ANNEX 4

ASSESSMENT

REGARDING POST REGISTRATION CHANGES

CELULOSA ARAUCO Y CONSTITUICIÓN

VALDIVIA BIOMASS POWER PLANT

Report No: 10457 - 14-026

Date: 2015-11-25

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Assessment Report on post registration changes	***Report No.***	***Rev. No.***	***Date of 1st issue:***	***Date of this rev.***
	10457 –14/026	3	2015-02-25	2015-11-25
Project:	***Title:***		***Registr. date:***	***UNFCCC-No.:***
	Valdivia Biomass Power Plant		2009-04-01	1787
Project Participant(s):	***Host Country PP – Name:***		***Host Party:***	
	Celulosa Arauco y Constituición S.A.		Chile	
	Investor PP(s) – Name(s):		***Investor Party(ies)***	
	Celulosa Arauco y Constituición S.A.		United Kingdom of Great Britain and Northern Ireland	
Applied methodology/ies:	***Title:***		***No.:***	***Scope:***
	Consolidated methodology for grid-connected electricity generation from renewable sources Consolidated methodology for electricity generation from biomass residues		ACM0002 ver. 6 ACM0006 ver. 5	1 / 1.2 1 / 1.1
Post Registration Changes:	***Type of requested changes***		***Number of changes***	***Prior Approval required***
	☒ Temporary deviations from the MP		1	☐
	☐ Temporary deviations from the MM		-	☐
	☐ Corrections that do not affect the project		-	☐
	☐ Change to the start date of the crediting p.		-	☐
	☐ Permanent changes from the MP		-	☐
	☐ Permanent changes from the MM		-	☐
	☒ Design changes to the project activity/PoA		1	☐
	☐ Changes specific to A/R		-	☐
Revised PDD:	***Title:***	***Version:***	***Attached in TC:***	***Attached clean:***
	Valdivia Biomass Power Plant	*10*	☒	☒
Assessment team / Technical Review and Final Approval	***Assessment Team:***		***Technical review:***	***Final approval:***
	Sergio Cruz, (TL), Marcelo Sebben (TM), Gilberto Andrade (TM)		Stefan Winter	Stefan Winter
Assessment Opinion:	☐	The post registration changes require prior Approval by the Board		
	☒	The post registration changes do **not** require prior Approval by the Board		
Document information:	*Filename:*			*No. of pages:*
	2015-11-08_Annex 4 Assessment on PRC Valdivia rev.3.docx			57

Abbreviations

CA	**Corrective Action / Clarification Action**
CAR	**Corrective Action Request**
CDM	**Clean Development Mechanism**
CDEC	**Economic Dispatch Center *"Centro de Despacho Económico de Carga"***
CER	**Certified Emission Reduction**
CNE	**National Commission of Energy - *"Comisión Nacional de Energía"***
CO_2	**Carbon dioxide**
CO_{2eq}	**Carbon dioxide equivalent**
CONAF	**Forestry National Corporation**
CONAMA	**Environmental National Commission – DNA of Chile - "*Comisión Nacional del Medio Ambiente*" – (now: Environmental Ministry)**
CL	**Clarification Request**
DIA	**Environmental Impact Declaration**
DVerR	**Draft Verification Report**
DNA	**Designated National Authority**
EB	**CDM Executive Board**
EIA	**Environmental Impact Assessment**
ER	**Emission Reduction**
FAR	**Forward Action Request**
GHG	**Greenhouse gas(es)**
INFOR	**National Forestry Institute – "Instituto Nacional Forestal"**
MP	**Monitoring Plan**
MR	**Monitoring Report**
PA	**Project Activity**
PDD	**Project Design Document**
PP	**Project Participant**
QA/QC	**Quality Assurance / Quality Control**
SEA	**Environmental Evaluation Service – *"Servicio de Evaluación Ambiental"***
SEC	**Superintendence of Electricity and Fuels - *"Superintendencia de Electricidad y Combustibles"***

SEIA	**Environmental Impact Assessment System *"Sistema de Evaluación del Impacto Ambiental"***
SIC	**Central Interconnected System – *"Sistema Interconectado Central"***
S/N	**Serial Number**
UNFCCC	**United Nations Framework Convention on Climate Change**
VVS	**Validation and Verification Standard**
XLS	**Emission Reduction Calculation Spread Sheet**

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1 OBJECTIVE / SCOPE

Celulosa Arauco y Constituición S.A. has commissioned the TÜV NORD JI/CDM Certification Program (CP) to assess post registration changes of the project

"[Valdivia Biomass Power Plant]"

This report serves for all kind of post registration changes as defined in the PS.

In this case it serves as an annex to the verification report.

2 GENERAL CHARACTERISTICS

2.1 Project Characteristics

As this assessment was carried out as part of the 4th verification of the project activity please refer to chapter 2 of the verification report.

For a detailed project description please refer to the registered PDD and/or the latest verification report (to which this report is attached).

2.2 Overview of Post Registration Changes

Within this report post registration changes as listed in Table 2-2 are assessed.

Table 2-2: Overview Post Registration Changes

#	Applicable as of / from - to	Type of post registration change [1)]	Description
1	between 2013-07-09 and 2013-07-23 (for fuel oil, diesel and black liquor) Between 2013-07-09 and 2013-07-25 (for sawdust and bark)	TDfrMP	The samplings of NCV were not done according to the monitoring plan which determines that at least three samplings every 6 months have to be done. It could be observed that there were some delays in the samplings. The following delays were observed: • Between 2013-07-09 and 2013-07-23 (for fuel oil, diesel and black liquor) – 14 days • Between 2013-07-09 and 2013-07-25 (for sawdust and bark) – 16 days
2	2013-02-05	CoPD	During this monitoring period a new equipment has been installed in the Project Activity. It consists of a dryer that uses waste heat in form of steam from the evaporators of the pulp mill plant. This energy is then used for drying the biomass residues before entering the power boiler

1) TDfrMP : Temporary deviation from registered monitoring plan
TDfMM : Temporary deviation from the monitoring methodology
CrPDD : Corrections to the registered PDD
ChSD : Change to the start date of the crediting period
PCfrMP : Permanent changes from registered Monitoring Plan
PCfMM : Permanent changes from Monitoring Methodology
CoPD : Changes to the project design of a registered project activity / PoA
CstAR : Changes specific to afforestation or reforestation

2.3 Assessment team members and technical reviewers

As this assessment was carried out as part of the 4th verification of the project activity please refer to the main part of the verification report.

2.4 Assessment Steps

The *assessment of post registration changes* consisted of the following steps:

- Appointment of team members and technical reviewers
- A desk review of the registered and revised PDD/PDD/ submitted by the client and additional supporting documents
- On-Site assessment (if required)
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Resolution of corrective actions (CARs / CLs) (if any)
- Final reporting
- Technical review
- Final approval.

In this case all activities were carried out as part of the 4th verification of this project activity.

2.5 Review of Documents

The registered as well as the revised PDD and supporting background documents related to the project design and the post registration changes were reviewed.

As far as required the assessment team used additional documentation by third parties like host party legislation, technical reports referring to the project design or to the basic conditions and technical data.

2.6 Follow-up Interviews

The validation team has carried out interviews in order to assess the information included in the project documentation and to gain additional information regarding the compliance of the project with the relevant criteria applicable for CDM.

During validation the validation team has performed interviews to confirm selected information and to resolve issues identified in the document review. The main topics of the interviews are summarized in table 2-4.

Table 2-4: Interviewed persons and interview topics

Interviewed Persons / Entities	Interview topics
Project proponent representatives Project consultant	- Details of the project validation and earlier verifications - Project history - Technical details of plant - Intended / implemented changes from the previous project design - Impact of changes on the additionality justification - Impact on the monitoring of the project - Editorial issues of the revised PDD

A comprehensive list of all interviewed persons is part of section 7 ‘References’.

2.7 Resolution of Clarification and Corrective Action Requests

2.7.1 Definition

A **Corrective Action Request (CAR)** will be established where:

- mistakes have been made in assumptions, application of the methodology or the project documentation which will have a direct influence the project results,
- the requirements deemed relevant for validation of the intended / implemented changes,
- there is a risk that the changes cannot be approved by the UNFCCC or that emission reductions would not be able to be verified and certified after the implementation of the changes.

A **Clarification Request (CL)** will be issued where information is insufficient, unclear or not transparent enough to establish whether a requirement is met.

2.7.2 Assessment

After reviewing all relevant documents and taken all other relevant information into account, the assessment team issues all findings (in the course of a draft report, if applicable) and hands over the findings to the project proponent in order to respond on the issues raised and to revise the documentation accordingly.

The final reporting step starts after resolution of the raised CARs and CLs. In case the findings from CARs and CLs cannot be resolved by the project proponent or the proposed action related to the FARs raised cannot be assessed as adequate, no positive assessment opinion can be issued by the validation team.

The CAR(s) / CL(s) / FAR(s) are documented in the context of the respective chapters.

2.8 Technical review

Before submission of the final assessment report a technical review is carried out. The technical reviewer is a competent GHG auditor being appointed for the scope this project falls under. The technical reviewer is not considered to be part of the verification team and thus not involved in the decision making process up to the technical review.

As a result of the technical review process the assessment opinion as prepared by the validation team leader may be confirmed or revised. Furthermore reporting improvements might be achieved.

2.9 Final approval

After successful technical review of the final report an overall (esp. procedural) assessment of the requested post registration changes will be carried out by a senior assessor located in the accredited premises of TÜV NORD.

Only after this step the notification or the report can be forwarded to the UNFCCC (in case of a positive validation opinion).

3 CHANGES THAT DO NOT AFFECT THE PROJECT DESIGN

3.1 Assessment of Changes

Requested Deviation / Change #1		
Type of change(s):	☒	*Temporary Deviation from Monitoring Plan*
	☐	*Temporary Deviation from Monitoring Methodology*
	☐	*Corrections that do not affect the project design*
	☐	*Permanent Change from Monitoring Plan*
	☐	*Permanent Change from Monitoring Methodology*
	☐	*Changes specific to afforestation or reforestation*

A. Description of post registration change			
Start Date: Please provide the start date of the change	2013-07-09	**End Date:** Please provide the end date of the change, if applicable	2013-07-23 (for fuel oil, diesel and black liquor) and 2013-07-25 (for sawdust and bark)
Description: Please give a detailed description of the change(s)	The samplings of NCV were not done according the monitoring plan which determines that at least three samplings every 6 months have to be done. It could be observed that there were some delays in the samplings. The following delays were observed: Between 2013-07-09 and 2013-07-23 (for fuel oil, diesel and black liquor) – 14 days Between 2013-07-09 and 2013-07-25 (for sawdust and bark) – 16 days		
B. Assessment of post registration change – Temporary deviations from MP or MM			
Accuracy: Please give a detailed assessment whether the deviation is likely to lead to a reduction in the accuracy of the ER calculation.	The deviation is not likely to lead to a reduction in the accuracy. The samplings are taken every six months as per monitoring plan. What occurred was a delay in 14 days and 16 days for sampling the fuels for determining their NCVs. The measure taken by the PP was to apply to these delayed days the higher or lower possible NCV's value, depending on the influence in the ER calculations they had. By assessing the calculation, the VT considered this approach accurate.		
Conservative-ness: Please give a detailed assessment whether conservative assumptions or discount factors have been applied to ensure that ER will not be overestimated.	The upper values of NCVs in the IPCC tables are higher than the values obtained in the analysis before and after the delays for all materials. Likewise the lower values of NCVs in the IPCC tables are lower than values obtained in the analysis before and after the delays of all materials.		

Requested Deviation / Change #1

Fuel	NCV analysis (for the year) TJ/000ton	Lower IPCC TJ/000ton	Upper IPCC TJ/000ton
Diesel (2013)	43.005	41.4	43.3
Fuel oil (2013)	40.663	39.8	41.7
Black liquor (2013)	11.8	5.9	23
Wood waste (sawdust + bark) (2013)	17.823	7.9	31

As conservative measure the following calculations were done:

Diesel: upper value was used as it is accounted for project emissions

Fuel Oil: upper value was used as it is accounted for project emissions

Sawdust and bark:

- upper value used in the calculation of project emissions (methane emissions by burning it in the boilers)
- lower value when determine the baseline methane emissions associated to additional biomass consumption due to PA.

Black liquor: upper value for determining the net quantity of increased electricity generation which results in a lower ER. It is important to notice, for the case of the black liquor NCV sampling delay, that only the NCVs from pine campaign have their samplings delayed. Thus, in order to calculate the adjusted NCV for the 2nd semester 2013, the IPCC value for black liquor's NCV was only applied for the proportion of pine, which is 64.87% of the total amount of black liquor of the second semester 2013. This proportion was cross-checked with values from campaign and is considered correct by the verification team.

Thus, taking into consideration the adjustments done in the ER calculations, the VT considers the measure conservative. The calculations can be checked in the section B.2.1 of the MR. The calculations are considered correct.

Appendix 1 PS:

Check if the changes fall under one of the scenarios of appendix 1 of the PS.

This change falls under one of the scenarios of the appendix 1 of the PS: para 3

"If project participants have temporarily not monitored parameters related to project GHG emissions or are unable to produce evidence related to such monitoring, prior approval by the Board is not required if project participants estimate these parameters assuming that the source of the GHG emissions operated at maximum capacity for the full period of the missing data. In the case of project GHG emissions related to the consumption of electricity, the estimate shall include an addition of 10% to account for transmission and distribution losses."

It is important to point out that only the underlined piece of the paragraph above is applicable.

Requested Deviation / Change #1	
C. Revised PDD	
Rev. of PDD: Check whether the changes have been fully addressed in a revised PDD.	☐ The changes have correctly been reflected in the revised PDD. ☒ A revision of the PDD is not required (in case of temp. changes). ☐ The revised PDD has been forwarded in (i) track-change and (ii) clean version.
D. Prior Approval	
Prior approval: Assess whether the change requires prior approval of the board	☐ *The post registration change requires prior approval* ☒ *The post registration change does not require prior approval*

3.2 Related Findings

No findings have been identified in this context.

4 CHANGE TO THE START DATE OF THE CREDITING PERIOD

The post registration changes do not fall under this category.

5 CHANGES TO THE PROJECT / PROGRAMME DESIGN

5.1 Assessment of Changes

Requested Changes to the project design #1			
Type : ☒ *Changes to the project design* ☐ *Changes to the PoA design*			
A. Description of post registration change			
Start Date: Please provide the start date of the change	2013-02-05	**End Date:** Please provide the end date of the change, if applicable	N/A
Description: Please give a detailed description of the changes esp. with regards to the effect on the project design.	During this monitoring period new equipment has been installed in the Project Activity. It consists of a dryer that uses waste heat in form of steam from the evaporators of the pulp mill plant. This energy is then used for drying the biomass residues before entering the power boiler		
B. Applicability and application of the Approved Baseline Methodology			

Description:
Please give a detailed description on how the changes affect the applicability and application of the approved Baseline Methodology. Check if the actual changes would adversely affect the conclusions during validation.
	The requested change only adds equipment (dryer) to the process which reduces the moisture of the biomass from forest operations before being combusted in the power boiler. This equipment was installed in order to achieve the moisture estimated during the registration of the project activity, as the observed humidity of the biomass brought from 3rd parties was, in the real case, higher than the estimated one.
	
	The applied methodology does not prevent the use of this equipment. Furthermore the proposed change does not affect the applicability and application of the methodology as it will still be as per approved Baseline Methodology (ACM 0006 v.5):
	
	No other biomass types than biomass residues, in this case black liquor and biomass residues from forest operations (sawdust and bark), which have been defined as biomass residues in the registered PDD, are the predominant fuel used in the project activity.
	
	And according to the ACM 0006 v.5 the baseline scenarios will still be the # 3 and #4 of the applied methodology:
	
	- according to the scenario # 3,
	  - the PA will use additional biomass from forest operations (sawdust and bark) for additional electric power generation
	  - “The proposed project activity involves the installation of a new biomass residue fired cogeneration plant at a site where no power was generation occurs”
	  - “The power generated by the project plant is fed into the grid		

Requested Changes to the project design #1	
	or would in the absence of the PA be purchased from the grid" - "The biomass residues would, in the absence of the PA, be dumped or left to decay" - "The heat generated by the new cogeneration plant would in the absence of the PA be generated in boilers using the biomass residues that are fired in the cogeneration plant." - according to the scenario #4 - a pulp mill with a higher electric efficiency was installed - "The proposed project activity involves the installation of a new biomass residue power generation plant at a site where no power was generation occurs" - "In the absence of this project activity, a new biomass residue fired power plant would be installed instead of the project activity at the same site and with the same thermal firing capacity but with a lower efficiency of electricity generation as the project plant". - "The same type and quantity of biomass residues as in the project plant would be used in the baseline plant".
	The power generated by the project plant would in the absence of the project activity be generated: - In the reference plant. - Partly in power plants in the grid. - "The heat generated by the project plant would in the absence of the project activity be generated in the reference plant". The actual changes will not affect the conclusions of the validation process.
C. Additionality assessement	
Description: Please give a detailed description re-assessment of additionality, Check whether the actual changes would adversely affect the conclusions during validation. If required please make use of the assessment tables in the annex.	**Methodology:** The justification of the additionality in the original project documentation was done in line with the requirements of the ACM 0006 v.5 and "Tool for the demonstration and assessment of additionality". **Decisive Route of Additionality Justification** During the original validation of the project the additionality was justified on the basis of a barrier analysis and this proposed change (inclusion of a dryer to reduce the moisture of the biomass combusted in the power boiler) in any way affect the additionality of the project activity. The barriers presented in the original validation were: - Investment barriers: This barrier is only enhanced as another investment was done (installation of the dryer) and higher are the

Requested Changes to the project design #1	
	risks associated to the project activity. Furthermore, the extra complexity of a pulp mill industry entering in the power production market remains as in the validation phase. Thus this barrier still would prevent the implementation of the project activity. - Technological barriers: An additional equipment enhances also the complexity of the project activity once the low pressure steam that was firstly partially released to the atmosphere is now reused in the process (dryer). The subjects raised during the validation phase, such as increase of quantity of equipment which increases the overall risk of failure, the requirement of high skilled and trained labour to operate the pulp mill and dispatch the energy to the grid still remain as a technological barrier. Thus, this barrier still would prevent the implementation of the PA. - Barriers due to prevailing practice: The installation of the dryer does not change the fact that, at the time of validation, Valdivia was the first pulp mill in Chile designed to generate surplus of electricity to be dispatched to the grid. Thus, this change does not affect this barrier. - Cultural barriers: the inclusion of a dryer to reduce the biomass moisture does not affect this barrier. - Barriers to entry in the electric power industry: the inclusion of a dryer to reduce the biomass moisture does not affect this barrier.
	Re-Assessment of Additionality During the original validation of the project the additionality was justified on the basis of a barrier analysis and this proposed change (installation of a dryer to reduce the moisture of the biomass combusted in the power boiler) in any way affects the additionality of the project activity. This equipment was installed in order to achieve the moisture estimated during the registration of the project activity, as the observed humidity of the biomass brought from 3rd parties was, in the real case, higher than the estimated one and not to increase the ER achieved. According to the PP the pulp mill is located in the X Region of Valdivia, commune of San José de la Mariquina, in the province of Valdivia, one of the most rained regions of Chile. Furthermore the moisture content in the biomass burned in the power boiler has a project specific condition as no other pulp mill is located in this province. Consequently, the dryer solution would not be a common practice in the country, but would be a common practice in the specific location of the project activity. The VT checked this information and verified that this PA is the only one installed in this particular region (X Region) (Cellulose Industry in Chile/CEL/). Furthermore, a comparison was made with other similar PAs situated in Chile regarding the moisture content of the biomass:

Requested Changes to the project design #1	

	Moisture content of biomass (average)		
Project Activity	2013	2012	2011
Valdivia	**61,4%**	**63.9%**	**64.5%**
NAF I (ref. #0258)	53.7%	N/A	52.6%
Horcones (ref. # 4052)	41.04%	N/A	N/A

Thus, is reasonable the PP's explanation that due to the high moisture content, a dryer may be necessary to avoid operational problems such as to sustain a stable combustions and reach the designed boiler efficiency. It is also reasonable that in the baseline scenario similar measure would be taken, once the same high moisture biomass would be used and a dryer may be necessary.

The verification team understands that the installation of the dryer corresponds to an auxiliary process of a very complex process which is the pulp manufacture. The influence of this installation was assessed and the results show that the influence on the emission reduction exists but it does not affect the status of business as usual (BAU). Neither the design capacity (728,640 ADt/y calculated through the energy/mass balance of the plant and valid for baseline and project scenarios) nor the allowed capacity (550,000 ADt/y as per page 2 of the registered PDD v.4 valid for baseline and project scenario) have changed due to the installation of the dryer. These data are referenced in the spreadsheet "Valdivia_dryer impact on baseline parameters.xlsx"/Dryer-6/.

The verification team considers that the installation of the equipment does not change the applicability of the Monitoring Plan.. According to the energy and mass balance provided by the conceited consultant's (KSH Consulting) who are responsible for estimations in the company, there will be a change in one value that influence the calculation of two parameter estimated in the PDD. The value is the internal power consumption of the plant. This parameter will be increased in 0.5 MW which is approximately the total power consumption of the dryer. The influence in the fixed parameters ex ante will be as follows:

- The fixed parameter electric efficiency of reference plant ($\varepsilon_{el.other\ plant(s)}$) will increase from 12.093% to 12,127%. The evidence of this calculation was provided to the verification team (Valdivia_dryer impact on baseline parameters.xlsx/Dryer-6/) and it was considered reliable and conservative. The internal consumption, in the baseline scenario will not increase by 0.5 MW

Requested Changes to the project design #1	
	as the dryer, in this scenario will only be applied to the eucalyptus campaign. Thus, the increase, in this case will be 0.2 MW, as according to the registered PDD on page 11, the Valdivia pulp mill only produce pulps from eucalyptus 35% of the time, leaving the 65% of the time devoted exclusively to pine pulp production.
	- The quantities of black liquor and forest residues applied in the calculation of $\varepsilon_{el.other\ plant(s)}$ in the reference plant did not vary with the installation of the dryer as these values corresponded to estimations obtained from energy and mass balances stated in the PDD, and remained unaltered. Monitored values of biomass consumption could not be applied for calculate this parameter for two reasons: the plant cannot reach its design capacity due to an environmental restriction (explained in the CL B2 – corrective action #2). Another reason is that $\varepsilon_{el.other\ plant(s)}$ is a parameter fixed ex-ante and as per applied methodology will not be monitored. - The parameters NCVs included in the formula to calculate the parameter electric efficiency of reference plant ($\varepsilon_{el.other\ plant(s)}$) remained unaltered as, according to the applied methodology, $\varepsilon_{el.other\ plant(s)}$ was fixed ex-ante and will not be monitored. - The second parameter influenced by the internal consumption change is the "Additional power consumption due to the project activity" which will change from 4.22% to 4.59%. The evidence of this calculation was also provided to the verification team (Valdivia_drier impact on baseline parameters.xlsx/Dryer-6/) and it was considered reliable and conservative. The reason for this difference is that the dryer installation will increase the internal consumption in project and baselines scenarios. As this parameter is calculated using these data, the result of the parameter will also increase (check ref. /Dryer-6/). Taking this information into account, with the installation of the equipment more internal consumption will be associated to the project activity, resulting in less emission reductions associated to the project activity as net electricity generation will be smaller. This measure hence, is considered conservative. As these changes occurred, all Estimated ER have to be recalculated and it was fully demonstrated in the corrective action of the CL B2 from the FVR to which this report is attached
	Result of Additionality Re-Assessement

Requested Changes to the project design #1	
	The verification team concludes that the additionality of the project is not affected by the technical changes carried out as a deviation from the project design originally validated and registered. For further assessment please refer to CL D2 in the Verification report.
D. Scale of the Project activity	
Description: Please give a detailed regarding the effect of the changes on the scale of the PA (i.e. LSC or SSC).	This is a large scale project activity; therefore this criterion is not applicable in this case.
E. Revised PDD	
Rev. of PDD: Check whether the changes have been fully addressed in a revised PDD. In this context pl. refer to - Changes in the effect-tive output capacity. - Addition of components or extension of technolo-gy - In case of multiple site projects: Removal or addition of sites - Operational parameters under the control of PPs differing from expected parameters - Changes to the baseline Meth (e.g. addition of a new Meth or change of the BL scenario. - Effects with regards to B, C and D above incl. compliance with the MP and level of accuracy and completeness of monitoring.	☒ - The installation of the dryer does not result in an increase of the processing capacity of raw input, or in other substantial changes in this process. The raw input is absolutely determined by the processing capacity of the pulp mill of 550,000 (ADt/y) determined by the Environmental Permit. This capacity has not been altered to date and has not (and will not) change due to the implementation of the project activity. It is important to point out that the design capacity of the plant is equal to 728,640 ADt/y. This capacity is the same as applied in the registered PDD and remain unaltered. The design capacity cannot be reached due to environmental restrictions. - The proposed change will cause a reduction in the actual ER for this monitoring period as the parameters "$\varepsilon_{el.other\ plant(s)}$" and "Additional power consumption due to the project activity" will increase. This measure was considered conservative by the verification team. The calculations were assessed and attested the conservativeness. - The operational parameters were all recalculated by reputed consultant and are considered reliable taking the change into account. No changes in the additionality, scale and compliance with applied methodology have been observed. The level of accuracy is considered higher as real data have been used whereas estimating the reference plant efficiency. The post registration change has correctly been reflected in the revised PDD. The following changes in the PDD were observed related to this PRC. - The PDD was changed to the CDM-PDD-FORM version 5 and no changes apart from the ones described below have been observed: - Front page: The estimated annual average GHG ERs changed to 126,860 tCO_{2eq}. This ERs are related only to the

Requested Changes to the project design #1	
	first crediting period as required by this version of the PDD template. - Section A.1: Foot note was included explaining the difference between the informed capacity (allowed capacity) and the design capacity. - Section A.3: The dryer characteristics were included in the table 1 of this section. - Section A.3: The diagrams with mass/energy balances described in the were updated to the new data obtained from the recalculations done by KSH Consulting taking into account the dryer installation. - Section A.4: The table of project participants was updated. The current project participants were checked in the UNFCCC website for its veracity. - Section B.2: explanation on the difference between the allowed capacity and the design capacity of the pulp mill (incl. foot note #7). - Section B.6.2: - the section "purpose of data" was included in all parameters following the PDD form version 5.0 - information from parameter GWP_{CH4} was updated for first and second commitment period - parameter $\varepsilon_{el.other\ plant(s)}$ was updated to 12.127%. With the update of the reference data, the baseline scenario has changed: One of the consequences is the increase of the parameter $\varepsilon_{el.other\ plant(s)}$ (electric efficiency of the reference plant), resulting in a decrease of the actual ER obtained in the period as per equation 14 of the ACM0006 v.5. A foot note was included to explain the calculation. - parameter "Additional electric power consumption of the project mill" changed to 4.59 % due to recalculations of the project plant parameters after installation of the dryer. The foot note # 26 was included in the PDD explaining this change. - Section B.6.3 - The table that calculates the emission of fossil fuel consumption related to additional consumption of biomass per year was now demonstrated per year during the 1st crediting period. The total emissions remained the same. - The table that calculates the emission related to fossil fuel consumption in the recovery boiler were also calculated per year during the 1st crediting period. The emissions remained the same.

Requested Changes to the project design #1	
	- The table that calculates the emission related to fossil fuel consumption in the power boiler were also calculated per year during the 1st crediting period. The total amount of fossil fuel consumption in the power boiler is obtained as a proportion defined in the PDD of the amount of biomass combusted (3.43 kgFO/m^3st). In order to estimate the amount of biomass combusted in the baseline scenario, the amount of energy to process necessary for the plant was required. At the recalculation, the PP used monitored biomass NCVs instead estimated ones from 2009 to 2013, resulting in difference of biomass consumption and consequently difference in fuel oil consumption. From 2014 to 2016 the values remained unaltered. That is the reason for the change of the following values in the estimated ER calculations: o average additional consumption of fuel oil in the power boiler from 1,765 ton/y to 1,752 ton/y, resulting in a difference of total emissions from this source. o The estimative of biomass consumed yearly attributable to the project activity changed to 511,361 m^3st/yr. It happened as the NCVs applied in the eq. 30 of the ACM 0006 v.5 for determining this value are the monitored values as they are available for the monitored years. Notes were included below these calculation tables in the section B.6.3. o Fraction of Biomass attributable to the project activity changed from 54,1% to 53,7%. o Average fossil fuel amount used for on-site biomass transportation due to the implementation of the project activity slightly changed from 45 to 45.14 ton/y. - The table that calculates the emission related to diesel used for biomass transportation were also calculated per year during the 1st crediting period. The emissions changed for the years between 2009 and 2013 as the emission factor for heavy truck transportation applied actual values of diesel emission factor on its calculation. The following years (from 2014 to 2016) remained unaltered. - The total estimated project emission from on-site

Requested Changes to the project design #1	
	consumption of fossil fuels during the 1st crediting period was informed yearly. - The methane emission from combustion of biomass was informed yearly during the 1st crediting period. It changed as the total amount of biomass from forest operations attributed to the PA changed to 511,361 m^3st/yr and the GWP_{CH4} changed to 25 from 2013. - The table of total project emissions was updated to the new values and informed yearly for the 1st crediting period. - For the estimation of the ER due to displacement of electricity, the PP included the yearly calculations from the 1st crediting period. The PP used in the estimated calculations, actual monitored values from 2009 until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. - The EF_{grid} for the 1st crediting period was informed yearly and the values followed the same rationale above: the PP used in the estimated calculations, actual monitored values from 2009 until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. Thus, the total estimated emission savings for the 1st crediting period were updated accordingly. - The biomass emissions due to burning of anthropogenic sources of biomass residues was also updated as it used the monitored NCVs from 2009 until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. Furthermore, as it was calculated yearly, the GWP_{CH4} used was also updated to 25 t_{CO2eq}/t_{CH4} from 2013. - A table with total estimated baseline emissions and total estimated project emissions was presented yearly for the 1st crediting period. - The Net emission savings of the project activity were also updated to the values calculated before. - Section B.6.4 - The table was updated to the yearly new values. And a footnote was included explaining the calculation details. - Section B.7.1

Requested Changes to the project design #1	
	- Tables were updated to the new template version - The values for all parameters were indicated for the crediting period, between 2009 and 2016. - Parameter $FF_{projectplant,i,y}$: actual values were applied yearly as per monitoring results until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. - Parameter $FF_{projectsite,i,y}$: actual values were applied yearly as per monitoring results until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. - Parameter $EG_{project\ plant,y}$: actual values were applied yearly as per monitoring results until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. - Parameter NCV_i : actual values were applied yearly as per monitoring results until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. - Parameter NCV_k : actual values were applied yearly as per monitoring results until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. - Parameter EF_{grid} : actual values were applied yearly as per monitoring results until 2013. For the years 2014 until 2016 the data applied was the same used in the validation phase. - Parameter $EFOM_{grid}$: actual values were applied yearly as per monitoring results until 2013. No values were used from 2014 to 2016. The EF_{grid} or EF CM was directly estimated. - Parameter $EFBM_{grid}$: actual values were applied yearly as per monitoring results until 2013. No values were used from 2014 to 2016. The EF_{grid} or EF CM was directly estimated. - Parameters $GEN_{j/k/n,y}$ and $F_{i,y}$: real data was applied from 2009 until 2013. Data from 2014 was not available - Appendix 3: filled up as required by the PDD form. This information was already presented in the Annex 3 of the registered PDD - Appendix 4:

Requested Changes to the project design #1		
		- included information regarding recalculation of Reference Plant Electric Efficiency after the installation of the dryer. - - Appendix 6: Including the information regarding the summary of PRC.
Traceability: Check if the PPs have provided a revised PDD in both clean and track-change version.	☒	The revised PDD has been forwarded in (i) track-change and (ii) clean version.
F. Prior Approval		
Prior approval: Assess whether the change requires prior approval of the board.	☒	The changes do not raise concerns with respect to aspects outlined in the PS: a. applicability and application of the Approved Baseline Methodology under which the project activity has been registered. b. additionality of the project c. scale of the CDM project activity (the project remains as large scale) and Prior Approval by the Board is not required.
	☐	The post registration change requires prior approval.

5.2 Related Findings

The following tables include all raised CARs and CLs and the assessments of the same by the assessment team.

Finding	**CL B2**		
Classification	☐ CAR	☒ CL	☐ FAR
Description of finding *Describe the finding in un-ambiguous style; address the context (e.g. section)*	During the last verification, the verification team observed that a dryer has been installed in the company's site which reduced the moisture of the biomass injected in the power boiler and increases the auxiliary electricity consumption by the pulp mill. The functioning of this equipment has been observed during the current site visit. The PP is requested to clarify the influence of this new equipment in the baseline / project activity scenario and the consequences in the emission reduction calculation. Furthermore, no reference of this design change has been		

Finding	CL B2
	made in the section B.1 and B.2.4. Associated checklist question: B.1.3, B.2.5
Corrective Action #1 *This section shall be filled by the PP. It shall address the corrective action taken in details. In case the MR is changed as part of the CA, the PP is requested to indicate the revised sections as well as the new version No.*	**INTRODUCTION** The rationale behind the installation of the biomass dryer have been to reduce the moisture content in the fired biomass down to the predicted level in the original PDD and by this reduce the need for support fuel to sustain a stable combustion and also to improve the boiler efficiency. 1. Evidence is provided on the issue related to the impact of the biomass drier, in both baseline and project activity scenarios, and the consequences in the emission reduction calculation. 2. The situation is described for a number of key parameters before and after the installation of the Dryer as well as the predicted key parameters. 3. The Project Participant summarizes the post registration changes between the registered PDD and the actual project activity: **PREDICTED AND REAL BIOMASS MOISTURE CONTENT** Based on results below moisture content is much higher in the real biomass than in the predicted one. As a result of this the amount of fired biomass has been lower and the amount of support fuel oil higher. In the table below is the predicted and real moisture content in the biomass fuel shown. **Predicted moisture content** % 56.72%[17] **Biomass mixture moisture content 2013** % 61,22 **Average biomass mixture content 2010 - 2013** % 64,36 Biomass mixture moisture content 2012 % 63,90 Biomass mixture moisture content 2011 % 64,53 Biomass mixture moisture content 2010 % 64,66 Source: Past monitoring periods of this project activity Ref.1787 <u>Comments on results obtained:</u> As can be seen the moisture content is almost 7% units higher in the real biomass mixture compared with the predicted moisture content of the mix of biomass.

[17] This corresponds to the estimate in the project case energy/mass balance of the registered PDD determined as: 56.3%* 65%+ 57.5%*35%, where 65% correspond to the number of days producing pine pulp and 35% number of days producing euca pulp.

Finding	CL B2
	It shall be noted that the dryer was started-up during 2013 and in stable operation at the end of 2013. Preliminary analysis indicate that the dryer reduce the moisture content with about 5 - 6 % units. With moisture content as high as in the real fuel mixture before the dryer installation it is in most boilers difficult if possible to sustain a stable combustion without support fuel. Below it is shown that this has been the case before the dryer was installed. The Project Participant provides clarifications on issue related to the impact of the new biomass drier, in the baseline and project activity scenarios and the consequences in the emission reduction calculation. Evidence to support this is explained as follows: **BASELINE SCENARIO** According to the registered PDD, in the baseline scenario there would be a low-pressure power boiler that would burn a lower amount of the same biomass residues types as the amount that would be burned in the power boiler under the project scenario. The biomass power boiler installed under the baseline scenario would have generated saturated steam instead of high pressure steam flow that would be used to meet process heat demand of the pulp mill. **IMPACT ON THE ENERGY BALANCE FROM THE DRYER** According to the registered PDD on page 11, the Valdivia pulp mill was designed to produce two types of pulp alternatively, from pine (long fiber pulp) or from Eucalyptus (short fiber pulp). It is foreseen that Valdivia plant only produced pulp from euca 35% of the time, leaving the 65% of the time devoted exclusively to pine pulp production. The estimate values (with and without drier) are determined as the summary of 65% of original PDD baseline case pine balance and 35% of the original PDD baseline case eucalyptus balance. Comments on results obtained: Based on results shown below the drier would not have impact on biomass power boiler generation since the boiler installed under the baseline scenario would have generated saturated steam instead of high pressure steam flow that would be used to meet process heat demand of the pulp mill. Then the

Finding	CL B2

additional power consumption due to the drier operation would have been import from the grid.

Based on results below the LP steam process consumption would have increased in 4.5 (t/h). This amount would be used as inlet flow of the drier sourced partially by the increased in 0.6 (t/h) of saturate steam generated in biomass power boiler and the rest would be sourced with steam discarded to the environment in the absence of the drier installation.

		BASELINE CASE						
Parameters	Units	**With drier**			**Without Drier**			**Difference [(2) - (1)]**
Campaigne type		Pine	Euca	Estimate (2)	Pine	Euca	Estimate (1)	
Steam generation in the biomass boiler	t/h	0.0	112.9	39.5	0.0	111.2	38.9	**0.6**
Gross electric power generation.	MW	62.5	56.8	60.5	62.5	56.8	60.5	**0.0**
Internal power consumption.	MW	62.5	62.7	62.6	62.5	62.2	62.4	**0.2**
Import power	MW	0.0	5.9	2.1	0.0	5.4	1.9	**0.2**
Process heat consumption								
MP-steam	t/h	0.0	96.1	33.6	0.0	96.1	33.6	**0.0**
LP-steam	t/h	0.0	386.1	135.1	0.0	373.1	130.6	**4.5**
Blow-off	t/h	34.6	42.2	37.0	34.6	53.7	41.3	**-4.0**

Sources:
Data from the energy/mass balance (with drier) performed by KSH Consulting.
Data from the energy/mass balance in the registered PDD (pages 10 and 11) performed by AF Celpap.
The Project Participant would like to note the following:

- **Note 1:** This additional drier power consumption of 0.2 (MW) sourced as import power from the grid (MW). According to manufacture average electrical consumption estimate based on 70% of the connected electrical load (i.e. 0.472MW = 0.675MW*70%).
- **Note 2:** Under pine campaign the pulp mill would be capable of producing all the electric power for internal consumption and meeting the process heat demand from black-liquor consumption in the recovery boiler. With this would not be required steam generated from the other sources, in this case, from biomass consumed in the power boiler.
- **Note:** Under euca campaign the internal power consumption (MW) would have increased with the drier power consumption (MW) and would be met by import an additional amount of power from the grid. However, the gross electric power generation (MW) did not vary since under the baseline scenario the biomass power boiler would have generated only saturated steam.

PROJECT SCENARIO

In this case, the installed biomass power boiler was designed to generate high pressure steam flow for power generation purpose. With the installed biomass drier the impacts on available power for external consumers, power consumption and generation were assessed:

IMPACT ON THE ENERGY BALANCE FROM THE DRYER

Finding	CL B2

Considering the above the estimate values (with and without drier) are determined as the summary of 65% of original PDD project case pine balance and 35% of the original PDD project case eucalyptus balance.

Comments on results obtained:

As can be seen from below table the steam generation in the biomass boiler slightly increased in 3.0 t/h with the drier, but it can be also be seen that the LP steam, process consumption increased significantly in 12.6 t/h due to the drier steam consumption.

The power generation decreased in 0.8 MW with the drier as less heat was available for the condensing tail as the process heat consumption increased due to drier operation. Additionally, internal power consumption also increased in 0.4 MW due to drier's power consumption. As a result, available power export decreased in 1.2 MW.

Considering the above it can be stated that the drier installation did not increase the power generation compared with the original PDD.

		PROJECT CASE						
Parameters	Units	**Updated energy/mass balances (With drier)**			**Original energy/mass balances (Without Drier)**			Difference [(2) - (1)]
Campaigne type		Pine	Euca	Weight[18] average (2)	Pine	Euca	Original[2] PDD (1).	
Steam generation in the biomass boiler	t/h	93.2	93.0	93.1	90.1	90.2	90.1	**3.0**
Gross electric power generation.	MW	110.9	83.1	101.2	111.6	84.0	101.9	**-0.8**
Internal power consumption.	MW	66.1	64.6	65.6	65.7	64.1	65.1	**0.4**
Available for external consumers	MW	44.8	18.5	35.6	45.9	19.9	36.8	**-1.2**
Process heat consumption								
MP-steam	t/h	112.1	96.1	106.5	112.1	96.1	106.5	**0.0**
LP-steam	t/h	353.5	351.1	352.7	341.2	337.9	340.0	**12.6**

Sources:
Data from the energy/mass balance (with drier) performed by KSH Consulting.
Data from the energy/mass balance in the registered PDD (pages 10 and 11) performed by AF Celpap.

The Project Participant would like to note the following:

[18] Determined as weight average 65%/35%, where 65% correspond to the number of days producing pine pulp and 35% number of days producing euca pulp.

Finding	CL B2

- **Note 1:** Internal power consumption (MW) marginally increased in 0.5 MW attributable to drier power consumption. This is in accordance with manufacture average electrical consumption estimate based on 70% of the connected electrical load i.e. 0.472MW = 0.675MW*70%.

FUEL OIL CONSUMPTION IN THE BIOMASS BOILER

Before the drier was installed a relevant amount of Fuel oil was consumed to reduce moisture content of biomass with aim to maintain the temperature of the chamber improving the efficiency of biomass combustion and therefore steam generation. The drier was installed and start operating on Feb 15, 2013 with aim to minimize the fossil fuel consumed reducing the moisture content of biomass residues using process steam generated.

In the table below is shown the predicted and real fuel oil consumption in the biomass boiler before and after the drier was installed:

Predicted fuel oil consumption	t/a	3 200
2013 after the Dryer installation	t/a	6,033
Average 2011 – 2012	t/a	8.586
[01/01/2012 – 31/12/2012]	t/a	9,848
[01/01/2011 – 31/12/2011]	t/a	8,812
[01/01/2010 – 31/12/2010].	t/a	7,097

Source: Past monitoring periods of this project activity Ref.1787

Comments on results obtained:
The fuel oil consumption went down when biomass dryer was installed due to the fact that less support fuel was needed as the fired biomass was drier.

Note that 2013 was a start-up year for the dryer and therefore the annual fuel oil consumption is expected to be well below the one for 2013.

BIOMASS CONSUMPTION IN THE BIOMASS BOILER

In the table below is shown the predicted biomass consumption as well as the real ones before and after the Dryer installation.

		Total	Own	External
Predicted biomass consumption	BDt/a	171 442[19]	---	---
2013 after the Dryer installation	t/a	163 327	109 667	53 660

[19] This corresponds to the monitored biomass consumed in the power boiler. Note that the biomass residues estimate in the project case energy/mass balance of the registered PDD was 171,442(BDt/y) determined as: 167,904(BDt/y)*65% + 178,112(BDt/y)*35%, where 65% correspond to the number of days producing pine pulp and 35% number of days producing euca pulp.

Finding	CL B2

Average 2011 – 2012	t/a	127 087	103 114	23 974
[01/01/2012 – 31/12/2012][20]	t/a	137 738	110 625	27 113
[01/01/2011 – 31/12/2011]	t/a	123 651	104 098	19 553
[01/01/2010 – 31/12/2010][21]	t/a	119 873	94 618	25 255

Source: Past monitoring periods of this project activity Ref.1787

Comments on results obtained:

In the table above it can clearly be seen that the biomass consumption in the biomass boiler was well below the predicted one and has increased after the Dryer was installed 2013 to a level close to the predicted one. The reason for the low biomass consumption before the Dryer was installed is the fact that it was not possible to fire more biomass due to its high moisture content although significant amount of support fuel was fired in the boiler.

The biomass consumption increased after the drier was installed as a result of that more biomass could be fired due to lower moisture content.

STEAM GENERATION IN THE BIOMASS BOILER

The predicted steam generations in the biomass boiler as well as the real ones are shown in the table below.

Predicted steam generation	t/a	761 460
2013 after the Dryer installation	t/a	855 904
Average 2011 – 2012	t/a	678 340
2012	t/a	752 543
2011	t/a	646 884
2010	t/a	635 596

Source: Past monitoring periods of this project activity Ref.1787

It can be seen that a dramatic increase in steam generation have taken place 2013 after the biomass Dryer was started-up. However, it should be noted that the real steam generations includes steam generated from fuel oil and the predicted ones are for biomass only. In the table below is the real steam generations recalculated to a biomass base only. At the recalculation it has been assumed that 1 ton of fuel oil correspond to 13(22) ton of high pressure steam.

Total steam	Steam generated	Steam due to

[20] Issuance of CERs approved by UNFCCC.
[21] Issuance of CERs approved by UNFCCC.
[22] Design value of fuel oil consumption of the biomass power boiler.

Finding	CL B2

		generated (a)	due to FO. (b)	Biomass. (a) – (b)
Predicted steam generation	t/a	803,060	41,600	761 460
2013 after the Dryer installation	t/a	855 904	78,429	777 475
Average 2011 – 2012	t/a	678 340	111,618	566 722
2012	t/a	752 543	128,024	624 519
2011	t/a	646 884	114,556	532 328
2010	t/a	635 596	92,261	543 335

Source: Past monitoring periods of this project activity Ref.1787

The steam generation 2013 from biomass was very close to the predicted one. The difference can be explained with the fact that more biomass than predicted was fired 2013.

Hereby, the Project Participant summarizes the post registration changes between the registered PDD and the actual project activity:

<u>Corrections to the registered PDD based on the actual project activity (with the drier installation).</u>

- Average net electric efficiency of power in the reference power cogeneration plant that would use the biomass residues fires in the project plant in the absence of the project activity.

Parameter[3]	Units	Reference plant[1]	Reference plant (with drier)[2]
$\varepsilon_{el.other\ plant(s)}$ [4]	(GWh_{el}/GWh_{bio})	12.093%	11.971%

(1) Reference plant: Data from the energy/mass balance in the registered PDD (pages 10 and 11) performed by AF Celpap.
(2) Data from the energy/mass balance (with drier) performed by KSH consulting.
(3) Parameter used in equation 14 of the ACM0006 (Version 05), page 29 to determine the net quantity of increased electricity generation, as a result of the project activity.
(4) Evidence of the detailed calculation of the electric efficiencies is provided by the Project Participant in the document named <u>Valdivia drier impact on baseline parameters.xls</u>.

<u>Comments on results obtained:</u>

With the above result, the reference plant would remain self-sufficient in terms of heat and power generation, without generating any surplus power to the grid. This means that the baseline definition of electric power self-sufficiency remains unaltered after the completion of the optimization project.

The net electric efficiency of the “reference plant (with drier)” would be **11.971%,** which is slightly lower than the original value used for the reference pulp mill which is the current

Finding	CL B2

electric efficiency that is now being used by the PP.

– Additional electric power consumption of the project mill

This is the additional electric power consumption of the project pulp mill with surplus power capacity generation to the grid with respect to the baseline pulp mill, which does not have surplus electric power capacity to the grid. This marginal higher power consumption was derived from the installation of the equipment that enables the project pulp mill to generate additional power, (for instance, the installation of a higher biomass capacity power boiler in the project mill, compared to the one that would have been installed in the baseline pulp mill.

The additional power consumption value of 4.59[23]% due to project activity (with drier) results to be higher than the value of 4.22[24]% obtained originally (without drier). This means that using a higher value translates into a more conservative emission reduction.

Power generation and consumption (without drier)

Source: Evidence of the detailed calculation of the electric efficiencies is provided by the Project

		Real plant			Reference plant			
		Pine	Euca	Weight avg[25] (a)	Pine	Euca	Weight avg.[7] (b)	[(a)-(b)][26]
Gross electric power generation	(MW)	**111.6**	**84.0**	102.0	62.5	56.90	60.6	41.5
Internal consumption	(MW)	**65.7**	**64.1**	65.1	62.5	62.2	62.4	2.7

Additional power consumption due to the project activity	(MW)	4.22%

Participant in the document named Valdivia drier impact on baseline parameters.xls.

Power generation and consumption (with drier)

Real plant			Reference plant			
Pine	Euca	Weight avg[7] (a)	Pine	Euca	Weight avg.[7] (b)	[(a)-(b)][8]

[23] Determine as the additional internal power consumption (3.0MW) divided by the total internal power consumption of the project plant (65.6MW).
[24] Determine as the additional internal power consumption (2.7MW) divided by the total internal power consumption of the project plant (65.1MW).
[25] Determine as weight average calculation considering the Valdivia plant will produce pulp from euca 35% of the time, leaving the remaining 65% of the time devoted to pine pulp production in accordance with the PDD, based on real performance of the plant.
26 Determine as the difference of weight average result between project and baseline case.

Finding	CL B2

Gross electric power generation	(MW)	**110.9**	**83.1**	101.26	62.5	56.90	60.6	40.7
Internal consumption	(MW)	**66.1**	**64.6**	65.6	62.5	62.7	62.6	3.0

Additional power consumption due to the project activity	(MW)	4.59%

Source: Evidence of the detailed calculation of the electric efficiencies is provided by the Project Participant in the document named Valdivia drier impact on baseline parameters.xls.

Comments on results obtained:

With the above result, the additional internal power consumption increased to 3.0(MW) from 2.7(MW) defined in the original PDD. This additional consumption can explained due to the drier power consumption[27] attributable to the project activity.

The weigh average gross electric power generation (with drier) results in 101.26MW, which compared to the original estimate of 102MW, marginally decrease.

Impact on emission reductions:

The Project Participant has performed a comparison between the amount of emission reductions claimed in the monitoring period: [01/01/2013 – 31/12/2013] considering the original and the adjusted (with drier) values of the electric efficiency of the reference plant and the additional power consumption (MW) percentage due to the project activity.

Using the adjusted electric efficiency of the reference plant and the additional power consumption percentage due to the project activity the monitored emission reductions obtained for the monitoring period will be 3% high.

		Original	Adjusted
(1) Gross electricity generated by the project plant	(MWh/yr)	695,232	695,232
(2) Total internal electricity consumption	(MWh/yr)	426,580	426,580
(3) Additional power consumption percentage due to the project activity.	%	4.22%	4.59%
(4) Average net energy efficiency of electricity generation in the baseline plant.	%	12.09%	11.971%
(5) Quantity of black liquor combusted in the project plant (dry	(tDS/yr)	1,080,962	1,080,962

[27] According to manufacture specifications the drier´s total connected electrical load is 0.675MW.

Finding	CL B2

basis).			
(6) Quantity of biomass from forest ops combusted in the project plant (dry basis).	(BDt/yr)	163,531	163,531
(7) Net calorific value of black liquor (dry basis) (adjusted).	(GJ/tDS)	12.25	12.25
(8) Net calorific value of biomass from forest operations (dry basis) (adjusted)	(GJ/BDt)	18.67	18.67

Calculations.

(9) Net quantity of electricity generated in the project plant	(1)-(2)*(3)	677,228	675,647
(10) Electric power generated in the baseline mill	(4)*((5)*(7)+(6)*(8))*(1/3,600)	547,188	541,634
(11) Net quantity of increased electricity	(9)-(10)	130,040	134,013

Total grid emission savings (adjusted)	**(tCO_2/yr)**	99,595	102,638

Source: Emission reduction calculations from this monitoring period.xls

Emission sources	(tCO2eq)	(tCO_2eq)
Carbon dioxide emissions due to electricity displacement	99,595	102,638
Methane emissions due to uncontrolled biomass burning avoidance	21,884	21,884
Total	121,479	124,523

	2013	2013
Baseline emissions	121,479.5(tCO2eq)	124,522.5(tCO2eq)
Project emissions	25,035.8(tCO2eq)	25,035.8(tCO2eq)
Leakage	0(tCO2eq)	0(tCO2eq)
Net emission reductions	96,443.6(tCO2eq)	99,486.7(tCO2eq)

Finally, the Project Participant summarizes that the changes described above due to drier installation do not adversely impact i) the applicability of the baseline methodology, ii) the additionality of the project activity and iii) the scale of the project activity:

The Project Participant applied the approved consolidated baseline methodology ACM0006 (Version 05) “Consolidated methodology electricity generation from biomass residues”, which is applicable to the project activity as follows:

- No other biomass types than biomass residues, in this case

Finding	CL B2
	black liquor and biomass residues from forest operations (sawdust and bark) from its own and third party, which have been defined as biomass residues in the registered PDD, are the predominant fuel used in the project activity. The drier installed had not impact here. - The implementation of the project shall not result in an increase of the processing capacity of raw input, or in other substantial changes in this process. The raw input is absolutely determined by the purchased processing capacity of the pulp mill of 550,000 (ADt/y). As previously mentioned and clarified, this capacity has not been altered to date and has not (and will not) change due to the implementation of the project activity. The rational to install a biomass drier was due to operational reasons based on the fact that the actual moisture content of biomass is so high that the biomass is difficult to fire with a reduced power boiler capacity as a result, not to increase the generation of emission reduction credits (CERs). In the table presented above in section **BIOMASS CONSUMPTION IN THE BIOMASS BOILER** is shown the predicted biomass consumption as well as the real ones before and after the Dryer installation. <u>Comments on results obtained:</u> In the table above it can clearly be seen that the biomass consumption in the biomass boiler was well below the predicted one and has increased after the Dryer was installed 2013 to a level close to the predicted one. The reason for the low biomass consumption before the Dryer was installed is the fact that it was not possible to fire more biomass due to its high moisture content although significant amount of support fuel was fired in the boiler. <u>Additionality of the project activity</u> The additionality of the Valdivia biomass power plant was based on a barrier analysis and the drier project did not change or affect any of the barriers faced by the project activity. The reference pulp mill still complies with the following conditions: – <u>Under pine (long fiber pulp)</u> the mill would still be capable of

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	producing all the electric power for internal consumption and meet process heat demand. – Under euca (short fiber pulp) the mill would not be capable of producing all the electric power for internal consumption and must marginally rely on the grid for power purpose (i.e. this is explained as the Kraft cycle for Eucalyptus does not produce enough black liquor to generate all the electric power required by the mill). As it was above described, in accordance with the original PDD, despite above and for conservative reasons, it will be assumed that the baseline pulp mill would have been completely self-sufficient in electric power generation and heat to process and the project pulp mill still faces the same barriers outlined in the registered PDD. Therefore, the drier project had not impact on the additionality of this project activity. The scale of the project activity The Valdivia biomass power plant is a large-scale CDM project activity and the implementation of the drier project did not change in any way the scale of the emission reduction PA.
DOE Assessment #1 *The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	It has been observed during the site visit that a biomass dryer has been installed in the project activity, which influences the project activity. The VT understands that the installation of the dryer is directly connected to the overall increase of the pulp mill efficiency which is the main activity of the company. However, as it has influence on the project activity as well, a better comprehension of it was required. The reason of this installation, in the first place, was to reduce the moisture content of the biomass obtained from third parties, increasing the efficiency of the power boiler. It is important to point out that this plant was designed to be self-sufficient in electricity. The PA, in this case, is to generate surplus of electricity by burning biomass and export it to the grid. It can be observed in the registered PDD that the moisture of the biomass residues (bark and sawdust) was expected to be 56.72% (average) which is much lower than the actual values. Bearing that in mind, the VT concludes that the dryer would be installed either with or without the installation of the project activity, in order to reach the design moisture content. Below the comments about the influence of the installation of the dryer in project activity when comparing to the reference

Finding	**CL B2**
	plant also with the dryer installed. - The PP provided the recalculations of the electricity and steam generation and electricity consumption for the reference plant (baseline scenario) and project plant done by consultant to the VT. - In the reference plant, with the installation of the dryer, there would be an increase of low pressure steam consumption (used in the dryer). This extra consumption would be replaced partially by the increase of the steam generation in the biomass boiler and partially by the steam that would be normally release to the atmosphere (blow-off). Furthermore, there would be an increase of electricity consumption due to the installation of the dryer. - In the case of the project scenario, the recalculations were also observed. It has been noted that with the installation of the dryer, due to conditions of steam generation and power consumption, the available electricity export capacity decreased from 36.8 MW to 35.6 MW, i.e, 1.2 MW. Thus, it is concluded that, the installation of the dryer does not enhance the project activity's capacity of generating surplus of electricity. This resulted in a reduction of emission reductions acquired by the PA. - Regarding the fuel oil consumption: with the reduction of moisture entering the power boiler, less fuel oil is to be consumed. This reduction is explained as the more moisture injected in the boiler, more fuel oil needs to be combusted to maintain the chamber temperature constant. The comparison was made between the past years and the current MP (with the dryer installed) and a reduction in fuel oil consumption in the power boiler was observed, resulting in a reduction of project emissions. As less fuel oil is being combusted in the power boiler, the energetic portion has to be replaced with biomass. The registered PDD already forecasted a higher amount of biomass to be combusted when compared with the actual figures (171,442 BDt/y in PDD while before installation of the dryer – until 2012 - the amount did not reach 140,000 BDt/y). It can be noted that during this MP (2013) the total biomass burned is equal to 163,327 BDt/y. But it is very important to point out that, even with the biomass value reaching or surpassing the estimated value, the amount of used biomass did not reach 125% of availability, as was checked in the biomass balance in the region (the availability is 238% of the quantity used)[/BALANCE/]. - Regarding the steam generation, it has been observed a slightly increase in the total amount of steam generated when comparing to the previous years. However, the value is currently very close to the estimated amount, which reinforces that, in the PDD, the estimated values were very well predicted when compared to the actual values, taking into account the differences in the biomass moisture. Taking the points above into consideration and the recalculation

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	provided by the consultant, the following parameter were corrected in the PDD: - $\varepsilon_{el.other\ plant(s)}$ (Average net energy efficiency of the reference plant): taking into account the variation of the consumption of biomass from forest operations and the change in the total internal electricity consumption, the parameter changed from 12.09% to 11.97%. The calculations were provided by PP and calculated by KSH Consulting /Dryer & Balance/. The calculations were considered reliable by the verification team. - Additional power consumption due to the project activity: according to the calculation provided by the PP, the additional power consumption due to the PA will increase from 4.22% to 4.59%. The calculations were provided to the VT and are considered reliable. In this case, one would not expect changes in this case as the dryer is being considered in both baseline and project scenarios. However, as per calculations, the differences occurred due to different influences of the dryer in the pine and eucalyptus campaign. - The ER calculations were all updated in the PDD. As a result, an increase of approx 3% of the ER could be observed due to the installation of the dryer. It happened mainly because of the increase of the Net electricity attributed to the project activity. This variation can be observed in the calculations described above. The VT considers that all implications of the installation of the dryer in the project activity were detailed in the correction action above. All evidence was provided and is listed in section 7 of this FVR /Dryer & Balance/. All calculations were checked and were considered reasonable. The installation of this dryer was considered as a post registration change and the full implications regarding additionality, scale and applicability of the methodology were assessed in the Annex 3 of this report. (Assessment on Post registration changes) However, by reviewing the calculation of the parameter $\varepsilon_{el.other\ plant(s)}$, the PP is requested to explain why the NCVs used in the calculations of the parameter above were updated to the average historic measurements (2009-2013) monitored directly from the pulp mill whereas the consumption of black liquor and biomass from forest operations were based on weighted average amounts of these fuels that would be burnt in the reference plant. **CL remains opened.**
Corrective Action #2 *This section shall be filled by the PP. It shall address*	The net electric efficiency of the reference pulp mill would be 11.971%, which results to be lower than the original value of

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the corrective action taken in details. In case the MR is changed as part of the CA, the PP is requested to indicate the revised sections as well as the new version No.	12.09% used for the reference pulp mill. This can be explained as follows: • The updated value of the baseline electric power generation 528.6 (GWh/y) resulted to be marginally higher than the original value of 527.1 (GWh/y). This can be explained because the installed power consumption capacity of the biomass drier was added to the reference plant. • The net calorific values originally informed in the PDD were updated with the average net calorific value of the period (2009-2013) obtained for fuels type of black-liquor and biomass residues from forestry operations and used in the electric efficiency calculation of the reference plant. For the fuels consumption the case would be different as it explained as follows: • The consumption fuels of type of black-liquor and biomass residues from forest operations that would be burnt in the boilers are used instead of monitored values of fuels consumption in the electric efficiency calculation. The monitored values of fuels consumption cannot be applied to calculate the electric efficiency of the reference plant and at the same time assume the reference plant should be self-sufficient with power. This is explained as follows: The mill was designed for a production capacity of 728,640[28] (ADt/y). This production level was used for the reference and project plant informed in the original PDD. But the mill got an environmental permit which limited its pulp production to 550,000[29] (ADt/y). As a result, the pulp mill is oversized for the actual production levels and less energy efficient than expected at production level closed to design capacity. With this, the energy behaviour of the reference plant would be different from the one defined and informed in the original PDD, not being a self-sufficient reference plant in electric power generation. A further explanation is presented as follows:

[28] The design production capacity is as follows: 2,200(ADt/y)*35%+2,000(ADt/y)*65%, where the 2,200 (ADt/y) and 2,000(ADt/y) correspond to the pulp production under euca and pine campaign. From 352 days of normal operation 65% of the time the plant operated under pine campaign and 35% under euca.

[29] This is informed in the original PDD on page 2 and correspond to the environmental permit of the pulp mill to operate below the 550,000 (ADt/y).

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	○ In the case real values for fuels consumption are applied the reference plant would not be capable of producing all the electric power required by the mill, neither under pine nor under campaign, differing with the reference plant defined and informed in the original PDD. The power generation[30] (MW) of the reference plant would have decreased as steam flow to the turbo-generator would be much lower using real values than design values. ○ The specific power generation[31] (kWh/ADt) of the reference plant would be much lower using real values of fuels than original fuels amount informed in the PDD. This is consequence of the lower efficiency obtained at lower load. This can mainly be explained because of the limited pulp production the plant need to comply with. ○ For the total power consumption (MW) and specific power consumption of the reference plant the situation is opposite. ○ The specific consumption [32](KWh/ADt) increase as production level decreased. This can be explained as only a minority of drives has variable frequency, and therefore most of power consumers have more or less a constant consumption regardless of the production level reached by the plant. Considering the above using real values for fuels for the reference plant would end in less power generation and high power consumption per unit of pulp produce than it was estimate originally. This results in a reference plant that would have increased its dependency on power import from the grid not being self-sufficient in term of power and heat as it was informed in the original PDD. The new value of 11.971% for the net electric efficiency of the reference plant

[30] The mill would be not capable of producing all the electric power for internal consumption, not being self-sufficient in term of power, and therefore must rely on the grid for power purpose under both pine and euca campaign.

[31] For euca the original specific power generation was 134.0 (kWh/tsteam) but if real values for steam are applied only 124.6 (kWh/tsteam) was obtained. For pine the situation is similar, the original specific power generation was 132.1 (kWh/tsteam) and if real values are applied the result is 129.4 (kWh/tsteam). This is based on an energy and mass balance of the reference plant performed under real production levels.

[32] For euca case the specific power consumption informed in the original PDD was 678.5 (kWh/ADt), but if real values were applied the specific power consumption would be much higher 887.4 (kWh/ADt). For pine campaign the situation would be similar, with the original specific power consumption of 750 (kWh/ADt) compare with the 919.5 (kWh/ADt) applying real values. This is based on an energy and mass balance of the reference plant performed under real production levels.

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	will be used by the Project Participant for estimating emission reduction calculation in this PDD and emission reduction calculations in future monitoring periods.
DOE Assessment #2 *The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	It is clear now to the verification team that it is not possible to apply real values to the quantity of biomass used in the reference plant for the ex-ante calculations. The current capacity of the project activity is being restricted as per environmental permission, which caps the productivity to 550,000 ADt/y while the reference plant has its capacity defined as per plant design (higher value). Consequently, the consumption of biomass in the reference plant would be higher. In the case of NCV, it is acceptable to use measured values of NCVs as they are more reliable than estimated values. However, during the EB assessment, following issues were raised: - The DOE has explained that it is not possible to apply real values to the quantity of biomass used in the reference plant for the ex-ante calculations. The DOE is requested to clarify why a request for post-registration change due to the project design is not required . - The estimated amount of annual average GHG emission reductions have increased by 28% (i.e. from 107,015 tCO2e (registered PDD ver. 04.0) to 137,170 tCO2e (revised PDD ver. 09.0) due to the requested PRC. - Explanation is requested why PRC does not require prior approval from EB considering that the new equipment (dryer) installed as part of the requested PRC will change some operational parameters; and - The applied monitoring methodology (ACM0006 ver. 05 page 47) has listed the electric efficiency of reference plant, as parameter which is fixed ex-ante (not monitored). However, the PP has applied the monitored values for the biomass NCVs to update this parameter. The DOE is requested to clarify why a deviation from the applied monitoring methodology is not requested considering that the efficiency of reference plant," is fixed ex-ante whereas the PP proposes to update it ex-post. **CL was reopen due to Incomplete.**
Corrective Action #3 *This section shall be filled by the PP. It shall address*	*i. The reference mill would have had the same design production capacity as the real mill with the CDM project activity.*

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the corrective action taken in details. In case the MR is changed as part of the CA, the PP is requested to indicate the revised sections as well as the new version No.	The PP provides an explanation and the evidence to support the condition above has been accomplished:

Emission reduction calculations (With biomass drier)

		2009	2010	2011	2012	2013	2014	2015	2016
Net quantity of energy displaced from the grid	(GWh/yr)	252,2	196,6	196,5	175,3	206,3	209,9	209,9	209,9
Combined Margin for the CDM activity	(tCO_2/GWh)	647,60	718,68	695,79	694,16	765,88	700,00	500,00	450,00
Electric efficiency of the baseline mill	%	12,127%	12,127%	12,127%	12,127%	12,127%	12,127%	12,127%	12,127%
Additional power consumption due to the project activity.	%	4,59%	4,59%	4,59%	4,59%	4,59%	4,59%	4,59%	4,59%
Grid emission savings	(tCO_2/yr)	163.386	141.288	136.752	121.670	157.966	146.919	104.942	94.448
CH_4 emissions savings	(tCO_2eq/yr)	3.704	3.778	3.796	3.884	4.530	4.568	4.568	4.568
TOTAL BASELINE EMISSIONS.		**167.089**	**145.066**	**140.548**	**125.554**	**162.495**	**151.487**	**109.510**	**99.016**
TOTAL PROJECT EMISSIONS.	(tCO_2eq/yr)	13.630	13.709	13.716	13.803	13.966	13.908	13.908	13.908
TOTAL BASELINE EMISSIONS See notes (1), (2)	(tCO_2eq/yr)	**125.317**	**145.066**	**140.548**	**125.554**	**162.495**	**151.487**	**109.510**	**24.754**
TOTAL PROJECT EMISSIONS See note (3),(4)	(tCO_2eq/yr)	**10.223**	**13.709**	**13.716**	**13.803**	**13.966**	**13.908**	**13.908**	**3.477**
NET EMISSION SAVINGS	(tCO_2eq/yr)	**115.094**	**131.358**	**126.832**	**111.751**	**148.529**	**137.580**	**95.603**	**21.277**

984.732
96.709
888.023 126.860 tCO2

The pulp mill has an environmental permit to operate below the 550,000 (ADt/y). This was only a restriction imposed to the pulp mill by the environmental agency, and it has nothing to do with the design production capacity of the pulp mill, as can be explained as follows:

According to the energy/mass balances informed in the registered PDD the pulp mill was designed for a pulp production capacity of 728,640 (Adt/y). It must be noticed that the same design production capacity is defined for the reference and real mill. Evidence to support this can be seen in the baseline and project case energy/mass balances informed in the registered PDD.

Based on data from the baseline and project case energy/mass balances the design production capacity of the reference plant would have had the same capacity as the real mill.

<u>Reference mill:</u>

Design capacity of 728,640 (ADt/y) determined as follows: [2,200(ADt/y)*35% + 2,000(ADt/y)*65%]*352days, where 2,200(ADt/y) and 2,000(ADt/y) corresponds to the design capacity of euca and pine pulp production, respectively obtained from baseline energy/mass balances informed in the registered PDD.

<u>Real mill:</u>

Design capacity of 728,640 (ADt/y) determined as follows:[2,200(ADt/y)*35% + 2,000(ADt/y)*65%]*352days, where 2,200(ADt/y) and 2,000(ADt/y) corresponds to the design capacity of euca and pine pulp production, respectively obtained from project case energy/mass balances informed in the registered PDD.

Note that from 352 days of normal operation 65% of the time the plant would operate under pine and 35% of the time under euca campaign.

ii. The PP presents a comparison between the emission reduction calculations (without biomass drier) informed in the original PDD and the emission reductions (with biomass drier):

a) The estimate amount of annual average GHG emissions **<u>reductions decreased by 14%, determined as</u>**:
($126,860\ tCO_2$ -$148,300 tCO_2$)/$148,300\ tCO_2$ for the first crediting period.

Table below considers the monitored period **[April 1st, 2009 to March 31st, 2016.].**

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	Registered PDD	Updated PDD (with biomass drier)
Electric efficiency of the baseline mill (%) **(1)**	12.09%	12.127%
Additional power consump due to p.a.**(2)**	4.22%	4.59%
Average Grid emission factor (tCO_2/GWh) **(3)**	706.96	646.54
Total baseline emissions (tCO_{2eq}/y). **(4)**	1,134,024	984,732
Total Project emissions(tCO_{2eq}/y)	95,925	96,709
Net Emission savings(tCO_{2eq}/y)	1,038,099	888,023
Annual average over the crediting period of estimated reduct. (tonnes of CO_2 e)	**148,300**	**126,860**

The PP would like to note the following:

The reasons that can mainly explain that annual average emission reduction over the crediting period result to be lower than originally estimate amount informed the PDD are described as follows:

1. The net electric efficiency of the reference pulp mill would be 12.127%, which results to be slightly higher, and thereby more conservative from the emission reduction calculation, than using the original value of 12.09% used for the reference pulp mill. It must be noticed that the new value of the reference plant was calculated using ex-ante data (not monitored data). This is in accordance with the ACM0006 (ver05) which state that this is a fixed ex-ante (not monitored) parameter. The reason that can explain the increase in the value of the electric efficiency is explained as follows:

   The baseline electric power generation of 528.6 (GWh/y) resulted to be marginally higher than the original value of 527.1 (GWh/y). **This is explained because of the installed capacity of power consumption of the biomass drier added to the baseline electric power generation of the reference plant**. (Refer to Appendix 4 of the updated PDD for detailed information).

2. The additional power consumption due to project activity would be 4.59%, which results to be higher, and thereby more conservative from the emission reduction calculations, than the original value of 4.22% used. **This difference can be explained because of the installed capacity of the biomass drier.** (Refer to ex-ante emission reduction calculation for detailed information)

Additionally, the PP would like to note that real values of the grid emission factor were used in the emission reduction calculation to be more precise in the emission reduction calculations.

3. *Grid emission factor (tCO_2/GWh):* The average value of grid factor for the period (2009-2016) results to be 646.54 (tCO_2/GWh), using calculated annual grid factors using official data on an annual base for the period (2009-2013) and for the period (2014-2016) were used estimated values informed in the original

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PDD. This results in an average low grid emission factor than the average grid factor of 706.96 (tCO_2/GWh)informed in the original PDD. The decrease in this parameter result in less emission reduction due to electricity generated by the project activity.

Therefore, the PP concluded by the evidence described above that the biomass drier installation, as a change in the project design, **results to be conservative in term of the emission reduction calculation.**

In addition to the above, the PP would like to show the brief of the emission reduction calculations with and without the biomass drier installation:

4. Registered PDD: Emission reductions calculations (without biomass drier)

Register PDD

		2009	2010	2011	2012	2013	2014	2015	2016
Net quantity of energy displaced from the grid	(GWh/yr)	212,80	212,80	212,80	212,80	212,80	212,80	212,80	212,80
Combined Margin for the CDM activity	(tCO_2/GWh)	461,50	673,87	911,96	1.058,38	900,00	700,00	500,00	450,00
Electric efficiency of the baseline mill	%	12,09%	12,09%	12,09%	12,09%	12,09%	12,09%	12,09%	12,09%
Additional power consumption due to the project activity.	%	4,22%	4,22%	4,22%	4,22%	4,22%	4,22%	4,22%	4,22%
Grid emission savings	(tCO_2/yr)	98.207	143.399	194.066	225.223	191.520	148.960	106.400	95.760
CH_4 emissions savings	(tCO_2eq/yr)	3.837	3.837	3.837	3.837	3.837	3.837	3.837	3.837
TOTAL BASELINE EMISSIONS.	(tCO_2eq/yr)	**102.044**	**147.236**	**197.903**	**229.060**	**195.357**	**152.797**	**110.237**	**99.597**
TOTAL PROJECT EMISSIONS.	(tCO_2eq/yr)	13.704	13.704	13.704	13.704	13.704	13.704	13.704	13.704
TOTAL BASELINE EMISSIONS [See notes (1), (2)]	(tCO_2eq/yr)	**76.533**	**147.236**	**197.903**	**229.060**	**195.357**	**152.797**	**110.237**	**24.899**
TOTAL PROJECT EMISSIONS [See note (3),(4)]	(tCO_2eq/yr)	**10.278**	**13.704**	**13.704**	**13.704**	**13.704**	**13.704**	**13.704**	**3.426**
NET EMISSION SAVINGS	(tCO_2eq/yr)	**66.255**	**133.533**	**184.199**	**215.357**	**181.654**	**139.094**	**96.534**	**21.473**

Total
1.134.024
95.925
Total
1.038.099 148.300 tCO2/y

Notes:
(1) The Project Participant informs the starting date of the first crediting periods in April 1st, 2009. This implies the following The estimate of baseline emission were adjusted considering the starting date in April 1st 2009: 125,317 tCO_2 = 167,089 tCO_2 * (9/12)
(2) The annual estimate emission reductions were adjusted considering the March 31 st 2016 as the end date of the 1st crediting period: 24,754 tCO_2 =99,016 tCO_2*(3/12)
(3) The project emission were adjusted considering April 1st of 2009 the start date of the 1st Crediting period: 10,223(tCO_2) = 13,630(tCO_2) * (9/12)
(4) The project emission were adjusted considering March 31st of 2016 as the end date of the 1st Crediting period: 3,477(tCO2) = 13,908(tCO2) * (3/12)

In conclusion, based on the evidence above described annual average emission reduction over the crediting period [April 1st, 2009 to March 31st, 2016.] result to be lower than originally estimated, and therefore more conservative.

b) The PP summarizes that the changes described above due to the biomass drier installation do not adversely impact i) the applicability of the baseline methodology, ii) the additionallity of the project activity and iii) the scale of the project activity.

The PP explains that the biomass drier installation, as a change in the project design of the registered project activity, do not adversely impact the applicability and application of the applied methodology, the additionality and the scale of the project activity.

The Project Participant applied the approved consolidated baseline methodology ACM0006 (Version 05) “Consolidated methodology electricity generation from biomass residues”, which is applicable to the project activity as follows:

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	- No other biomass types than biomass residues, in this case black liquor and biomass residues from forest operations (sawdust and bark) from its own and third party, which have been defined as biomass residues in the registered PDD, are the predominant fuel used in the project activity. **The drier installed had not impact here.** - The implementation of the project shall not result in an increase of the processing capacity of raw input, or in other substantial changes in this process. The raw input is absolutely determined by the purchased processing capacity of the pulp mill. According to the energy and mass balances informed in the original PDD the design production capacity of the pulp mill is 728,640(ADt/y) for both reference and project case. Note that in this case the pulp mill has an environmental permit to operate below the 550,000 (ADt/y). This capacity has not been altered to date and has not (and will not) change due to the implementation of the project activity. The rational to install a biomass drier was due to operational reasons based on the fact that the actual moisture content of biomass is so high that the biomass is difficult to fire with a reduced power boiler capacity as a result, not to increase the generation of emission reduction credits (CERs). In the table presented above in section **BIOMASS CONSUMPTION IN THE BIOMASS BOILER** is shown the predicted biomass consumption as well as the real ones before and after the Dryer installation. Comments on results obtained: The PP presented evidence that the biomass consumption in the biomass boiler was well below the predicted one and has increased after the Dryer was installed 2013 to a level close to the predicted one. The reason for the low biomass consumption before the Dryer was installed is the fact that it was not possible to fire more biomass due to its high moisture content although significant amount of support fuel was fired in the boiler. - Additionality of the project activity The additionality of the Valdivia biomass power plant was based on a barrier analysis and the drier project did not change or affect any of the barriers faced by the project activity. The reference pulp mill still complies with the following conditions: • Under pine (long fiber pulp) the mill would still be capable of producing all the electric power for internal consumption and meet process heat demand. • Under euca (short fiber pulp) the mill would not be capable of producing all the electric power for internal consumption and must marginally rely on the grid for power purpose (i.e. this is explained as the Kraft cycle for Eucalyptus does not produce enough black liquor to generate all the electric power required by the mill). As it was above described, in accordance with the original PDD, despite above and for conservative reasons, it will be assumed that the baseline pulp mill would have been completely self-sufficient in electric power generation and heat to process and the project pulp mill still faces the same barriers outlined in the registered PDD. Therefore, the drier project had not impact on the additionality of this project activity. - The scale of the project activity The Valdivia biomass power plant is a large-scale CDM project activity and the implementation of the drier project did not change in any way the scale of the

Finding	CL B2
	emission reduction project activity iii. In accordance with the ACM0006 (ver.05) the electric efficiency of the reference plant is fixed ex-ante (not monitored values). In accordance with the ACM0006 (ver.05) the electric efficiency of the reference plant is listed as fixed ex-ante, and so for its calculation the PP used ex-ante (not monitored) values for the parameters (i.e. black-liquor, biomass from forest operations and corresponding NCVs).
DOE Assessment #3 *The assessment shall encompass all open issues in annex A-1. In case of non-closure, additional corrective action and DOE assessments (#2, #3, etc.) shall be added.*	- The DOE has revised the assessment opinion. It is clear to the verification team that there is no change of the production capacity between the reference plant and the project plant. The plant was design for a capacity of 728,640 ADt/y (vide mass/energy balance and footnote #1 of the revised PDD)/PDD/ /Balance/. The informed capacity 550,000 ADt/y in page 2 of the registered PDD v.4 is the capacity allowed by the environmental permit/EIA/. The verification team wants to point out that real values of biomass consumption could not be applied to the calculation of the parameter electric efficiency of the reference plant ($\varepsilon_{el.other\ plant(s)}$) because the plant is currently operating with lower capacity due to environmental restrictions (550,000 ADt/y) . By applying real values to this parameter, the reference plant would not be "self-sufficient in thermal and electric power generation", what is not in accordance with the registered PDD (pg. 9/PDD/). Bearing that in mind, the DOE understands that there is no reason for request a post-registration change due to change of production capacity between reference plant and project plant as both plants (Reference and project) have their design capacity equal to 728,640 ADt/y and both plants would have the same environmental restrictions, or in other words, both plants would have their productivity capped in 550,000 ADt/y. Thus, the statement of the reg. PDD page 7 "it must be noted that the alternative business-as-usual (BAU) pulp mill (or reference mill) would have had the same capacity as the real mill (with the implementation of the CDM project activity)" is still valid. - The installation of the dryer resulted in a reduction of the estimated ERs in 14% (from 148,300 tCO2e to 126,860 tCO2e) for the first crediting period and a total of 15 % (from 107,015 tCO2e to 90,920 tCO2e) for the 21-year period. This reduction resulted from a slightly increase of the parameter "electric efficiency of the energy plant" from 12.09% to 12.127% which is considered conservative by the verification team. It is important to point out that in the registered PDD the annual estimation of 107,015 tCO2e ERs was calculated based on three crediting periods. Whereas in the revised PDD, using the updated template (version 05.0), the annual average is only based on the 1st crediting period which results in 126,860 tCO2e. - The DOE considers that this PRC does not require prior approval from EB. Even by changing the operational parameters informed above, the PRC is still in accordance with the Appendix 1, para 6 of the Project Standard V.07.0, "Proposed or actual changes to the project design of a registered CDM project activity that do not adversely impact any of the following do not require prior approval by the Board:

Finding	CL B2
	(a) The applicability and application of the applied methodology and, where applicable, the applied standardized baseline under which the project activity has been registered; *(b) The additionality of the project activity;* *(c) The scale of the project activity."* These 3 aspects were not adversely impacted by the installation of the dryer thus it is concluded that a prior approval by the board is not needed as per PS V.07.0. - The electric efficiency of the reference plant is a parameter fixed ex-ante. Thus, the PP kept the initial values of NCV validated during the validation phase for the calculation of this parameter. **CL is closed**
Conclusion *Tick the appropriate checkbox*	☐ To be checked during the next periodic verification ☐ Additional action should be taken (finding remains open) ☒ The finding is closed

6 SUMMARY OF ASSESSMENT OPINIONS

The below listed changes have occurred after the registration of the project / PoA.

Type of Change occured		*Total No. of changes*	*No. of changes which require prior approval*
☒	Temporary deviations from the MP	1	0
☐	Temporary deviations from the MM		
☐	Corrections that do not affect the project		
☐	Change to the start date of the crediting p.		
☐	Permanent changes from the MP		
☐	Permanent changes from the MM		
☒	Design changes to the project activity / PoA	1	0
☐	Changes specific to AR projects		

None of the changes requires prior approval of the Board.

São Paulo, 2015-11-25

Sergio Cruz
TÜV NORD JI/CDM CP
Assessment Team Leader

Essen, 2015-11-25

Stefan Winter
TÜV NORD JI/CDM CP
Final Approval

7 REFERENCES

All references are listed in the Verification Report to which this assessment is attached.

APPENDIX

A1: Assessment of Financial Parameters

A2: Assessment of Barrier analysis

A3: Competence statements of involved personnel

APPENDIX 1: ASSESSMENT OF FINANCIAL PARAMETERS

Table A-1: Assessment of Financial Parameters (VVS, §§ 120, 121 / in case financial parameters stem from FSR §122)

☒	No financial parameters are used for additionality justification
☐	Assessment of all financial parameters see below

Parameter	Value applied	Unit	Source of Information (please indicate document and page)	Reference	DOE ASSESSMENT	
					Correctness of value applied	Comment

APPENDIX 2: ASSESSMENT OF BARRIER ANALYSIS

Table A-2: Assessment of Barrier Analysis (VVS, §§ 124-127)

☐	No barrier parameters are used for additionality justification
☒	Assessment of barriers see below

Kind of Barrier (invest, tech, other)	Description of Barrier	Evi-dence used	Assessment of validation team	
			Appropri-ateness of information source	Explanation of final result
Investment barriers	Since the proposed baseline scenario for the Valdivia biomass power plant project activity would have used a conventional (business as usual) pulp mill configuration, the facility would have been self-sufficient in thermal and electric power generation and would have not generated additional electric power to the grid. Therefore, there would have been no additional operational risks and the project risk would have not differed from that of the conventional mill in the corresponding industry.	/PDD/	☒	This barrier is only enhanced as another investment was done (installation of the dryer) and higher are the risks associated to the project activity. Furthermore, the extra complexity of a pulp mill industry entering in the power production market remains as in the validation phase. Thus this barrier still would prevent the implementation of the project activity.

Kind of Barrier (invest, tech, other)	Description of Barrier	Evi-dence used	Assessment of validation team	
			Appropri-ateness of information source	Explanation of final result
	Investment barriers would not prevent other conventional baseline case scenarios either, such as to generate electric power by using fossil fuels. As was mentioned before, the project proponent has implemented these solutions in other of its pulp mill facilities.			
Technological barrier	The same argument mentioned above applies in this case, since in a conventional pulp mill, there are no additional technological barriers other than the ones normally found in the corresponding industries. The technological barriers for a conventional power generation alternative would also be minor, since there are plenty of companies and brokers that provide new / used power generation equipment, spares and technical support at competitive prices today	/PDD/	☒	Another equipment enhances also the complexity of the project activity once the low pressure steam that was firstly partially released to the atmosphere is now reused in the process (dryer). The subjects raised during the validation phase, such as increase of quantity of equipment which increases the overall risk of failure, the requirement of high skilled and trained labor to operate the pulp mill and dispatch the energy to the grid still remain as a technological barrier. Thus, this barrier still would prevent the implementation of the PA.
Barriers due to	The proposed baseline case scenario, as well as each of the		☒	The installation of the dryer does not change the fact that, at the time of

Kind of Barrier (invest, tech, other)	Description of Barrier	Evi-dence used	Assessment of validation team	
			Appropri-ateness of information source	Explanation of final result
prevailing practice	other conventional power generation alternatives presented in Step 1 constitutes the common practice in the corresponding industries.			validation, Valdivia was the first pulp mill in Chile designed to generate surplus of electricity to be dispatched to the grid. Thus, this change does not affect this barrier.
Cultural Barrier	There would be no cultural issues with the proposed baseline project scenario or with any of the BAU / conventional alternatives presented in Step 1. There are no barriers in the pulp industry that would prevent the utilization of alternative fossil fuel power units for electric power generation other than the ones that could be found in the corresponding industry. Though the installation of a small power plant nearby a pulp mill would imply entering into the power generation business, the operation and administration of such power facility could be done with independence of the pulp mill operation.		☒	The inclusion of a dryer to reduce the biomass moisture does not affect this barrier.
Barriers to entry in the electric	Given that the proposed baseline scenario would not contemplate additional electric power generation capacity, the coordination		☒	The inclusion of a dryer to reduce the biomass moisture does not affect this barrier.

Kind of Barrier (invest, tech, other)	Description of Barrier	Evi-dence used	Assessment of validation team	
			Appropri-ateness of information source	Explanation of final result
power industry:	for power injection with the CDEC-SIC and the transmission, distribution and power companies would not be required, so none of the barriers mentioned before for the project activity would apply. The only coordination the power plant would require would be that of any normal client with the electric system, which would be part of the business as usual practice. As for the conventional power generation baseline options, these barriers would exist, however, given the nature of the more conventional power generation alternative, they would be less restrictive. It must be noted that most of the barriers and low incentives for renewable energy sources presented in this section have been addressed and ratified by the OECD Environmental Performance Review study for Chile, published early in 200519. Given that the identified barriers do compromise the viability of the proposed project activity and do not significantly affect the baseline or the other project activity alternatives, the proposed project activity presents a clear case for additionality from a barrier perspective analysis.			

APPENDIX 3: STATEMENTS OF COMPETENCE OF INVOLVED PERSONNEL

The statements of competence of involved personnel are included in the verification report to which this report is attached.