was made publicly available on DNV's climate change website (www.dnv.com/certification/climatechange) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 23 August 2005 and 21 September 2005. No comments were received.

Also the earlier PDD of February 2005 (applying AM0019) was made publicly available on DNV's climate change website and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 26 February 2005 and 28 March 2005. No comments were received in this call either.

5 VALIDATION OPINION

Det Norske Veritas Certification Ltd. (DNV) has performed a validation of the "Lihir Geothermal Power Project" in Papua New Guinea. The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism (CDM) as well as criteria given to provide for consistent project operations, monitoring and reporting.

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

The objective of the project activity was to establish a new geothermal power plant with 52.8 MW of installed net capacity using geothermal energy from the Luise caldera released during mining operations at the Lihir Gold Mine. It supplies power to the Lihir Gold Mine and a small local grid.

The only project participant is Lihir Gold Ltd. The host Party Papua New Guinea meets all relevant participation requirements. No participating Annex I Party was identified for the project. The DNA of Papua New Guinea has provided written approval of voluntary participation.

By promoting renewable energy, the project is in line with the current sustainable development priorities of Papua New Guinea. The DNA of Papua New Guinea confirmed that the project assists in achieving sustainable development.

The project applies the approved consolidated baseline methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources". The baseline methodology has been correctly applied and the assumptions made for the selected baseline scenario are sound. The selected baseline scenario is the installation of a conventional power plant using fossil fuel, which is the existing installation. It is sufficiently demonstrated that the project is not a likely baseline scenario and that emission reductions attributable to the project are thus additional.

By displacing fossil fuel based electricity with electricity generated from a renewable source, the project will result in emission reductions that are real, measurable and will give long-term benefits to the mitigation of climate change. The emission reductions forecast stated in the PDD is a likely estimate.

The monitoring methodology ACM0002 has been correctly applied. The monitoring plan provides for monitoring of the indicators necessary for the ex-post determination of project emissions. The combined margin emission coefficient is fixed for the crediting period of the project.

Local stakeholders' comments were consulted and comments received were taken into account in the project design. Comments by Parties, stakeholders and NGOs were also invited via the UNFCCC web-site. No comments were received.

In summary, it is DNV's opinion that the project, as described in the project design document of 7 November 2005, meets all relevant UNFCCC requirements for the CDM and correctly applies the approved baseline and monitoring methodology ACM0002. Hence, DNV requests the registration of the "Lihir Geothermal Power Project" in Papua New Guinea as a CDM project activity.

6 REFERENCES

Documents provided by the Project Participants that relate directly to the GHG components of the project:

/1/ Lihir Management Company Ltd: *CDM PDD for the "Lihir Geothermal Power Project",* Version "undated" of February 2005, Version "undated" of August 2008 and Version No 2 of 7 November 2005

/2/ Lihir Management Company Ltd: *Financial Analysis for the "Lihir Geothermal Power Project,* version of February 2005 and August 2005

/3/ Lihir Gold Ltd: *Environmental Inception Report,* December 2004

/4/ Department of National Planning and Rural Development: *Letter of approval for the Lihir Geothermal Power Project,* 2 December 2005

/5/ CDM Executive Board: *ACM0002 Consolidated methodology for grid connected electricity generation from renewable sources,* Version 04, 28 November 2005.

/6/ CDM Executive Board: *Tool for the demonstration and assessment of additionality,* Version 02, 28 November 2005.

/7/ Department of Environment and Conservation: *Environmental Performance Statement* 14 April 2003

/8/ Department of Environment and Conservation: *Approval of Environmental Inception Report,* 10 February 2005

Background documents related to the design and/or methodologies employed in the design or other reference documents:

/9/ Det Norske Veritas (DNV) et al. for the World Bank and IETA, *Validation and Verification Manual*, at www.vvmanual.info

/10/ Lihir Gold Ltd: Annual Report 2003

/11/ International Energy Agency: *World Energy Outlook 2002*, 2003

/12/ Bank of Papua New Guinea: *Statistics Update Vol 4 No 12,* 11 Jun 2004

/13/ Australian Government – Export Finance and Insurance Corporation: *Rating and Benchmarking PNG – The Numbers and Their Implications,* Presentation to 20th Australia PNG Business Forum, Cairns, 28 March 2004

/14/ Lihir Gold Ltd Press Release: *First Geothermal Power Station in PNG,* 16 April 2003

/15/ Lihir Gold Ltd Press Release: *Official Launch of the 6MW Geothermal Power Station,* 27 April 2003

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

/16/ Geoff Day - LMC - General Manager External Affairs and Sustainability Development

/17/ Michael Wiener – SMEC Australia

/18/ Stuart Sanke – LMC Engineering Manager

/19/ Phillip Matha – LMC PS Superintendent

/20/ Bernard Suruman – PNG Department of Environment and Conservation

/21/ Luke Kabariu – LMC (senior Lihir representative)

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APPENDIX A

CDM 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, CDM Modalities and Procedures §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, CDM Modalities and Procedures §40a	OK	DNA of PNG has been notified on the UNFCCC website
5. 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
6. 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, CDM Modalities and Procedures §43	OK	Table 2, Section B.2
7. Potential public funding for the project from Parties in Annex I shall not be a diversion of official development assistance	Decision 17/CP.7	OK	No public funding involved
8. Parties participating in the CDM shall designate a national authority for the CDM	CDM Modalities and Procedures §29	OK	DNA of PNG has been notified on the UNFCCC website
9. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol	CDM Modalities §30/31a	OK	Papua New Guinea: Ratification on 28 March 2002

Requirement	Reference	Conclusion	Cross Reference / Comment
10. The participating Annex I Party's assigned amount shall have been calculated and recorded	CDM Modalities and Procedures §31b	NA	No Annex I Party yet identified
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	NA	No Annex I Party yet identified
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 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.	CDM Modalities and Procedures §37c	OK	Table 2, Section F
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	PDD has been published on www.dnv.com/certification/climatechange and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during the period of 23 August to 21 September 2005.
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	CDM Modalities and Procedures §47	OK	Table 2, Section B.2

Requirement	Reference	Conclusion	Cross Reference / Comment
to force majeure			
19. The project design document shall be in conformance with the UNFCCC CDM-PDD format	CDM Modalities and Procedures Appendix B, EB Decision	OK	CDM-PDD (version 04 of 1 July 2005).

Table 2 Requirements Checklist

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
A. General Description of Project Activity *The project design is assessed.*					
A.1. Project Boundaries *Project Boundaries are the limits and borders defining the GHG emission reduction project.*					
A.1.1. Are the project's spatial (geographical) boundaries clearly defined?	/1/	DR	Ref /1/ A.4.1.4. The project is wholly located on Lihir Island, New Ireland province, New Guinea. The existing power station that is to be replaced by the new geothermal power plant supplies the Lihir Mine and the distribution network on Lihir Island.		OK
A.1.2. Are the project's system (components and facilities used to mitigate GHGs) boundaries clearly defined?	/1/	DR	Ref /1/ Fig B3. The system boundaries are clearly defined.		OK
A.2. Technology to be employed *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.*					
A.2.1. Does the project design engineering reflect current good practices?	/1/	DR	The design of the project includes the following system elements: - Steam wells within the Lihir basin		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			- Steam conditioning (removal of water, dissolved salts) - Steam turbines - Electric generators - Electrical distribution network LMC have engaged expert engineering consultants to design and build the power plant, utilising design specifications and techniques proven in New Zealand and with other geothermal and fossil fuel thermal power systems.		
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/ /17/	DR I	The Lihir Geothermal Power Plant (LGPP) is the first of its kind in PNG (Ref /1/ A.4.3., Ref /17/). The LGPP is a phased development, with an initial 6MW plant commissioned in April 2003 (Ref /1/ A.2.) to demonstrate the technology and its suitability for the operating environment. The steam turbines do not use current manufacturing techniques, having been manufactured for the US Navy over 50 years ago and never placed into service. They are, however, particularly robust and sized appropriately for the available steam and unit size in the power plant system. The generator, switchgear, control systems and other ancillary equipment are all of a type currently in use in new power installations in Annex I countries. On this basis the technology to be employed is considered		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			well-suited to the environment.		
A.2.3. Is the project technology likely to be substituted by other or more efficient technologies within the project period?	/1/	DR	The selected technologies are of types which have a long economic life. Technology improvements tend to be incremental in nature. As such it is unlikely there will be any material substitution.		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	The project does require extensive staff training and the support of international experts as the project commences operation. Appropriate resources and cost allocations have been made in the financial analysis.		OK
A.2.5. Does the project make provisions for meeting training and maintenance needs?	/1/ /12/	DR I	The current mining and power plant are substantially operated by local Lihirian and PNG personnel, and the mining company has an extensive training program in place (Ref /13/ p28, 29). Extension of the training program to include the new geothermal technology would appear to be within the capacity of the mining company and the existing workforce. Appropriate resources and cost allocations have been made in the financial analysis.		OK
A.3. Contribution to Sustainable Development *The project's contribution to sustainable development is assessed.*					
A.3.1. Is the project in line with relevant legislation and plans in the host country?	/1/ /3/ /7/ /8/	DR	The development of the power plant is authorised under the existing consents for the mining operation itself. LMC has voluntarily chosen to adhere to the latest		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
	/17/	I	environmental legislation currently being implemented within PNG. LMC has submitted an Environmental Inception Report pursuant to the new requirements, and this has been accepted by the PNG government (Ref /8/).		
A.3.2. Is the project in line with host-country specific CDM requirements?	/1/ /3/ /4/ /8/	DR	PNG has not yet formalised either a DNA or specific CDM requirements. However, the national government have participated in the stakeholder consultation process and have approved the LGPP as it is described in the Environmental Inception Report. The PNG Government formally approved the CDM project on 9 March 2004.		OK
A.3.3. Is the project in line with sustainable development policies of the host country?	/1/ /3/ /4/ /8	DR	PNG has not formalised specific sustainable development policies. However, sustainable development is a core component of the government's development strategy (Ref /1/ p3). The Environmental Inception Report discusses the LGPP (Ref /3/ p17, 18) and has been approved (Ref /8/) by the PNG Government. The letter of approval from the PNG Government for the project (Ref /4/) clearly confirms that the project assists PNG in achieving sustainable development and is consistent with PNG's development strategy and national energy and climate change policies		OK
A.3.4. Will the project create other environmental or social benefits than GHG emission reductions?	/1/	DR	Ref /1/ p3. The project will also create a long term sustainable power supply for the		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			island and reduce emissions from the existing power plant. The availability of a long term low cost source of power is expected to considerably enhance the business opportunities for the island, particularly in relation to services provided to nearby island communities.		
B. Project Baseline *The validation of the project baseline establishes whether the selected baseline methodology is appropriate and whether the selected baseline represents a likely baseline scenario.*					
B.1. Baseline Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
B.1.1. Is the baseline methodology previously approved by the CDM Executive Board?	/1/ /5/	DR	Approved Consolidated Methodology ACM0002 "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" is applied to this project.		OK
B.1.2. Is the baseline methodology the one deemed most applicable for this project and is the appropriateness justified?	/1/ /5/	DR	Methodology ACM0002 is proposed for this project. The applicability requirements are: - Applies to capacity additions from a range of renewable sources, including geothermal – the proposed energy source is geothermal steam from the Luise caldera, which is located within the mining area. Clarification is required as	~~CL 1~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			to whether this is a capacity addition or not. (AM0019 was found to be unsuitable as it was inapplicable when there was capacity addition). - Not applicable to fuel switch project activities – The existing PutPut power plant is HFO fuelled, and will be retained as a backup installation. The plant will be put into care and maintenance after the new Geothermal Power Plant is installed. Currently installed capacity is 75.6MW (12 off 6.3MW Wartsila Vasa 32 diesel gensets, excluding parasitic losses). The nett capacity available is 70MW (Ref /1/ B.1.1). It is noted that in Ref /1/ B.2 the installed capacity to the grid is shown is 80MW, which includes the PutPut plant, the standby generator and the 6MW geothermal pilot plant. This is inconsistent with the calculation for the operating and build margins. The LGPP is not co-located with the existing fossil fuel generating system. Clarification is required as to whether this could be regarded as fuel switch based on no net capacity addition. - Geographic and system boundaries can be readily identified and the characteristics of the grid are available –		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			the boundaries are readily defined. If the LGPP is capacity addition then the grid comprises two power stations connected at 11kV. ACM0002 p3 "Baselines" notes that the baseline is only applicable if the most likely scenario is supply from other sources feeding into the grid, including both existing and new generation. This has been demonstrated. Clarification is requested as to whether all supply to the grid could be solely sourced from the LGPP for a significant period, of how this situation will be monitored, and of its impact if this situation were to occur. The generation capacity considered as formally connected to the grid should be consistently described throughout the PDD. The PDD should note and explain fully the reason for changing from the approved methodology AM0019 to ACM0002		
B.2. Baseline Determination *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.*					
B.2.1. Is the application of the methodology and the discussion and determination of the chosen	/1/ /5/	DR	The consolidated baseline methodology ACM0002 was selected for this project (Ref	~~CAR 2~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
baseline transparent?	/21/	I	/1/ sB.1.1., Ref /5/). ACM0002 uses a default weighting of 50% Operating Margin and 50% Build Margin to determine the baseline emission factor. The baseline applies where the project is a capacity addition. Of the options for Operating Margin, the Simple OM method was selected. This applies where must-run plants are less than 50% of total grid generation. In this case, the existing PutPut generating plant is clearly a must-run facility because it is the only other generator on the grid. The 6 MW pilot plant is also discussed in this analysis. The status of the 6MW needs to be clearly stated in the PDD, as to whether it is part of the grid or part of the project. Ref /1/ Annex 3 includes the 6 MW plant as a "must run" plant, and the PutPut as "not must run" plant. This would thus suggest the use of the Average OM method. Again, the status of the 6MW pilot geothermal plant needs to be clearly stated. (Ref. /1/ A.2.). The Build Margin factor has two options. The option selected is Option 1, 20% capacity. In this case, the Build Margin would be based on the most recent expansion at the PutPut generating plant, and the description of application of this option needs to clearly justify the choices		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			made, including the reason for exclusion of the 6MW pilot geothermal plant from the BM calculation (Ref. A.2.). The emission factor baseline is determined from the average emission factor of the existing power plant over the three most recent years of operation of the PutPut plant for which complete and accurate data is available. Data on HFO usage is subject to independent external audit by the mine's financial auditors (PWC) and the electricity usage data is downloaded directly from the mines process control system. The methodology was reviewed with the mine Power Station Superintendent and found to be effectively implemented. sB.2 does not fully demonstrate that the calculation of OM (use of the most appropriate OM option) and BM (clarification of the projects used as the benchmark for the BM) have been completed fully in accordance with the methodology.		
B.2.2. Has the baseline been determined using conservative assumptions where possible?	/1/ /21/	DR I	Ref /1/ p14. Energy use data was extracted from the mine process control system. Information on the use of HFO is gained from regular tank dipping and fuel usage reconciliation. The IPCC default factor for emissions from the combustion of HFO is used. The methodology was reviewed with		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			the mine Power Station Superintendent and found to be effectively implemented.		
B.2.3. Has the baseline been established on a project-specific basis?	/1/	DR	The baseline is specific to the existing PutPut power plant on the island, and was developed using local fuel and energy usage data.		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	The baseline is developed from fuel usage and energy sent out at the existing power plant. No specific risks are identified.		OK
B.2.5. Is the baseline determination compatible with the available data?	/1/	DR	The baseline has been developed from available data.		OK
B.2.6. Does the selected baseline represent the most likely scenario among other possible and/or discussed scenarios?	/1/ /5/	DR	Three scenarios are considered – 1. Continuation of the existing situation 2. Development of the 55MW power plant with no CDM contribution 3. Development of the 55MW power plant with CDM contribution These are the only possible scenarios.		OK
B.2.7. Is it demonstrated/justified that the project activity itself is not a likely baseline scenario (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	/1/ /2/ /6/ /8/ /14/ /15/ /16/	DR I	The approved Additionality Tool (Ref /6/) has been applied. It should be noted that this Tool did not exist at the time the decision to develop the project was made. However, application of the Tool ex poste demonstrates that the initial decision was made taking account of anticipated future developments. - Step 0 – the project was submitted for pre-validation in April 2004 prior to the		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
proposed area of implementation, and not required by a Party's legislation/regulations)?			start of construction in May 2004. This evidences that the CDM was seriously considered in the decision to proceed with the project activity. In addition, the Lihir Gold Annual Report 2003 notes in the Chairman's report (p8) that an increase in capacity to 50MW geothermal capacity was likely, and in the Operations overview (p20 of the Annual Report) that CDM registration and sale of credits was part of the overall analysis and development process. - Step 1a – two alternatives to the project were considered as noted in B.2.6. above: a. Continuation of the existing situation b. Development of the 55MW power plant with no CDM contribution - Step 1b – all of the alternatives comply with current PNG legislation (Ref /8/). - Step 2a – Option III Benchmark Analysis was selected as the choice is between the proposed project and BAU. - Step 2b – In accordance with Option III, Government bond rates were chosen. In the case of PNG (as there is no market in Government bonds) the 182 day Treasury Bill rate was selected. Initial		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			approval for the project was during the first half of 2003. The documentation does not clearly state the date on which the project was approved or those responsible for the decision. The average 182 Day Treasury Bill rate for the first half of 2003 was 18.65%. From the second half of 2003 through to 2005 the 182 Day Treasury Bill rate has fallen and is now below 5%. Historically the 182 day Treasury Bill has shown wide variability, with the rate in June 1999 at 25.82%, August 2002 at 11.31% and June 2003 at 20.23%. LMC did not include any additional component to reflect project risk, which could be considered to be around 3% for a geothermal power project. Ref /16/ considers the overall risk and rating measures applicable to PNG. The overall conclusion (p5) is that the PNG economy is import intensive with a "spotty" record of fiscal management and some uncertainty regarding major new export resource projects. This translates to an economy prone to external liquidity crises and thus high variability in internal benchmark rates. On this basis, the benchmark rate used in the analysis can be considered as		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			conservative. - Step 2c – a comparative NPV analysis was performed by examining the NPV of the project with and without CDM revenue at a discount rate of 18.5% and with 2002 base costs adjusted by 2003 exchange rate movements. 2003 fuel prices were considered (USD195/mt). The time at which the NPV was performed and the investment decision made is critical. In accordance with the decision of the 15th meeting of the Methodology Panel, for assessing additionality, the information available at the time the decision was made was considered. Since the decision was made in early 2003, conditions have become much more positive, as described in the following comments. It is noted that the costs for the project include the costs of care and maintenance of the existing generating facility as it is being retained as a backup installation (Ref /1/ p14). These costs are included by allowing a proportion (75%, which is a conservative estimate) of the base maintenance costs in the "with project" cash flow. It is also noted that current (24 August 2005) Singapore rates for IFO180 are around USD304/mt. It is also noted that ref. /14/		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			Table 3.2 p93 suggests that expectations were for oil prices to remain no higher the USD27/bbl (about USD180/mt) in 2002 dollars through to 2030. Thus, although fuel oil prices in 2005 have changed dramatically to make the project more financially attractive, the situation at the time the decision to proceed was made and construction commenced was much more negative. - Step 2d – A sensitivity analysis was also conducted and the results reported in Ref /1/ Table B2. The parameters varied were: generation, ±10%; HFO price, ±10%; Discount rate, ±3%; and costs, ±10%. In every situation the project NPV remained negative. It is considered that the sensitivity analysis is reasonable in the circumstances. - Step 4a –there are no other geothermal projects in PNG, noting that the 6MW geothermal pilot plant was commissioned in April 2003 as part of the phased development of the LGPP. - Step 4b – there are no other similar projects. - Step 5 – the impact of CDM registration is to reduce the financial risk of the project. The conclusion of this analysis was that the		

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			project would not be considered without the benefit of CDM revenue stream. Considering (from the perspective of early 2003) the nature of the PNG economy, the selected technology and the risk averse nature of the mining activity, this seems a reasonable assessment of a decision made in early 2003.		
B.2.8. Have the major risks to the baseline been identified?	/1/	DR	No major risks were identified. This appears a reasonable assessment.		OK
B.2.9. Is all literature and sources clearly referenced?	/1/	DR	Footnotes were used throughout the PDD.		OK
C. Duration of the Project/ Crediting Period *It is assessed whether the temporary boundaries of the project are clearly defined.*					
C.1.1. Are the project's starting date and operational lifetime clearly defined and reasonable?	/1/	DR	Ref /1/ sC.2.2.1., sC.1.1., Table B.5. Table 5 indicates that construction commenced in May 2004 and that 31.7 MW became operational in June 2005. It is planned to commission further generation to a total net capacity of 52.8MW in 2007.		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	Ref /1/ sA.4.4.1., sC.2.2.2. A fixed ten year crediting period has been selected. It should be clarified that the actual date of registration will define the commencement of the ten year crediting period. The nominated date commencement date is 5 June 2006.	~~CL 2~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
D. Monitoring Plan *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).*					
D.1. Monitoring Methodology *It is assessed whether the project applies an appropriate baseline methodology.*					
D.1.1. Is the monitoring methodology previously approved by the CDM Executive Board?	/1/	DR	Ref /1/ sD.1. The monitoring methodology proposed is the approved methodology ACM0002.		OK
D.1.2. Is the monitoring methodology applicable for this project and is the appropriateness justified?	/1/ /21/	DR I	Ref /1/ sD.2. The monitoring methodology is applicable and appropriate. The electricity metering and plant data acquisition systems were reviewed during the onsite audit. Application of the baseline methodology ACM0002 determination of the OM and BM can be either ex ante or ex post. The initial OM and BM has been calculated based on the last three years of generation data, and is thus the ex ante method.		OK
D.1.3. Does the monitoring methodology reflect good monitoring and reporting practices?	/1/	DR	The methodology adopts the requirements of ACM0002. It is noted from the determination of the OM and BM that an ex ante approach has been	~~CL 3~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			adopted. However, the monitoring methodology in Table D.2.1.3. data items 12 to 18 suggest that an ex post approach has been adopted. Clarification is sought as to which approach is to be used for determination of the grid EF.		
D.1.4. Is the discussion and selection of the monitoring methodology transparent?	/1/	DR	Ref /1/ sD.2. The basis for the selection is clearly described.		OK
D.2. Monitoring of Project Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
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/	DR	Ref /1/ D.2.1.1. These are monitored in accordance with ACM0002. The fraction of CO_2 and CH_4 in the steam produced in excess of normal mining requirements is to be measured and calculated on a quarterly basis, or more frequently if necessary. The steam generated as a result of mining operations will also be monitored, and the fugitive emissions counted from the steam wells drilled specifically for the power plant.		OK
D.2.2. Are the choices of project GHG indicators reasonable?	/1/ /5/	DR	Ref /5/ defines the monitoring requirements included in Ref /1/ D.2.1.1. They include the energy supplied to the grid from the existing power source, the energy supplied from the geothermal power source and fugitive emissions from the geothermal steam.		OK
D.2.3. Will it be possible to monitor / measure the	/1/	DR	Ref /1/ D.2.1.1. Note 2 defines the		OK

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specified project GHG indicators?			methodology for monitoring fugitive CO_2 and CH_4 from the geothermal steam. Standard electrical metering equipment is used for the electrical output of the old and the new power plants.		
D.2.4. Will the indicators give opportunity for real measurements of achieved emission reductions?	/1/	DR	Ref /1/ B.3. Step 4. The process follows that approved in ACM0002.		OK
D.2.5. Will the indicators enable comparison of project data and performance over time?	/1/	DR	Ref /1/ D.2.1.1. The data planned for collection would be adequate to allow a range of unplanned assessment to be completed.		OK
D.3. Monitoring of Leakage *It is assessed whether the monitoring plan provides for reliable and complete leakage data over time.*					
D.3.1. Does the monitoring plan provide for the collection and archiving of all relevant data necessary for determining leakage?	/1/ /5/	DR	Ref /1/, Ref /5/ p6. No leakage is identified in ACM0002.		OK
D.4. Monitoring of Baseline Emissions *It is established whether the monitoring plan provides for reliable and complete project emission data over time.*					
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/ /5/	DR	Ref /5/ There is no baseline monitoring requirement, as the emissions of the existing power plant are determined ex ante based on historical data. Clarification is required as D.2.1.3. indicates	~~CL 3~~	OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			that the OM and BM are recorded yearly, but the selected options for determination of the baseline from ACM0002 are determined ex ante.		
D.5. Monitoring of Sustainable Development Indicators/ Environmental Impacts *It is checked that choices of indicators are reasonable and complete to monitor sustainable performance over time.*					
D.5.1. Does the monitoring plan provide the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/ /3/ /5/ /7/	DR	Ref /1/, /5/. No specific monitoring requirements have been identified. General environmental compliance and monitoring requirements for the mine (which includes the power plant) are fully discussed in Ref /3/ and subject to monitoring, reporting and approval by the PNG authorities (Ref /7/) under existing arrangements. Economic and social indicators are discussed in Ref /3/ s6, and it is in that reference indicated that these issues are put of a full review of the Lihir Integrated Benefits Package, an agreement by which the mine provides funding and support to a wide range of activities on Lihir.		OK
D.5.2. Is the choice of indicators for sustainability development (social, environmental, economic) reasonable?	/1/	DR	Refer to D.5.1.		OK
D.5.3. Will it be possible to monitor the specified sustainable development indicators?	/1/	DR	Refer to D.5.1.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
D.5.4. Are the sustainable development indicators in line with stated national priorities in the Host Country?	/1/	DR	Refer to D.5.1.		OK
D.6. Project Management Planning *It is checked that project implementation is properly prepared for and that critical arrangements are addressed.*					
D.6.1. Is the authority and responsibility of project management clearly described?	/1/ /21/	DR I	The Project Management and operational control requirements are not described in the PDD or associated documents. However, the mine and power plant is operated by Lihir Mining Company, a wholly owned subsidiary of Rio Tinto. LMC operates the main under contract with Lihir Mining, a company publicly listed on the ASX, NASDAQ and POMSOX. As such, no unusual project risks are anticipated.		OK
D.6.2. Is the authority and responsibility for registration, monitoring, measurement and reporting clearly described?	/1/	DR	Refer to D.6.1.		OK
D.6.3. Are procedures identified for training of monitoring personnel?	/1/	DR	Refer to D.6.1.		OK
D.6.4. Are procedures identified for emergency preparedness for cases where emergencies can cause unintended emissions?	/1/	DR	Refer to D.6.1.		OK
D.6.5. Are procedures identified for calibration of monitoring equipment?	/1/	DR	Refer to D.6.1.		OK
D.6.6. Are procedures identified for maintenance of monitoring equipment and installations?	/1/	DR	Refer to D.6.1.		OK

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D.6.7. Are procedures identified for monitoring, measurements and reporting?	/1/	DR	Refer to D.6.1.		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/	DR	Refer to D.6.1.		OK
D.6.9. Are procedures identified for dealing with possible monitoring data adjustments and uncertainties?	/1/	DR	Refer to D.6.1.		OK
D.6.10. Are procedures identified for review of reported results/data?	/1/	DR	Refer to D.6.1.		OK
D.6.11. Are procedures identified for internal audits of GHG project compliance with operational requirements where applicable?	/1/	DR	Refer to D.6.1.		OK
D.6.12. Are procedures identified for project performance reviews before data is submitted for verification, internally or externally?	/1/	DR	Refer to D.6.1.		OK
D.6.13. Are procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting?	/1/	DR	Refer to D.6.1.		OK

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E. Calculation of GHG Emissions by Source *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.*					
E.1. Predicted Project GHG Emissions *The validation of predicted project GHG emissions focuses on transparency and completeness of calculations.*					
E.1.1. Are all aspects related to direct and indirect GHG emissions captured in the project design?	/1/	DR	Ref /1/ Table B.6. A range of direct and indirect emissions are considered. In particular, only the emissions from steam vents additional to those required for normal mining operations are monitored. The analysis does not appear to exclude any material sources which should be included.		OK
E.1.2. Are the GHG calculations documented in a complete and transparent manner?	/1/ /5/	DR	Ref /1/ B.3 Step 3, 4 and 5. The GHG calculations follow the model in ACM0002.		OK
E.1.3. Have conservative assumptions been used to calculate project GHG emissions?	/1/	DR	Ref /1/ Tale B.3. The methodology required by ACM0002 has been implemented, whereby the emission factor for the baseline power station is determined over a three year average.		OK
E.1.4. Are uncertainties in the GHG emissions estimates properly addressed in the documentation?	/1/	DR	Ref /1/ .D.2.1. Data accuracy is not addressed in the PDD.	~~CL 4~~	OK
E.1.5. Have all relevant greenhouse gases and source	/1/	DR	Ref /1/ CO_2 and CH_4 have been included.		OK

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categories listed in Kyoto Protocol Annex A been evaluated?			The switchgear for the existing power station and the new power station is vacuum insulated. No gases which should have been included have been excluded.		
E.2. Leakage *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.*					
E.2.1. Are potential leakage effects beyond the chosen project boundaries properly identified?	/1/	DR	Ref /1/ E.2. No potential leakage sources are identified.		OK
E.3. Baseline Emissions *The validation of predicted baseline GHG emissions focuses on transparency and completeness of calculations.*					
E.3.1. Have the most relevant and likely operational characteristics and baseline indicators been chosen as reference for baseline emissions?	/1/ /5/	DR	The baseline indicators are nominated in ACM0002 and included in Ref /1/ D.2.1. Using the options from ACM0002, the emission factor of the existing power plant is to be established ex ante and used for the duration of the crediting period. However, D.2.1.3. indicates that these parameters are determined annually and clarification has been requested previously.	~~CL 3~~	OK
E.3.2. Are the baseline boundaries clearly defined and do they sufficiently cover sources and sinks for baseline emissions?	/1/ /5/	DR	Ref /1/ Fig. B3 and Fig. B4, Ref /5/ Fig. 1 and Fig. 2. The baseline boundaries have been established in accordance with the		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			requirements of ACM0002.		
E.3.3. Are the GHG calculations documented in a complete and transparent manner?	/1/ /5/	DR	Ref /1/		
E.3.4. Have conservative assumptions been used when calculating baseline emissions?	/1/ /5/	DR	The baseline emission calculation method is nominated in ACM0002 and included in Ref /1/ B.2. Step 5. The emission factor of the existing power plant is established ex ante and used for the duration of the crediting period.		OK
E.3.5. Are uncertainties in the GHG emission estimates properly addressed in the documentation?	/1/	DR	Data uncertainties are not addressed in the PDD.	~~CL 4~~	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	Ref /1/ B.3. Step 5. The same basis of calculation has been used, which is nett electricity sent out from the new power plant has replaced electricity that would have been generated at the existing power plant. Fugitive emissions from geothermal steam are accounted for.		OK
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/ /3/ /5/	DR	Ref /1/ Table B5. Emission removals have been calculated according to the requirements of ACM0002.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
F. Environmental Impacts *Documentation on the analysis of the environmental impacts will be assessed, and if deemed significant, an EIA should be provided to the validator.*					
F.1.1. Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/ /3/	DR	Ref /1/ F.1. The review conducted as part of the development of the Environmental Inception Report did not identify any environmental issues that were not already addressed in the mining operation.		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	Ref /1/ F.1. There are no such requirements.		OK
F.1.3. Will the project create any adverse environmental effects?	/1/	DR	Ref /1/ F.2. No such impacts have been identified by either the proponent or the PNG government.		OK
F.1.4. Are transboundary environmental impacts considered in the analysis?	/1/	DR	Ref /1/ F.1. No such impacts have been identified by either the proponent or the PNG government.		OK
F.1.5. Have identified environmental impacts been addressed in the project design?	/1/	DR	Refer to F.1.3. above.		OK
F.1.6. Does the project comply with environmental legislation in the host country?	/1/ /3/ /20/	DR I	Ref /1/ F.1. Compliance is confirmed through approval by the PNG Department of Environment and Conservation of the Environmental Inception Report and through direct discussion with a representative of the DEC.		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
G. Stakeholder Comments *The validator should ensure that a stakeholder comments have been invited and that due account has been taken of any comments received.*					
G.1.1. Have relevant stakeholders been consulted?	/1/ /20/ /21/	DR I	Ref /1/ G.1. The following stakeholders have been consulted: - Local and national authorities - Land owners - The broader community The following types of stakeholder consultation events have taken place: - Newsletters - Individual consultation - Community meetings - Workshops on the project Discussions with the DEC representative and the senior Lihirian working with the Lihir Mining Company indicated that stakeholder consultation meetings had been appropriate to the audience, and had been favourably received.		OK
G.1.2. Have appropriate media been used to invite comments by local stakeholders?	/1/ /20/ /21/	DR I	Ref /1/ G.1. It is indicated in the PDD and confirmed through discussion with the Mr Suruman and Mr Kabiriu that a variety of communication methods have been used. It should be noted that this project forms only a small part of much broader and longer lasting community consultation, interaction		OK

CHECKLIST QUESTION	Ref.	MoV*	COMMENTS	Draft Concl	Final Concl
			and support which is part of the Integrated Benefits Package.		
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	Ref /1/ G.1. No specific indication is given in the PDD of the need or otherwise to undertake community consultation. However, the local and national authorities were involved in the program and have approved the project.		OK
G.1.4. Is a summary of the stakeholder comments received provided?	/1/ /21/	DR I	Ref /1/ G.2. A range of mostly positive comments are noted in the PDD. Discussions with Mr Kabiriu indicated that the local population understood the issues, and that the comments noted in the PDD were the substantive comments received as part of the consultation process.		OK
G.1.5. Has due account been taken of any stakeholder comments received?	/1/	DR	Ref /1/ G.3. There is reference to on issue requiring change where appropriate action was taken.		OK

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 participants' response	Validation team conclusion
CAR 1: CDM-PDD (version 02 of 1 July 2004). However, the PDD was published on 23 August but does not follow the revised guidelines which came into force 13 May 2005 (version 03) and July 2005 (version 04) with regard to the presenting of information in tabular form in section A.3, E.4.1 and E.6 and including data and version number in section A.1. Annex 4 is not completed. Also, the project participants nominated in sA.3. are not consistent with those nominated in Annex 1.	Table 1 - 19	OK. PDD Template follows the revised guidelines of 8 July 2005 (version 4) Section A.1. – Data and version number updated A.3. – Project participants listed in the table same as those mentioned in Annex 1 E.4.1 – We have inserted a table showing the grid CEF calculation in section E.4. , is this adequate? The guidelines only mention a section E.4. E.6. – Table providing the Emissions Reductions has been inserted according to the latest guidelines Annex 4 – Has been completed	The changes are accepted. CAR closed.
CAR 2: sB.2 does not fully demonstrate that the calculation of OM (use of the most appropriate OM option) and BM (clarification of the projects used as the benchmark for the BM) have been completed fully in accordance with the methodology.	B.2	Section B.2. – Changes have been made to indicate that the calculation of OM and BM have been completed in accordance with the methodology	The changes are accepted. CAR closed.
CL 1: Clarification is required as to whether this is a capacity addition or not. (AM0019 was found	B.1.2	ACM0002 is applicable to LGPP as the project is not regarded as a fuel switch as it is a new geothermal plant and is	The changes are accepted. CL closed.

Draft report clarifications and corrective action requests by validation team	Ref. to Table 2	Summary of project participants' response	Validation team conclusion
to be unsuitable as it was inapplicable when there was capacity addition). It is noted that in Ref /1/ B.2 the installed capacity to the grid is shown is 80MW, which includes the PutPut plant, the standby generator and the 6MW geothermal pilot plant. This is inconsistent with the calculation for the operating and build margins. The LGPP is not co-located with the existing fossil fuel generating system. Clarification is required as to whether this could be regarded as fuel switch based on no net capacity addition. Clarification is requested as to whether all supply to the grid could be solely sourced from the LGPP for a significant period, of how this situation will be monitored, and of its impact if this situation were to occur. The generation capacity considered as formally connected to the grid should be consistently described throughout the PDD. The PDD should note and explain fully the reason for changing from the approved methodology AM0019 to ACM0002.		not located at the site of the Putput power plant. This PDD is a completely new application, which applies to the ACM0002 methodology and is not seen as a change from AM 0019 methodology. B1.1 justifies the appropriateness of ACM0002 for this PDD. Therefore no clarification is required in the PDD on whether or not the project is a capacity addition. Inconsistencies in the calculations of the build and operating margin have been rectified in B.2 It is possible that all supply to the grid could be solely sourced from the LGPP; details of the monitoring plan are given in Annex A. This will have no impact on the emissions reductions as the emission factor is calculated ex ante and not ex post, and a fixed emission factor will be used.	
CL 2: It should be clarified that the actual date of registration will define the commencement of the ten year crediting period.	C.1.2.	Section C.2.2.1. – states that the 10 year crediting period will start on 5 June 2006.	The changes are accepted CL closed.

Draft report clarifications and corrective action requests by validation team	Ref. to Table 2	Summary of project participants' response	Validation team conclusion
CL 3: It is noted from the determination of the OM and BM that an ex ante approach has been adopted. However, the monitoring methodology in Table D.2.1.3. data items 12 to 18 suggest that an ex poste approach has been adopted. Clarification is sought as to which approach is to be used for determination of the grid EF.	D.1.3 D.4.1 E.3.1	Table D.2.1.3. – the table has been corrected	The changes are accepted. CL closed.
CL 4: Ref /1/ .D.2.1. Data accuracy is not addressed in the PDD.	E.1.4 E.3.5	Section D.2. 1. – the data accuracy issue is addressed in this section.	The changes are accepted. CL closed.

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