VALIDATION REPORT

MARIPOSAS HYDROELECTRIC PROJECT IN CHILE

REPORT NO. 2010-0751

REVISION NO. 01

DET NORSKE VERITAS

VALIDATION REPORT

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Recommended for approval by: Hendrik W. Brinks	Approved by Hendrik W. Brinks	Organisational unit: DNV Climate Change and Environmental Services
Client: Hidroeléctrica Rio Lircay S.A.		Client ref.: José Manuel Contardo

DET NORSKE VERITAS
CERTIFICATION AS

Veritasveien 1,
1322 HØVIK, Norway
Tel: +47 67 57 99 00
Fax: +47 67 57 99 11
http://www.dnv.com
Org. No: NO 945 748 931 MVA

Summary:

Project Name: Mariposas Hydroelectric Project
Country: Chile
Methodology: AM0026
Version: 3
GHG reducing Measure/Technology: Grid connected renewable electricity generation
ER estimate: 21 000 tCO_2e per year (average)

Size

☒ Large Scale ☐ Small Scale

Validation Phases:

☒ Desk Review ☒ Follow up interviews
☒ Resolution of outstanding issues

Validation Status

☐ Corrective Actions Requested ☐ Clarifications Requested
☒ Full Approval and submission for registration ☐ Rejected

In summary, it is DNV's opinion that "Mariposas Hydroelectric Project" in Chile, as described in the PDD, version 4.4 of 29 June 2010, in relation to all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AM0026, version 3. Hence DNV requests the registration of the proposed project activity as a CDM project activity.

Report No.: 2010-0751	Subject Group: Environment	
Report title: Mariposas Hydroelectric Project		
Work carried out by: Felipe Antunes, Francisco Chavez		
Work verified by: Peter Peng Huang (applicant), Weidong Yang		
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VALIDATION REPORT

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Abbreviations

BM	Build Margin
CAR	Corrective Action Request
CDEC-SIC	Economic Dispatch Center in the Central Interconnected System
CDM	Clean Development Mechanism
CEF	Carbon Emission Factor
CER	Certified Emission Reduction
CIS	Central Interconnected System
CL	Clarification request
CM	Combined Margin
CNE	National Energy Commission
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CONAMA	National Environmental Authority (Comisión Nacional del Medio Ambiente)
DNV	Det Norske Veritas
DOE	Designated Operation Entity
DNA	Designated National Authority
GHG	Greenhouse gas(es)
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MP	Monitoring Plan
NGO	Non-governmental Organisation
ODA	Official Development Assistance
OM	Operating Margin
PDD	Project Design Document
RCA	Environmental Qualification Resolution
UNFCCC	United Nations Framework Convention on Climate Change

1 EXECUTIVE SUMMARY – VALIDATION OPINION

Det Norske Veritas Certification AS (DNV) has performed a validation of the project activity "Mariposas Hydroelectric Project". The validation was performed on the basis of UNFCCC criteria for the Clean Development Mechanism and host Party criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

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

The host Party is Chile, which fulfils the participation criteria and has approved the project and authorized the project participant Hidroeléctrica Río Lircay S.A. There is no Annex I Party identified yet. The DNA from Chile confirmed that the project assists in achieving sustainable development criteria of host country.

The project correctly applies the approved consolidated baseline and monitoring methodology AM0026, version 3 – "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid". The baseline methodology has been correctly applied and the assumptions made for the selected baseline scenario are sound.

The project activity is a run-of-river hydroelectric power plant with 6.3 MW of installed capacity. By generating electricity from hydropower and displacing electricity from the grid that is partly generated from fossil fuels, the project results in reductions of CO_2 emissions that are real, measurable and give long-term benefits to the mitigation of climate change.

It is demonstrated that the project is not a likely baseline scenario. Emission reductions attributable to the project are hence additional to any that would occur in the absence of the project activity.

The total emission reductions from the project are estimated to be on the average 21 000 tCO_2e per year over the selected 7 year renewable crediting period. The emission reduction forecast has been checked and it is deemed likely that the stated amount is achieved given that the underlying assumptions do not change.

The monitoring plan provides for the monitoring of the project's emission reductions. The monitoring arrangements described in the monitoring plan are feasible within the project design and it is DNV's opinion that the project participants shall be able to implement the monitoring plan.

In summary, it is DNV's opinion that the project activity "Mariposas Hydroelectric Project" in Chile, as described in the PDD, version 4.4 dated 29 June 2010, meets all relevant UNFCCC requirements for the CDM and all relevant host Party criteria and correctly applies the baseline and monitoring methodology AM0026, version 3. Hence, DNV requests the registration of the project as a CDM project activity

2 INTRODUCTION

Hidroeléctrica Río Lircay S.A. has commissioned Det Norske Veritas Certification AS (DNV) to perform a validation of the Mariposas Hydroelectric Project in Chile. This report summarises the findings of the validation of the project, performed on the basis of UNFCCC criteria for the CDM, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to Article 12 of the Kyoto Protocol, the CDM modalities and procedures, and the subsequent decisions by the CDM Executive Board.

2.1 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).

2.2 Scope

The validation scope is defined as an independent and objective review of the project design document (PDD) /1/. The PDD is reviewed against the criteria stated in Article 12 of the Kyoto Protocol, the CDM modalities and procedures as agreed in the Marrakech Accords, and the relevant decisions by the CDM Executive Board, including the approved baseline and monitoring methodology AM0026 version 3 /25/. The validation was based on the recommendations in the Validation and Verification Manual version 1.2 /24/.

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

3 METHODOLOGY

The validation consisted of the following three phases:

I a desk review of the project design documents

II follow-up interviews with project stakeholders

III the resolution of outstanding issues and the issuance of the final validation report and opinion.

The following sections outline each step in more detail.

3.1 Desk review of the project design documentation

The following tables list the documentation that was reviewed during the validation.

3.1.1 Documentation provided by the project participants

/1/ Hidroeléctrica Rio Lircay: CDM-PDD for project activity "Mariposas Hydroelectric Project", Version 3 dated 20 February 2010, Version 4.3.4 dated 31 May 2010 and Version 4.4 dated 29 June 2010.

/2/ Hidroeléctrica Rio Lircay: Mariposas Generation Matrix dated October 2009.

/3/ Hidroeléctrica Rio Lircay: Mariposas Feasibility Study, dated October 2009.

/4/ CONAMA: Resolution 139 (RCA approval) dated 29 May 2009, and Resolution 135 (transmission line route change) dated 22 July 2010.

/5/ Hidroeléctrica Rio Lircay: contract with ICAFAL for civil works dated 28 October 2009 and notice to proceed letter dated 19 November 2009.

/6/ BICE Bank: Loan contract dated 19 November 2009.

/7/ Hidroeléctrica Rio Lircay and ACM: Agreement for water rights dated 9 October 2009.

/8/ Hidroeléctrica Rio Lircay: Turbine purchase order dated 1 September 2008

/9/ Hidroeléctrica Rio Lircay: Generator contract dated 3 November 2008

/10/ Hidroeléctrica Rio Lircay: Board meeting minutes dated 8 September 2009

/11/ Hidroeléctrica Rio Lircay: F-CDM Prior consideration form submitted to the EB and the Chilean DNA on 12 November 2009.

/12/ ICAFAL: Civil works proposal dated 8 October 2009.

/13/ Vatech-Andritz: Turbine proposal dated 14 March 2008 and turbine parts proposal dated 25 September 2009.

/14/ Alconza: Generator proposal dated 14 March 2008.

/15/ Inamar: Crane and gates proposal dated 15 and 16 September 2009

/16/ Transmission line parts and construction proposals:

- CAM for transmission line construction dated 5 February 2008;
- Bosch for transmission metal towers dated 21 January 2008;

- EECOL for conductor Alliance and parts dated 7 May 2009;
- Vitel for transmission concrete towers dated 07 May 2009.

/17/ Rhona: Power transformer proposal dated 4 November 2008;

Pais: Substation construction proposal dated 27 February 2008.

/18/ Hidroeléctrica Rio Lircay: Spreadsheet with IRR, revision 9.

/19/ Price Waterhouse Coopers: Hidroelectrica Rio Lircay's financial states dated 31 March 2010

/20/ Hidroeléctrica Rio Lircay: Spreadsheet with ER calculation, version 2.

/21/ CONAMA: Stakeholders consultation process:
https://www.eseia.cl/expediente/ficha/fichaPrincipal.php?id_expediente=3480223&idExpediente=3480223& modo=ficha
https://www.e-seia.cl/expediente/ficha/fichaPrincipal.php?modo=ficha&id_expediente=4499635

/22/ Hidroeléctrica Rio Lircay: Letter to the CDEC-SIC dated 9 December 2009 presenting all information required by the Chilean Mining Ministry (Laws DS 327 – General Electric Services Law and DS 291 – CDEC Regulation)

3.1.2 Letters of approval

/23/ CONAMA (DNA of Chile): *Letter of Approval*. 25 August 2010

3.1.3 Methodologies, tools and other guidance by the CDM Executive Board

/24/ CDM Executive Board: *Validation and Verification Manual*. Version 1.2 from EB055

/25/ CDM-Executive Board: AM0026 – "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid". Version 3 from EB035

/26/ CDM-Executive Board: *Methodological Tool "Tool to calculate the emission factor for an electricity system"*, Version 02 from EB050

/27/ CDM Executive Board: "*Tool for the demonstration and assessment of additionality*", version 5.2 from EB039

3.1.4 Documentation used by DNV to validate / cross-check the information provided by the project participants

/28/ IPCC, *2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2: Energy*

/29/ Chilean Mining Ministry: Chilean Electrical Law DFL 4/2006 dated 12 May 2006

/30/ CDEC-SIC Operational Decree dated 14 January 2010.

/31/ Economy Ministry: Chilean Law of Income Tax dated 1 January 2004

/32/ CDEC-SIC: Statistical data presenting the correlation between hydrology and energy spot prices.

/33/ Evidence for raw material prices increase: London Metal Exchange website –

www.lme.com.

/34/ CDEC-SIC Node Price Report – October 2009.

/35/ CDEC-SIC Operation Statistics 1999 – 2008. Hourly data available in www.cdec-sic.cl

/36/ Det Norske Veritas: Climate Change Services Agreement signed in 26 February 2010

/37/ CNE Energy Balance (2008).

The main changes between the PDD published for the 30 days stakeholder commenting period and the final PDD submitted for registration are:

- Change in the installed capacity from 6 to 6.3 MW, based in the equipment nameplate;
- Changes related to the CAR/CL raised (Table 3).

3.2 Follow-up interviews with project stakeholders

On 13 May 2010, Felipe Antunes from DNV visited the Hidroelectrica Rio Lircay office and performed interviews with project stakeholders. No power plant site visit was performed because the project activity is a greenfield project and at the time of the site visit there was no installed equipment at the project site, only some civil works.

	Date	Name	Organization	Topic
/38/	13 May 2010	José Manuel Contardo	Hidroelectrica Rio Lircay – Project Manager	• Status of the project implementation • Technical issues • Methodology applicability • Project additionality • CDM consideration and real action to secure the implementation of the CDM project • GHG emission calculation • Monitoring Plan • Environment Impact Assessment • Consulting process on the stakeholder's comments;
/39/	13 May 2010	Gustavo Weber	Hidroelectrica Rio Lircay – Project Assistant	

3.3 Resolution of outstanding issues

The objective of this phase of the validation was to resolve any outstanding issues which needed be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency a validation protocol was customised for the project. The protocol shows in a transparent manner the 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 four tables. The different columns in these tables are described in the figure below. The completed validation protocol for the project activity "Mariposas Hydroelectric Project" in Chile is enclosed in Appendix A to this report.

A corrective action request (CAR) is raised if one of the following occurs:

(a) The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions;

(b) The CDM requirements have not been met;

(c) There is a risk that emission reductions cannot be monitored or calculated.

A clarification request (CL) is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met.

A forward action request (FAR) is raised during validation to highlight issues related to project implementation that require review during the first verification of the project activity. FARs shall not relate to the CDM requirements for registration.

Validation Protocol Table 1: Mandatory Requirements for CDM Project Activities		
Requirement	***Reference***	***Conclusion***
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**) or a **corrective action request (CAR)** if a requirement is not met.*

Validation Protocol Table 2: Requirement Checklist				
Checklist question	***Reference***	***Means of verification (MoV)***	***Assessment by DNV***	***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 different sections, following the logic of the CDM-PDD	*Gives reference to documents where the answer to the checklist question or item is found.*	*Means of verification (MoV) are **document review (DR)**, **interview (I)** or any other follow-up actions (e.g., on site visit and telephone or email interviews) and **cross-checking (CC)** with available information relating to projects or technologies similar to the proposed CDM project activity under validation.*	*The discussion on how the conclusion is arrived at and the conclusion on the compliance with the checklist question so far.*	*OK is used if the information and evidence provided is adequate to demonstrate compliance with CDM requirements. A c**orrective action request (CAR)** is raised when project participants have made mistakes, the CDM requirements have not been met or there is a risk that emission reductions cannot be monitored or calculated. A **clarification request (CL)** is raised if information is insufficient or not clear enough to determine whether the applicable CDM requirements have been met. A **forward action request (FAR)** during validation is raised to highlight issues related to project implementation that require review during the first verification of the project activity.*

Validation Protocol Table 3: Resolution of Corrective Action and Clarification Requests			
Corrective action and/ or clarification requests	***Ref. to checklist question in table 2***	***Response by project participants***	***Validation conclusion***
*The **CARs** and/ or **CLs** raised in Table 2 are repeated here.*	*Reference to the checklist question number in Table 2 where the CAR or CL is explained.*	*The responses given by the project participants to address the CARs and/or CLs.*	*The validation team's assessment and final conclusions of the CARs and/or CLs.*

Validation Protocol Table 4: Forward Action Requests		
Forward action request	***Ref. to checklist question in table 2***	***Response by project participants***
The FARs raised in Table 2 are repeated here.	*Reference to the checklist question number in Table 2 where the FAR is explained.*	*Response by project participants on how forward action request will be addressed prior to first verification.*

Figure 1: Validation protocol tables

3.4 Internal quality control

The final validation report underwent technical review before requesting registration of the project activity. The technical review was performed by a technical reviewer qualified in accordance with DNV's qualification scheme for CDM validation and verification.

3.5 Validation team

				Type of involvement						
Role	***Last Name***	***First Name***	***Country***	Administrative	Desk review	Site visit / Interviews	Reporting	Supervision of work	Technical review	Sectoral competence
Project manager	Antunes	Felipe	Brazil	✓						
Technical team leader (CDM validator)	Antunes	Felipe	Brazil		✓	✓	✓			
Sector expert	Chávez	Francisco	Norway		✓		✓			✓
Technical reviewer	Yang	Weidong	USA						✓	
Person with sectoral competence assisting technical reviewer / Technical reviewer (applicant)	Huang	Peng (Peter)	China						✓	✓

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

4 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 PDD, version 4.4 dated 29 June 2010.

4.1 Participation requirements

The project participant is Hidroelectrica Rio Lircay S.A. of host Party Chile. The host Party (Chile) meets all relevant participation requirements. There is no Annex I Party identified yet. The host Party (Chile) meets all relevant participation requirements and has provided written approval of voluntary participation in the project /23/.

The project does not involve any public funding from an Annex I Party, and the validation did not reveal any information that indicated that the project can be see as a diversion of official development assistance (ODA) funding towards Chile. The project signed a loan with BICE /6/, a private bank.

4.2 Project design

The project activity is a run-of-river hydroelectric power plant with 6.3 MW of installed capacity /3/ located in the Province of Talca, commune of San Clemente, VII Region of Maule, Chile, with geographical coordinates 35°35’49.2" S and 71°15’43.2" W for the intake, and 35°35’45.6" S and 71°15’50.4" W for the power house. The plant is connected to the Chilean Central Interconnected System. The project is expected to generate 40 GWh per year, according to the hydrological study (1960-1999) /2/ presented to the local bank while applying for project financing /6/, which corresponds to a plant load factor of 72.5%. DNV considers this load factor reasonable for run-of-river hydropower plants.

The project design engineering reflects current good practice since it consists of a well known efficient technology. The essential equipment consists of one vertical Compact Axial Turbine of 6.3 MW, connected directly to synchronous generator of 7 MVA, obtaining an installed total power of 6.3 MW /3/. The generator will connect to a power transformer elevating the voltage from 6.6 kV to 66 kV in the Mariposas substation.

The starting date of the project activity is 19 November 2009, which corresponds to the financial closure and instruction date for civil works /5/. DNV considers this reasonable, as described in section 4.5. The operational lifetime is estimated to over 40 years, as confirmed in the project feasibility study /3/. A renewable 7 year crediting period has been chosen and the starting date is on 1 November 2010.

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

4.3 Application of selected baseline and monitoring methodology

The proposed project activity applies the approved baseline methodology AM0026 version 3 – “Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid” /25/.

This methodology is applicable to the "Mariposas Hydroelectric Project" as this project consists of a new run-of-river hydropower plant /3/ for supplying electricity to the SIC grid. Besides this, the project is connected to the Chilean interconnected grid and fulfils all the legal obligations under the Chilean Electricity Regulation, as confirmed with the RCA approval /4/ and the letter to the CDEC-SIC /22/.

4.4 Baseline determination

Since the project is additional, cf. Section 4.5, the baseline scenario electricity is in accordance with AM0026 /25/ that the delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. In the absence of proposed project activity, the same amount of electricity would have been generated by power plants connected to the SIC electricity system.

The project boundary is the physical, geographical site of the renewable generation source and the SIC grid /3//22//35/. The grid boundary is the spatial extent of the power plants that can be dispatched without significant transmission constraints in the SIC grid. Baseline emissions correspond to CO_2 emissions from fossil fuel based electricity generation of SIC grid.

		GHGs involved	*Description*
Baseline emissions	*Grid electricity generation*	CO_2	Fossil fuel electricity generation in the grid
Project emissions	*None*	-	No project emissions were identified as per AM0026, since the proposed project activity is a run-of-river power plant with no reservoir /3/.
Leakage emissions	*None*	-	No leakage emissions were identified as per AM0026

The selected sources and gases are justified for the project activity.

The application of the baseline methodology is transparent and conservative.

4.5 Additionality

The additionality of the project has been demonstrated using the "Tool to identify the baseline scenario and demonstrate additionality" version 5.2 /27/.

4.5.1 Evidence for prior CDM consideration and continuous actions to secure CDM status

i) The starting date of the project activity is 19 November 2009, which corresponds to the financial closure and instruction date for civil works /5/. DNV considers this reasonable, since 93% of the project's investment is financed by the BICE bank /6/, and the previous contracts for civil works /5/ and water rights /7/ were conditioned to the financial closure. The generation equipmanet were purchased before the project starting date: the turbine in 1 September 2008 /8/, and the generator in 3 November 2008 /9/. However, the reason that project participants

signed those contracts at that time was to seize the opportunity since another project with the same characteristics was being developed by the supplier VATECH-Andritz; signing the contract at that time could shorten the supply cycle of the turbine after the final decision to go ahead with the project implementation. The board approved the project implementation on 8 September 2009 /10/, considering CDM revenues and on the condition of obtaining the loan for 93% of the investments. It is important to highlight that the turbine and generator costs correspond to 20% of the total investment, so that would be recovered by the loan.

ii) In order to have the loan approved, the project proponent developed a feasibility study in October 2009 /3/, which carried out an investment analysis /18/ and considered CDM revenues.

It was demonstrated that CDM benefits were taken into account before a final decision to proceed with the process was made. On 12 November 2009, the company submitted the "F-CDM Prior consideration form" to both UNFCCC and Chilean DNA informing about the commencement of the project activity and the intention to seek CDM status /11/.

The contract with DNV for project CDM validation was signed in February 2010 /36/, only four months after the project activity starting date. The PDD was published for global stakeholders in 8 April 2010. Hence, efforts to secure CDM status were found satisfactory.

4.5.2 Identification of alternatives to the project activity

According to AM0026, the possible scenarios identified are i) the project without CDM revenues and ii) electricity from the grid including new diesel and coal fired power plants, and both scenarios are in compliance with Chilean laws and regulations /22/.

4.5.3 Investment analysis

Choice of approach

Since the proposed project generates financial and economic benefits through the sales of electricity other than CDM-related income and the alternative does not involve any investment, a benchmark analysis is applicable.

Benchmark selection

The pre-tax project benchmark of 10% chosen for the project activity is the official rate of return for electric projects defined by the Chilean electrical law. DNV considers this benchmark conservative and reasonable, as this is used to determine node prices, transmission line and distribution investments /29/.

Input parameters

DNV has validated all input values to the investment analysis based on appropriate evidence, as described below.

Investment costs:

The total investment is estimated to be USD 18 091 000. From this amount:

- USD 8 755 000 corresponds to civil works costs, as per the proposal presented from the supplier Icafal on 8 October 2009 /12/;
- USD 3 714 000 corresponds to turbine and generator costs, as per the supplier proposals dated 14 March 2008 and 25 September 2009 /13//14/;

- USD 1 134 000 corresponds to crane and gates costs, as per the supplier proposal dated 15 and 16 September 2009 /15/;
- USD 1 140 000 corresponds to transmission line costs, as per the suppliers proposals dated January 2008 – May 2009 /16/;
- USD 572 000 corresponds to the substation costs, as per the suppliers proposals dated February 2008 – November 2008 /17/.

O&M costs:

The operation and maintenance costs were estimated based on the project manager's experience in the Chilean electrical market, and are equivalent to a maximum of 3.9% of the total investment. It is DNV's opinion that this is reasonable value for hydropower projects. The water right costs included in the O&M costs were calculated according to the agreement between Hidroelectrica Río Lircay and the Maule Channel Association /7/.

Electricity tariff and capacity price:

The project proponent envisages selling 30% of the energy generated at spot prices, estimated as USD 57.25/MWh according to the SIC investment plan, the SIC sales projection for 2009 – 2012, the availability of gas, the fuel prices and the marginal costs. All this information was obtained from the CDEC-SIC projections as per the Node Price Report /34/. The remaining 70% will be sold at node prices, estimated according to the CDEC-SIC Node Price Report /34/ as US$ 56.20/MWh.

The capacity price that was estimated as US$ 105.98/kW-year, was also according to the CDEC-SIC Node Price Report /34/.

Electricity generation:

The project is expected to generate 40 GWh per year, according to the hydrological study (1960-1999) /2/ presented to the local bank while applying for project financing /6/, which corresponds to a plant load factor of 72.5%. This is in line with annex 11 of the 48th meeting of CDM-EB.

Firm Capacity:

Firm capacity is calculated considering the CDEC-SIC operational decree dated 14 January 2010 /30/. According to the hydrological study /2/, this corresponds to 2.3 MW.

Taxes and depreciation:

DNV could also confirm that the values of 17% for the income tax and a linear depreciation of 13 years with zero residual value /31/ were established accordingly to the Chilean legal requirements.

According to the guidance of EB51 Annex 58, the interest payable should be taken into account of the income tax calculation in cases where the benchmark applied in the investment analysis is post tax. As for the proposed project, the IRR benchmark is post tax and the 3.9%

interest tax payable /6/ for the loan, which is 93% of the investment, has been verified to be included in the calculation of the income tax.

Calculation and conclusion

The IRR calculations for 40 years were provided in a spreadsheet /18/. The calculations were verified and found to be correct by DNV. The assumptions used in the calculations were deemed to be correct by DNV. The project-IRR without CDM revenues is 9.22%, which confirms that the project in the absence of CDM benefits and compared to the benchmark is not financially attractive.

Sensitivity analysis

A sensitivity analysis was carried to check the robustness of the investment analysis. Parameters contributing more than 20% to the revenues or costs were considered to the total investments, O&M costs and energy node prices. Considering the strong inverse correlation between the hydrology variations and the energy spot prices, it is not possible to carry on an independent sensitivity analysis for each of these parameters. The sensitivity analysis demonstrates the following:

- Total investments: If the total investments decrease by 6.5%, the project-IRR will reach the benchmark. However, considering that most of the main contracts were based in fixed prices as per the proposals /12/ - /17/, such a variation is not likely. In addition, DNV confirmed that all commodities and raw materials required for the construction of the project have increased their prices since September 2008 /33/.
- Operation and maintenance (O&M) cost: If the O&M costs decrease by 52.6%, the IRR will reach the benchmark. However, considering that all commodities and raw materials required for the construction and operation of the project has increased their prices since September 2008 /33/, this is not likely to happen.
- Energy node prices: To reach the benchmark, the electricity tariff must increase 9.2%, which is not likely to happen, since the electricity tariff is based in a long term average established by the CDEC-SIC, which does not foresee such an increase in tariffs /34/.
- Electricity generation: A direct sensitivity analysis for hydrology variations was not conducted, since there is an inverse correlation between the hydrological scenarios and the energy spot prices. Therefore, the project proponent considered two scenarios: the first three years of generation with extreme dry conditions (31 GWh per year, corresponding to energy spot prices of USD 150/MWh /2//32/), and the first three years with extreme humid conditions (43 GWh per year, corresponding to energy spot prices of USD 20/MWh /2//32/). For the first scenario an increase in 55% of the energy spot prices would be required for the IRR to reach the benchmark. For the second scenario an increase of 515% would be required. This is not likely, since the CDEC-SIC Node Price Report /34/ do not foresee such an increase. The analysis is limited to the first three years because an extreme hydrological scenario for many years is not likely, and the first years have the largest impact in the project revenues.

The sensitivity analysis shows that even with substantial variation of the key indicators, the IRR of the proposed project is lower than the benchmark.

4.5.4 Barrier analysis

In line with the "Guidelines for objective demonstration and assessment of barriers" (EB59 annex 13), the following barriers are presented to complement that the investment analysis is not favourable to the project: water availability barrier, and company scale barrier.

a) Water availability barrier: it was demonstrated that the project faces risk against drought and low inflow periods. Besides that, the project water resources do not only depend on the natural hydrological fluctuations, but also to the operation of the Canal Maule Norte Alto irrigation channel. As per the Water Rights agreement /7/, whenever there is difficulty to deliver the irrigation waters from this channel, this may be compensating by delivering water through other upstream channels and therefore affecting the project water availability.

b) Company scale risk: previous to any project implementation, several preliminary steps are required for the identification and scope of the project. This is presented as a barrier for small generation project developers that do not benefit from scale economies that large energy companies from the power sector have. Further, small scale companies do not benefit from competitive financing rates, due to the inherent higher risk. DNV could confirm that Hidroelectrica Rio Lircay is a new player in the electricity sector with Mariposas as its first and only project /19/. The project was made possible because of BICE loan agreement dated 19 November 2009 /6/. One of the requirements of the financing bank as part of the due diligence study was the analysis of the feasibility study /3/, which clearly addresses CDM revenues.

The feasibility study /3/ shows that the CDM could alleviate these barriers, since the project will be able to sell CERs in the market as additional income reducing risks.

It is demonstrated that the identified barriers would not prevent the implementation of natural gas combined or open cycle plants and coal fired plants.

4.5.5 Common practice analysis

According to the CDEC–SIC Node Price Report dated October 2009 /34/, the CNE indicative expansion plan for 2009 – 2012 considers basically diesel and coal fired power plants, with the exception of a large reservoir project. All other plants are renewable wind or run-of-river power plants that are undergoing CDM registration process.

Therefore DNV confirms that the project is not common practice in Chile.

In conclusion, the assessment of the arguments presented above is deemed to sufficiently demonstrate that the project is not a likely alternative, and that emission reductions resulting from the project are additional.

4.6 Monitoring

The project applies the approved monitoring methodology AM0026 - "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid", Version 3 /25/. The monitoring methodology is applicable to the proposed project activity as the electricity capacity addition is a run-of-

river hydro power plant and the project is connected to the central grid of the Republic of Chile.

The monitoring plan is in accordance with the monitoring methodology. The monitoring plan will give opportunity for real measurements of achieved emission reductions.

4.6.1 Parameters determined ex-ante

The parameters used for emission reduction calculations that are available *ex ante* are given as below:

- w_{BM}: Weight for build margin emission factor of 0.25.
- w_{OM}: Weight for operating margin emission factor of 0.75.

According to the "Tool to calculate the emission factor for an electricity system" /26/, the alternative weights for build margin and operating margin may be applied for the project activity because the project is a highly off-peak project (62% of its generation will occur during the off peak season (from October to March), according to the project hydrological study (1960-1999) /2/). Besides that, the project size is very small compared to the SIC grid total installed capacity (less than 0.06%). Therefore, DNV considers it reasonable for the proposed weights.

4.6.2 Parameters monitored ex-post

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

- Generation: Electricity generation of the project each hour.
- EF_y: emission factor of the dispatched energy from the grid.
- EF_{OM}: Operating margin emission factor.
- $EF_{j,h}$: Operating margin emission factor of hour h.
- D(j,i): Energy displaced of the marginal plant "i" due to the proposed CDM project "j".
- d_i: Emission factor of the marginal plant "i".
- SFC_i: Specific fuel consumption per unit of electric energy produced in the 'i^{th}' marginal plant.
- M: Number of electricity generation plants on the margin, that would supply to the system in the absence of the CDM projects in the system.
- N: List of CDM plants in the system.
- C_j: Electric energy of the j^{th} CDM project of the system in the hour h.
- A_i: Generation capacity of the i^{th} plant on the margin during hour h.
- B_i: Electric energy of the i^{th} plant on the margin during hour h.
- EF_{BM}: Build Margin emission factor.
- $EF_{ELm,y}$: CO_2 Emission Factor of power unit *m* in the Build Margin cohort.

- $EG_{m,y}$: Net quantity of electricity generated and delivered to the grid by power unit *m*.
- Plant name.
- $CEF_{OM,i}$: Carbon emission factor of fuel used in the i^{th} plant of the build margin cohort.
- $Oxid_i$: Fraction of fuel oxidized on combustion.
- $FC_{i,m,y}$: Amount of fossil fuel type i consumed by power unit m.
- $NCV_{i,y}$: Net calorific value (energy content) of fossil fuel type *i*.
- $EF_{CO2,i,y}$: CO_2 emission factor of fossil fuel type i

4.6.3 Management system and quality assurance

Detailed responsibilities and authorities for project management, monitoring procedures and QA/QC procedures have been presented. The monitoring practices are considered appropriate.

Details of data to be collected, its certainty, and format and location to be filed are correctly described.

The PDD describes the responsibility for project management, monitoring and reporting project activities.

The data will be kept for two years after the end of the last crediting period or last issuance which ever is later.

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

4.7 Estimation of GHG emissions

The baseline emission factor for the project is determined *ex-post* as a combined margin, consisting of combination of the operating margin (OM) and build margin (BM). AM0026 version 3 calculates the operating margin by observing actual dispatch data, the generation from the power plants and the merit order. The emission factor for the operating margin is determined by the generation that would be dispatched in the absence of this CDM Project.

The BM emission factor will be determined *ex-post* as required in the option (i) of the AM0026, that is, build margin emission factor estimation process described in the "Tool to calculate the emission factor for an electricity system" (version 2). The CO_2 emission factor of power unit *m* in the build margin cohort is calculated using option A1 from the Tool, using data from the CNE official reports /34//37/, and NCV and EF from IPCC2006 guidelines using the lower limit of the 95% confidence interval /28/.

The weights ω_{OM} and ω_{BM} are selected as 0.75 and 0.25 respectively, as described in the previous section 4.6.2.

The estimations of the emission reduction forecast are based on electricity generation estimates provided by the Central Interconnected System of Chile (SIC) /34//35/. The build margin emission coefficient (BM) was estimated considering the most recent 20% power plants capacity additions (in MWh) in the electricity system, since those comprises a larger annual generation when compared to the five power units that have been built most recently. The operating margin (OM) emission coefficient is found to be 0.585 tCO_2e/MWh and the

build margin (BM) emission coefficient is 0.344 tCO_{2e}/MWh, resulting in a combined margin emission coefficient of 0.525 tCO_{2e}/MWh (weighted average of the build and operating margin).

The project is estimated to result in 21 000 tCO_2 of emission reductions annually through out the 7 year renewable crediting period. The baseline emission estimate can be replicated using the data and parameter values provided in the PDD and supporting files submitted for registration. The data sources mentioned have been verified by DNV.

In summary, the GHG calculations are complete and transparent, and their accuracy has been verified. No other project emission or leakage sources contributing more than 1% and not mentioned by the methodology have been found.

4.8 Environmental impacts

According to the Chilean environmental regulations, the project proponent submitted an Environmental Impact Declaration to the Environment National Authority, CONAMA, and received the corresponding approval of the project through the "Resolución Exenta N°139/2009" /4/.

No significant environmental impacts are predicted.

4.9 Comments by local stakeholders

Stakeholders' involvement was organized through the publishing of the Environmental Impact Declaration to local stakeholders such as local community and local authorities.

Correspondent evidences were provided to DNV /21/. The project activity received some comments, mostly related to clarifications of the project. No negative comments were received.

DNV considers the local stakeholder consultation carried out adequately.

4.10 Comments by Parties, stakeholders and NGOs

The PDD, version 03, dated 20 February 2010, was made publicly available on the CDM website (http://cdm.unfccc.int/Projects/Validation/DB/LBL34QNUI85J04GD5T5W2YSTR431LN/view.html) and Parties, stakeholders and NGOs were through the CDM website invited to provide comments during a 30 days period from 8 April 2010 to 7 May 2010. No comments were received.

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APPENDIX A

CDM VALIDATION PROTOCOL

Table 1 Mandatory requirements for Clean Development Mechanism (CDM) project activities

Requirement	Reference	Conclusion
About Parties		
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	NA
2. The project shall assist non-Annex I Parties in contributing to the ultimate objective of the UNFCCC.	Kyoto Protocol Art.12.2.	OK
3. 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	~~CAR 1~~ OK
4. 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	~~CAR 1~~ OK
5. In case public funding from Parties included in Annex I is used for the project activity, these Parties shall provide an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties.	Decision 17/CP.7, CDM Modalities and Procedures Appendix B, § 2	NA
6. Parties participating in the CDM shall designate a national authority for the CDM.	CDM Modalities and Procedures §29	OK
7. The host Party and the participating Annex I Party shall be a Party to the Kyoto Protocol.	CDM Modalities §30/31a	OK
8. The participating Annex I Party's assigned amount shall have been calculated and recorded.	CDM Modalities and Procedures §31b	NA
9. 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
About additionality		
10. Reduction in GHG emissions shall be additional to any that would occur in the 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	Kyoto Protocol Art. 12.5c, CDM Modalities and Procedures §43	~~CAR 2~~ ~~CAR 3~~

Requirement	Reference	Conclusion
that would have occurred in the absence of the registered CDM project activity.		OK
About forecast emission reductions and environmental impacts		
11. 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
For large scale projects only		
12. 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
About stakeholder involvement		
13. 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
14. 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
Other		
15. The baseline and monitoring methodology shall be previously approved by the CDM Executive Board.	CDM Modalities and Procedures §37e	OK
16. 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
17. The baseline methodology shall exclude to earn CERs for decreases in activity levels outside the project activity or due to force majeure.	CDM Modalities and Procedures §47	OK
18. 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 Requirements checklist

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A General description of project activity					
A.1 Title of the project activity (VVM para 55-57)					
A.1.1 Does section A.1 of the PDD include a clearly identifiable project title, version number of the PDD and date of the PDD?	/1/	DR	☒ Clearly identifiable title of the project activity ☒ Version number of the PDD is included ☒ Date of the PDD is included.		OK
A.1.2 Is the PDD is in accordance with the applicable requirements for completing PDDs?	/1/	DR	☒ No Considering that the project activity is applying the methodology AM0026, the PDD should follow the CDM-PDD format, and the "Tool for the demonstration and assessment of additionality" should be applied. The PDD should present a precise reference for each and all statements.	~~CAR 2~~ ~~CL 1~~	OK
A.2 Description of the project activity (VVM para 58-64)					
A.2.1 How was the design of the project assessed?	/1/ /2/ /3/ /4/	DR I	*What type is the project?* ☐ Project in existing facility or utilizing existing equipment(s) ☐ Large scale project ☐ bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year ☐ Individual small scale project activity with a limit of 45 MW thermal outputs and 15 MW electricity output. ☒ Greenfield project		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			How was the design of the project assessed? ☒ Reviewing available designs and reports.		
A.2.2 If a greenfield project, describe the physical implementation of the project when the validation was commenced.	/1/ /5/	DR I	The civil works started in 19 November 2009. There are no equipments in place yet.		OK
A.2.3 If physical site visits were performed based on sampling (only applicable for bundled small scale projects, each with emission reductions not exceeding 15 000 tCO_2e per year), justify the sampling through a statistical analysis:	/1/	DR	NA		OK
A.2.4 Is the description of the proposed CDM project activity as contained in the PDD sufficiently covers all relevant elements, is accurate and that it provides the reader with a clear understanding of the nature of the proposed CDM project activity?	/1/ /2/ /3/ /6/	DR I	The project activity is a run-of-river hydroelectric power plant with 6.3 MW of installed capacity. The plant is connected to the Chilean Central Interconnected System. The project is expected to generate 40 GWh per year, according to the hydrological study (1960-1999) presented to the local bank while applying for project financing, which corresponds to a plant load factor of 72.5%. DNV considers this load factor reasonable for run-of-river hydropower plants.		OK
A.2.5 Does the project activity involve alteration of existing installations? If so, have the differences between pre-project and post-project activity been clearly described in the PDD?	/1/	DR I	No, the proposed project activity does not involve alteration of existing installations.		OK
A.2.6 Does the project design engineering reflect current good practices?	/1/ /3/ /4/	DR I	The project design engineering reflects current good practice. The essential equipment consists of one vertical Compact Axial Turbine of 6.3 MW, connected directly to synchronous generator of 7 MVA, obtaining an installed total power of 6.3 MW. The generator will connect to a power transformer elevating the voltage from 6.6 KV to 66 kV in the Mariposas substation.		OK
A.2.7 Would the technology result in a significantly better performance than any commonly used technologies in the	/1/ /3/	DR I	The proposed project activity will reduce greenhouse gas emissions by displacing part of		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
host country? Is any transfer of technology from any Annex-I Party involved?	/4/		the electricity generated in the SIC grid, which is partly generated by fossil fuels. The technology is imported from Europe.		
A.3 Participation requirements (VVM para 51-54, 125-127)					
A.3.1 Do all participating Parties fulfil the participation requirements as follows:	/1/	DR	The involved party is Chile as the host Party. There is no Annex I Party identified yet.		OK
	Chile (host)				
a) Party has ratified the Kyoto Protocol	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
b) Party has designated a Designated National Authority	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
c) The assigned amount has been determined	NA	☐ Yes ☐ No	☐ Yes ☐ No		
A.3.2 Do the letters of approval meet the following requirements?	/1/	DR	The Letter of Approval from the host Party has not yet been issued.	~~CAR 1~~	OK
	Chile (host)				
a) LoA confirms that Party has ratified the Kyoto Protocol	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
b) LoA confirms that participation is voluntary	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
c) The LoA confirms that the project contributes to the sustainable development of the host country?	☒ Yes ☐ No	NA	NA		
d) The LoA refers to the precise project activity title in the PDD	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
e) The LoA is unconditional with respect to (a) to (d) above	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
f) The LoA is issued by the respective Party's DNA	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No		
g) The LoA was received directly by the DNA or the PP	☐ DNA ☒ PP	☐ DNA ☐ PP	☐ DNA ☐ PP		
h) In case of doubt regarding the authenticity of the letter of approval, describe how it was verified that the letter of approval is authentic	There was no doubt about the LoA authenticity.				
A.3.3 Have all private/public project participants been authorized by an involved Party?	/1/	DR	The Letter of Approval from the host Party has not yet been issued.	~~CAR 1~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
A.4 Technical description of the project activity (VVM para 58-64)					
A.4.1 Is the project's location clearly defined?	/1/	DR I	The proposed project is located in the 7th Region of Maule, Chile, at about 40 km southeast from Talca city and 250 km south from Santiago, Chile. The Project's intake is placed in the Maule Norte Alto canal, and the Powerhouse facilities are placed in Bramadero sector. The water's restoration take place through a tailrace channel, delivering the water to the Mariposas canal, restoring the water to their previous course, where it is used for the local community to irrigate their fields. The project geographical coordinates are 35°35'49.2" S and 71°15'43.2" W for the intake, and 35°35'45.6" S and 71°15'50.4" W for the power house.		OK
A.5 Public funding of the project activity					
A.5.1 In case public funding from Parties included in Annex I is used for the project activity, have these Parties provided an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of these Parties?	/1/ /6/	DR I	The project does not involve any public funding from an Annex I Party, and the validation did not reveal any information that indicated that the project can be see as a diversion of official development assistance (ODA) funding towards Chile. The project signed a loan with BICE, a private bank.		OK
B Application of a baseline and monitoring methodology					
B.1 Methodology applied (VVM para 65-76)					
B.1.1 Does the project apply an approved methodology and the correct version thereof?	/1/ /25/	DR	Yes. The proposed project activity applies the approved baseline methodology AM0026 Version 3 – "Methodology for zero-emissions		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid"		
B.2 Applicability of methodology (and tools) (VVM para 65-76)					
B.2.1 How was it validated that project complies with the following applicability criteria: Projects that are renewable electricity generation projects of the following types: (a) Run-of-river hydro power plants and hydro electric power projects with existing reservoirs where the volume of the reservoir is not increased; (b) New hydro electric power projects with reservoirs having power densities (installed power generation capacity divided by the surface area at the full reservoir level) greater than 4 W/m2. (c) Wind sources; (d) Solar sources; (e) Geothermal sources; (f) Wave and tidal sources?	/1/ /3/ /4/ /25/	DR I	It is confirmed that the project activity consists of a run-of-river hydro power plant that displace electricity from the SIC grid.		OK
B.2.2 How was it validated that project complies with the following applicability criteria: Projects that are connected to the interconnected grids of the Republic of Chile and Projects that fulfils all the legal obligations under the Chilean Electricity Regulation?	/1/ /3/ /4/ /25/	DR I	It is confirmed that the project activity consists of a run-of-river hydro power plant that displace electricity from the SIC grid.		OK
B.2.3 How was it validated that project complies with the following applicability criteria: The methodology is not applicable to: 1) The proposed CDM project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, and 2) if the baseline is the continued use of fossil fuels at the site?	/1/ /3/ /4/ /25/	DR I	The power plant will not replace fossil fuels use at the site, it will only displace electricity from the SIC grid.		OK
B.2.4 Is the selected baseline one of the baseline(s) described in the methodology and this hence confirms the applicability of the methodology?	/1/	DR	Yes. The selected baseline is the correspondent generation of electricity from the SIC grid.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.3 Project boundary (VVM para 78-80)					
B.3.1 What are the project's system boundaries (components and facilities used to mitigate GHGs)? Are they clearly defined and in accordance with the methodology?	/1/	DR I	Yes. The project system boundary is delineated and in line with the approved CDM methodology AM0026 version 3. The project boundary is the physical, geographical site of the renewable generation source and the SIC grid.		OK
B.3.2 Which GHG sources are identified for the project? Does the identified boundary cover all possible sources linked to the project activity? Give reference to documents considered to arrive at this conclusion.	/1/ /7/	DR I	Baseline emissions: CO_2 emissions from fossil fuel based electricity generation of SIC grid. No project emissions sources were identified, as per the applied methodology. No leakage sources were identified, as per the applied methodology.		OK
B.3.3 Does the project involve other emissions sources not foreseen by the methodologies that may question the applicability of the methodology? Do these sources contribute with more than 1% of the estimated emission reductions of the project?	/1/	DR	All project emission sources are foreseen by the methodology.		OK
B.4 Baseline scenario determination (VVM para 81-88, 105-107)					
B.4.1 Which baseline scenarios have been identified? Is the list of baseline scenarios compete?	/1/	DR I	As per AM0026, the following baseline scenarios were identified: 1) Implementation of the proposed project activity without CDM registration; 2) Electricity generation from SIC connected power plants.		OK
B.4.2 How have the other baseline scenarios been eliminated in order to determine the baseline?	/1/	DR I	The project proponent is required to demonstrate why diesel power plants is not a realistic scenario to the project activity.	~~CL 6~~	OK
B.4.3 What is the baseline scenario?	/1/	DR I	The selected baseline is the correspondent generation of electricity from the SIC grid.		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.4.4 Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/	DR	Yes. The baseline scenario is the one prescribed in the methodology.		OK
B.4.5 Has the baseline scenario been determined using conservative assumptions where possible?	/1/	DR I	Yes.		OK
B.4.6 Does the baseline scenario sufficiently take into account relevant national and/or sectoral policies, macro-economic trends and political aspirations?	/1/ /29/	DR I	Yes. The baseline scenario is totally in line with local laws and regulations.		OK
B.4.7 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR I	Yes. See B.4.6		OK
B.4.8 Is the baseline determination adequately documented in the PDD? • All assumptions and data used by the project participants are listed in the PDD and related document to be submitted for registration. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable • Relevant national and/or sectoral policies and circumstances are considered and listed in the PDD. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed CDM project activity	/1/	DR I	Yes. See B.4.4 – B.4.7		OK
B.5 Additionality determination (VVM para 94-121)					
B.5.1 What approach/tool does the project use to assess additionality? Is this in line with the methodology?	/1/ /27/	DR	Considering that the project activity is applying the methodology AM0026, the PDD should follow the CDM-PDD format, and the "Tool for the demonstration and assessment of additionality" should be applied.	~~CAR 2~~	OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.2 Have the regulatory requirements correctly been taken into account to evaluate the project activity and the alternatives?	/1/	DR	Yes, see section B.4		OK
B.5.3 Is sufficient evidence provided to support the relevance of the arguments made?	/1/	DR	The barriers presented for the additionality demonstration are directly linked to the project financial attractiveness, and should be supported by a financial analysis. Besides, both hydrological and spot market barriers are general and not specific for the project activity.	~~CAR 3~~	OK
B.5.4 What is the project additionality mainly based on (Investment analysis or barrier analysis)?	/1/	DR	The project additionality is mainly based on barrier analysis. See B.5.3.	~~CAR 3~~	OK
Prior consideration of CDM (VVM para 98-103)					
B.5.5 What is the evidence for serious consideration of CDM prior to the time of decision to proceed with the project activity?	/1/ /11/	DR I	The starting date of the project activity is 19 November 2009, which corresponds to the financial closure and instruction date for civil works. On 12 November 2009, the company submitted the "F-CDM Prior consideration form" to both EB and Chilean DNA informing about the commencement of the project activity and the intention to seek CDM status.		OK
B.5.6 If the starting date is after 2 August 2008 and before the global stakeholder consultation, has the DNA and UNFCCC confirmed that the project participants have informed in writing of the project's intention to seek CDM status?	/1/ /11/	DR I	Yes. See B.5.5		OK
Continuous efforts to secure CDM status (only to be completed if starting date is before 2 August 2008)					
B.5.7 What initiatives where taken by the project participants from the starting date of the project activity to the start of validation in parallel with the physical	/1/	DR I	The contract with DNV for project CDM validation was signed on February 2010, only four months after the project activity starting		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
implementation of the project activity?			date.		
B.5.8 When did the construction of the project activity start?	/1/	DR	The construction started in 19 November 2009.		OK
B.5.9 When was the project commissioned?	/1/	DR	The project was not commissioned yet.		OK
B.5.10Does the timeline of the project confirm that continuous actions in parallel with the implementation were taken to secure CDM status?	/1/	DR	Yes. See B.5.7		OK
Investment analysis (VVM para 108-114)					
B.5.11Does the project activity or any of the remaining alternatives generate revenues apart from CDM? Is this reflected in the PDD?	/1/	DR	NA		NA
B.5.12Do any of the alternatives to the project activity involve investment? Is this reflected in the PDD?	/1/	DR	NA		NA
B.5.13Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	NA		NA
B.5.14Is the benchmark/discount rate the latest available at the time of decision?	/1/	DR	NA		NA
B.5.15What is the financial indicator? Is it on equity/project basis? Before/after tax? Is the financial indicator in correspondence with the benchmark?	/1/	DR	NA		NA
B.5.16Are the underlying assumptions appropriate, e.g. what is considered as waste in the baseline is considered to have zero value?	/1/	DR	NA		NA
B.5.17Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/	DR	NA		NA
B.5.18Is the time period of the investment analysis and operating time of the project realistic? Has salvage value been taken into account? Is working capital returned in the last year of operation?	/1/	DR	NA		NA
B.5.19When a feasibility study report or similar approved by	/1/	DR	NA		NA

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
the government is used as the basis for the investment analysis: Can it be confirmed that the values used in the PDD are fully consistent with the FSR and is the period of time between finalization of the FSR and the investment decision adequate?					
B.5.20How was the amount of output (e.g. sales of electricity) assessed? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ The plant load factor provided to banks and/or equity financiers while applying the project activity for project financing, or to the government while applying the project activity for implementation approval ☐ The plant load factor determined by a third party contracted by the project participants (e.g. an engineering company) ☐ Other approach. NA		OK
B.5.21How was the output price (e.g. electricity price) assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants NA		OK
B.5.22How were the investment costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants NA		OK
B.5.23How were the O&M costs assessed? Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
version 1 paragraph 95.			related to the project and the project participants NA		
B.5.24Describe the assessment of the other input parameters. Were the data available and valid at the time of decision? Remember to include all the data sources used and list all the projects that have been used for cross-checking in accordance with VVM version 1 paragraph 95.	/1/	DR	☐ Cross-check against third-party or publicly available sources (e.g. invoices or price indices) ☐ Review of feasibility reports, public announcements and annual financial reports related to the project and the project participants NA		OK
B.5.25Was the financial calculation spreadsheet verified and found to be correct?	/1/	DR	NA		OK
B.5.26Sensitivity analysis: Have the key parameters contributing to more than 20% of the revenue/costs during operating or implementation been identified? Has possible correlation between the parameters been considered?	/1/	DR	NA		OK
B.5.27Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/	DR	NA		OK
B.5.28Have the key parameters been varied to reach the benchmark and the likelihood of this to happen been justified to be small?	/1/	DR	NA		OK
Barrier analysis (VVM para 115-118)					
B.5.29Are the barriers identified complimentary to a potential investment analysis? Does the barrier have a clear impact on the financial returns so that it can be assessed in an investment analysis? Each barrier is discussed separately.	/1/	DR	The barriers presented for the additionality demonstration are directly linked to the project financial attractiveness, and should be supported by a financial analysis. Besides, both hydrological and spot market barriers are general and not specific for the project activity.	~~CAR 3~~	OK
B.5.30How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/	DR	NA		OK
B.5.31How does CDM alleviate the investment barriers?	/1/	DR	NA		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.5.32Is the project activity prevented by the investment barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	NA		OK
B.5.33How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/	DR	NA		OK
B.5.34How does CDM alleviate the technological barriers?	/1/	DR	NA		OK
B.5.35Is the project activity prevented by the technological barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	NA		OK
B.5.36How were the barriers due to prevailing practise assessed to be real? Are the barriers due to prevailing practise substantiated by a source independent of the project participants?	/1/	DR	NA		OK
B.5.37How does CDM alleviate the barriers due to prevailing practise?	/1/	DR	NA		OK
B.5.38Is the project activity prevented by the barriers due to prevailing practise and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	NA		OK
B.5.39How were the other barriers assessed to be real? Are the other barriers substantiated by a source independent of the project participants?	/1/ /2/ /3/ /6/ /7/ /19/ /34/	DR	In line with the "Guidelines for objective demonstration and assessment of barriers" (EB59 annex 13), the "Other barriers" are: Hydrological risk: it was demonstrated that the project faces risk against drought and low inflow periods. Consequently, project incomes are highly variable. DNV checked the average monthly generation and hydrological variations of the Mariposas run-of-river project, obtained through historical and estimated data, and it demonstrates that, between humid and dry		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			seasons, there are near 11 GWh of energy variations, representing 28% of the average energy production. This variability limits the amount of energy that can be contracted at long term and stabilized prices. Spot market risk: The project participant will sell all the electricity produced to the generators market at spot prices. DNV confirmed the variation in the spot prices, and this results in highly variable income of the project. Company scale risk: previous to any project implementation, several preliminary steps are required for the identification and scope of the project. This is presented as a barrier for small generation project developers that do not benefit from scale economies that large energy companies from the power sector have. Further, small scale companies do not benefit from competitive financing rates, due to the inherent higher risk. DNV could confirm that Hidroelectrica Rio Lircay is a new player in the electricity sector with Mariposas as its first and only project. The project was made possible because of BICE loan agreement dated 19 November 2009. One of the requirements of the financing bank as part of the due diligence study was the analysis of the Feasibility Study, which clearly addresses CDM revenues; Water right risks: the water rights come from near 2,200 independent irrigators organized through the Asociación Canal Maule (ACM). The final agreement between Hidroelectrica Rio		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Lircay and ACM compromises annual disbursements towards ACM of near 5% of the project incomes.		
B.5.40How does CDM alleviate the other barriers?	/1/	DR	The barriers presented for the additionality demonstration are directly linked to the project financial attractiveness, and should be supported by a financial analysis. Besides, both hydrological and spot market barriers are general and not specific for the project activity.	~~CAR 3~~	OK
B.5.41Is the project activity prevented by the other barriers and at least one of the possible alternatives to the project activity is feasible under the same circumstances?	/1/	DR	Yes. The baseline scenario is not affected by any of the presented barriers.		OK
Common practice analysis (VVM para 119-121)					
B.5.42What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR	NA		NA
B.5.43What is the scope of technology and size (e.g. capacity of power plant) for the common practice analysis and how has this been justified?	/1/	DR	NA		NA
B.5.44What is the data source(s) used for the common practice analysis?	/1/	DR	NA		NA
B.5.45How many similar non-CDM-projects exist in the region within the scope?	/1/	DR	NA		NA
B.5.46How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR	NA		NA
B.5.47What is the conclusion of the common practice analysis?	/1/	DR	NA		NA
Conclusion					
B.5.48What is the conclusion with regard to the additionality of the project activity?	/1/	DR	Pending from the resolution of the previous CARs/CLs.		OK

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Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
B.6 Calculations of GHG emission reductions					
Data and parameters that are available at validation and that are not monitored (VVM para 199-203)					
B.6.1 How were the parameters verified?	/1/	DR	Section B.6.2 of the PDD should only present the data and parameters that will be kept fixed for the whole crediting period.	~~CL 2~~	OK
Baseline emissions (VVM para 89-93)					
B.6.2 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/ /20/ /34/ /35/	DR I	The baseline emissions have been calculated as per the approved CDM methodology AM0026 and the "Tool to calculate the emission factor of an electricity system". The estimations of the *ex-ante* emission reduction forecast are based on electricity generation estimates provided by the Central Interconnected System of Chile (SIC). The build margin emission coefficient (BM) was calculated considering the most recent 20% power plants capacity additions (in MWh) in the electricity system. The operating margin (OM) emission coefficient is found to be 0.600 tCO_2e/MWh and the build margin (BM) emission coefficient is 0.359 tCO_2e/MWh, resulting in a combined margin emission coefficient of 0.480 tCO_2e/MWh (weighted average of the build and operating margin). The emission reduction spreadsheet shall be presented in English, with no hidden cells, lines or columns, and with its formulae.	~~CL 3~~	OK
B.6.3 Have conservative assumptions been used when calculating the baseline emissions?	/1/	DR I	See B.6.2		OK
B.6.4 Are uncertainties in the baseline emission estimates	/1/	DR	See B.6.2		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
properly addressed?		I			
Project emissions (VVM para 89-93)					
B.6.5 Are the calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR I	No project emissions sources were identified, as per the applied methodology.		NA
B.6.6 Have conservative assumptions been used when calculating the project emissions?	/1/	DR	NA		NA
B.6.7 Are uncertainties in the project emission estimates properly addressed?	/1/	DR	NA		NA
Leakage (VVM para 89-93)					
B.6.8 Are the leakage calculations documented according to the approved methodology and in a complete and transparent manner?	/1/	DR I	No leakage sources were identified, as per the applied methodology.		OK
B.6.9 Have conservative assumptions been used when calculating the leakage emissions?	/1/	DR I	NA		OK
B.6.10Are uncertainties in the leakage emission estimates properly addressed?	/1/	DR I	NA		OK
Emission Reductions (VVM para 89-93)					
B.6.11Algorithms and/or formulae used to determine emission reductions: • All assumptions and data used by the project participants are listed in the PDD and related document submitted for registration. The data are properly referenced • All documentation is correctly quoted and interpreted. • All values used can be deemed reasonable in the context of the project activity • The methodology has been correctly applied to calculate the emission reductions and this can be replicated by the data provided in the PDD and supporting files to be	/1/ /20/ /34/ /35/	DR I	Yes, all algorithms and formulae used were correctly applied and the values are deemed reasonable. The emission reduction spreadsheet shall be presented in English, with no hidden cells, lines or columns, and with its formulae.	~~CL 3~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
submitted for registration.					
B.7 Monitoring plan (VVM para 122-124)					
Data and parameters monitored					
B.7.1 Do the means of monitoring described in the plan comply with the requirements of the methodology?	/1/	DR I	Yes. The proposed project activity applies the approved baseline methodology AM0026 Version 3 – "Methodology for zero-emissions grid-connected electricity generation from renewable sources in Chile or in countries with merit order based dispatch grid"		OK
B.7.2 Does the monitoring plan contains all necessary parameters, and are they clearly described?	/1/	DR I	Yes. The electricity generated by the project activity will be monitored, as well as public data that will be used to update the SIC combined emission factor. The project proponent is requested to present in the PDD a single line diagram of the power plant showing the position of the meter(s).	~~CL 4~~	OK
B.7.3 In case parameters are measured, is the measurement equipment described? Describe each relevant parameter.	/1/	DR I	Yes. Electricity meters will be used.		OK
B.7.4 In case parameters are measured, is the measurement accuracy addressed and deemed appropriate? Describe each relevant parameter.	/1/	DR I	The PDD does not specify clearly the accuracy and calibration frequency of the electricity meter.	~~CL 5~~	OK
B.7.5 In case parameters are measured, are the requirements for maintenance and calibration of measurement equipment described and deemed appropriate? Describe each relevant parameter.	/1/	DR I	See B.7.4.	~~CL 5~~	OK
B.7.6 Is the monitoring frequency adequate for all monitoring parameters? Describe each parameter.	/1/	DR I	Yes. The electricity generation will be monitored continuously. Data used to update the SIC combined emission factor will be monitored hourly.		OK
B.7.7 Is the recording frequency adequate for all monitoring	/1/	DR	Yes. The electricity generation will be recorded		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
parameters? Describe each parameter.		I	every 15 minutes.		
Ability of project participants to implement monitoring plan					
B.7.8 How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR I	During the site visit DNV interviewed the responsible monitoring people (project manager and project assistant). DNV considers the monitoring plan feasible.		OK
B.7.9 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 I	Yes. All monitoring parameters will be kept for two years after the crediting period and they will archived on paper and on electronically files.		OK
B.7.10Are the data management and quality assurance and quality control procedures sufficient to ensure that the emission reductions achieved by/resulting from the project can be reported ex post and verified?	/1/	DR I	Yes. The electricity generation will be cross checked with the electricity bills from the distributor.		OK
B.7.11Will all monitored data required for verification and issuance be kept for two years after the end of the crediting period or the last issuance of CERs, for this project activity, whichever occurs later?	/1/	DR I	Yes. All monitoring parameters will be kept for two years after the crediting period.		OK
Monitoring of sustainable development indicators/ environmental impacts					
B.7.12Is the monitoring of sustainable development indicators/ environmental impacts warranted by legislation in the host country?	/1/	DR I	Neither the approved methodology AM0026 nor the Chilean DNA requires monitoring sustainable development indicators.		NA
B.7.13Does the monitoring plan provide for the collection and archiving of relevant data concerning environmental, social and economic impacts?	/1/	DR	NA		NA
B.7.14Are the sustainable development indicators in line with stated national priorities in the host country?	/1/	DR	NA		NA

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
C Duration of the project activity / crediting period					
C.1.1 Start date of project activity (VVM para 99-100, 104)					
C.1.2 How has the starting date of the project activity been determined? What are the dates of the first contracts for the project activity? When was the first construction activity?	/1/ /5/ /6/ /7/	DR	The starting date of the project activity is 19 November 2009, which corresponds to the financial closure and instruction date for civil works. DNV considers this reasonable, since 93% of the project's investment are financed by the BICE bank, and all previous contracts for civil works and water rights were conditioned to the financial closure.		OK
C.1.3 Is the stated expected operational lifetime of the project activity reasonable?	/1/ /3/	DR I	The expected operational lifetime of project activity is 40 years, as described in the Mariposas Feasibility Study.		OK
C.1.4 Is the start date, the type (renewable/fixed) and the length of the crediting period clearly defined and reasonable?	/1/	DR I	Yes the crediting period is clearly defined and can be considered reasonable. A renewable 7 year crediting period has been chosen and the starting date is on 1 November 2010.		OK
D Environmental Impacts (VVM para 131-133)					
D.1.1 Are there any host country requirements for an Environmental Impact Assessment (EIA), and if yes, is an EIA approved? Does the approval contain any conditions that need monitoring?	/1/ /4/	DR	According to the Chilean environmental regulations, the project proponent submitted an Environmental Impact Declaration to the Environment National Authority, CONAMA, and received the corresponding approval of the project through the "Resolución Exenta N°139/2009". No significant environmental impacts are predicted.		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
D.1.2 Does the project comply with environmental legislation in the host country?	/1/ /4/	DR	Yes, see D.1.1		OK
D.1.3 Will the project create any adverse environmental effects?	/1/ /4/	DR	No, see D.1.1		OK
D.1.4 Have identified environmental impacts been addressed in the project design?	/1/ /4/	DR	Yes, see D.1.1		OK
D.1.5 Has an analysis of the environmental impacts of the project activity been sufficiently described?	/1/ /4/	DR	Yes, see D.1.1		OK
D.1.6 Are transboundary environmental impacts considered in the analysis?	/1/ /4/	DR	Yes, see D.1.1		OK
E Stakeholder Comments (VVM para 128-130)					
E.1.1 Have relevant stakeholders been consulted?	/1/ /21/	DR	Stakeholders involvement was organized through the publishing of the Environmental Impact Declaration to local stakeholders such as local community and local authorities. Correspondent evidences were provided to DNV. The project activity received some comments, more related to clarifications of the project. No negative comments were received. DNV considers the local stakeholder consultation carried out adequate.		OK
E.1.2 Have appropriate media been used to invite comments by local stakeholders?	/1/ /21/	DR	Yes, see E.1.1		OK
E.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/ /21/	DR	Yes, see E.1.1		OK

MoV = Means of Verification, DR= Document Review, I= Interview, CC= Cross-Checking

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
E.1.4 Is a summary of the stakeholder comments received provided?	/1/ /21/	DR	Yes, see E.1.1		OK
E.1.5 Has due account been taken of any stakeholder comments received?	/1/ /21/	DR	Yes, see E.1.1		OK

Table 3 Resolution of corrective action requests and clarification requests

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CAR 1 The Letter of Approval from the host Party has not yet been issued.	A.3.2 A.3.3	The Letter of Approval will be requested in the following weeks.	The Chilean Letter of Approval was received accordingly. Therefore this CAR is closed.
CAR 2 Considering that the project activity is applying the methodology AM0026, the PDD should follow the CDM-PDD format, and the "Tool for the demonstration and assessment of additionality" should be applied.	A.1.2 B.5.1	An updated PDD (version 4.3) has been submitted, and the additionality has been demonstrated in line with the "Tool for the demonstration and assessment of additionality"	The revised PDD correctly applies the CDM-PDD format, as well as the "Tool for the demonstration and assessment of additionality". Therefore this CAR is closed.
CAR 3 The barriers presented for the additionality demonstration are directly linked to the project financial attractiveness, and should be supported by a financial analysis. Besides, both hydrological and spot market barriers are general and not specific for the project activity.	B.5.3 B.5.4 B.5.29 B.5.40	The updated PDD (version 4.3) has been submitted with the financial analysis. The spot market and the water right barriers were removed since they are generic and basically related to project incomes. Hydrological barriers were revised to water availability barriers, which is project specific.	The revised PDD clearly demonstrates that the project activity is not financially attractive. The Excel spreadsheet was assessed by DNV, and all calculations and assumptions are deemed to be correct. DNV also crosschecked the input values applied. Spot market and water right barriers were removed. Hydrological barriers were revised to water availability barriers, which is supported by the Water Right agreements. Therefore this CAR is closed.
CAR 4 The Build Margin emission factor formulae and calculation are not in line with AM0026 requirements, since it applies partially option i) and partially option ii).	B.6.2	All formulae have been corrected and now is in line with AM0026 and the "Tool to calculate the emission factor for an electricity system"	The revised PDD is applying the correct formulae as per AM0026 requirements. Therefore this CAR is closed.

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
CL 1 The PDD should present a precise reference for each and all statements.	A.1.2	Several references where added to the PDD document. However precise web links have not been indicated always, in order to avoid broken links.	The revised PDD includes the correct references for all statements. Therefore this CL is closed.
CL 2 Section B.6.2 of the PDD should only present the data and parameters that will be kept fixed for the whole crediting period.	B.6.1	Section B.6.2 has been updated in the PDD (version 4.3)	Section B.6.2 of the revised PDD version 4.4 only presents the data and parameters that will be kept fixed during the crediting period. Therefore this CL is closed.
CL 3 The emission reduction spreadsheet shall be presented in English, with no hidden cells, lines or columns, and with its formulae.	B.6.2 B.6.11	The Excel sheet has been corrected to reflect all detailed calculations. Minor corrections were applied in the emission factor considered for a thermal power plant.	The Excel spreadsheet was corrected as required. Therefore this CL is closed.
CL 4 The project proponent is requested to present in the PDD a single line diagram of the power plant showing the position of the meter(s).	B.7.2	The updated PDD (version 4.3) has in considered a simplified single line diagram with the metering system in section B.7.2	The revised PDD version 4.4 presents a clear single line diagram of the power plant. Therefore this CL is closed.
CL 5 The PDD does not specify clearly the accuracy and calibration frequency of the electricity meter.	B.7.4 B.7.5	The accuracy of the metering system has been indicated in 0.2% as it is required in the system for all power generators. A periodic calibration frequency is not mandatory. However PDD states a calibration period every two years.	The electricity meter accuracy and calibration frequency were included in the PDD. Therefore this CL is closed.
CL 6 The project proponent is required to demonstrate why diesel power plants is not a realistic scenario to the project activity.	B.4.2	The diesel power plant scenario was removed from the baseline alternatives.	Considering that the approved methodology prescribes the baseline scenario, DNV considers reasonable to identify only the baseline and the

Corrective action and/ or clarification requests	Reference to Table 2	Response by project participants	Validation conclusion
			project activity without CDM benefits. Therefore this CL is closed.

Table 4 Forward action requests

Forward action request	Reference to Table 2	Response by project participants

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APPENDIX B

CERTIFICATES OF COMPETENCE

CERTIFICATE OF COMPETENCE

Felipe Antunes

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJI-i1)

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Expert***	***Methodology Expert***	***Technical Reviewer***
Landfill gas			Sept 2009			
Renewables	*Hydro power*	Jan 2009	Sept 2009		Jan 2009	Jan 2009
	Wind power		Sept 2009			
	Other renewable		Sept 2009			
Biomass		Jan 2009	Jan 2009			
Grid connection of isolated system			Sept 2009			
Cement						
Waste-heat / waste-gas recovery						
Efficiency of thermal power plants						
Coal mine methane						
Fuel switch						
Manure management		Jan 2009	Jan 2009			
Waste / wastewater treatment		Jan 2009	Jan 2009			Feb 2010
Energy efficiency						
N_2O						
HFCs						
Flare reduction						
PFCs						
Charcoal			Sept 2009			
CO_2 recovery						
Transport						
Non-renewable biomass			Sept 2009			
Biofuel						
Pipeline leakage reduction						
SF_6						

Høvik, 3 February 2010

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Francisco Chávez

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJI-i1)

GHG Auditor:	Yes

Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Knowledge***	***Sector Expert***	***Technical Reviewer***
Landfill gas						
Renewables	*Hydro power*				Aug 2009	
	Wind power			Nov 2009		
	Other renewable			Nov 2009		
Biomass						
Grid connection of isolated system				Nov 2009		
Cement						
Waste-heat / waste-gas recovery						
Efficiency of thermal power plants				Nov 2009		
Coal mine methane						
Fuel switch				Nov 2009		
Manure management						
Waste / wastewater treatment						
Energy efficiency				Nov 2009		
N_2O						
HFCs						
Flare reduction				Nov 2009		
PFCs						
Charcoal						
CO_2 recovery				Nov 2009		
Transport						
Non-renewable biomass						
Biofuel						
Pipeline leakage reduction				Nov 2009		
SF_6						

Høvik, 11 January 2010

Michael Lehmann
Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Peng (Peter) Huang

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJI-i1)

GHG Auditor:						
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Knowledge***	***Sector Expert***	***Technical Reviewer***
Landfill gas						
Renewables	*Hydro power*	Jan 2009	Jan 2009	Nov 2009		
	Wind power	Mar 2009	Jan 2009			
	Other renewable		Sept 2009			
Biomass						
Grid connection of isolated system			Sept 2009			
Cement						
Waste-heat / waste-gas recovery			Jan 2010			
Efficiency of thermal power plants			Jan 2010			
Coal mine methane						
Fuel switch			Jan 2010			
Manure management						
Waste / wastewater treatment						
Energy efficiency			Jan 2010	Nov 2009		
N_2O						
HFCs						
Flare reduction						
PFCs						
Charcoal						
CO_2 recovery			Jan 2010			
Transport						
Non-renewable biomass						
Biofuel						
Pipeline leakage reduction						
SF_6						

Høvik, 22 January 2010

Michael Lehmann

Technical Director, Climate Change Services

CERTIFICATE OF COMPETENCE

Weidong Yang

Qualification in accordance with DNV's Qualification Scheme CDM/JI (ICP-8-1-CDMJI-i1)

GHG Auditor:		Yes				
Technical Area		***CDM Validator***	***CDM Verifier***	***Sector Knowledge***	***Sector Expert***	***Technical Reviewer***
Landfill gas						
Renewables	*Hydro power*					Jan 2009
	Wind power					
	Other renewable					
Biomass						
Grid connection of isolated system						
Cement						
Waste-heat / waste-gas recovery						
Efficiency of thermal power plants						
Coal mine methane						June 2010
Fuel switch						
Manure management						
Waste / wastewater treatment						
Energy efficiency						
N_2O						June 2010
HFCs						
Flare reduction						
PFCs						
Charcoal						
CO_2 recovery						
Transport						
Non-renewable biomass						
Biofuel						
Pipeline leakage reduction						
SF_6						

Høvik, 9 June 2010

Michael Lehmann

Michael Lehmann
Technical Director, Climate Change Services