VCS VALIDATION REPORT

VIÑALES BIOMASS POWER PLANT

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Summary:

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Viñales Biomass Power Plant" in Chile to confirm that the project design, as documented, is sound and reasonable and meets the identified criteria. The validation was performed on the basis of VCSA requirements for the VCS project, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation was conducted by means of document review, follow-up interviews and site inspection, and the resolution of outstanding issues. The review of the project design documentation and the subsequent follow-up interviews and site inspection have provided DNV with sufficient evidence to determine the fulfilment of stated criteria.

The project activity consists in the installation of a new biomass cogeneration power plant in the Viñales sawmill. The new cogeneration unit consists of a 210 ton/hr fluidized bed boiler and a 41 MW condensing / extracting turbo generator unit, allowing for on-site electric power generation, displacing electricity from the central Chilean grid (SIC). The project has applied the CDM methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass", version 12.1.1.

In summary, it is DNV's opinion that the project activity "Viñales Biomass Power Plant" as described in the VCS PD, dated 10 May 2013, meets all relevant VCSA requirements for the VCS project and correctly applies the CDM methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass", version 12.1.1. Hence, DNV recommends the registration of the project as a VCS project activity.

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1 INTRODUCTION

Arauco Bioenergía S.A., a subsidiary of Celulosa Arauco y Constitución S.A., has commissioned DNV Climate Change Services AS (DNV) to perform a validation of the Viñales Biomass Power Plant in Chile (the project). This report summarizes the findings of the validation of the project, performed on the basis of VCS criteria for VCS projects, as well as criteria given to provide for consistent project operations, monitoring and reporting. VCS criteria refer to VCS program documents and policy announcements.

1.1 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 compliance with relevant VCS 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 VCS projects and is necessary to provide assurance to stakeholders of the quality of the project and its intended generation of the Verified Carbon Units (VCUs).

1.2 Scope and Criteria

The validation scope is defined as an independent and objective review of the VCS project document (VCS PD). The VCS PD is reviewed against the criteria stated in the VCS Version 3.2 and the relevant documents and policy announcements made by the VCSA. The VCS PD is also reviewied against the requirements of theCDM methodology ACM0006 “Consolidated methodology for electricity and heat generation from biomass”, version 12.1.1, that is applied by the project.

The validation does not include project consulting. However, requests for clarifications and/or corrective actions may have provided input for improvement of the project design.

1.3 Level of assurance

DNV provides reasonable assurance that the “Viñales Biomass Power Plant” meets VCS criteria. To ensure complete transparency, a validation protocol check list is included in Appendix A. The validation protocol check list addresses all of the criteria that must be met for VCS projects. Any clarification or corrective actions raised have been included in the validation protocol.

In addition, DNV applies materiality of 5 per cent in accordance with the requirements in VCS Standard.

1.4 Summary Description of the Project

The “Viñales Biomass Power Plant” project located in the community of Constitución in the Maule Region of Chile is a grid-connected renewable energy project activity, displacing grid electricity with electricity generated from renewable sources (sawdust and bark from sawmills and biomass residues from forestry operations) after meeting the captive steam and electricity requirements of attached sawmill, thus resulting in emission reductions of greenhouse gases in the energy sector.

The project activity consists in the installation of a new biomass cogeneration power plant in the Viñales sawmill. The new cogeneration unit consists of a 210 ton/hr fluidized bed boiler and a 41 MW condensing / extracting turbo generator unit, allowing for additional electricity of 291.18 GWh/year to be displaced from the central Chilean grid (SIC). Prior to the implementation of the project activity, the Viñales sawmill relied on an external company who supplied heat to the Viñales sawmill and on the grid for electric power.

2 VALIDATION PROCESS

2.1 Method and Criteria

The validation consisted of the following three phases:

- A desk review of the project documents.
- Follow-up interviews with project stakeholders and site inspection where necessary.
- The resolution of outstanding issues and the issuance of the validation report and opinion.

The following sections outline each step in more detail.

2.2 Document Review

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

2.3.1 Documentation provided by the project participants

/1/ Arauco: VCS PD for project activity “Viñales Biomass Power Plant” in Chile, Version 01 dated 18 March 2013 and version 02 dated 10 May 2013.

/2/ Arauco: Purchase Order for the power boiler dated 23 April 2008

/3/ Arauco: Environmental Impact Declaration approved by Resolution 80/2009 issued by Environmental Regional Comission in 25 March 2009

/4/ Arauco: Stakeholders consultation process – invitation, report and comments received

/5/ Arauco: Biomass balance for 2008 and supporting evidences (INFOR – National Forestry Institute webpage www.infor.cl and CONAF – National Corporation of Forestry webpage www.conaf.cl)

/6/ Arauco: Emission reduction calculation spreadsheet

/7/ Arauco: investment analysis of other projects:

- DHM storage building in Lincancel, dated May 2003;
- Thermal plant in Itata complex, dated February 2003;
- Constitución production equipment, dated 1998;
- Arauco port, dated 29 September 1997.

/8/ Budget for the investment in a low-pressure power boiler and Bremer proposal for a boiler dated 15 April 2008

/9/ Arauco: Biomass residues balance dated April 2008

/10/ Arauco: Biomass residues invoices from 2006 to 2008

/11/ PCM: Biomass residues analysis dated 14 April 2008

/12/ Arauco: Colorado plant electric consumption and demineralized water costs

/13/ Budgets for the investment in scenarios 3 and 4, and Nueva Aldea Phase 1 power boiler purchase order dated 2 January 2003

/14/ Arauco: Nueva Aldea Phase 1 O&M costs

/15/ Arauco: Investment analysis spreadsheet

/16/ AF Celpap: Study for Arauco power plants dated December 2007

/17/ Fuel and Electricity Superintendency: Fines resumes (2003 to 2006)

/18/ Schneider Electric: Power Logic System Catalogue, dated 2011

/19/ Schneider Electric: Certificate of Compliance and Calibration:

- meter ION7550, dated October 2010
- meter ION8660, dated January 2012

/20/ Arauco: Manufacture Biomass Calculations

/21/ Arauco: Operation History and Electricity Availability, dated December 2012

2.3.2 Standards, methodologies, and other guidance by the VCSA

/22/ VCSA: VCS Standard, version 3.2.

/23/ CDM Executive Board: ACM0006 - Methodology “Consolidated methodology for electricity and heat generation from biomass”, version 12.1.1.

/24/ CDM Executive Board: Tool for the demonstration and assessment of additionality (Version 7.0.0).

/25/ CDM Executive Board: Tool to determine the baseline efficiency of thermal or electric energy generation systems. (Version 1.0).

/26/ CDM Executive Board: Tool to calculate the emission factor for an electricity system (Version 3.0.0).

/27/ CDM Executive Board: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 2.0).

/28/ CDM Executive Board: Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 1.0).

/29/ CDM Executive Board: Tool for project and leakage emissions from transportation of freight (Version 1.1).

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

/30/ Evidence of sawmills common practice in Chile: “Boletín Estadístico 118”, “La Industria del Aserrío, Chile 2007”, issued by Chilean Agricultural Ministry

/31/ CNE: Ministerial Resolution 119, issued on 4 November 2001

/32/ CNE: Node price report dated October 2007

/33/ Chilean Law of Income Tax

/34/ Chilean Law 20257/2008

/35/ CDEC-SIC: Transmission fees report dated 14 April 2008

/36/ Economy Ministry: Law 18 410, modified on 19 May 2005

/37/ CDEC-SIC webpage: www.cdec-sic.cl

/38/ Boyce, Meherwan P. “Handbook for cogeneration and combined cycle power plants”, Asme press, 2002.

Geroy, Gary D. Passmore, David L. “Assesment of training needs for cogeneration technology in Schuyikill County”, Pennsylvania State University, 1987

/39/ Third party studies that ratify the existence of barriers for non-convention renewable power generation in Chile:

- The study: “Evaluaciones del Desempeño Ambiental Chile” (Environmental Performance Review study for Chile), published by the OECD in 2005;
- The study: “Aporte Potencial de Energías Renovables no Convencionales y Eficiencia Energética a la Matriz Eléctrica, 2008 – 2025” (Potential contribution of non-conventional renewable power sources and energy-efficiency to power generation, 2008 – 2025), June 2008, developed by Universidad de Chile and Universidad Técnica Federico Santa María;
- The report: “Chile Energy Policy Review 2009”, October 2009, developed by the International Energy Agency;

The article “Inversiones por US$ 3,000 millones en energías verdes estarían en riesgo por

rigidez de la ley" (Investments for US$ 3,000 million would be at risk due to law rigidities), published in November 25th, 2009 in the journal "Electricidad Interamericana"

/40/ Information on the Viñales Biomass Power Plant available on the UNFCCC website:
http://cdm.unfccc.int/Projects/DB/DNV-CUK1287571838.72/view

/41/ Viñales Biomass Power Plant: Equipment nameplates verified during site visit, dated 26 March 2013

/42/ Andritz: Boiler efficiency calculation, dated 16 January 2012

/43/ Metso: Boiler efficiency calculation, dated 16 January 2012

/44/ E-mail by Sam Hoffer of VCSA of 5 July 2011

/45/ E-mail by David Antonioli of VCS of 29 May 2013

2.3 Interviews

On 26 March 2013 DNV visited the Viñales sawmill and performed interviews with project stakeholders.

	Date	Name	Organization	Topic
/46/	26 March 2013	Christian Patrickson	Arauco	Project starting date update Monitoring plan
/47/	26 March 2013	Cristian Mosella	Arauco	Emission reductions estimation
/48/	26 March 2013	Carla Seguel	Arauco	Environmental Licenses
/49/	26 March 2013	Arturo Maturana	Arauco	

2.4 Site Inspections

On 26 March 2013, Fernando Sasdelli, auditor from DNV carried out an on-site visit to the Viñales sawmill site and interacted with the operating personnel of the Viñales Biomass Power Plant, located at Km. 5 of the M-50 road to Chanco, commune of Constitución in the Maule Region, Chile.

The project activity was completely implemented and operating as per the project design. No problems or flaws on the operation were evidencied during the site visit.

2.5 Resolution of Any Material Discrepancy

The objective of this phase of the validation was to resolve any outstanding issues that needed be clarified prior to DNV's positive conclusion on the project design. In order to ensure transparency, a validation

protocol was customized 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 organizes, details and clarifies the requirements a VCS 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 completed validation protocol check list for the project "Viñales Biomass Power Plant" is enclosed in Appendix A to this report.

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

- The project participants have made mistakes that will influence the ability of the project activity to achieve real, measurable additional emission reductions.
- The VCS requirements have not been met.
- 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 VCS 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 do not relate to the VCS requirements for registration.

The validation identified seven CARs, two CLs and zero FARs. The CARs and CLs were satisfactorily addressed by the project participants by among other revising the PD (please refer to Table 2 in Appendix A for further details).

3 VALIDATION FINDINGS

3.1 Project Design

3.3.1 Project Proponent

The project participants is Celulosa Arauco y Constitución S.A. of host Party Chile.

3.3.2 Project Activity and Eligibility of the Project

The "Viñales Biomass Power Plant" project located in the commune of Constitución in the Maule Region, Chile is a grid-connected renewable energy project activity, displacing grid electricity with electricity generated from renewable sources (sawdust and bark from sawmills and biomass residues from forestry operations) after meeting the captive steam and electricity requirements of attached sawmill, thus resulting in emission reductions of greenhouse gases in the energy sector.

The project activity consists in the installation of a new biomass cogeneration power plant in the Viñales sawmill. The new cogeneration unit consists of a 210 ton/hr fluidized bed boiler and a 41 MW condensing / extracting turbo generator unit, allowing for additional electricity of 291.18 GWh/year to be displaced from the central Chilean grid (SIC). Prior to the implementation of the project activity, the Viñales sawmill relied on an external company who supplied heat to the Viñales sawmill and on the grid for electric power.

The project design engineering reflects good practice applying the steam Rankine cycle technology for generation of steam and power.

The starting date of the project activity is 19 May 2012, which corresponds to the date when the project started generating electricity /21/.

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

3.3.3 Project Scale and Crediting Period

The "Viñales Biomass Power Plant" is a large scale project and the average estimated GHG emission are 258 093 tCO_2 per year. The first crediting period will last 10 years, from 1 January 2014 to 31 December 2023.

3.3.4 Project compliance with applicable laws, statutes and other regulatory frameworks

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°80/2009" /3/.

No significant environmental impacts are predicted.

3.3.5 Ownership and other programs

Celulosa Arauco y Constitución S.A. constructed and owns the Viñales Biomass Power Plant according to the Environment National Authority, CONAMA, through the "Resolución Exenta N°80/2009" /3/

The project participants are not participating in trading programs or seeking registration in other GHG programs /1/.

However, the project activity applied for CDM registration, but registration was rejected by the CDM Executive Board due failing to substantiate prior CDM consideration /40/. DNV confirmed with the VCS Association that a rejection based on a failure to demonstrate prior consideration (in itself) would be considered a rejection based on "procedural or eligibility requirements", and so it's possible that the project is eligible under the VCS /44/. Relevant CDM requirements require that the benefits of the CDM were a decisive factor in the decision to proceed with the project. The CDM Executive Board did not consider valid the evidence of prior consideration of the CDM provided, in particular the emails and information regarding the financial evaluation of the project in which CDM income was considered were not considered valid because there was no clear indication of the decision taken by the PP to develop the proposed project activity considering the CDM. However, the project complies with the relevant VCS

requirements which require that Non-AFOLU projects shall complete validation within two years of the project start date, which for this project is 19 May 2012 as indicated above.

The project may receive ERNC. However, in accordance with VCS guidance, ERNC may not be considered GHG-related environmental credits /45/.

3.3.6 Additional information relevant to the project

Not applicable.

3.2 Application of Methodology

3.3.1 Title and Reference

The project applies the CDM methodology ACM0006 “Consolidated methodology for electricity and heat generation from biomass”, version 12.1.1 /23/ in combination with the “Tool for the demonstration and assessment of additionality (Version 7.0.0), “Tool to determine the baseline efficiency of thermal or electric energy generation systems” (Version 1.0), “Tool to calculate the emission factor for an electricity system” (Version 3.0.0), “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” (Version 2.0), “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” (Version 1.0), “Tool for project and leakage emissions from transportation of freight” (Version 1.1).

3.3.2 Applicability

This methodology is applicable to the Viñales Biomass Power Poant as this project consists of a renewable energy co-generation plant for supplying electricity to the Chilean grid (SIC). DNV confirmed during the site visit that the project meets the applicability conditions of ACM0006 as:

1. ***No other biomass types than biomass residues are used in the project plant.***

During site visit DNV verified that the only biomass used as fuel in the project activity are biomass residues, which include: sawdust and bark from operations from the Viñales sawmill itself and from off-site sawmills and biomass from forestry operations at Arauco forests, which are originated from harvesting, thinning and pruning operations.

2. ***Fossil fuel may be co-fired in the project plant. However, the amount of fossil fuels co-fired does not exceed 80% of the total fuel fired on an energy basis.***

Due to operational reasons (start-up and shut down) fossil fuel may be co-fired in the boiler. Through assessment of the emission reduction spread sheet /6/, DNV confirmed that the amount of 50 ton/year corresponds to 2 165 GJ, which is only 0,04% of total energy input (5 785 968 GJ).

3. ***For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project does not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc) or in other substantial changes (e.g. product change) in the process.***

The core business of Viñales Biomass Power Plant is the production of sawn timber and wood panels. The implementation of the project activity will not result in an increase of the processing capacity of raw input. During site visit DNV confirmed that the plant capacity is fixed and that part of the biomass is

obtained from off-site, which means that the production of sawn timber and wood panels is determined by market conditions, not by the biomass residues generated by the Viñales plant.

4. ***The biomass used by the project facility are not stored for more than one year.***

During site visit DNV confirmed that there is no available area for to store biomass for a long time. The stock available was designed to last less than two weeks.

5. ***The biomass used by the project facility are not obtained from chemically processed biomass (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemical-degradation, etc) prior to combustion. Moreover, the preparation of biomass-derived fuel does not involve significant energy quantities, except from transportation or mechanical treatment so as not to cause significant GHG emissions.***

The only processes involved in the biomass residues preparation are mechanical and transportation. Both emissions are accounted as project emissions. DNV confirmed during site visit that there was no chemical process in the biomass preparation.

6. ***In the case of fuel switch project activities, the use of biomass or the increase in the use of biomass as compared to the baseline scenario is technically not possible at the project site without a capital investment in:***

- ***The retrofit or replacement of existing heat generators/boilers; or***
- ***The installation of new heat generators/boilers; or***
- ***A new dedicated biomass residues supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); or***
- ***Equipment for preparation and feeding of biomass.***

There is no fuel switch activity at the Viñales Biomass Power Plant project.

7. ***In the case that biogas is used in power and/or heat generation, this methodology is applicable under the following conditions:***
   - ***The biogas is generated by anaerobic digestion of wastewaster (to be) registered as a CDM project activity and the details of the registered CDM project activity must be included in the PDD. Any CERs from biogas energy generation should be claimed under the proposed project activity registered under this methodology;***
   - ***The biogas is generated by anaerobic digestion of wastewater that is not (and will not) be registered as a CDM project activity. The amount of biogas does not exceed 50% of the total fuel fired on an energy basis.***

Not applicable. There is no biogas consumption in the project activity.

8. ***In the case of biomass from dedicated plantations:***
   - ***a) The cultivated land can be clearly identified and used only for dedicated energy biomass plantations;***
   - ***b) The CDM project activity does not lead to a shift of pre-project activities outside the project boundary, i.e. the land under the proposed project activity can continue to provide at least the same amount of goods and services as in the absence of the project;***
   - ***c) The plantations are established:***

(i) On land which was, at the start of the project implementation, classified as degraded or degrading; or

(ii) On a land area that is included in the project boundary of one or several registered A/R CDM project activities;

d) The plantations are not established on organic soil (notably peatlands);

e) The land area of the dedicated plantations will be planted by direct planting and/or seeding;

f) After harvest, regeneration will occur either by direct planting, seeding or natural sprouting;

g) Grazing will not occur within the plantation;

h) No irrigation is undertaken for the biomass plantations;

i) The land area where the dedicated plantation will be established is, prior to project implementation, severely degraded and in absence of the CDM project activity would have not been used for any other agricultural or forestry activity;

j) Only perennial plantations are eligible.

Not applicable. There is no biomas from dedicated plantations.

3.3.3 Project Boundary

According to the chosen methodology the project boundary is the physical, geographical site where the biomass cogeneration takes place, which includes:

- One biomass boiler fuelled with a biomass from industrial and forestry operations, with steam generation capacity of 210 t/h, operating at 42 bar(a) /41/;
- One back pressure turbo generator, with capacity of 41 MW /41/;

The project's system boundaries (components and facilities used to mitigate GHGs) are clearly defined and in accordance with the methodology Consolidated methodology for electricity and heat generation from biomass, version 12.1.1 /23/.

Emission sources and gases included in the project boundary are:

	GHGs involved	*Description*
Baseline emissions	CO_2 CH_4	CO_2 emissions from electricity and heat generation and the CH_4 from uncontrolled burning or decay of surplus biomass residues
Project emissions	CO_2 CH_4	CO_2 emissions from on-site fuel consumption, and from on-site biomass transportation. CH_4 from combustion of surplus biomass residues for electricity generation. There is no anaerobic treatment of waste water generated from the treatment of biomass residues in the project activity.

Leakage	N/A	As per Consolidated methodology for electricity and heat generation from biomass, version 12.1.1 there is no leakage associated to the project activity.

3.3.4 Baseline Scenario

The project participants have followed the "Selection of the baseline scenario and demonstration of additionality", as per Consolidated methodology for electricity and heat generation from biomass, and identified the realistic alternative scenarios to the proposed project activity:

Step 1: Identification of alternative scenarios

Step 1a: Define alternative scenarios to the proposed CDM project activity

POWER GENERATION

During the site visit DNV confirmed that i) there is no power generation unit at the project site, ii) there are no other biomass types available in the region to generate power, as confirmed from the INFOR website /5/ and iii) there are no off-site plants available to supply electric power to the project activity.

Therefore, the alternatives of P2, P3, P4, P6 are eliminated. The feasible alternative scenarios for power generation would be P1, P5 and P7.

HEAT

During the site visit DNV confirmed that i) there is are no exisiting plants at the project site, ii) there is no biomass cogeneration power plant installed, iii) there are no other heat generation technologies available at the site iv) there is distric heating available in the region. Therefore, the feasible alternative scenarios for heat generation would be H1 and H5.

BIOMASS

During the site visit DNV confirmed that i) there is no biomass boiler at the project site, ii) there is a surplus of biomass available in the region that would be left to dacey in stock-piles, iii) the generation of bio-fuels is not developed in Chile and iv) the biomass residues used for energy generation purposes are not the same as the biomass residues used for feedstock or for pulp and paper production. Therefore, the feasible alternative scenarios for biomass would be B1, B3 and B4

MECHANICAL POWER

all alternative scenarios were excluded because there is no mechanical power utilization in the facility.

According to the Consolidated methodology for electricity and heat generation from biomass and regarding the alternatives presented, the biomasses where classified into four biomass categories (k) /1/:

- Category 1: Sawdust and bark from industrial on-site operations used for heat generation (B4);
- Category 2: Sawdust and bark from industrial on-site operations used for power generation(B1, B3));
- Category 3: Sawdust and bark from industrial off-site operations (B1, B3);

- Category 4: Biomass from forestry opertaions (B1, B3);

According to Consolidated methodology for electricity and heat generation from biomass, for biomass residues under scenario B1 and B3, project participant have justified that there is a surplus of more than 25% of the quantity of biomass residue type which is utilized in the region /1/.

Sub-step 1b: Consistency with mandatory applicable laws and regulations

DNV confirmed that the approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios:

1. **The installation of a low-pressure boiler on biomass fuels.** This scenario would apply the methodology scenarios: P7, H5, B1, B3 and B4.
2. **The installation of a new cogeneration power plant on biomass fuels, implemented with a lower efficiency/scale.** This scenario would apply the methodology scenarios: P5, P7, H5, B1, B3 and B4
3. **The proposed project activity.** This scenario would apply the methodology scenarios: P1, H1 and B4.

DNV considers the list of realistic and credible alternatives to be complete. The alternatives are in compliance will all mandatory and applicable legal and regulatory requirements /3//7//34/

All the assumption and data used by the project participants are listed in the PD and/or supporting documents. All documentation relevant for establishing the list of scenarios are correctly quoted and interpreted in the PD. Assumptions and data used in the identification of the list of scenarios are justified appropriately, supported by evidence and can be deemed reasonable. Relevant national and/or sectoral policies and circumstances are considered and listed in the PD /1/.

3.3.5 Additionality

The additionality of the project has been demonstrated in accordance with ACM0006, using the "Combined tool to identify the baseline scenario and demonstrate additionality" 12.1.1

Step 1. Identification of alternatives to the project activity

According to section 3.3.4, the possible scenarios identified are.

i. Alternative 1: no investment in new heat and/or power generation equipment (baseline)
ii. Alternative 2: a low-pressure power boiler unit on biomass fuels
iii. Alternative 3: a new cogeneration power plant on biomass fuels, implemented with a lower efficiency or at a later stage, not undertaken as a CDM project activity and
iv. Alternative 4: the proposed project activity not undertaken as a CDM project activity.

All the provided alternatives are in compliance with the legal and regulatory requirements.

Step 2. Barrier analysis

a) *Investment Barriers*: It has been argued that as a member of the CDEC-SIC dispatch centre, Arauco is exposed to penalties applied to power generators by the national authority in case of any contingency in the power system, such as black-outs, system instability, cascading outages or voltage collapse. This was confirmed by DNV from the Economy Ministry: Law 18 410, modified on 19 May 2005 /36/. According to the law, these penalties are applied in proportion to the installed capacity of each

electric power company /31/. Being Viñales Biomass Power Plant a large cogeneration project its fine can be significantly high. This higher risk exposure prevents companies whose core business is not power generation from investing in power cogeneration projects. DNV has also verified that Arauco has paid to the date around US$ 130,000 in fines to the authority because of power contingencies of other grid connected biomass power projects /17/.

b) Technological Barriers: The project activity faces two kinds of technological barriers: necessity of skilled and trained labor to operate the power plant and risk of technological failure, because the cogeneration power plant tends to work with higher steam conditions and may interfere with the normal operation of the production processes. DNV confirmed through technical literature that specialized operators are a key issue to the successful operation of a co-generation power plant /38/. DNV also confirmed during the site visit (on-site inspection and interview with plant managers) that the Viñales Complex faces specific characteristics due to the project activity (surplus of electric power generation) that are not usual in the sawmill industry. Those specific characteristics are: i) larger number of equipment in the power plant; ii) skilled and trained labour required in order to operate the mill in a way that both the production and power generation are optimized; iii) work with higher steam conditions (i.e. 85 bar and 485°C); iv) power generation may interfere with the normal operation of the sawmill processes. The risk of technological failure was also corroborated by an AF Celpap study /16/ which was evidenced by DNV.

c) Barriers due to prevailing practice: DNV was able to confirm that large scale electric power generation is not a normal practice in the sawmill industry. DNV confirmed with the CDEC-SIC (Economic Dispatch Center in the Central Interconnected System in Chile) that there is no other large scale biomass power plant that operates in the context of the sawmill industry other than CDM registered projects. DNV has evidenced that there are 10 biomass based power plant in operation in Chile, of which 6 are CDM projects. The other 4 plants are small generators, from 5 to 13 MW, which demonstrates that the project activity at 41 MW installed capacity is not a common practice.

d) Cultural Barriers: The production and commercialization of pulp and paper is the principal business of Arauco as a consequence the internal culture is strongly influenced by the commodity market, which differs from the culture in the electric power sector. DNV confirmed during the site visit that the production and commercialization of pulp and paper is the principal business of Arauco.

e) Barriers to entry to the electric power industry: In Chile, there are no legal framework for grid connected small power generators from non conventional renewable energy and the project developer are not able to define the convenient regulatory scheme to dispatch to the grid. Furthermore, the project faces an operational barrier compared to power units. A dual penalization system is induced by the Chilean power dispatch for power generators that also produce power for their proper demand in case of dispatch failure. In Chile there are not several incentives to implement cogeneration units from non conventional renewable energy to generate electricity. The current initiatives do not make this kind of project financially attractive in the traditional electricity price context. DNV confirmed that the project faces barriers in the electric power industry with the following sources: i) CDEC-SIC Internal Regulation, Article 118; ii) Ministry Resolution RM 40; iii) Ministry Resolution RM 17.

DNV could ratify the existence of the mentioned barriers by assessing independent studies, reports and articles /39/ that confirm the barriers faced for non-conventional renewable power generation sources in Chile.

DNV has verified that while Arauco has other grid connected biomass based power plants in operation at other locations, these are stand alone projects and are not integrated in to the operation of a sawmill as in the case of the project and hence has specific barriers.

Step 3. Investment analysis

Choice of approach

In order to substantiate the financial barriers and illustrate the CDM relevance for the project, the project proponent decided to conduct an investment analysis. Since the proposed project generates financial and economic benefits through the sales of electricity other than CDM-related income and the project proponent has other alternatives to the project activity, an investment comparison analysis is applicable. NPV analysis has been selected for each alternative defined in step 1 and compared with the alternative scenario 1 (baseline) of no investment for power and/or heat generation. The NPV values calculated with a discount rate of 12% indicated a negative NPV value for all the alternatives considered. DNV verified this through assessment of the financial budgets /8//13/ and spreadsheets /15/.

The comparison was made by comparing the alternative scenarios 3, 4 with the alternative scenario 2. In doing so, a reference heat price was established in order to be the equivalent price required to finance the installation of a low-pressure power boiler unit in Viñales, leading to a zero NPV for alternative scenario 2. This reference price is then used in NPV calculations for alternative scenarios 3 and 4.

Discount Rate selection

The discount rate was established to be 12%. DNV confirms that this discount rate is used internally for project investment analysis in the Arauco group, such as the DHM storage building in Lincancel dated May 2003, thermal plant in Itata complex dated February 2003, Constitución production equipment dated 1998, and Arauco port project dated 29 September 1997 /7/. Dispite the variety of types of investments, DNV considers that the Thermal Plant in Itata Complex is a good refence of similar type of project using the Arauco's internal dicousnt rate.

Input parameters

DNV confirmed all assumptions and input parameters during the site visit.

- Alternative 2: a low-pressure power boiler unit on biomass fuels;
    - The investment was considered to be USD 17,453,000. This was confirming by assessing Arauco's correspondent budget and confirming the major investment with the boiler supplier's proposal dated 15 April 2008 /8/;
    - Residual value: it was confirmed by assessing Arauco's previous project initiatives /7/ that a residual value of 20 – 25% has been applied;
    - The biomass conversion factor of 0.15 BDt/m^3st was confirmed by assessing the monitoring reports of other registered CDM project activities from Arauco (Trupan – 0259 and Nueva Aldea Phase 1 – 0258);
    - The amount of biomass from Arauco was confirmed by assessing the biomass residues balance /9/;
    - The biomass price was confirmed by checking the historical biomass price from Arauco suppliers from 2006 to 2008 /10/;
    - The wood gross calorific value was confirmed by the PCM laboratory analysis carried on in 14 April 2008 /11/;

  - The combustion efficiency was confirmed by assessing the project energy and mass balance presented in the PD /1/;
  - The electric consumption (MWh/steam ton) and demineralized water costs were confirmed by assessing the operational data of another similar sawmill without co-generation from Arauco – Colorado plant /12/;
  - The electrical costs were confirmed by assessing the latest CNE Node Price Report available at the time of the decision making /32/;
  - CAPEX: it was confirmed by assessing Arauco's previous project initiatives /7/ that a value of 1% of total investment has been applied;
  - The 10 years of depreciation and the 17% of income tax were confirmed in the Chilean Law of Income Tax /33/;
- Alternative 3: a new cogeneration power plant on biomass fuels (90 ton at 41.5 bar and 15 MW):
  - The investment was considered to be USD 49,034,000. This was confirming by assessing Arauco's correspondent budget and confirming the major investment with the Nueva Aldea Phase 1 project power boiler purchase order dated 2 January 2003 /13/; both power boilers are similar.
  - The electrical efficiency, power plant consumption, fuel consumption and biomass demand were confirmed by assessing the project energy and mass balance presented in the PD /1/;
  - The electrical and power costs were confirmed by assessing the latest CNE Node Price Report available at the time of the decision making /32/;
  - The ERNC benefits were confirmed by checking the Chilean Law 20257 /34/;
  - The O&M costs were assessed by checking the Nueva Aldea Phase 1 O&M costs that were used for reference /14/;
  - The transmission and distribution fees were confirmed by the correspondent CDEC-SIC reports /35/;
- Alternative 4: The proposed project activity:
  - The investment was considered to be USD 99,970,000. This was confirming by assessing Arauco's correspondent budget and confirming the major investment with the Nueva Aldea Phase 1 project power boiler purchase order dated 2 January 2003 /13/; both power boilers are similar.
  - Remaining parameters were confirmed as per alternative 3.

Calculation and conclusion

The NPV calculations were provided in a spreadsheet /15/. The calculations were verified and found to be correct. The assumptions used in the calculations were deemed to be correct by DNV as stated in the above section. The results were as follow:

- Alternative 2: USD 0.00;
- Alternative 3: (USD (-) 14,891);
- Alternative 4: (USD (-) 23,025) (normal plant factor) and (USD (-) 9,916) (high plant load factor);

The project-NPV without CDM revenues confirms that the project in the absence of CDM benefits and compared to the baseline (alternative 2) is not financially attractive.

Sensitivity analysis

A sensitivity analysis considering variations in the total investment, power price, heat price and biomass price demonstrates the following:

- Total investments: If the total investments decrease by 30.40% (normal plant factor) or by 13.09% (high plant factor), the project NPV will become positive. However, considering the analysis of the investment behavior in other Arauco projects /7/, the widest fluctuation between the investment estimation and real investment is from -10% to +25%. Therefore, a 13.09% decrease in the total investment is unlikely.
- Power price: Arauco has analysed the last 49 annual hydrological scenarios to determine the possible power price scenarios. For the project activity with normal plant factor, the power price would have to correspond to an extremely dry hydrology, which has not happened in the last 49 years; for the project activity with high plant factor, the power price would have to correspond to an extremely dry hydrology, which has only happened 3 times in the last 49 years. DNV considers this possibility very unlikely.
- Heat price: If the heat prices increase 171% (normal plant factor) or 74% (high plant factor) the project NPV will become positive. However, in both situations the baseline alternative will have a much more attractive result.
- Biomass fuel price: If the biomass fuel price decrease by 65% (normal plant factor) or by 19% (high plant factor), the project NPV will become positive. However, considering the historical biomass prices from 2006 to 2008 /10/, this is not likely to happen.

The sensitivity analysis shows that even with substantial variation of the key indicators, the NPV of the proposed project is negative.

Step 4. Common practice analysis

DNV verified that while cogeneration is normally used in the pulp industry in Chile (only for self-consumption), this technology is not common practice in the sawmill and panel board industries. Arauco is the only company who has developed biomass cogeneration to the point to become a relevant net energy generator in the SIC. Very few similar companies in the world and no other similar company in Chile have been deliberately designed to generate surplus electricity. The CDEC-SIC data that confirm this information is presented in the annex 3 of the PD and confirmed in the CDEC-SIC webpage.

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.

3.3.6 Quantification of GHG Emission Reductions and Removals

The various algorithm/formulae for calculating baseline and project emissions have been transparently documented in line with the requirements of the Consolidated methodology for electricity and heat generation from biomass version 12.1.1.

The emission reductions are calculated as the difference between project emissions, leakage emissions and baseline emissions. The baseline emissions are due to grid emissions savings from electricity generation with biomass residues and due to the natural decay or burning of anthropogenic sources of biomass residues.

The project emissions are due to fossil fuel consumption at project site, electricity imported from the grid, biomass mechanical process and transportation to the site.

The potential source of leakage is related to local sawdust and bark market depletion. The Viñales Biomass Power Plant biomass power plant counts with sufficient biomass locally and has not caused

other biomass plants in the area to switch from biomass to fossil fuels. Therefore, estimation of leakage emissions are considered to be nil.

The system boundary for the grid electricity system affected by the project is defined as the system of the SIC grid. The combined margin emission coefficient for the grid will be calculated and monitored *ex-post* in accordance with the "Tool to calculate the emission factor for an electricity system".

The calculations of the *ex-ante* emission reduction forecast are based on electricity generation estimates provided by the Central Interconnected System of Chile (SIC) for the electricity generated in grid in the year 2011. The operating margin (OM) emission coefficient is calculated using the simple adjusted method and the build margin (BM) emission coefficient was calculated considering the most recent 20% power plants capacity additions, resulting in a combined margin emission coefficient of 0.68784 tCO_2e/MWh (weighted average of the build and operating margin).

As for CH_4 emissions savings, the amount of biomass residues from each categories was multiplied by the correspondent net calorific value, adjusted CH_4 for uncontrolled burning and CH_4 global warming potential, resulting in 73 345 tCO_2 per year.

The total estimated amount of GHG emission reductions from the project is calculated to be 2 736 308 tCO_2 over a 10-years crediting period, resulting in estimated average annual emission reductions of 273 631 tCO_2.

The emission reduction calculation were provided in a spreadsheet /3/, and it 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 emissions 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.

3.3.7 Methodology Deviations

The following deviations from the Consolidated methodology for electricity and heat generation from biomass, version 12.1.1 were assessed by DNV:

Biomass residue calculation method: Part of the biomass, approcimately 10% of total, is transported by a pneumatic system. Due to the difficulty of measurement of this fraction of the biomass, project paticipants will indirectly measure this amount. The amount of biomass will be calculated based on the wood mass difference between the wood entering and exiting the sawmill and remanufacture plants. For each remanufacture plant a measured method and respective parameter were defined. Also calibration (when applicable) and measurement frequency were presented by the project participants. DNV assessed the proposed method described at Annex 1 of the PD /1/ and confirms that the calculation method is conservative, accurate and is clearly described at the PD.

Heat generator baseline efficiency: According to Step 1.5 of the methodology (version 12.1.1) only Option 1: "Default values should be chosen" is applicable to the project. This option automatically refers to Option F: "Use a default value" of the "Tool to determine the baseline of thermal or electric energy generation system". At Table 1: "Default baseline efficiency for different technologies" only fossil fuel

boilers (natural gas, oil and coal) are listed, and there is no option that could be chosen in order to represent the technology used at sawmills and panel board mills industry. In cases where no options of Table 1 are applicable the "Tool to determine the baseline of thermal or electric energy generation system" (version 1) indicates the maximum default efficiency of 100% should be used, as a simple and conservative approach. However for this project if the efficiency of 100% was used it would not result in the most conservative scenario.

The higher the efficiency of the heat generator in the baseline scenario, the lower will be the amount of biomass residues attributed to heat generation, assuming the total consumption of biomass in the project is fixed. The lower the baseline heat generator efficiency, the lower would be the amount of biomass associated with power generation. Consequently there would be lower emission reductions due to avoided methane emissions of biomass attributable to the project activity, assuring conservativeness.

Based on global suppliers estimatives, Andritz and Metso, the lower recommended efficiency for the project's heat generator is 85%. DNV assessed those references /42//43/ and confirmed that the proposed value is conservative.

Calculation of the auxiliary power consumption: Due to measurement impossibilities, part of the auxiliary power consumption (10%) will be estimated based on the installed capacity of the equipment. DNV assessed the proposed calculation methods and confirms that this is conservative and acceptable.

3.3.8 Monitoring Plan

The project has applied the CDM methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass", version 12.1.1 /23/ in combination with "Tool for the demonstration and assessment of additionality (Version 7.0.0), "Tool to determine the baseline efficiency of thermal or electric energy generation systems" (Version 1.0), "Tool to calculate the emission factor for an electricity system" (Version 3.0.0), "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 2.0), "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" (Version 1.0), "Tool for project and leakage emissions from transportation of freight" (Version 1.1)

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

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

- P_x = Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year x from plants operated at the project site.
- $CAP_{HG,h}$ = Baseline capacity of heat generator h (GJ/h).
- $LFC_{HG,h}$ = Baseline load factor of heat generator h (ratio).
- GWP_{CH4} = Global Warming Potential of methane valid for the commitment period (tCO_2/tCH_4).
- $EF_{burning,CH4,k,y}$ = CH_4 emission factor for uncontrolled burning of the biomass residue type k during year y.
- $EF_{CH4,BR}$ = CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ).

- $\eta_{BL,HG,BR,boiler}$ = Heat efficiency of the boiler (heat generator) that would have been installed in the baseline scenario.As listed at this report, section 3.3.7, “Heat generator baseline efficiency”, DNV has assessed and validated the deviation and confirms that the efficiency of the baseline boiler (85%) is conservative and acceptable.
- $EF_{CO2,f}$ = Default CO_2 emission factor for freight transportation activity *f*.

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:

- $BR_{PJ,n,y}$ = Quantity of biomass residues of category n used in the project activity in year y (tonnes on dry-basis).
- $BR_{B4,n,y}$ = Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B4: (tonne on dry-basis).
- $BR_{B1/B3,n,y}$ = Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B1: or B3: (tonnes on dry-basis).
- $BR_{B5/B8,n,y}$ = Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B5:, B6:, B7: or B8: (tonnes on dry-basis)..
- $EF_{FF,y,f}$ = CO_2 emission factor for fossil fuel type f in year y (tCO_2/GJ).
- $EF_{CH4,BR}$ = CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)..
- $EF_{CO2,LE}$ = CO_2 emission factor of the most carbon intensive fossil fuel used in the country (tCO_2/GJ).
- $HC_{BL,y}$ = Baseline process heat generation in year y (GJ).
- $EL_{PJ,gross,y}$ = Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh)..
- $EL_{PJ,imp,y}$ = Project electricity imports from the grid in year y (MWh)..
- $EL_{PJ,aux,y}$ = Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh).
- $NCV_{BR,n,y}$ = Net calorific value of biomass residue of category n in year y (GJ/tonne on dry-basis).
- Moisture content of the biomass residues
- Py = Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year y from plants operated at the project site.
- LOC_y = Length of the operational campaign in year y (hour).
- $FC_{i,j,y}$ = Quantity of fuel type i combusted in process j during the year y
- $NCV_{i,y}$ = Weighted average net calorific value of fuel type i in year y.
- $EF_{CO2,I}$ = Weighted average CO_2 emission factor of fuel type i in year y.
- $D_{f,m}$ = Return trip road distance between the origin and destination of freight transportation activity *f* in monitoring period *m*.
- $FR_{f,m}$ = Total mass of freight transported in freight transportation activity f in monitoring period m.

- $FC_{i,m,i,y}$, $FC_{i,k,y}$ = Amount of fossil fuel type i consumed by power plant/unit m, k or n.
- $NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y.
- $EF_{CO2,i,y}$, $EF_{CO2,m,i,y}$ = CO_2 emission factor of fossil fuel type i used in power unit m in year y.
- $EG_{m,y}$, $EG_{k,y}$ = Net electricity generated by power plant/unit m, k in year y.

Since emissions due to displacement of heat have not been considered for the project activity it is not necessary to monitoring the average net energy efficiency of heat generation in the boiler that would generate heat in the absence of the project activity.

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 PD 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.

The monitoring of sustainable indicators is neither required by the methodology ACM0006 nor by the Chilean DNA.

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

3.3 Environmental Impact

According to the Chilean environmental regulations, the project proponent submitted in September 2008 an Environmental Impact Declaration to the Environment National Authority, CONAMA, and received the corresponding approval of the project through the “Resolución Exenta N°80/2009” /3/.

No significant environmental impacts are predicted.

3.4 Comments by stakeholders

Stakeholders involvement was organized through the following channels: television, radio, press, door-to-door presentation of the project to the local community and meetings with local stakeholders such as environmental authorities of the VII Region, Viñales personnel, local business community, CORMA (the Wood Corporation), fisherman federation of the VII Region, Environmental Committee of Constitución and Personnel of the Constitución pulp mill.

Correspondent evidences were provided to DNV /4/. No negative comments were received.

DNV considers the local stakeholder consultation that was carried out to be adequate.

4 VALIDATION CONCLUSION

DNV Climate Change Services AS (DNV) has performed a validation of the project activity "Viñales Biomass Power Plant" in Chile. The validation was performed on the basis of VCS criteria for VCS projects as well as criteria given to provide for consistent project operations, monitoring and reporting.

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

The project correctly applies the CDM methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass", version 12.1.1.

The project activity consists in the installation of a new biomass cogeneration power plant in the Viñales sawmill. The new cogeneration unit consists of a 210 ton/hr fluidized bed boiler and a 41 MW condensing / extracting turbo generator unit, allowing for on-site electric power generation, displacing electricity from the central Chilean grid (SIC). As a result, the project results in reductions of CO_2 and CH_4 emissions which 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 average 258 093 tCO_2e per year over the selected 10 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 are able to implement the monitoring plan.

In summary, it is DNV's opinion that the project activity "Viñales Biomass Power Plant" in Chile, as described in the VCS PD, version 02 dated 10 May 2013, meets all relevant VCS requirements for VCS projects and correctly applies the CDM methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass", version 12.1.1. Hence, DNV recommends the registration of the project as a VCS project activity.

APPENDIX A

VCS VALIDATION PROTOCOL

Table 1 Requirements Checklist

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
1 PROJECT DETAILS					
1.1 Summary Description of the Project					
1.1.1 Does Section 1.1 of the VCS PD include a clear summary description of the project?	/1/	DR	☒ Clearly identifiable title of the project activity		OK
1.2 Sectoral Scope and Project Type					
1.2.1 Are the sectoral scopes applicable to the project clearly described? Is the project a grouped project?	/1/	DR	The Viñales biomass power plant is a renewable energy supply side grid-connected project activity. It involves reduction of emission of greenhouse gases in the energy sector; more specifically, reduction of greenhouse gas emission sources from fuel combustion in energy industries, according to the list of sector/source categories indicated in Annex A of the Kyoto Protocol. The Viñales project activity is not a grouped project activity.		OK
1.3 Project Proponent					
1.3.1 Are contact information and roles/responsibilities for the project proponent(s) clearly and properly described?	/1/	DR	Yes. The project participants is Celulosa Arauco y Constitución S.A. of host Party Chile.		OK
1.4 Other Entities Involved in the Project					
1.4.1 Have contact information and roles/responsibilities for any other entities involved in the development of the project be provided?	/1/	DR	Not applicable.		OK
1.5 Project Start Date					

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
1.5.1 What is the project start date? Has the project start date been defined correctly?	/1/	DR	The starting date of the project activity is 19 May 2012, which corresponds to the date when the project started generating electricity.		OK
1.6 Project Crediting Period					
1.6.1 What is the crediting period start date? Is the date determined appropriately? What is the selected crediting period?	/1/	DR	The first crediting period will last 10 years, from 1 January 2014 to 31 December 2023, and it will be renewed twice.		OK
1.7 Project Scale and Estimated GHG Emission Reductions or Removals					
1.7.1 What is the scale of the project? What are the estimated annual GHG emission reductions or removals for the project crediting period?	/1/	DR	The "Viñales Biomass Power Plant" is a large scale project and the average estimated GHG emission are 258 093 tCO_2 per year.		OK
1.8 Description of the Project Activity					
1.8.1 What are project activity or activities (including the technologies or measures employed) and how it/they will achieve net GHG emission reductions or removals? What is the lifetime of the project activity(s)?	/1/	DR	The project activity consists in the installation of a new biomass cogeneration power plant in the Viñales sawmill. The new cogeneration unit consists of a 210 ton/hr fluidized bed boiler and a 41 MW condensing / extracting turbo generator unit, allowing for additional electricity of 291.18 GWh/year to be displaced from the central Chilean grid (SIC). Prior to the implementation of the project activity, the Viñales sawmill relied on an external company who supplied heat to the Viñales sawmill and on the grid for electric power.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
1.9 Project Location					
1.9.1 What is the project location and geographic boundaries if applicable?	/1/	DR	The "Viñales Biomass Power Plant" project located in the commune of Constitución in the Maule Region, Chile. In line with ACM0006, the system boundary includes the power plant, the biomass transportation and grid-connected power plants.		OK
1.10 Conditions prior to Project Initiation					
1.10.1 Are the conditions prior to project initiation clearly described in the VCS PD with supporting evidence?	/1/	DR	Yes. The history was clear described in the VCS PD.		OK
1.10.2 Is it demonstrated that the project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal or destruction?	/1/	DR	Yes, the project was implemented to generate electricity for internal consumption and for selling the surplus to the SIC grid.		OK
1.11 Compliance with Laws, Statutes and Other Regulatory Frameworks					
1.11.1 What relevant local, regional and national laws, statutes and regulatory frameworks are identified?	/1/ /3/	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°80/2009".		OK
1.11.2 Is the project in compliance with all the relevant local, regional and national laws, statutes and regulatory frameworks identified? How is this demonstrated?	/1/	DR	Yes, see 1.11.1.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
1.12 Ownership and Other Programs					
1.12.1 Is evidence of right of use proper?	/1/ /3/	DR	Celulosa Arauco y Constitución S.A. constructed and owns the Viñales Biomass Power Plant according to the Environment National Authority, CONAMA, through the "Resolución Exenta N°80/2009".		OK
1.12.2 Where applicable, has it been demonstrated that net GHG emission reductions or removals generated by the project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions?	/1/	DR	The project participants are not participating in trading programs or seeking registration in other GHG programs.		OK
1.12.3 Has the project been registered, or is seeking registration under any other GHG programs? Where the project has been registered under any other GHG program, has the registration number and details been provided?	/1/ /40/	DR	The project activity was rejected from the CDM UNFCCC, failing to substantiate prior CDM consideration. DNV confirmed with the VCS Association that a rejection based on a failure to demonstrate prior consideration (in itself) would be considered a rejection based on "procedural or eligibility requirements", and so it's possible that the project is eligible under the VCS.		OK
1.12.4 Has it been demonstrate that the project neither has nor intends to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program, or that any such credit has been or will be cancelled from the relevant program?	/1/	DR	Yes, GHG credits will only be claimed under VCS.		OK
1.12.5 Has the project been rejected by any other GHG programs? Where the project has been rejected, has the relevant information been provided?	/1/	DR	Yes, see 1.12.3.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
1.13 Additional Information Relevant to the Project					
1.13.1 For grouped projects, have eligibility criteria for inclusion of new instances of each project activity been properly identified?	/1/	DR	Not applicable.		OK
1.13.2 Where applicable, has the leakage management plan and implementation of leakage and risk mitigation measures been properly described?	/1/	DR	Not applicable.		OK
1.13.3 Has any commercially sensitive information been excluded from the public version of the VCS PD? If yes, can the excluded information be justified as being commercially sensitive? Has the items to which such information pertains been described?	/1/	DR	Not applicable.		OK
2 VCS METHODOLOGY					
2.1 Title and reference of the VCS methodology applied to the project activity and explanation of methodology choices					
2.1.1 Does the project apply a VCS program approved methodology and the correct version thereof?	/1/ /23/	DR	The project has applied the CDM methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass", version 12.1.1 in combination with ".		OK
2.1.2 Has any methodology deviation been applied? If yes, how has the deviation been determined acceptable?	/1/	DR	.		
2.1.3 Has any methodology revision been applied? If yes, has the revision been approved through a double-approval process?	/1/	DR	Not applicable.		OK
2.2 Justification of the choice of the methodology and why it is applicable to the project activity					
2.2.1 How was it validated that project complies with the following applicability	/1/	DR	During site visit DNV verified that the only biomass residues are used as fuel in the		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
criteria: *No biomass types other than biomass residues are used in the project plant?*			project activity.		
2.2.2 How was it validated that project complies with the following applicability criteria: *Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired does not exceed 80% of the total fuel fired on an energy basis?*	/1/	DR	Due to operational reasons (start-up and shut down) fossil fuel may be co-fired in the boiler. Through assessment of the emission reduction spread sheet /6/, DNV confirmed that this amount corresponds to less than 80% of total emission.		OK
2.2.3 How was it validated that project complies with the following applicability criteria: *For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project does not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process?*	/1/	DR	The core business of Viñales Biomass Power Plant is the production of sawn timber and wood panels. The implementation of the project will not result in an increase of the processing capacity of raw input. DNV confirmed this information during site visit.		OK
2.2.4 How was it validated that project complies with the following applicability criteria: *The biomass residues used by the project facility are not stored for more than one year?*	/1/	DR	During site visit DNV confirmed that there is no available area for to store biomass for a long time. The stock available was designed to last less than two weeks.		OK
2.2.5 How was it validated that project complies with the following applicability criteria: *The biomass residues used by the project facility are not obtained from chemically processed biomass (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemicaldegradation,etc.) prior to combustion. Moreover, the preparation of biomass-derived fuel do not involve significant energy quantities, except from transportation or mechanical treatment so as not to cause significant GHG emissions?*	/1/	DR	The only processes involved in the biomass residues preparation are mechanical and transportation. Both emissions are accounted as project emissions. DNV confirmed during site visit that there was no chemical process in the biomass preparation		OK
2.2.6 How was it	/1/	DR	The is no fuel switch activity at the Viñales		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
validated that project complies with the following applicability criteria: *In the case of fuel switch project activities, the use of biomass residues or the increase in the use of biomass residues as compared to the baseline scenario is technically not possible at the project site without a capital investment in:* *• The retrofit or replacement of existing heat generators/boilers; or* *• The installation of new heat generators/boilers; or* *• A new dedicated biomass residues supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); or* *• Equipment for preparation and feeding of biomass residues*			Biomass Power Plant project.		
2.2.7 How was it validated that project complies with the following applicability criteria: *In the case that biogas is used in power and/or heat generation, this methodology is applicable under the following conditions:* *• The biogas is generated by anaerobic digestion of wastewaster (to be) registered as a CDM project activity and the details of the registered CDM project activity must be included in the PDD. Any CERs from biogas energy generation should be claimed under the proposed project activity registered under this methodology;* *• The biogas is generated by anaerobic digestion of wastewater that is not (and will not) be registered as a CDM project activity. The amount of biogas does not exceed 50% of the total fuel fired on an energy basis.*	/1/	DR	Not applicable. There is no biogas consumption in the project activity.		OK
2.2.8 In the case of biomass from dedicated plantations: • *The cultivated land can be clearly identified and used only for dedicated energy biomass plantations;* • *The CDM project activity does not lead to a shift of pre-project activities outside the project boundary, i.e. the land under the*	/1/	DR	Not applicable. There is no biomas from dedicated plantations.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.

proposed project activity can continue to provide at least the same amount of goods and services as in the absence of the project;
• *The plantations are established:*
  ○ *On land which was, at the start of the project implementation, classified as degraded or degrading; or*
  ○ *On a land area that is included in the project boundary of one or several registered A/R CDM project activities;*
• *The plantations are not established on organic soil (notably peatlands);*
• *The land area of the dedicated plantations will be planted by direct planting and/or seeding;*
• *After harvest, regeneration will occur either by direct planting, seeding or natural sprouting;*
• *Grazing will not occur within the plantation;*
• *No irrigation is undertaken for the biomass plantations;*
• *The land area where the dedicated plantation will be established is, prior to project implementation, severely degraded and in absence of the CDM project activity would have not been used for any other agricultural or forestry activity;*
• *Only perennial plantations are eligible*					

2.3 Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project					
2.3.1 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	In line with ACM0006, the system boundary includes the power plant, the biomass transportation and grid-connected power plants.		OK
2.3.2 Which GHG sources, sinks and reservoirs are identified for the baseline scenario? Is the identification complete?	/1/	DR	Baseline emissions: CO_2 from grid electricity generation and CH_4 emissions from the natural decay or burning of anthropogenic sources of biomass	~~CL1~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			residue.		
2.3.3 Which GHG sources, sinks and reservoirs are identified for the project? Is the identification complete?	/1/	DR	Project emissions: CO_2 emissions from biomass transportation, on-site consumption of fossil fuels, and combustion of biomass residues.		OK
2.4 Description of how the baseline scenario is identified and description of the identified baseline scenario					
2.4.1 What is the baseline scenario?	/1/	DR	DNV confirmed that the approved baseline methodology has been correctly applied to identify a complete list of realistic and credible baseline scenarios: 1. **The installation of a low-pressure boiler on biomass fuels.** This scenario would apply the methodology scenarios: P7, H5, B1, B3 and B4. 2. **The installation of a new cogeneration power plant on biomass fuels, implemented with a lower efficiency/scale.** This scenario would apply the methodology scenarios: P5, P7, H5, B1, B3 and B4 3. **The proposed project activity.** This scenario would apply the methodology scenarios: P1, H1 and B4.		OK
2.4.2 Which baseline scenarios have been identified? Is the	/1/	DR	**POWER GENERATION**		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
list of baseline scenarios complete?	/5/		During the site visit DNV confirmed that i) there is no power generation unit at the project site, ii) there are no other biomass types available in the region to generate power, as confirmed from the INFOR website and iii) there are no off-site plants available to supply electric power to the project activity. Therefore, the alternatives of P2, P3, P4, P6 are eliminated. The feasible alternative scenarios for power generation would be P1, P5 and P7. **HEAT** During the site visit DNV confirmed that i) there is are no exisiting plants at the project site, ii) there is no biomass cogeneration power plant installed, iii) there are no other heat generation technologies available at the site iv) there is distric heating available in the region. Therefore, the feasible alternative scenarios for heat generation would be H1 and H5. **BIOMASS** During the site visit DNV confirmed that i) there is no biomass boiler at the project site, ii) there is a surplus of biomass available in the region that would be left to dacey in stock-piles, iii) the generation of bio-fuels is not developed in Chile and iv)		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			the biomass residues used for energy generation purposes are not the same as the biomass residues used for feedstock or for pulp and paper production. Therefore, the feasible alternative scenarios for biomass would be B1, B3 and B4 **MECHANICAL POWER** all alternative scenarios were excluded because there is no mechanical power utilization in the facility. According to the Consolidated methodology for electricity and heat generation from biomass and regarding the alternatives presented, the biomasses where classified into four biomass categories (k): • Category 1: Sawdust and bark from industrial on-site operations used for heat generation (B4); • Category 2: Sawdust and bark from industrial on-site operations used for power generation(B1, B3)); • Category 3: Sawdust and bark from industrial off-site operations (B1, B3); • Category 4: Biomass from forestry opertaions (B1, B3); According to Consolidated methodology for electricity and heat generation from		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			biomass, for biomass residues under scenario B1 and B3, project participant have justified that there is a surplus of more than 25% of the quantity of biomass residue type which is utilized in the region..		
2.4.3 How have the other baseline scenarios been eliminated in order to determine the baseline? Is the determination of the baseline scenario in accordance with the guidance in the methodology?	/1/	DR	Please make reference to item 2.4.2 regarding the scearions eleminations. The determination of the baseline scenarios is in accordance with the guidance in the methodology.		OK
2.4.4 Is the baseline scenario determination compatible with the available data and are all literature and sources clearly referenced?	/1/	DR	DNV considers the list of realistic and credible alternatives to be complete. The alternatives are in compliance will all mandatory and applicable legal and regulatory requirements		OK
2.4.5 Is the baseline determination adequately documented in the VCS PD? • All assumptions and data used by the project participants are listed in the VCS PD. The data are properly referenced. • All documentation is relevant as well as correctly quoted and interpreted. • Assumptions and data can be deemed reasonable. • The methodology has been correctly applied to identify what would occurred in the absence of the proposed VCS project activity.	/1/	DR	Yes. Considering the business as usual practice in the sawmill industry and the level of feasibility and the conservativeness of the alternatives, the most likely and conservative alternative is the installation of a new low pressure biomass boiler with no power generation capacity. In accordance with ACM0006, an electricity baseline emission factor for the grid mix is calculated in accordance with the Tool to calculate the emission factor for an electricity system Version 3.0.0 as a combined margin emission coefficient,		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			consisting of the combination of a simple adjusted operating margin (OM) emission coefficient and a build margin (BM) emission coefficient. Both, the OM and BM emission coefficients will be updated ex-post based on the electricity generation data at grid plants for the year of operation of project plant. The electricity system selected to determine the combined margin emission coefficient is the SIC grid system in Chile.		
2.5 Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality)					
2.5.1 What approach does the project use to assess additionality? Is this in line with the methodology?	/1/ /24/	DR	The additionality of the project has been demonstrated in accordance with ACM0006, using the "Tool for the demonstration and assessment of additionality.		OK
Investment analysis					
2.5.2 Does the project activity or any of the remaining alternatives generate revenues apart from carbon revenues? Is this reflected in the VCS PD?	/1/	DR	Since the proposed project generates financial and economic benefits through the sales of electricity other than CDM-related income and the project proponent has other alternatives with investment to the project activity, an investment comparison analysis is applicable. NPV analysis has been selected for each alternative defined in step 1 and		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			compared with the alternative scenario 1 of no investment for power and/or heat generation.		
2.5.3 Do any of the alternatives to the project activity involve investment? Is this reflected in the VCS PD?	/1/	DR	Yes, see 2.5.2.		OK
2.5.4 Is the choice of benchmark analysis, investment comparison or simple cost analysis correct?	/1/	DR	Yes, see 2.5.2.		OK
2.5.5 Is the benchmark/discount rate the latest available at the time of the decision?	/1/ /7/	DR	The discount rate was established to be 12%. DNV confirms that this discount rate is used internally for project investment analysis in the Arauco group, such as the DHM storage building in Lincancel dated May 2003, thermal plant in Itata complex dated February 2003, Constitución production equipment dated 1998, and Arauco port project dated 29 September 1997.		OK
2.5.6 What is the financial indicator? Is it on equity/project basis? Before/after tax? Does the financial indicator correspond with the benchmark?	/1/	DR	Not applicable.		OK
2.5.7 Are the underlying assumptions appropriate, e.g., what is considered as waste in the baseline and is this considered to have zero value?	/1/	DR	Yes.		OK
2.5.8 Does the income tax calculation take depreciation into account? Is the depreciation year in accordance with normal accounting practice in the host country?	/1/ /33/	DR	Yes, The 10 years of depreciation and the 17% of income tax were confirmed in the Chilean Law of Income Tax.		OK
2.5.9 Is 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	Yes.		OK
2.5.10 How was the amount of output (e.g., sales methane) assessed?	/1/	DR	• The electrical efficiency, power plant consumption, fuel		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	/32/ /34/		consumption and biomass demand were confirmed by assessing the project energy and mass balance presented in the PD; • The electrical and power costs were confirmed by assessing the latest CNE Node Price Report available at the time of the decision making; • The ERNC benefits were confirmed by checking the Chilean Law 20257.		
2.5.11 How was the output price (e.g., methane) assessed? Were the data available and valid at the time of the decision?	/1/	DR	See 2.5.10.		OK
2.5.12 How were the investment costs assessed? Were the data available and valid at the time of the decision?	/1/ /8/ /13/	DR	For alternative 2, the investment was considered to be USD 17,453,000. This was confirming by assessing Arauco's correspondent budget and confirming the major investment with the boiler supplier's proposal dated 15 April 2008. For alternative 3, the investment was considered to be USD 49,034,000. This was confirming by assessing Arauco's correspondent budget and confirming the major investment with the Nueva Aldea Phase 1 project power boiler purchase order dated 2 January 2003; both power boilers are similar. For alternative 4, the investment was considered to be USD 99,970,000. This was confirming by assessing Arauco's		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			correspondent budget and confirming the major investment with the Nueva Aldea Phase 1 project power boiler purchase order dated 2 January 2003; both power boilers are similar.		
2.5.13 How were the O&M costs assessed? Were the data available and valid at the time of decision?	/1/ /14/	DR	The O&M costs were assessed by checking the Nueva Aldea Phase 1 O&M costs that were used for reference;		OK
2.5.14 Describe the assessment of the other input parameters. Were the data available and valid at the time of decision?	/1/	DR	Yes, see report section 3.3.5.		OK
2.5.15 Was the financial calculation spreadsheet verified and found to be correct?	/1/ /15/	DR	The NPV calculations were provided in a spreadsheet. The calculations were verified and found to be correct. The assumptions used in the calculations were deemed to be correct by DNV as stated in the above section. The results were as follow: • Alternative 2: USD 0.00; • Alternative 3: (USD (-) 14,891); • Alternative 4: (USD (-) 23,025) (normal plant factor) and (USD (-) 9,916) (high plant load factor); The project-NPV without CDM revenues confirms that the project in the absence of CDM benefits and compared to the baseline (alternative 2) is not financially attractive.		OK
2.5.16 Sensitivity analysis: Is the range of variations is reasonable in the project context?	/1/ /7/	DR	A sensitivity analysis considering variations in the total investment, power		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	/10/		price, heat price and biomass price demonstrates the following: • Total investments: If the total investments decrease by 30.40% (normal plant factor) or by 13.09% (high plant factor), the project NPV will become positive. However, considering the analysis of the investment behavior in other Arauco projects, the widest fluctuation between the investment estimation and real investment is from -10% to +25%. Therefore, a 13.09% decrease in the total investment is unlikely. • Power price: Arauco has analysed the last 49 annual hydrological scenarios to determine the possible power price scenarios. For the project activity with normal plant factor, the power price would have to correspond to an extremely dry hydrology, which has not happened in the last 49 years; for the project activity with high plant factor, the power price would have to correspond to an extremely dry hydrology, which has only happened 3 times in the last 49 years. DNV considers this possibility very unlikely. • Heat price: If the heat prices increase 171% (normal plant factor) or 74% (high plant factor) the project NPV will become		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			positive. However, in both situations the baseline alternative will have a much more attractive result. • Biomass fuel price: If the biomass fuel price decrease by 65% (normal plant factor) or by 19% (high plant factor), the project NPV will become positive. However, considering the historical biomass prices from 2006 to 2008, this is not likely to happen. The sensitivity analysis shows that even with substantial variation of the key indicators, the NPV of the proposed project is negative.		
Barrier analysis					
2.5.17 Are 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	Some barriers are used complimentary to the investment analysis.		OK
2.5.18 How were the investment barriers assessed to be real? Are the investment barriers substantiated by a source independent of the project participants?	/1/ /17/ /31/ /36/	DR	It has been argued that as a member of the CDEC-SIC dispatch centre, Arauco is exposed to penalties applied to power generators by the national authority in case of any contingency in the power system, which was confirmed by DNV from the Economy Ministry: Law 18 410, modified on 19 May 2005. According to the law, these penalties are applied in proportion to the installed capacity of each		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			electric power company. This higher risk exposure prevents companies whose core business is not power generation from investing in power cogeneration projects. DNV has also verified that Arauco has paid to the date around US$ 130,000 in fines to the authority because of power contingencies of other grid connected biomass power projects.		
2.5.19 How does carbon revenue alleviate the investment barriers?	/1/	DR	Carbon revenues will help to pay eventual penalties.		OK
2.5.20 Is the project activity prevented by the investment barriers and is at least one of the possible alternatives to the project activity feasible under the same circumstances?	/1/	DR	Yes, the baseline scenario is not affected by the investment barriers.		OK
2.5.21 How were the technological barriers assessed to be real? Are the technological barriers substantiated by a source independent of the project participants?	/1/ /16/ /38/	DR	The project activity faces two kinds of technological barriers: necessity of skilled and trained labor to operate the power plant and risk of technological failure, because the cogeneration power plant tends to work with higher steam conditions and may interfere with the normal operation of the production processes. DNV confirmed through technical literature that specialized operators are a key issue to the successful operation of a co-generation power plant. DNV also confirmed during the site visit (on-site inspection and interview with plant managers) that the Viñales Complex faces specific characteristics due to the project activity		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			(surplus of electric power generation) that are not usual in the sawmill industry. Those characteristics are: i) more equipment; ii) skilled and trained labour required in order to operate the mill in a way that both the production and power generation are optimized; iii) work with higher steam conditions (i.e. 85 bar and 485°C); iv) may interferes with the normal operation of the operational processes. The risk of technological failure was also corroborated by an AF Celpap study which was evidenced by DNV.		
2.5.22 How does carbon revenue alleviate the technological barriers?	/1/	DR	Carbon revenues will help to overcome technological barriers.		OK
2.5.23 Is the project activity prevented by the technological barriers and is at least one of the possible alternatives to the project activity feasible under the same circumstances?	/1/	DR	Yes, the baseline scenario is not affected by the technological barriers.		OK
2.5.24 How were the regulatory and institutional barrier assessed to be real? Are the regulatory and institutional barrier substantiated by a source independent of the project participants?	/1/ /39/	DR	In Chile, there are no legal framework for grid connected small power generators from non conventional renewable energy and the project developer are not able to define the convenient regulatory scheme to dispatch to the grid. Furthermore, the project faces an operational barrier compared to power units. A dual penalization system is induced by the Chilean power dispatch for power generators that also produce power for their proper demand in case of dispatch		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			failure. In Chile there are not several incentives to implement cogeneration units from non conventional renewable energy to generate electricity. The current initiatives do not make this kind of project financially attractive in the traditional electricity price context. DNV confirmed that the project faces barriers in the electric power industry with the following sources: i) CDEC-SIC Internal Regulation, Article 118; ii) Ministry Resolution RM 40; iii) Ministry Resolution RM 17. DNV could ratify the existence of the mentioned barriers by assessing independent studies, reports and articles that confirm the barriers faced for non-conventional renewable power generation sources in Chile.		
2.5.25 How does carbon revenue alleviate the barriers due to prevailing practice?	/1/	DR	Carbon revenues will help to overcome prevailing practice barriers.		OK
2.5.26 Is the project activity prevented by the regulatory and institutional barrier and is at least one of the possible alternatives to the project activity feasible under the same circumstances?	/1/	DR	Yes, the baseline scenario is not affected by the regulatory barriers.		OK
Common practice analysis					
2.5.27 What is the geographical scope of the common practice analysis? Is this justified?	/1/	DR	DNV verified that while cogeneration is normally used in the pulp industry in Chile (only for self-consumption), this technology is not common practice in the sawmill and panel board industries. Arauco is the only company who has		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			developed biomass cogeneration to the point to become a relevant net energy generator in the SIC. Very few similar companies in the world and no other similar company in Chile have been deliberately designed to generate surplus electricity. The CDEC-SIC data that confirm this information is presented in the annex 3 of the PD and confirmed in the CDEC-SIC webpage.		
2.5.28 What 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	See 2.5.27.		OK
2.5.29 What is the data source(s) used for the common practice analysis?	/1/	DR	See 2.5.27.		OK
2.5.30 How many similar projects without carbon income exist in the region within the scope?	/1/	DR	See 2.5.27.		OK
2.5.31 How were possible essential distinctions between the project activity and similar activities assessed?	/1/	DR	See 2.5.27.		OK
2.5.32 What is the conclusion of the common practice analysis?	/1/	DR	See 2.5.27.		OK
Conclusion					
2.5.33 What is the conclusion with regard to the additionality of the project activity?	/1/	DR	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.		OK
2.6 Methodology Deviation					
2.6.1 Has any methodology deviation been applied? If yes, has the deviation been justified?	/1/ /42/	DR	Yes, the following methodology deviations were applied and justified:	~~CAR3~~	OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
	/43/		Biomass residue calculation method: Part of the biomass, approcimately 10% of total, is transported by a pneumatic system. Due to the impossibility of measurement of this fraction of the biomass, project paticipants will indirectly measure this amount. DNV assessed the proposed method described at Annex 1 of the PD. The amount of biomass will be calculated based on the wood mass difference between the wood entering and exiting the sawmill and remanufacture plants. DNV confirms that the calculation method is conservative and is clearly described at the PD. Heat generator baseline efficiency: According to Step 1.5 of the methodology (version 12.1.1) only Option 1: "Default values should be chosen" is applicable to the project. This option automatically refers to Option F: "Use a default value" of the "Tool to determine the baseline of thermal or electric energy generation system". At Table 1: "Default baseline efficiency for different technologies" only fossil fuel boilers (natural gas, oil and coal) are listed, and there is no option that could be chosen in order to represent the technology used at sawmills and panel board mills industry.		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			In cases where no options of Table 1 are applicable the "Tool to determine the baseline of thermal or electric energy generation system" (version 1) indicates the maximum default efficiency of 100% should be used, as a simple and conservative approach. However for this project if the efficiency of 100% was used it would not result in the most conservative scenario. The higher the efficiency of the heat generator in the baseline scenario, the lower will be the amount of biomass residues attributed to heat generation, assuming the total consumption of biomass in the project is fixed. The lower the baseline heat generator efficiency, the lower would be the amount of biomass associated with power generation. Consequently there would be lower emission reductions due to avoided methane emissions of biomass attributable to the project activity, assuring conservativeness. Based on global suppliers estimatives, Andritz and Metso, the lower recommended efficiency for the project's heat generator is 85%. DNV assessed those references and confirmed that the		

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			proposed value is conservative. Calculation of the auxiliary power consumption: Due to measurement impossibilities, part of the auxiliary power consumption (10%) will be estimated based on the installed capacity of the equipment. DNV assessed the proposed calculation methods and confirms that this is conservative and acceptable.		
3 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS					
3.1 Baseline Emissions					
3.1.1 Has the procedure for quantification of the baseline emissions and/or removals been properly described? Have all the relevant equations described?	/1/	DR	Yes, quantification of baseline emissions have been correctly described.	~~CAR4~~	OK
3.1.2 Are the estimated baseline emissions calculated correctly?	/1/	DR	Yes, baseline emission were correctly calculated		OK
3.2 Project Emissions	/1/	DR			
3.2.1 Has the procedure for quantification of the project emissions and/or removals been properly described? Have all the relevant equations described?	/1/	DR	Yes, quantification of project emissions have been correctly described.		OK
3.2.2 Are the estimated project emissions calculated correctly?	/1/	DR	Yes, project emission were correctly calculated		OK
3.3 Leakage					
3.3.1 Has the procedure for quantification of leakage been properly described? Have all the relevant equations described?	/1/	DR	Leakage is not applicable to the project actual configuration		OK
3.3.2 Are the estimated leakage calculated correctly?	/1/	DR	Leakage is not applicable to the project actual configuration		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
3.4 GHG Emission Reductions and Removals	/1/	DR			
3.4.1 Has the procedure for quantification of net GHG emission reductions and removals been properly described? Have all the relevant equations described?	/1/	DR	Yes, quantification of net GHG emissions have been correctly described.		OK
3.4.2 Are the net GHG emission reductions and removals calculated correctly	/1/	DR	Yes, net GHG emission were correctly calculated		OK
4 MONITORING					
4.1 Data and Parameters Available at Validation					
4.1.1 Have all the data and parameters available at validation properly identified?	/1/	DR	Yes, all data and parameters ex-ante were properly identified	~~CAR6~~	OK
4.2 Data and Parameters Monitored					
4.2.1 Have all the data and parameters monitored subsequent to validation properly identified?	/1/	DR	Yes, all data and parameters ex-post were properly identified	~~CAR7~~ ~~CL2~~	OK
4.3 Description of the Monitoring Plan					
4.3.1 How has it been assessed that the monitoring arrangements described in the monitoring plan are feasible within the project design?	/1/	DR	During the site visit it was observed that the application of the monitoring methodology is transparent and DNV considers the project participants able to implement the monitoring plan.		OK
4.3.2 Have organizational structure, responsibilities and competencies been properly identified?	/1/	DR	Yes. Structure, responsibilities and competencies have been identified.		OK
4.3.3 Have methods for generating, recording, storing, aggregating, collating and reporting data on monitored parameters been properly defined?	/1/	DR	Yes. Methods of generating, recording, storing and reporting data were properly defined.		OK
4.3.4 Have procedures for handling internal auditing and non-conformities been properly defined?	/1/	DR	Yes. Internal procedures and non-conformities have been defined.		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
5 ENVIRONMENTAL IMPACT					
5.1.1 Are there any requirements for an Environmental Impact Assessment (EIA) by applicable legislation or regulation? And if yes, is an EIA approved?	/1/ /3/	DR	According to the Chilean environmental regulations, the project proponent submitted in September 2008 an Environmental Impact Declaration to the Environment National Authority, CONAMA, and received the corresponding approval of the project through the "Resolución Exenta N°80/2009".	~~CAR1~~	OK
5.1.2 Is a summary of environmental impact assessment described in the VCS PD when such an assessment is required by applicable legislation or regulation?	/1/	DR	No significant environmental impacts are predicted.		OK
5.1.3 Have identified environmental impacts been addressed in the project design?	/1/	DR	No significant environmental impacts are predicted.		OK
6 STAKEHOLDERS COMMENTS					
6.1.1 Have relevant stakeholders been consulted?	/1/ /4/	DR	Stakeholders involvement was organized through the following channels: television, radio, press, door-to-door presentation of the project to the local community and meetings with local stakeholders such as environmental authorities of the VII Region, Viñales personnel, local business community, CORMA (the Wood Corporation), fisherman federation of the VII Region, Environmental Committee of Constitución and Personnel of the		OK

Checklist Question	Ref	MoV	Assessment by DNV	Draft Concl.	Final Concl.
			Constitución pulp mill. Correspondent evidences were provided to DNV. No negative comments were received. DNV considers the local stakeholder consultation carried out adequate.		
6.1.2 Is a summary of the stakeholder comments received provided?	/1/	DR	See 6.1.1.		OK
6.1.3 Has due account been taken of any stakeholder comments received?	/1/	DR	See 6.1.1.		OK
6.1.4 Have mechanisms been identified in the VCS PD for on-going communication with stakeholders?	/1/	DR	See 6.1.1.		OK

Table 2 Resolution of Corrective Action Requests and Clarification Requests

Corrective action and/ or clarification requests	Reference to Table 1	Response by project participants	Validation conclusion
CAR 1 The operation licence from CONAMA of the CDM-project activity was not presented for the year of 2012.	5.1.1	The Project Proponent sent the Environmental Impact Declaration resolution and the notification letter by the CONAMA (Chile's national Environmental Authority) to DNV in a previous audit to the Viñales emission reduction project. The Project Proponent will send this information again to DNV. It must be noted that a favorable environmental resolution is granted by the CONAMA once the project fully complies with all the relevant environmental requirements and permits. In other words, once this letter is obtained, the project has authorization to go ahead.	DNV assessed the Environment Impact Declaration of 2012 and confirmed that it is acceptable. Therefore this CAR is closed.
CAR 2 The charts and tables tabulation throughout the report are not correctly fitting in the pages of the PD (version 3).	NA	The Project Proponent went through the Project Document and changed / modified all the tables that did not fit correctly in the document.	DNV assessed the revised PD and confirmed that the charts and tables tabulation is adjusted. Therefore this CAR is closed.
CAR 3 Project participants did not provide enough details at Section 2.6 of the PD (version 3), related to both deviations: proposal of residues measurement and baseline boiler efficiency.	2.6.1	The Project Proponent provided further explanation and details in Section 2.6 about the deviations related to biomass residues management and the utilization of the efficiency value that was proposed for	The revised PD assessed by DNV presents a more complete description of the project deviations. Therefore this CAR is closed.

Corrective action and/ or clarification requests	Reference to Table 1	Response by project participants	Validation conclusion
		the baseline scenario. The Project Proponent also added some details about a minor deviation related to the measurement of the auxiliary power consumption in the Viñales Power Plant as well.	
CAR 4 At page 53 of the PD (version 3) units of emission factors do not match.	3.1.1	The Project Proponent changed the emission factor units, so that they now are consistent and correct.	The revised PD was assessed by DNV and contains the correct units of the emission factors. Therefore this CAR is closed.
CAR 5 At Step 1.7 of the PD (version 3), the source of emission factors – SIC data – for last three years was not presented.	3.1.1	The Project Proponent sent the files containing the information source of the emission factors –SIC data- for the last three years. For higher transparency and clarity, the Project Proponent also provided the web link in which such information is available from official sources.	DNV receive the files used calculate the Chilean emission factor. DNV confirms those files are in line with the values presented in the emission factor spread sheet. Therefore this CAR is closed.
CAR 6 Calibration of electricity meters (ION 8600 and ION 7550) have different dates from the certificates presented during site visit. Also the frequency of calibration is not in line with the supplier's manual.	4.1.1	The Project Proponent made the necessary corrections so that now the referenced information is consistent and correct.	The revised PD assessed by DNV contains the correct dates as per the certificates and correct calibration frequency as per supplier's manual. Therefore this CAR is closed.
CAR 7 At Annex 1 of the PD (version 3) details related to the proposed parameters are incomplete. Units, measurement and recording frequency and applicability of calibration, were not presented.	4.2.1	The Project Proponent provided additional information related to the parameters addressed in Annex 1, including units, type of measurement, recording frequency and applicability	The Annex 1 of the revised PD assessed by DNV is now complete and presents details of the monitoring process for the respective parameters.

Corrective action and/ or clarification requests	Reference to Table 1	Response by project participants	Validation conclusion
		of calibration as it corresponded.	Therefore this CAR is closed.
CL 1 At page 13 of the PD (version 3), it is not clear if CO_2 emissions from on-site fossil fuel consumption and off-site transportation of biomass residues are or are not "an important emission source".	2.3.2	The Project Proponent changed the phrase "(…) may be an important emission source." for a phrase that more objectively addresses the relevance of CO_2 emissions from the referenced emission sources.	DNV assessed the revised PD and confirmed that the classification of the CO_2 emissions is clear and objective. Therefore this CL is closed.
CL 2 For parameter LOC, it is not clear how and on which basis the operating hours were estimated.	4.2.1	The Project Proponent provided a more precise and complete description of how the LOC parameter was determined for the Viñales emission reduction project.	The revised PD assessed by DNV now presents a complete description of the determination of the parameter LOC. Therefore this CL is closed.

Table 3 Forward Action Request

Forward action requests	Reference to Table 1	Response by project participants	Validation conclusion
Not applicable.			