Validation report form for renewal of crediting period for CDM project activities

(Version 03.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title and UNFCCC reference number of the project activity	Valdivia biomass power plant UNFCCC reference number 1787
Number and duration of the next crediting period	2nd Crediting period: 01/04/2016 – 31/03/2023
Version number of the validation report	2
Completion date of the validation report	15 November 2019
Version number of PDD to which this report applies	3
Project participants	Celulosa Arauco y Constitución S.A.
Host Party	Chile
Applied methodologies and standardized baselines	ACM0006, Version 14 “Consolidated Methodology: Electricity and heat generation from biomass”.
Mandatory sectoral scopes	Scope 1: Energy industries (renewable - / non-renewable sources),
Conditional sectoral scopes, if applicable	NA
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	77,973 CERs
Name and UNFCCC reference number of the DOE	ERM Certification and Verification Services Limited
Name, position and signature of the approver of the validation report	Melanie Eddis, Partner 

SECTION A. Executive summary

>> The project activity is presented by Celulosa Arauco y Constitución S.A. (from now on, Arauco). The proposed project activity consists of the construction of a new 550,000 (ADt/year) pulp mill with 61 MW maximum surplus electric power capacity to the grid. This new pulp mill functions as a new grid-connected biomass power plant and is located in the XIV Region of Chile. The surplus electric power capacity of the mill is a result of:

- The installation of a high capacity biomass power boiler, designed for electric power generation.

- The construction of a more efficient pulp mill, capable of generating surplus electric power for the grid.

This capacity would have not been available to the grid with a more conventional business as usual pulp mill design.
The project activity is designed to use black liquor and biomass from forest operations (bark and sawdust) for power cogeneration in the new pulp mill facility. The reduction in greenhouse gas emissions is therefore accomplished through the displacement of energy from the SIC grid by the carbon neutral surplus electric power generation of the new biomass power plant, and also by the use of the additional biomass from forest operations, which is burned efficiently in the project plant instead of being dumped in piles for natural decay or burned in the open air in an uncontrolled manner.

SECTION B. Validation team, technical reviewer and approver

B.1. Validation team member

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader & validator	EI	Labbé	Javiera	ERM CVS, London	x	x	x	x

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	**IR**	**Avis**	**Jonathan**	**ERM CVS, London**
2.	**Approver**	**IR**	**Eddis**	**Melanie**	**ERM CVS, London**

SECTION C. Means of validation

C.1. Desk/document review

>>
A detailed desk review was undertaken prior to the site visit. The desk review included:

- A review of data and information to verify the correctness, credibility and interpretation of presented information;
- Cross checks between information provided in the PDD and information from other sources, not limited to those provided by the PPs, applying ERM CVS's sectoral or local expertise and, if necessary, with independent background investigations
- Reference to available information relating to projects or technologies similar to the proposed project activity
- Review, based on the approved methodology being applied, of the appropriateness of formulae and accuracy of calculations

Where the review of the PDD at the document review stage raised issues, these were further reviewed and validated through supporting documentation and cross-checking from other sources and interviewing the PPs and relevant personnel involved in the project during the site visit. During the document review the project team also compared the proposed project activity with available information relating to projects or technologies similar to the proposed project activity under validation. Where appropriate, the validation team assessed the appropriateness of formulae and the correctness of calculations presented by the PPs.

Documents reviewed are described in Appendix 3 and correspond to PDD, ERs Calculations, and monitored data from previous monitoring periods, internal Valdivia records, laboratory reports and other public information.

C.2. On-site inspection

Duration of on-site inspection: 26/07/2016 to 27/07/2016				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	Visit to recovery boiler and power plant	Valdivia	26/07/2016	Javiera Labbé
2.	Check on site equipment installed for measuring biomass consumption (black liquor and sawdust and bark), and heat and electricity generation.	Valdivia	26/07/2016	Javiera Labbé
3	Interviews personnel on site about frequency and methods for measuring %moisture, NCV, and others.	Valdivia	27/07/2016	Javiera Labbé
4	Interviews about ex-ante ER calculation, assumptions made, data used for calculation and others.	Valdivia	27/07/2016	Javiera Labbé

C.3. Interviews

No.	**Interviewee**			**Date**	**Subject**	**Team member**
	Last name	**First name**	**Affiliation**			
1.	Santibáñez	Camilo	Trainee Engineer-Arauco Valdivia	26/07/2016	Recovery boiler and power plant operations, and monitoring device.	Javiera Labbé
2	Devoto	Giorgio	Operational manager-Arauco Valdivia	26/07/2016	Recovery boiler and power plant operations, and monitoring device.	Javiera Labbé
3	Inzunza	Claudia	Assistant Engineer-Arauco Valdivia	26/07/2016	Recovery boiler and power plant operations, and monitoring device.	Javiera Labbé
4	Rodriguez	Christian	Head of Climate Change-	27/07/2016	ER calculations, EF calculations.	Javiera Labbé

			Arauco			
5	Cancino	Hernán	Engineer-Arauco Valdivia	27/07/2016	Frequency and methods for measuring %moisture, NCV, and others.	Javiera Labbé

C.4. Sampling approach

>> Not applicable.

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	-	1	-
Application and selection of methodologies and standardized baselines	-	-	-
Validity of original baseline or its update	-	2	-
Estimated emission reductions or net anthropogenic removals	3	2	-
Validity of monitoring plan	3	2	-
Crediting period	-	-	-
Project participants	-	-	-
Post-registration changes	-	-	-
Others (please specify): description of parameters and project.	-	2	-
Total	06	09	-

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	The PDD v2 dated 16 May 2016 was compared with the latest version of CDM-PDD-FORM. ERM CVS determined whether The updated PDD has been completed using the valid version of the applicable PDD form, following the instructions therein. Since the PPs had to use a later valid version of the PDD form for the updated PDD than the version of the form of the registered PDD, ERM CVS determined whether the information transferred to the later valid version of the PDD form is materially the same as that in the registered PDD.
Findings	CAR 1 is raised because the latest version of the PDD form was not used. The PDD was updated and the latest version has been used, and correctly completed following the instructions therein. The PDD v3 is using the of CDM-PDD-FORM v11. CAR 01 was closed. ERM CVS also confirmed that the information transferred to the later valid version of the PDD form is materially the same as that in the registered PDD.
Conclusion	The PDD correctly applies the latest version of the PDD form. The information transferred to the later valid version of the PDD form is materially the same as that in the registered PDD.

D.2. Application and selection of methodologies and standardized baselines

Means of validation	By means of document review of the PDD and applied methodologies and tools, ERM CVS has validated whether the selected methodologies and other applied methodological regulatory documents are applicable to the proposed CDM project activity and that the selected versions are valid at the time of submission of the proposed CDM project activity for renewal of crediting period.
Findings	The project applies methodology ACM0006: Electricity and heat generation from biomass - Version 14.0. This is the latest available version at the time of revalidation. The project also applies the following tools:

	"TOOL07: Tool to calculate the emission factor for an electricity system (Version 07.0)". "TOOL03: Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Version 03.0)". "TOOL09: Determining baseline efficiency of thermal or electric energy generation systems (Version 02.0)". "TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)". "TOOL16: Project and leakage emissions from biomass (Version 04.0)" "TOOL11Assessment of the validity of the original/current baseline and update the baseline at the renewal of a crediting period (Version 03.0.1)". "TOOL12: Project and leakage emissions from transportation of freight (Version 01.1.0)". These are the latest versions of the applicable tools at the time of revalidation. ERM CVS confirmed that the proposed CDM project activity meets all the applicability conditions of the selected methodology and tools. This was done by validating the project description (see above) and by verifying that the methodology and tools are correctly quoted and interpreted in the PDD. Please see Appendix 6 for further details. The methodology was also confirmed to have been correctly applied with respect to the following: (a) Project boundary; (b) Baseline identification; (c) Algorithms and/or formulae used to determine emission reductions; (d) Monitoring methodology. Please see below for details. ERM CVS determined that the selected methodology and tools are correctly quoted and applied by comparing them with the actual text of the valid version of these documents, and relevant requirements in the "CDM project standard for project activities".
Conclusion	The selected methodologies and other applied methodological regulatory documents are applicable to the proposed CDM project activity and the selected versions are valid at the time of submission of the proposed CDM project activity for crediting period renewal. The selected methodology and tools are correctly quoted and applied.

D.3. Validity of original baseline or its update

Means of validation	In accordance with the project standard, ERM CVS evaluated whether the Project Participants have assessed and incorporate the impact of national and/or sectoral policies and circumstances existing at the time of requesting renewal of the crediting period on the current baseline GHG emissions, without reassessing the baseline scenario. Where data and parameters used for determining GHG emission reductions are determined ex ante (and not monitored during the crediting period), ERM CVS assessed the continued validity of the values applied, and whether project participants have appropriately updated such data and parameters where needed. The validity of the baseline and the parameters determined ex-ante has been assessed in accordance with the 'Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period'. ERM CVS assessed: • compliance of the current baseline with relevant mandatory national and/or sectoral policies; • the impact of circumstances; • whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested; • validity of the data and parameters;

	• whether the baseline has been correctly updated; • whether the data and parameters have been appropriately updated. This included evaluating the conservativeness of the assumptions made, and evidence for the values applied.
Findings	There were several inconsistencies in the PDD concerning the inclusion or exclusion of the biomass left to decay or uncontrolled burning from the Baseline Emissions. CAR 02 was raised. The PDD was corrected, and now states correctly that biomass left to decay or uncontrolled burning is included as Baseline Emissions, and consistently the emissions from the combustion of biomass residues in the power boiler are included as a project emissions. CAR02 was closed. As mentioned on paragraph 112 of the methodology: for the second and third crediting period for a project activity, the continued validity of the baseline scenario (determined during the first crediting period) shall be assessed by applying the latest version of the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period". Concerning step 1.2. of this last tool, the PP has not evaluated the impact of the latest changes in conditions: o whether the conditions used to determine the baseline emissions in the previous crediting period are still valid, and o the availability of new fuels and the impact of electricity fuel and price. CAR 09 was raised. In response, the PDD was revised. The continued validity of the baseline scenario has been assessed by applying the latest version of the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period". Concerning step 1.2. of this last tool, the PP has now evaluated the impact of changes in conditions, availability of fuels and the impact of changes in electricity and fuel prices, demonstrating that whilst there have been changes in conditions in the country, the baseline remains valid. CAR 09 was closed.
Conclusion	The baseline has been reviewed as required by ACM 0006 v 14 and required tools. The Project Participants have assessed and incorporated the impact of national and/or sectoral policies and circumstances existing at the time of requesting renewal of the crediting period on the current baseline GHG emissions, without reassessing the baseline scenario. Where data and parameters used for determining GHG emission reductions are determined ex ante (and not monitored during the crediting period), ERM CVS that the values have been updated where needed, and confirmed the validity of the updated values. The validity of the baseline and the parameters determined ex-ante has been assessed in accordance with the 'Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period'. ERM CVS confirmed that: • the baseline conforms with relevant mandatory national and/or sectoral policies; • the baseline is not impacted by the impact of changes in circumstances. This included confirming the conservativeness of the assumptions made, and evidence for the values applied.

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	By review of the PDD, emission reduction calculation spreadsheet, grid emissions factor calculations and comparison with the applied methodology and tools, ERM

	CVS determined whether the description of how to undertake the ex-ante and ex-post calculations of baseline, project and leakage GHG emissions as well as GHG emission reductions to be achieved by the proposed CDM project activity is in accordance with the applied methodology and tools. Where the applied methodology or tools allow for selection between options for equations or parameters, ERM CVS has determined whether adequate justification has been provided (based on the choice of the baseline scenario, context of the proposed CDM project activity and other evidence provided) and that the correct equations and parameters have been used, in accordance with the applied methodology and tools. Where data and parameters have already been determined and will remain fixed throughout the crediting period, ERM CVS has determined whether all data sources and assumptions are appropriate and calculations are correct as applicable to the proposed CDM project activity, and will result in an accurate or otherwise conservative estimate of the emission reductions. Where parameters are to be monitored, ERM CVS has determined whether the estimates provided in the PDD for these data and parameters are reasonable.
Findings	CL01, 02, 03 and CAR 06 and 08 were raised. Further details on the validation of the emission reduction calculations is contained in appendix 5.
Conclusion	Estimated emission reduction calculation, data and values used were found correct. CLs and CARs were closed. ERM CVS has confirmed that: (a) All assumptions and data used by the project participants are listed in the PDD, including their references and sources; (b) All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD; (c) All values used in the PDD including GWPs are considered reasonable in the context of the proposed CDM project activity; (d) The methodologies and tools have been applied correctly to calculate baseline, project and leakage GHG emissions, as well as GHG emission reductions; (e) All estimates of the baseline GHG emissions can be replicated using the data and parameter values provided in the PDD; (f) Sampling is not applicable.

D.5. Validity of monitoring plan

Means of validation	The PPs have included a monitoring plan in the PDD for validation. Based on review of the PDD and comparison with the applied methodology and tools, and a visit to the project site to check meters and records to confirm that the monitoring plan is able to be implemented, ERM CVS has determined whether the description of the monitoring plan included in the PDD complies with the applied methodology and tools and is feasible. Sampling is not applicable for the proposed project. To assess compliance of the monitoring plan with the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents, ERM CVS has: (i) Identified the list of parameters required by the applied methodologies and tools, by means of document review; (ii) Confirmed that the description of the monitoring plan contains all necessary parameters, that they are described, and that the means of monitoring described in the monitoring plan comply with the requirements of the applied methodology and tools. To assess the feasibility of the monitoring plan, ERM CVS has, by means of review of the documented procedures, interviews with relevant personnel, project plans and the on-site inspection of the proposed CDM project activity, assessed whether: (i) The monitoring arrangements described in the monitoring plan are feasible within

	the project design; (ii) The means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures, are sufficient to ensure that GHG emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex post and verified.
Findings	CL04, 05, 06 CAR 05, 07 were raised in relation to the monitoring plan. Further details on the validation of the monitoring plan, including monitoring parameters, is contained in appendix 5.
Conclusion	All CL and findings were closed. ERM CVS has confirmed that the description of the monitoring plan included in the PDD complies with the applied methodology and tools. Sampling is not applicable for the proposed project. All parameters required by the applied methodologies and tools are included in the monitoring plan. The description of the monitoring plan contains all necessary parameters, they are described, and the means of monitoring described in the monitoring plan comply with the requirements of the applied methodology and tools. ERM CVS confirmed that the monitoring arrangements described in the monitoring plan are feasible within the project design, and the means of implementation of the monitoring plan, including the data management and quality assurance and quality control procedures, are sufficient to ensure that GHG emission reductions achieved by/resulting from the proposed CDM project activity can be reported ex post and verified. ERM CVS believes that the PPs can implement the monitoring plan.

D.6. Crediting period

Means of validation	By means of document review, including verifying UNFCCC web page, ERM CVS determined whether the type and duration of the crediting period are correctly determined.
Findings	ERM CVS determined that the type and duration of the crediting period are correctly determined.
Conclusion	The type and duration of the crediting period is found correct. The crediting period is 01 Apr 2016 - 31 Mar 2023. The next crediting period of the project activity commences on the day immediately after the expiration of the current crediting period.

D.7. Project participants

Means of validation	ERM CVS checked that the names of the project participants included in the updated PDD are consistent with the names of the project participants in the latest version of the MoC statement, by means of verifying the MoC statement and checking the UNFCCC CDM website.
Findings	The Project Participant is found to be correct: Celulosa Arauco y Constitución S.A. is the only PP listed in the MoC, in the updated PDD and on the CDM website.
Conclusion	The names of the project participants included in the updated PDD are consistent with the names of the project participants in the latest version of the MoC statement.

D.8. Post-registration changes

Type of post-registration changes (PRCs)	**Confirmation** (Y/N)	**Validation report for PRCs**	
		Version	**Completion date**
Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents[1]	NA		

[1] Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

Corrections	NA		
Change to the start date of the crediting period	NA		
Inclusion of a monitoring plan	NA		
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	NA		
Changes to the project design	NA		
Changes specific to afforestation and reforestation project activities	NA		

SECTION E. Internal quality control

>> The validation activities and content of the report are subject to a review by an independent technical reviewer. The role of the Technical Reviewer is to provide oversight that all procedures have been followed by the verification team and all conclusions justified and supported by evidence. The Technical Reviewer will either accept or reject the recommendations made by the verification team.

SECTION F. Validation opinion

>> Celulosa Arauco y Constitución S.A. has commissioned ERM CVS to validate the crediting period renewal for the CDM project “Valdivia Biomass Power Plant”, in line with all relevant UNFCCC requirements. The validation was conducted in line with the CDM Validation and Verification Standard (VVS) version 2.0. The review of the updated PDD and additional documents related to the project, the baseline and monitoring methodology, the subsequent background investigation, and follow-up interviews have provided ERM CVS with sufficient evidence to validate the fulfilment of the eligibility of the CDM project for crediting period renewal.

ERM CVS confirmed that the project participants have correctly updated sections of the PDD relating to the baseline, estimated GHG emission reductions or net anthropogenic GHG removals, the monitoring plan and the crediting period using the valid version of the approved methodologies and other methodological regulatory documents that are applicable to the project activity. The updated PDD complies with all the requirements of the selected methodology (additionality demonstration was not reassessed, as per the CDM Project Standard for Project Activities). The methodologies and other methodological regulatory documents were applied in accordance with the applicable requirements in the “CDM project standard for project activities”. The baseline, the estimated GHG emission reductions, and the monitoring plan in the updated PDD comply with the applicable requirements in the “CDM project standard for project activities”, and the valid version of the methodologies and other methodological regulatory documents that are applied in the updated PDD.

As the project participants used a later valid version of the PDD form for the updated PDD than the version of the form of the registered PDD, ERM CVS confirmed that the information transferred to the later valid version of the PDD form is materially the same as that in the registered PDD.

ERM CVS confirmed the validity of the baseline through an assessment of:
(a) The impact of new relevant national and/or sectoral policies and circumstances on the baseline, taking into account relevant guidance from the Board with regard to renewal of the crediting period of a registered CDM project activity, at the time of requesting renewal of crediting period of the project activity;
(b) The correctness of the application of the approved methodologies and, where applicable, the approved standardised baselines and the other methodological regulatory documents for the determination of the continued validity of the baseline or its update, and the estimation of GHG emission reductions or net anthropogenic GHG removals for the applicable crediting period of the registered CDM project activity.
ERM CVS confirmed that the baseline is still applicable and that the estimation of emission reductions has been correctly presented.

ERM CVS therefore requests renewal of the crediting period for the project activity.

Appendix 1. Abbreviations

Abbreviations	Full texts
1. DOE	Designated Operational Entities
2. PDD	Project Design Document
3. MP	Monitoring Plan.
4. CP	Crediting Period
5. PP	Project Participant
6. IPCC	Intergovernmental Panel on Climate Change
7. NA	Not applicable
8. MoC	Modalities of Communication

Appendix 2. Competence of team members and technical reviewers

Jonathan Avis is a lead validator and verifier of CDM and Gold Standard projects and programme manager of the CDM and carbon offsetting validation & verification programmes within ERM CVS. He is also a technical reviewer for CDM, Gold Standard and VCS projects, and a lead assessor for certification of EHS and energy management systems. Jonathan has acted as the auditor or technical reviewer for more than 150 carbon offset projects in a range of sectors including power (hydro, wind, solar, geothermal, biomass), waste management, industrial energy recovery, and household energy in developing countries. Jonathan also has substantial experience in the assessment of environmental and social impacts of energy projects, against a variety of criteria including the Gold Standard for carbon offset projects, and the World Commission on Dams for large hydro. In addition to this, Jonathan is an experienced assessor of environment (ISO 14001), health and safety (EHS) management systems (ISO 45001) and energy management systems (ISO 50001) in a range of sectors. Prior to joining ERM CVS, Jonathan worked as a researcher into clean energy in developing countries at the University of Oxford, and as a manager at the carbon trading firm EcoSecurities Ltd. Jonathan has also chaired the international forum of auditing bodies ('DOE Forum') under the UNFCCC's Clean Development Mechanism (CDM). Jonathan holds a BA in Geography (1st Class Hons) from the University of Oxford, and an MSc in Environmental Change and Management, also from the University of Oxford (Distinction).

Javiera Labbe is lead validator and verifier of CDM projects. She is a lead assessor for certification of EHS management systems. Javiera has acted as the auditor for more than 20 carbon offset projects in a range of sectors including power (hydro, biomass), waste management, industrial energy recovery, and agricultural projects in developing countries. Javiera also is an experienced assessor of environment (ISO 14001), health and safety (EHS) management systems (ISO 45001) in a range of sectors. Javiera also is a management system assessor and professor (Universidad de Chile). Prior to joining ERM CVS, Javiera worked as a project manager and technical reviewer at the carbon trading firm EcoSecurities Ltd. She is a Biochemical Engineer from the Universidad Catolica de Valparaiso, and she hold an MSc degree in Environmental Management and Engineering from the Ecole des Mines de Paris.

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	Arauco	PDD version 10, 08/19/2015. "Valdivia biomass power plant". Last PDD of first crediting period.	1st crediting period	Arauco
2	Arauco	PDD version 2, 16/05/2016. Submitted to DOE for validation of the renewal of the crediting period PDD version 3, 01/08/2019.	2nd crediting period	Arauco
3	Arauco	ER Calculation Spreadsheet, v1 26/06/2016. ER Calculation Spreadsheet, v1 22/08/2019.	2nd crediting period	Arauco
4	UNFCCC	ACM 0006, Consolidated methodology for electricity and heat generation from biomass, Version 14.	Unfccc.int	UNFCCC
5	UNFCCC	TOOL07: Tool to calculate the emission factor for an electricity system (Version 07.0)".	Unfccc.int	UNFCCC
6	UNFCCC	"TOOL09: Determining baseline efficiency of thermal or electric energy generation systems (Version 02.0)".	Unfccc.int	UNFCCC
7	UNFCCC	Tool11"Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (Version 03.0.1)	Unfccc.int	UNFCCC
8	UNFCCC	"TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 03.0)".	Unfccc.int	UNFCCC
9	UNFCCC	TOOL12: Project and leakage emissions from transportation of freight (Version 01.1.0)".	Unfccc.int	UNFCCC
10	Meth Panel	"TOOL16: Project and leakage emissions from biomass (Version 04.0)	Unfccc.int	UNFCCC

11	COREMA X region.	RCA Nº279/98. Environmental permit. Approving Valdivia Plant Project of Celulosa Arauco y Constitución.	30th October 1998. http://seia.sea.gob.cl/seia-web/ficha/fichaPrincipal.php?modo=ficha&id_expediente=891034 http://seia.sea.gob.cl/archivos/EIA/2012122014/EIA_891034_DOC_7672524.pdf	Comisión Regional de Medio Ambiente. X Region.
12	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	GrossGeneration.xls (Generacionbruta.xls). Data of gross electricity generation of power plant connected to Chilean grids. 1996-2018 Data.	https://www.cne.cl/estadisticas/electricidad/.	CNE
13	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	InstalledCapacity.xls (Capacidad-Instalada-Generacion.xls). Data of year of commissioning of power plant injecting electricity to Chilean Grids. 1909-2018 Data.	https://www.cne.cl/estadisticas/electricidad/.	CNE
14	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	Monthlygeneration.xls . Monthly data of gross electricity generation of power plant connected to Chilean grids. 2015-2017 Data.	https://www.cne.cl/estadisticas/electricidad/.	Arauco
15	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	PotenciaSuficiencia.xls. Data of gross electricity generation of power plant connected to Chilean grids. 2015-2017 Data.	https://www.cne.cl/estadisticas/electricidad/.	CNE
16	KHS solutions	Energy balance for baseline and project case, up-dated.		Arauco
17	CEN. Coordinador Eléctrico Nacional	RealDia.xls., CEN.. Hourly generation of power plants connected to Chilean grids. 2015-2017 Data.	https://www2.coordinador.cl/sistema-informacion-publica/portal-de-operaciones/operacion-real/generacion-real-de-las-centrales/	CEN
18	Arauco	Grid Emission Factor.xls. Calculation of OM Grid Emission Factor. 2015-2017 Data.		Arauco
19	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	Fossilfuelconsumption.xls . Consumos-de-Combustibles-SEN.xlsx 2008-2018 Data.	https://www.cne.cl/estadisticas/electricidad/.	CNE
20	Arauco	Additional_Elec_Power_Consumption.xlsx		Arauco
21	KHS solutions	MEMO – Background to parameters etc. used in balance calculations and in emission reduction calculations		KHS Solutions - Arauco

22	Aker Kvaerner-Arauco	Operation Manual Power Boiler		Arauco
23	Aker Kvaerner-Arauco	Operation Manual recovery Boiler		Arauco
24	Aker Kvaerner-Arauco	Operation Manual Turbogenerator 1		Arauco
25	Aker Kvaerner-Arauco	Operation Manual Turbogenerator 2		Arauco
26	Arauco	NCV biomass		Arauco
27	Arauco- CNE	Balances of energy 2016-2018	Record of electricity consumed from de grid.	Arauco
28	CNE	BNE Energy National Balance 2012		Public information. CNE
29	Arauco	March 2009 using the methodology developed by Hao et al. [1996].		Arauco
30	Meth Panel	AM_CLA_0280. Clarifications on updating DATEBaselineRetrofit of ACM0002 and on changing the grid emission factor calculation approach from ex post to ex ante. 26 Feb -01 Mar 2019/ MP 78		UNFCCC
31	IPCC	2006 IPCC Guidelines for National Greenhouse Gas Inventories. Volume 2 Energy. Chapter 1: Introduction	http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf (last access: 15/10/2016)	IPCC
32	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	Electricity import from the grid. ELimp.xls	https://www.coordinador.cl/informe-documento/mercados/transferencias-de-energia/antecedentes-de-calculo/	CNE
33	Arauco	Biomass supplied Arauco Valdivia	Distances from external sources of biomass to Valdivia plant. Calculation of tool 12-Project and leakage emissions from transportation of freight. V1.	Arauco
34	Arauco	Carbon footprint.xls	Carbon footprint. Fossil fuel consumption in power boiler and recovery boiler 2015. 2016 2017.	Arauco
35	INFOR Forestry National Institute/.Instituto	Anuario del aserrio 2018.Sawmill Yearbook 2018. Containing forestry production and residues	https://wef.infor.cl/publicaciones/publicaciones.php#P1.	Arauco

	Nacional Forestal	generation information for 2017 and 2016.		
36	INFOR Forestry National Institute/.Instituto Nacional Forestal	Estaditicas forestales. Forestry statistics. Residues factors, efficiencies and other factors for different kind of wood industry. Index biomass surplus Valdivia 2017 and 2016.xls. Arauco.		Arauco
37	Arauco	Biomass balance in Valdivia Region.		Arauco
38	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	Report: *Estudio de capacidad técnica disponible en sistemas de transmisión dedicados. Study of technical capacity available in dedicated transmission systems.*		CNE
39	Chilean Congress	Ley 20805. 2015. *Perfecciona el sistema de licitaciones de suministro eléctrico para clientes sujetos a regulaciones de precios*. Law 20805.2015. *Improves the system of tendering of electricity supply for customers subject to price regulations*.	https://www.leychile.cl/Navegar?idNorma=1074277	Chilean Congress
40	Energy Ministry	Resolución Exenta N°558, 2017. *Complementa y modifica Resolución Exenta N°778, que establece plazos , requisitos y condiciones para la fijación de precios de nudo promedio.* *It complements and modifies Resolution No. 778, which establishes deadlines, requirements and conditions for setting average node prices.*	https://www.leychile.cl/Navegar?idNorma=1108966	Energy Ministry
41	El Mercurio	El Mercurio articule. Consumo eléctrico de clientes libres tendría su peak en 2021. Electricity consumption of free customers would peak in 2021. This explain the decreasing prices in the new tendering in Chilean energy market.	http://www.elmercurio.com/inversiones/noticias/acciones/2018/02/26/consumo-electrico-de-clientes-libres-tendria-su-ipeaki-en-2021.aspx	El Mercurio
42	CNE. Nacional Energy Commission /Comisión Nacional de Energía.	CNE article explaining the decreasing prices in the new tendering in Chilean energy market	https://www.cne.cl/prensa/prensa-2017/11-noviembre-2017/valor-de-la-energia-mas-bajo-en-la-historia-de-las-licitaciones-en-chile/	CNE
43	Generadoras de Chile. Chilean Generators	Newsletter article explaining the decreasing prices in the new tendering in Chilean energy market	http://generadoras.cl/documentos/boletines/boletin-mercado-electrico-sector-generacion-julio-2018	Generadoras de Chile.
44	CNE. Nacional Energy Commission	Resolución Extenta N°207. 2019. Informe-costos-de-generación-2019. Tables 8, 9 and 11. Figure		CNE

	/Comisión Nacional de Energía.	1. Average costs of installations and operation of several kind of energy generation plans.		

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. CL from this validation

CL ID	01	**Section no.**	B.6.2	**Date:** 27/08/2016
Description of CL				

There are some equations/calculation methods used for ER calculations that are not clearly explained in the PDD and they are not part of the methodology ACM 0006. If the PP considers keeping these calculation methods in the PDD, Then, for the following situations:

i. Explain the assumptions and calculations in the PDD

ii. Submit information concerning how the fixed ex-ante value was determined (Section B.6.2) if applicable.

iii. Explain the conservativeness of the assumptions made.

1. Fossil fuel consumption in baseline: According to Step 4 (PDD v2, page 59), fossil fuel consumption is not applicable in baseline because the balance of process heat would not be met using fossil fuels, only with biomass. However, PP is considering in ER calculations, some fossil fuel consumption for start-up process and wet condition of biomass in winter. There is no equation/explanation in PDD for this, just a parameter "Fuel oil consumption per unit of combusted biomass in the Valdivia mill power boiler" in B.6.2, (page 78 of PDDv2), as a factor to determine the fuel oil consumption in baseline scenario. Please explain.

2. $EL_{pj,aux,y}$: According to methodology ACM0006, the parameter $EL_{pj,aux,y}$ should be measured using electricity meters. The PDD includes this parameter in section B.7.1 stating this parameter will be measured directly. However, this parameter would be calculated

$$EL_{pj,aux,j} = EL_{\text{consumed by entire cellulose plant}} \times Factor_{\text{ex-ante}} (4,59\%)$$

The factor "Additional electric power consumption of the project mill" is included in section B.6.2 (page 78 of PDDv2). Please explain also the reasons why this parameter ($EL_{pj,aux,y}$) cannot be directly measured and the rational for this factor.

Project participant response	**Date:** 01/03/2019

1) Fossil fuel consumption in baseline

Power boiler:

(2) Fossil fuel is accounted here when: i) it is consumed when the plant is selling surplus power to the grid and ii) fuel oil used to burn additional biomass related to the project activity.

About i) project emission source, the project participant will monitor all the additional fossil fuel consumed used to generate additional electric power to the grid. Note that fossil fuel consumption will only be considered as a project emission source when the pulp mill is generating surplus power to the grid. Under that condition, the project will consider all the fossil fuel used to increase the electric power output of the plant as a project emission source.

About ii) project emission source, for conservative reasons and simplifying the monitoring effort of this parameter, the project participant will contemplate as project emission **all amount of fossil fuel used to reduce moisture content of the total biomass consumed in the power boiler instead of only considering the additional biomass related to the project**, described originally in the registered PDD.

Which indicate to use a specific factor - (historic fossil fuel consumption per unit of biomass consumed in the power boiler under normal operation conditions).

Note that in addition to the latter, before the drier was installed, a relevant amount of fuel oil was consumed to reduce moister content of biomass with aim to maintain the T° of the chamber, improving efficiency of biomass combustion and therefore, increase steam generation. The drier was installed and start operating on Feb 15, 2013 with aim to minimize the fossil fuel consumption used to reduce moisture content of biomass consumed in the PB.

Recovery boiler:

The recovery boiler would be designed in the baseline and project case for the same amount of black liquor to be burnt and would have included the possibility of co-firing fossil fuels due to technical constraints. Average historical data of FO consumed in the recovery boiler due to operational reasons (e.g. trips, start-ups, etc..) results in 13,915 ton FO and 1,001 ton FO for the power boiler.

	CDM VALDIVIA BIOMASS POWER PLANT				
	Power boiler		Recovery boiler		
	Total FO	Project	Total FO	Project	
2013	not available	3,368	not available	2,408	
2014	1333	488	not available	1,040	Biomass drier was installed
2015	4756	711	17,223	2,225	
2016	761	228	13689	1,496	
2017	3,243	292	16505	1099	
Average FO consumption	2,523	1,522	15,806	1,891	
Baseline Fo consumption (*)	1,001		13,915		

Notes

(*) Baseline FO results from the substraction between average total FO consumed on the boiler minus the average FO attributable to the project activity

(**) Total FO monitored and informed in the carbon footprint measurement.

In the baseline case both boilers would have consumed some fuel oil as well. Boilers do allow some use of fossil fuels for start-up operations, to generate power when the mill is not capable of generating enough power for its own consumption. Since these two situations are not related to the implementation of the proposed project activity, as they would occur with or without the implementation of the project activity, fossil fuel amount is contemplated as part of the baseline case.
FO that would be consumed in the baseline case per campaign type (euca, pine) can be seen as follows:

Use of fossil fuels in the baseline due to technical constraints		Pine		Euca	
		Recovery boiler	Power boiler	Recovery boiler	Power boiler
Total Fuel oil used in the recovery boiler (note 1)	**(ton/yr)**	**9,740**	**0.0**	**4,174**	**1,001**
Fuel oil net calorific value	(GJ/ton)	39.8	39.8	39.8	39.8
Total Diesel used in the recovery boiler	**(ton/yr)**	**0.0**	**0.0**	**0.0**	**0.0**
Diesel net calorific value		41.4	41.4	41.4	41.4
				0.0	0.0
Total Natural gas used in the recovery boiler	**(ton/yr)**	**0.0**	**0.0**	**0.0**	**0.0**
Natural gas net calorific value.	(GJ/ton)	46.5	46.5	46.5	46.5
				0.0	0.0
Total Liquid petroleum gas (LPG) used in the recovery boil	**(ton/yr)**	**0.0**	**0.0**	**0.0**	**0.0**
LPG net calorific value.	(GJ/ton)	44.8	44.8	44.8	44.8
				0.0	0.0
Heat generation in the recovery boiler from fossil fuel utiliz	**(GJ/yr)**	342,759	0	146,897	35,225

$EL_{,pj,aux.y}$
This parameter $EL_{pj,aux,j}$ corresponds to "Additional electric power consumption of the project pulp mill" with surplus power generation capacity to the grid compare to a baseline pulp mill, which does not have surplus power capacity to the grid. This marginal higher power consumption is derived from **the installation of the equipment that enables to generate the surplus power to the grid.**

The PP informs that the additional electric power consumption is not possible to measure directly since it would require simulating the power consumption of a mill without surplus power generation capacity to the grid, given the production level of the project mill. **Note that this has been informed in the original PDD registered.**

In this case, the PP will determine the additional electric power consumption of the project as a percentage of the total electric power consumption of the pulp mill with surplus electric power capacity.

- The original value of this constant informed in the registered PDD is **4.59[2]%,** and it was determined using data obtained from energy and mass balance of the project and baseline mill, performed under average production level of the pulp mill, which contemplates 65% of the time pine campaign and 35% of the time

[2] Determined as the additional internal power consumption (3.0 MW) divided by the total internal power consumption of the project plant 63.4 MW (63.9*70% + 62.4*30% = 63.5 MW)

euca campaign. This approach was accepted in the original registered PDD as it is a good representation of the behavior of the real mill, and so considered appropriate and realistic at that time.

The following table resume the data used to calculate this constant:

Power generation and biomass data (Desing capacity)		Real mill			Baseline mill			Δ
		Pine	Eucalyptus	Wghted. avg.	Pine	Eucalyptus	Wghted. avg.	(Real - Baseline)
Gross electric power generation	(MW)	107.3	81.8	98.3	64.0	53.81	60.4	37.9
Internal consumption	(MW)	63.9	62.4	63.4	60.4	60.6	60.5	2.9
Black liquor production	(tDS/yr)	0	0	0	0	0	0	0
Biomass from forest operations	(BDt/yr)	0	0	0	0	0	0	0
Source:								
KSH energy / mass balances (Please see section A.4.3 of this PDD)			Additional power consumption due to the proje			(MW)		4.59%

Note: For both real and baseline mill values used to calculate the constant are from design the energy and mass balance, performed under average production level presented in the project design document (PDD),

The original value of 4.59% is updated with the value 4.71%: determined as the additional internal power consumption of the project activity divided by the total internal power consumption of the project activity. This new constant value assumes pulp mill production of 70% of the time under pine campaign and 30% under euca campaign. This is a more realistic representation of the pulp mill behavior than the one estimated originally. See table following with calculations:

Project case power generation data (average production without restricted production)

		project case			Baseline mill			Δ
		Pine	Eucalyptus	Wghted. avg.	Pine	Eucalyptus	Wghted. avg.	(Real - Baseline)
Gross electric power generation	(MW)	107.3	81.8	99.6	64.0	53.81	61.0	38.6
Internal consumption	(MW)	63.9	62.4	63.5	60.4	60.6	60.5	3.0
Black liquor production	(tDS/yr)	0	0	0	0	0	0	0
Biomass from forest operations	(BDt/yr)	0	0	0	0	0	0	0
Source:								
AFCelpap energy / mass balances.			Additional power consumption due to the project activity			(MW)		4.71%

The PP describes the method used to determine the Additional electric power consumption of the project pulp mill

The PP will determine the additional electric power consumption of the project pulp mill as a percentage of the total monitored electric power consumption of the pulp mill with surplus electric power capacity.

$$EL_{pj,aux,j} = EL_{pulp\ mill} * 4.71\ \%$$

Where:

$EL_{pulp\ mill}$: Directly measured value of the electric power consumption of the pulp mill. Determined using proper and dedicated electric meters. The accuracy level of these metes is +/- 0.5%

Documentation provided by project participant

The PP obtains the project and baseline parameters (see table above) by calculating a weight average of values obtained during eucalyptus and pine campaign. *Ref: Emission reduction calculations spreadsheet/data sheet!"*

- *"Additional electric power consumption" spreadsheet*
- *HC Balance Valdivia.xls spreadsheet*
-

DOE assessment | **Date:** 06/08/2019

1. Fossil fuel consumption in baseline

Step 4 of the ACM 0006 is not applicable because there is no need for fossil fuel consumption for energy needs in the baseline case (to meet the balance of process heat and electricity). However there is some consumption of fossil fuel (in baseline case) for operational reasons as start-up and (mill) trip, so the PP has considered the following criteria to define de fossil fuel in baseline case:

- *Recovery boiler: all fossil fuel consumed for operational reasons: start-ups and (mill) trips. Situations not related to the implementation of the project activity.*
- *Power boiler: all fossil fuel consumed during winter and wet season when biomass has higher moisture content will be considered for the baseline case.*

The fossil fuel consumptions when there is no injection of energy to the grid will be considered baseline. (situation explained in the PDD section B.6.1 "Determination of PE FF,y"). PP will no longer use a factor (%) to determine the baseline consumption and this approach is considered conservative.
It is also in accordance with:

- *Tool 3- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion and*
- *the up-dated ACM 0006 v14 and Monitoring Plan,*

The parameter $FC_{i,j,y}$ (Quantity of fuel type i combusted in process j during the year y) is considered the total amount of fossil fuel consumption of the boiler and power plant measured ex-post in the project case. ($FC_{i,j,y}$ from other internal processes as internal transportation is considered also in a separate manner as per the MP). This situation differs from the last crediting period, when BE_{ff} were considered = 0 tCO_2 and PE_{ff} were considered as emission from fossil fuel only attributable to the project (subtracting the baseline consumption) and not the total consumption.
For this reason, in order to determine the values applicable for $FC_{i,j,y}$, PP used fossil fuel consumption of the two boilers as defined by the carbon footprinting records (34) (reviewed and found correct), and reported data from the previous period are not used.
Values of fossil fuel used for ex-ante ER estimation.xls(3) and PDD v3 (2) were reviewed and found correct and consistent with this approach.

2. $EL_{,pj,aux.y}$: Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh) (parameter 33 of ACM 0006).

As the installed equipment for generating surplus energy are the same as the baseline case, it is not possible to conduct direct measurement for this parameter. The PP is proposing to use a factor of the total power consumption of the pulp mill. This equation has been used since the first crediting period. This factor has been updated, using the 30% pine and 70% euca as informed in the spreadsheet "Additional electric power consumption" (20), this calculation also used information from the energy balance performed for the first crediting period for KSH solutions, HC Balance Valdivia.xls (16). The calculation of the factor 4,71% was reviewed and found correct (20). This value is more conservative than 4.59% used during the first crediting period.

CL1 is closed.

CL ID	02	**Section no.**	B.6.2	**Date:** 27/08/2016

Description of CL

Concerning the determination of the following ex-ante fixed values: $CAP_{HG,h,,}$ $LFC_{HG,h,}$ (power and recovery boiler) the PP is asked for evidence for the following data used to calculate the parameters above:

1) *3,650.5 (tDs/d) as a design load as per manufacturer of the recovery boiler, and of 540 (BDt/d) for the power boiler.*
2) *3,307 tDS/d (pine) and 2,952 tDS/d (euca) as average load of the recovery boiler (black liquor), as per baseline energy/mass balance.*
3) *483.68 (BDt/d) (euca) as average load of biomass (sawdust and bark) as per baseline energy/mass balance.*
4) *422MW of design maximum heat generation capacity of the recovery boiler, as per energy/mass balance.*
5) *76,1MW of design maximum heat generation capacity of the power bolier, as per energy/mass balance.*
6) *$CAP_{HG,h}$: = 0 (MW). For pine.*

Project participant response **Date:** 01/03/2019

The PP provides evidence for the following parameters ex.-antes:
Baseline load factor of heat generator: $LFC_{HG,h}$
At pine campaign, average black liquor flow to the **recovery boiler is 3,307 tDS/d (pine) and 2,952 tDS/d (euca)**. The black liquor quantities have been specified for the pulping process by the suppliers of the actual pulp mill.
Under Pine campaign:
The baseline load factor (90.6%) is determined as follows: (Average load of black-liquor) / (Black-liquor design capacity of the recovery boiler), where:
- Black-liquor average load of 3,307 (tDS/d) obtained from the energy / mass balances presented in the

PDD.
- Black liquor average load 3,650 (tDS/d) corresponds to the black-liquor design capacity of the recovery boiler.

The base line recovery boiler capacity has been selected to be 3650 tDS/d which gives a load factor of 90,6% at pine campaigns, which is in line with the normal practice within the pulp and paper industry, with load factors in the range of (90% – 92%). ***Refer to MEMO – Background to parameters used in the balance calculations and in emission reduction calculation, 90045-N-T02-1, KSH consulting*.**
Under Euca campaign:
The baseline load factor (80.88%) is determined as follows: (Average load of black-liquor) / (Black-liquor design capacity of the recovery boiler), where the load factor 80.88% is determined as follows: 2,952/3,650.5 under euca pulp production. At euca campaigns the load factor will be less or 80,88%. The reason for this is that the specific solids generation at pulp production from euca is much lower than for pine. Another way to express this is that the yield is higher for euca pulp production than for pine pulp production. **Refer to MEMO – Background to parameters used in the balance calculations and in emission reduction calculation, 90045-N-T02-1, KSH consulting.**

- **Baseline capacity of heat generator h (GJ/h) $CAP_{HG,h}$**

The recovery boiler:

Units	MCR (1)	MCR ratio	Design (2)
MW	399,3	0,946	422

Notes:
(1) The MCR definition is the supplier guaranteed or otherwise given maximum continues load to the complete mill or to the equipment. **The 399.3 MW corresponds to the MCR value, informed in the original PDD.**
(2) This is the design capacity determined from the MCR value originally informed in the baseline energy and mass balance informed in the registered PDD.

The maximum continues load (MCR) (399.3/422) or 0.94 which is in line with the normal practice, 90 – 92%, within the pulp and paper industry. *Refer to MEMO – Background to parameters used in the balance calculations and in emission reduction calculation, 90045-N-T02-1, KSH consulting.*
The Power boiler:

Units	MCR (1)	MCR ratio	Design (2)
MW	71,7	0,933	76,9

Notes:
(1) The MCR definition is the supplier guaranteed or otherwise given maximum continues load to the complete mill or to the equipment. **The 71,7 MW corresponds to the MCR value, informed in the original PDD.**
(2) This is the design capacity determined from the MCR value originally informed in the baseline energy and mass balance informed in the registered PDD.

The maximum continues load (MCR) 0.933 that is in line with the normal practice, 90 – 92%, within the pulp and paper industry. *Refer to MEMO – Background to parameters used in the balance calculations and in emission reduction calculation, 90045-N-T02-1, KSH consulting.*

- **($LFC_{HG,h}$) = Baseline load factor of heat generated power boiler (ratio)**

In the case, the load factor 0.884 was determined as the ratio of 106.1 (t/h) / 120 (t/h) of steam under average euca production level. This ratio is around 90%, which is in line with normal practice (90%-92%) within the pulp and paper industry.
The values informed of 106.1(t/h) corresponds to the average load of steam generated under euca campaign, obtained from the design baseline case energy and mass balance, performed under average production level and informed in the revalidated PDD.

The value informed of 120 (t/h) corresponds to the design load of steam of the biomass power boiler specified in the baseline case.

References of documents used as evidence:

i) Design data of the boiler: Caldera BFB de Kvaerner, Valdivia Celulosa Arauco y Constitucion S.A. (BFBM-566-1), page 19, scenario N°2
ii) Refer to "**Memo- background to parameters used in the balance calculations and in the emission reduction calculations, section Boiler capacities and boiler load factors".**

$CAP_{HG,h}$= Baseline capacity of heat generator h (GJ/h) 0 (MW). For pine

Under a conventional pulp mill design, Kraft cycle for pine the mill would be self-sufficient in term of energy (heat and electricity) using the recovery boiler only. The Kraft cycle for Eucalyptus does not produce enough black liquor to generate all the electric power required by the mill. This shortcoming is a characteristic of a conventional pulp mill design, since other modern pulp mills recently built in Chile also present a small power deficit when they produce pulp from Eucalyptus. Refer to the diagrams on PDD which shows the energy / mass balances of the conventional BAU pulp mill and the project pulp mill.

Baseline heat to power ratio of heat engine i: (note that the original heat to power ratios calculated originally during the site visit have change as follows:

The PP would like to inform the following:

For baseline load factor of the power boiler, the PP considers more appropriate to use steam load (design and average) instead of biomass load (design and average data), as it was informed in the draft PDD.

References of documents used as evidence:

i) For additional information, refer to “Memo- background to parameters used in the balance calculations and in the emission reduction calculations.doc”.

- For the energy and mass balances, the PP informs assumptions made and monitored data used for the energy calculations:

For the revalidation of Valdivia CDM project, real measured values have been used as far as possible. In the emission reduction calculations, when it was possible average monitored data from 2009 to 2014 was used.

Heating values:

		Black-liquor (1)		MeOH (2)	CNCG (2)	Bark own (3)	sludge (4)
Fuel Moisture:		Pine	Euca				
Fuel mixture moisture	%	28	28	20	12,3	49,1	77,9
Fuel heating values:							
NCV dry basis	kJ/kg	12.331	11.443	19.980	7.240	19.2	13.800
Estimation of NCV:							
Evaporation of water		954	954	613	344	2367	8648
NCV	kJ/kg	11.377	10.489	19.367	6.896	16.93	5.152
NCV	GJ/t	11,377	10,489	19,367	6,896	16.93	5,152

(1) NCV excluding evaporation of water. NCV for black-liquor (pine and euca) are the values informed in the original PDD. The selected net calorific value of [11.37 pine and 10.48 euca (GJ/tDS)] for black liquor was used in the energy/mass balance calculation for the Valdivia project activity. This value is fully consistent with the default net calorific value of 11.8 (GJ/tDS) for Sulphite (black liquor) provided in table 1.2 of Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

(2) NCV(s) for MeOH and CNCG used in the energy and mass balance are crosscheck with the normal range of values used by major suppliers of evaporation and recovery boilers worldwide. Refer to the memo-MeOH and CNCGs:moister content and NCV (Net calorific value). The PP described briefly the comparison done:

The MeOH value of 19.367(GJ/BDt) corresponds to a default value used by KSH consulting in the energy/mass balances diagrams presented in this PDD. This value result to be as reasonable and conservative value when compared with values used by major suppliers of evaporation plants and recovery boilers worldwide, and AF Celpap, a leading Scandinavian consulting company. As a result, the default value informed above results in a reasonable value when compared with values used by Valmet: (19.9 GJ/tDS), Andritz: (21 GJ/tDS) and AF Celpap consulting (16.9-20.5 GJ/tDS).

The CNCG value of 6.896 (GJ/BDt) corresponds to a default value used by KSH consulting in the energy/mass balance diagrams presented in this PDD. This value results to be as a reasonable and conservative value when compared with values used by major suppliers of evaporation and recovery boilers worldwide and AF Celpap. As a result, default value above informed results in a reasonable value when compared with values used by Valmet: (7.9 GJ/tDS), Andritz: (10 GJ/tDS) and AF Celpap consulting (7.5GJ/tDS). Note that in this case tDS stands for tones of dry gas.

Note that from literature the NCV of 19.93 (MJ/kg) corresponds to pure methanol. Since MeOH is mixed with sulphur containing compounds the heating values can be lower and higher the heating value from pure MeOH. The amount of sulphur compounds is related to the white liquor sulphidity, temperature in the evaporation plant and other factors.

(3)These values, used in the energy/mass balance of the project plant, are average heating values from the monitored periods between 2009 and 2014 of Valdivia emission reduction project.

- Boiler efficiencies:

For both the biomass and the recovery boilers default values are used following the **tool09 "Determining the baseline efficiency of thermal or electric energy generation systems":**

- For both boilers an 85% efficiency is used, as specified for "new biomass boiler (on dry biomass basis).
- For power generation an overall efficiency of 83.5% as specified for cogeneration with steam turbine has used.

References of documents used as evidence:

- For detailed information, refer to the **Memo-"background to parameters used in balance calculations and in emission reduction calculations.doc".**
- Baseline energy and mass balance on average production level.pdf
  - Boiler capacities and boiler load factors.

  According to the **Memo - "background to parameters used in balance calculations and in emission reduction calculations.doc":**
    - At pine campaigns average black liquor flow to the recovery boiler is 3, 307 tDS/d and at euca campaigns the average black liquor flow is 2,952 tDS/d. The black liquor quantities have been specified for the pulping process by the suppliers of the actual pulp mill.
    - The base line recovery boiler capacity has been selected to be 3, 650 tDS/d which gives a load factor of 90,6% at pine campaigns which is in line with the normal practice, 90 – 92%, within the pulp and paper industry.
    - For the baseline biomass boiler, a boiler with 120 t/h steam generation capacity has been selected. The boiler is not in operation at pine campaigns and at euca campaigns the average load is 106,1 t/h. This results in a load factor of 106,1/120=0,884 or around 0,90 which is as mentioned above in line with the normal practice in the pulp and paper industry.
  - **Turbogenerator capacities and load factors**

    According to the **Memo - "background to parameters used in balance calculations and in emission reduction calculations.doc"**, the base line turbo generators have been selected with a capacity each of 45 MW each. This results in the following load factors:

Campaign:			Pine	Euca
Generation:				
TG1		MW	40,584	44,940
TG2		MW	23,439	8,870
Total		MW	64,023	53,811
Load factors: ($LFC_{EG,TG}$)				
TG1		**-**	**0,90187**	**0,99868**
TG2		**-**	**0,52087**	**0,19712**
Combined TG1 & TG2		**-**	**0,71372**	**0,59790**

At a first glance the load factors can be considered low. However, the following **design considerations** have been taken that justifies the capacities and load factors.

- TGs are with exactly the same size as they idea is to minimize the negative consequences of failure of one TG and also be able to have common spare parts for the generator and the rest of 13.2 kV system.
- It has been assumed that one of the turbo generator is operated with maximum admission steam flow and supplying all of the MP-steam demand, in case of pine campaigns, and part of the LP-steam demand. The other turbo generator is using the balance of HP-steam as admission steam. The outlet from the turbo generator is sent to the LP-steam system. The described operation is the most likely one to have been used in practice.
- The total installed power generation capacity is 90 MW (45MW + 45MW) in the baseline case. The difference between the design capacity and the average required capacity results is in the pine case

25,977 MW (90MW – 64,023 MW) and in the eucalyptus case 36.189 MW (90MW – 53,811MW).

- The main reasons behind the difference between average utilized and installed capacity i.e. (25,977MW and 36,189 MW) are due to the following considerations:
  a) The turbo generators have been selected on the big side to make sure that they can handle an increase in pulp production above the mill design which is quite common within the pulp industry.
  b) Margin to make sure that the TGs based on predicted values are not too small at the real plant operation.
  c) As the energy and mass balance was performed under average conditions of the pulp mill a margin shall be contemplated for seasonal variations in power consumption,
  d) Normally the pulp mill operated above average conditions for long periods of time, therefore additional capacity shall be contemplated to cope with this operational condition,
  e) To give sufficient catch-up capacity for unplanned maintenance stops,
  f) To give sufficient power generation capacity with one turbo generator to make possible a controlled shutdown or controlled reduction of production at a failure of one of the Turbo generators.

Documentation provided by project participant

- Memo - "background to parameters used in balance calculations and in emission reduction calculations.doc",
- Design data of the boiler: Caldera BFB de Kvaerner, Valdivia Celulosa Arauco y Constitucion S.A

DOE assessment | **Date:** 06/08/2019

PP has supplied the complete energy-mass balances (16) performed by KSH consultant specialised in pulp industry. These are the same energy balances presented and used during the first crediting period. However, these balances have been updated considering some data defined by ACM0006 v14 and tools required:

- *85% of efficiency of heat generation (Tool9)*
- *83.5% of efficiency of the over all heat-electricity process. (Tool9).*
- *NCV biomass obtained from previous period, and bibliography as applicable.*
- *Environmental pulp production restriction 550,000 ADt/y.*
- *Heat and electricity supplied to the process.*
- *Some other data defined during the validation of the first crediting period as a baseline and project capacity of power boilers, recovery boilers and turbo generators remain unchanged.*

Using those data, KHS consulting has up-dated the Energy balances (16), generating information that is used for ex-ante fixed values and data for parameters to be monitored ex.-post, but used for ex-ante estimations. In addition, it is supplied a report (21) detailing some of the criteria used, and results.
Some of the results are different from the PDD presented to revalidation.

It has been confirmed than:

For point 1) 2) and 3)

$LFC_{HG,h}$ Baseline load factor of heat generator h (ratio) (parameter 12)

h= rb as **Recovery Boiler**
$LFC_{HG,rb}$ for pine 3,307(tDS/d)/ 3,650 (tDS/d)= 90.6%
Being: 3,307(tDS/d) Black-liquor average load (pine) and 3,650 (tDS/d) black-liquor design capacity of the recovery boiler, according the KSH consulting. Report used for the validation of the original PDD, and up dated for the revalidation, Memo - "background to parameters used in balance calculations and in emission reduction calculations.doc", (21).

$LFC_{HG,rb}$ for euca recovery boiler= 2,952(tDS/d)/3,650.5(tDS/d) =80.88%
Being: 2,952 (tDS/d) Black-liquor average load (euca) and 3,650 (tDS/d) black-liquor design capacity of the recovery boiler, according the KSH consulting. Report used for the validation of the original PDD, and updated for the revalidation, Memo - "background to parameters used in balance calculations and in emission reduction calculations.doc", (21).

Both found correct. Those data are correctly informed and used in the PDD(2) and ERs Calculation (3)

h= pb as **Power Boiler**
$LFC_{HG,pb}$ =0.884 was determined as the ratio of 106.1 (t/h) / 120 (t/h) during euca process. There is no power boiler operation during pine processing, as explained below.
106.1 (t/h) is the average load under euca campaign, 120 (t/h) the steam generation capacity, according to (16) and (21), studies performed by KSH consulting, and also (22) Design data of the boiler: Caldera BFB de

Kvaerner, Valdivia Celulosa Arauco y Constitucion S.A. page 19, scenario N°2.
At the beginning of the revalidation, PP used data for biomass (BDt/d) to calculate the load factor of the power boiler, finely they decided to use the steam ratio to calculate the $LFC_{hg,powerboiler,.}$ Then evidence for 483.68 (BDt/d) (euca) as average load of biomass and 540 (BDt/d) as the capacity of the power boiler are no longer required.

4) Design maximum heat generation capacity of the recovery boiler 422 MW.
PP provided energy balances developed by a third party (16) used to determine the data needed for the ex-ante fixed parameters and ex-ante ER estimation. This Energy balance is performed by KSH (specialist in pulp industry) during 2016.
The recovery boiler MCR (Maximum continuous rating) 399,3 MW was validated for the baseline case during the first crediting period. Understanding the Maximum continuous rating (MCR) defined as the maximum output (MW) that a station is capable of producing continuously under normal conditions over a year. Under ideal conditions, the actual output could be higher than the MCR.
MCR= 399,3 MW MCR ratio=0,946 422 MW

This is an estimation performed by the KSH Solutions that is considered suitable. MCR ratio=0,946.

5) Similar to explanation above, for the power boiler.
The recovery boiler MCR (Maximum continuous rating) 71,7 MW (PDD first crediting period page 9) was validated for the baseline case during the first crediting period .

MCR= 71.7 MW MCR ratio=0,933 76,9MW as the max capacity power boiler

This is an estimation performed by the KSH Solutions that is considered suitable (16,21). CL02 closed

6) CAP $_{HG,h}$: = 0 (MW). For pine. Power Boiler.
PP shows the mass and energy balances performed by KSH consulting (16) showing that during pine campaign the power boiler does not operate because the black liquor generated would be enough to generate heat and electricity for the process in baseline scenario. This is consistent with the energy balances presented for the first crediting period, PDD v15 page 8.

CL02 is closed.

CL ID	03	**Section no.**	B.6.2	**Date:** 27/08/2016
Description of CL				
Concerning the definition of the ex-ante fixed values: 1) HPR $_{BL,i}$, 2)LFC $_{EG,CG,j}$, the PP is asked for evidence for the following: • *HPR $_{BL,TG1}$ =5.074 (under euca pulp production); 4.980 (under pine pulp production).* • *HPR $_{BL,TG2}$= 4.303 (under euca pulp production); 4.290 (under pine pulp production).* • *Under pine pulp production:* • *31.257MW produced to obtain $LFC_{EG,CG,TG1}$= 69.46% (31.257MW produced / 45MW installed)* • *34.53MW produced to obtain $LFC_{EG,CG,TG2}$= 76.73% (34.53MW produced / 45MW installed)* • *Under euca pulp production:* • *21.077MW produced to obtain: $LFC_{EG,CG,TG1}$= 46.84% (21.077MW produced / 45MW installed)* • *33.609MW produced to obtain: $LFC_{EG,CG,TG2}$= 74.69% (33.609MW produced / 45MW installed)*				
Project participant response				01/03/2019

$CAP_{EG,CG,i}$ = Two backpressures units of 45MW (TG1) and 45MW (TG2).
According to the original PDD, the size of the turbo generators would have been 2 x 45 MW as it is informed under the parameter $CAP_{EG,CH,i..}$ *Refer to the original PDD, Table 1: Detailed description of the Valdivia biomass power plant project activity*

Heat to power ration (HPR)
For the baseline case the following heat to power ratios have been calculated for the two turbogenerators:

$HPR_{BL,TG1}$ =4.361 (under euca pulp production); 4.935 (under pine pulp production).
$HPR_{BL,TG2}$= 6.358 (under euca pulp production); 4.616 (under pine pulp production).

Baseline heat to power ratio of heat engine is determined as follows:
(Quantity of process heat extracted from the heat engine / quantity of electricity generated in heat engine).
Value of these parameters were results from the calculations using data from the baseline design energy and mass balance. *Refer to ER_Calculation excel sheet for detailed calculation.*

$HPR_{BL,TG2}$ (pine): [4.616 = 2,316,674(GJ/hr)/139,396(MWh/yr)/3,6
$HPR_{BL,TG1}$ (pine): [4.935 = 4,288,038(GJ/hr)/241,361(MWh/yr)/3.6
$HPR_{BL,TG2}$ (euca): [6,358 = 517,458 (GJ/yr) / 22,608 /MWh/yr)] / 3.6
$HPR_{BL,TG1}$ (euca): [4.361 = 1,798,339(GJ/yr) /114,543 (MWh/h)]/3.6

Baseline load factor $LFC_{EG,CG,TGi}$:

$LFC_{EG,CG,I}$ =Baseline load factor of heat engine i (ratio)
$LFC_{EG,CG,j}$ =Baseline load factor of heat engine j (ratio)

The PP would like to inform that original values informed of power consumption have changed. This is mainly explained because of the updated baseline design energy and mass balance were with average production level under euca and pine campaign, which slightly impacted the redistribution of the power generation in the TGs, but the total power generation (MW) under euca and pine campaign remain slightly the same as originally informed.

Under pine pulp production:

Original total average power consumption: **65.78MW**
$LFC_{EG,CG,TG1}$= 69.46% (31.257MW produced / 45MW installed)
$LFC_{EG,CG,TG2}$= 76.73% (34.53MW produced / 45MW installed)

Updated total average power consumption: **64.02 MW**
$LFC_{EG,CG,TG1}$= 90.19%% (**40.58MW** produced / 45MW installed)
$LFC_{EG,CG,TG2}$= 52.09% (**23.44MW** produced / 45MW installed)

Under euca pulp production:

Original total average power consumption: **54.68MW**
$LFC_{EG,CG,TG1}$= 46.84% (21.077MW produced / 45MW installed)
$LFC_{EG,CG,TG2}$= 74.69% (33.609MW produced / 45MW installed)

Updated total average power consumption: **53.81 MW**
$LFC_{EG,CG,TG1}$= 99.87% (44.94MW produced / 45MW installed)
$LFC_{EG,CG,TG2}$= 19.71% (8.87MW produced / 45MW installed)

The baseline diagrams of the energy and mass balance informed in the PDD show an average power consumption of 64.023 MW (TG1: 40.584 MW + TG2: 23.439 MW) at pine campaigns and 53.811MW (TG1: 44.94 MW + TG2: 8.87 MW) at euca campaigns.

Campaign:			Pine	Euca
Generation:				
TG1		MW	40,584	44,940
TG2		MW	23,439	8,870
Total		**MW**	**64,023**	**53,811**
Load factors:				
TG1		-	**0,90187**	**0,99868**

TG2		-	**0,52087**	**0,19712**
Combined TG1 & TG2		-	0,71372	0,59790

The power generation in each of the Turbo generators (#1 and #2) was determined based on following parameters: a) the steam pressure in and out, b) the steam temperature in, c) steam flows in and out at the different levels, d) an overall efficiency at 83.5% as per Tool 09 "Determining the baseline efficiency of thermal electric generation systems" (version 02.0), e) thermodynamic laws and behavior of commercial steam turbines. *Design considerations that have been taken and justifies the capacities and load factors are described above in CL ID02 under section 4."Turbogenerator capacities and load factors".*

Documentation provided by project participant

Refer to ER_calculation excel sheet for detailed calculation.

***Refer to MEMO – Background to parameters used in the balance calculations and in emission reduction calculation, 90045-N-T02-1, KSH consulting**.*

DOE assessment | **Date:** 06/07/2019

1) HPR $_{BL,i}$ Heat to power of the turbogenerators (1 and 2)
Values originally asked in this CL were up dated.

HPR $_{BL,TG1}$ =4.361 (under euca pulp production); 4.935 (under pine pulp production).
HPR $_{BL,TG2}$= 6.358 (under euca pulp production); 4.616 (under pine pulp production).

PINE
HPR BL,TG1 (pine): [4.935 = 4,288,038(GJ/hr)/241,361(MWh/yr)/3.6
HPR BL,TG2 (pine): [4.616 = 2,316,674(GJ/hr) /139,396(MWh/yr)/3,6

This is calculated in ERs Calculation Xls (3), sheet Electricity baseline pine, between files 190-240. Following step 1.5 of ACM0006 v14, Option 1.

EUCA
HPR BL,TG1 (euca): [4.361 = 1,798,339(GJ/yr) /114,543 (MWh/h)]/3.6
HPR BL,TG2 (euca): [6,358 = 517,458 (GJ/yr) / 22,608 /MWh/yr)] / 3.6

This is calculated in ERs Calculation Xls (3), sheet Electricity baseline Euca, between files 190-240. Following step 1.5 of ACM0006 v14, Option 1.

This is also consistent to KSH solution report (21) page 6.

***2) Baseline load factor LFC $_{EG,CG,I}$.** Turbogenerators (1 and 2)*
Values originally asked in this CL were up dated.

According the new mass –energy balance performed by KSH consulting (16) and (21), the MW expected in a baseline case are:

Pine: TG1 40.58MW and TG2 23.44MW
Euca: TG1 44.94MW and TG2 8.87MW

Pine:
*LFCEG,CG,TG1= 90.19%% (**40.58MW** produced / 45MW installed)*
*LFCEG,CG,TG2= 52.09% (**23.44MW** produced / 45MW installed)*

Euca:
Updated total average power consumption: 53.81 MW
*LFCEG,CG,TG1= 99.87% (**44.94MW** produced / 45MW installed)*
*LFCEG,CG,TG2= 19.71% (**8.87MW** produced / 45MW installed)*

This is also consistent to KSH solution report (21) page 3-4.
Then LFC $_{EG,CG,I}$ has been up-dated accordingly, and is found to be correct. PDD and ERs Calculations has been up-dated correctly.

CL3 is Closed.

CL ID	04	Section no.	B.7.1	Date: 27/08/2016

Description of CL

Please submit references of the following values used for ex-ante ER estimates or/and informed in section B.7.1.of PDD.

1) *Biomass categories and quantities used in the project activity.: According to description in the MP, the values used for ex-ante ER Calculation are obtained from ex-post data in accordance with past monitoring periods. However, during the past monitoring periods, not all monitoring devices were installed to monitor the biomass separately as presented in "values applied". Please explain how those data were obtained.*

2) *$NCV_{BR,n,y}$: for Black Liquor (11.469 GJ/tDS for pine, 10,58 GJ/tDS for euca), Biomass sawdust and barks 16.93 (GJ/dry ton) and Sludge 5,15 (GJ/dry ton).*

3) *$EL_{PJ,imp,y}$: Project electricity imports from the grid in year y. 4,248(MWh) is informed.*

4) *FC i,j, y: Quantity of fuel type i combusted in process j during the year y. Fuel oil 10,012 (ton/yr) is informed. Different values were reported during the last monitoring periods. Not the same data used in ER calculations (where Diesel, Fossil fuel, natural gas an LPG).*

Project participant response | **Date:** 01/03/2019

Biomass categories and quantities used in the project activity:

Biomass categories quantities without restricted production from the energy and mass balance are summarized following:

Project case biomass data (average production without restricted production)

		project case (1)			Baseline mill (2)			Δ
		Pine	Eucalyptus	Wghted. avg.	Pine	Eucalyptus	Wghted. avg.	(Real - Baseline)
Power boiler								
Sludge from on-site industrial operations, heat generation.	(BDt/yr)	28.8	29.0	10,216	0.0	60.7	6,446.3	**3,770.1**
Mix of sawdust and bark from on-site industrial operations, heat and electricity	(BDt/yr)	264.6	423.0	110,490	0.0	423.0	44,922.6	**65,567.9**
Mix of sawdust and bark from off-site industrial operations, heat and electricity	(BDt/yr)	151.1	7.2	38,207	0.0	0.0	0.0	**38,207.2**
Mix of sawdust and bark from forest operations, electricity generation.	(BDt/yr)	0.0	0.0	0	0.0	0.0	0.0	**0.0**
Recovery boiler								
Black-liquor	tDS/yr	3,307	2,952	1,132,977	3,307	2,952	1,132,977	**0**
Methanol	tDS/yr	22.3	19.9	7,639	22.3	19.9	7,639.3	**0.0**
CNCGs	tDS/yr	13.5	12.0	4,621	13.5	12.0	4,621.5	**0.0**

Sources:
(1) Energy and mass balances of the pulp mill operating under average operational conditions (without the environmental restriction)
(2) Baseline energy and mass balances of the pulp mill operating under average operational conditions (Tool 09)

Biomass categories quantities with restricted production to 550,000 ADt/yr from the energy and mass balance are summarized following:

Project case biomass data (restricted production bellow 550,000 Adt/yr)

		project case (1)			Baseline mill (2)			Δ
		Pine	Eucalyptus	Wghted. avg.	Pine	Eucalyptus	Wghted. avg.	(Real - Baseline)
Power boiler								
Sludge from on-site industrial operations, heat generation.	(BDt/yr)	24.0	29.0	9,027	0.0	60.7	6,446.3	**2,580.7**
Mix of sawdust and bark from on-site industrial operations, heat and electricity	(BDt/yr)	221.0	353.0	92,252	0.0	423.0	44,922.6	**47,329.8**
Mix of sawdust and bark from off-site industrial operations, heat and electricity	(BDt/yr)	151.1	7.2	38,207	0.0	0.0	0.0	**38,207.2**
Mix of sawdust and bark from forest operations, electricity generation.	(BDt/yr)	0.0	0.0	0	0.0	0.0	0.0	**0.0**
Recovery boiler								
Black-liquor	tDS/yr	2757.4	2461.8	944,727	2757.4	2461.8	944,727	**0**
Methanol	tDS/yr	18.6	16.6	6,372	18.6	16.6	6,372.0	**0.0**
CNCGs	tDS/yr	11.3	10.0	3,858	11.3	10.0	3,849.8	**0.0**

Source:
(1) Energy and mass balance of the pulp mill with restricted production rate to 550,000 Adt/y
(2) Baseline energy and mass balances of the pulp mill operating under average operational conditions (Tool 09)

About $NCV_{BR,n,y}$:

The average heating values as well as the average moisture contents are listed in the table below.

	Reported values			
Fuel	Heating value NCV excluding evaporation of water content	Moisture Content	Calculated NCV including evaporation of water content	Remarks
	GJ/BDt dry substance	%	GJ/BDt including water	
Black liquor	**Pine - 12,331** **Euc - 11,443**	28 28	Pine –11,377 Euca- 10,48867	base-line moisture content is higher than the measured
MeOH	19,98	20	19,36	Based on data from

				CDM project Nueva Aldea.
CNCG	7,24	12,3	6,89	Based on data from CDM project Nueva Aldea
Bark own			16.93	
Sludge	13,80	77,9	5,150	

The calculations above are based on a heat of evaporation at 2,454 GJ/t evaporated water. About the NCV

$NCVi = [NCV_{avrg\ (2009-2014)} / NCV_{mix}]^* NCVi,PDD$

$NCV_{i=\ pine}$ = **12.331 (GJ7tDS)** = [11.887 (GJ/tDS) / 11.24 (GJ/tDS)] * 11.66 (GJ/tDS)

$NCV_{i=euca}$ = **11.433 (GJ/tDS)** = [11.887 (GJ/tDS) / 11.24 (GJ/tDs)]* 10.82 (GJ/tDS)

Where:
Black-liquor heating values 11.66 (GJ/tDS) for pine and 10.82 (GJ/tDS) for euca were informed in the original PDD. (refer to NCVs of biomass types.xls)

Black-liquor heating value 11.887 (GJ7TDS) of the mix informed in the original PDD (refer to NCVs of biomass types.xls)

EL $_{PJ,imp,y}$: Project electricity imports from the grid in year

The value 2,812 MWh/yr, which corresponds to the average monitored consumption of the most recent years.

Year	(MWh/y)
2018	5,053
2017	1,283
2016	2,099
	2,812

Fuente: Commercial report, Arauco Bioenergía.

FC $_{i,j,y}$: Quantity of fuel type i combusted in process j during the year y

For the recovery and power boiler the average fuel oil consumption resulted to be 15,806 ton FO and 2,523 ton FO, respectively. Details are presented following:

	CDM VALDIVIA BIOMASS POWER PLANT			
	Power boiler		Recovery boiler	
	Total FO	Project	Total FO	Project
2013	not available	3,368	not available	2,408
2014	1333	488	not available	1,040
2015	4756	711	17,223	2,225
2016	761	228	13689	1,496
2017	3,243	292	16505	1099
Average FO consumption (**)	2,523	1,522	15,806	1,891
Baseline Fo consumption (*)	1,001		13,915	

Notes
(*) Baseline FO results from the substraction between average total FO consumed on the boiler minus the average FO attributable to the project activity
(**) Total FO monitored and informed in the carbon footprint measurement.

For baseline case fuel oil amount would be consumed in the power and the recovery boiler (see table above). Both boilers do allow some use of fossil fuels for start-up operations, to generate power when the mill is not capable of generating enough power for its own consumption. Since these two situations are not related to the implementation of the proposed project activity, as they would occur with or without the implementation of the project activity, fossil fuel amount is contemplated as part of the baseline case.

Documentation provided by project participant

- *Background to parameters used in the balance calculations and in emission reduction calculation, 90045-N-T02-1, KSH consulting.*
- *NCVs of biomass types.xls*
- *Emission reduction calculations from previous monitored periods (2013-2014-2015)*
- *Carbon footprint registered for years 2015-16-17.*

DOE assessment	**Date:** 06/08/2019

1) *Biomass categories: These values are not taken from previous monitoring periods, since the previous methodology ACM 0006 v5 did not request separate biomass monitoring, so most of them were monitored as a mix. Thus, energy-mass balance calculations performed by KSH solutions consulting (16) were used to define the ex-ante estimation of biomass consumption (to be monitored ex-post).*
Using the consumption determined by the energy- mass balance, and estimating campaigns: 70% pine and 30%euca (as confirmed acceptable during the site visit) the final biomass quantity (parameter 20) was calculated in excel ER calculation (3) in "data" and "biomass consumption" sheet. Other energy balance was performed, considering the heat to process (equal in baseline and project case), in order to estimate the cut-off between biomass category 5 (B5, burnt in baseline case) and 6 (B1, left to decay in baseline case). This has been consistently applied in PDD and ER Calculations. PDD and ER calculations up-dated.

2) *NCV Sludge 5.15 (Gj/gry ton). Data informed by KHS Solutions Consulting(21). Diverse bibliography was analyzed informing very variable data for NCV of sludge of pulp mill (26). The data presented is an approximated average of the bibliography information. This data is to be monitored ex-post, then this value is only used for ex-ante ERs Estimations. Then this value is found correct.*

- *NCVBR,n,y: for Black Liquor (11.37 GJ/tDS for pine, 10.49 GJ/tDS for euca). Data informed by KHS Solutions Consulting (21). This data is to be monitored ex-post, then this value is only used for ex-ante ERs Estimations. Considering that in the previous monitoring report, from 2009-2014 the average NCV for black liquor was 11.9 and the default net calorific value of 11.8 (GJ/tDS) for Sulphite (black liquor) provided in table 1.2 of Volume 2 of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The values used for ex-ante ER estimation are found correct.*

- *NCV Biomass sawdust and barks 16.93 (GJ/dry ton) as the average of measured data in Valdivia plant during 2016 (26), directly measured data.*

- *NCV Methanol: 19.37 GJ/tDS, and CNCG 6.90 GJ/tDS, these values given by KSH consulting (21). These are to be monitored ex-post, and the quantity expected to be used (methanol and CNCG are minor compared to black liquor). The value was compared to different bibliographic information (26), and data used are considered suitable.*

3) *EL $_{PJ,imp,y}$: Project electricity imports from the grid in year.*

Year	*(MWh/y)*
2018	*5,053*
2017	*1,283*
2016	*2,099*
	2,812

Those value were compared to national data of electricity import (of power plant injecting to the grid), and data were found correct. Data from the Electric National Coordinator. https://www.coordinador.cl/informe-documento/mercados/transferencias-de-energia/antecedentes-de-calculo/ (32) , and also data monitored by the PP. Data is found correct.

4) *FC $_{i,j,y}$: Quantity of fuel type i combusted in process j during the year y. This parameter is found correct as per CL1 section1.*

CL04 is closed.

CL ID	05	Section no.	B.7.1	Date: 27/08/2016

Description of CL

The following information is not included in the PDD, section B.7.1.

1) *Biomass categories and quantities used in the project activity: Accuracy for sludge measurement, and monitoring frequency for sludge density and (%) solids: not defined.*
2) *Biomass categories and quantities used in the project activity: Mix of sawdust and bark from forest operations. Accuracy not defined.*
3) *For biomass residues categories for which scenarios B1, B2 or B3 is deemed a plausible baseline alternative: Monitoring frequency not defined.*
4) *FRf,m: Total mass of freight transported in freight transportation activity f in monitoring period m. Accuracy level not defined*
5) *Moisture content of the biomass residues. Monitoring frequency not defined for CNCG. For sludge and mix of sawdust and bark (biomass type 5,6,7,8). Measurement frequency defined as "each batch", however it is a continuous process. This needs to be clarified*.

Project participant response **Date:** 01/03/2019

1) *Accuracy for meters for sludge measurement is +-0,6kg.*
2) *The mix of sawdust and bark from off-site transported by trucks to the plant will be measured at the entrance of the plant by the weighbridge system of accuracy +/- 30 kg.*
3) *Data monitored continuously and aggregated as appropriate, to calculate emissions reductions.*
4) *Mix of sawdust and bark from off-site production sources (industrial and forest operations) brought by trucks to the Power Plant will be duly measured (weight) by proper and calibrated weighbridges with accuracy +/-30 kg when they enter the Plant.*
5) *Considering the CNCG are saturated, water content will be determined by measuring the temperature online at this point. This will let the DCS to compute the moisture content, continuously, and aggregated as required in the emission reduction calculations.*

Documentation provided by project participant

PDD for revalidation process.

DOE assessment **Date:** 07/08/2019

1) *Accuracy for weight meters for sludge measurement has been included. Monitoring frequency is also included. PP has also changed the measured method from volume to mass (according to ACM 006 v14). It was clarified in the PDD that no ERs will be claimed until the weight meter is installed.*
2) *The mix of sawdust and bark from off-site transported by trucks to the plant will be measured at the entrance of the plant by the weighbridge system of accuracy +/- 30 kg. Monitoring plan has been corrected.*
3) *Biomass categories and quantities: Data monitored continuously and aggregated as appropriate, to calculate emissions reductions. Monitoring plan has been corrected.*
4) *FRf,m: Mix of sawdust and bark from off-site production sources (industrial and forest operations) brought by trucks to the Power Plant will be duly measured (weight) by proper and calibrated weighbridges with accuracy +/-30 kg when they enter the Plant. Monitoring plan has been corrected.*
5) *Monitoring frequency of CNCG is now defined as a continuous. Monitoring frequency of Sludge and mix of sawdust and bark (biomass type 5,6,7,8) is defined as monthly.*

CL05 Closed.

CL ID	06	Section no.	B.7.1	Date: 27/08/2016
Description of CL				
Some of the parameters descriptions (name of the parameters) are not in line with ACM0006 v14 • *Biomass categories and quantities used in the CDM project activity* • *BR $_{PJ,n,y}$, Quantity of biomass residues of category n used in the CDM project activity in year y (tonnes on dry-basis).* • *BR $_{B4,n,y}$ Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline scenario is B4 (tonne on dry-basis)* • *BR $_{B1/B3,n,y}$ Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline* • *BR $_{B5/B8,n,y}$ Quantity of biomass residues of category n used in the CDM project activity in year y , for which the baseline scenario is B5, B6, B7 or B8 (tonnes on dry-basis)*				
Project participant response				**Date:** 01/05/2019
The PP has updated the description of all parameters in accordance with the ACM0006 (Version 14.0).				
Documentation provided by project participant				
PDD version 3.				
DOE assessment				**Date:** 07/07/2019
PDD has been rechecked and parameter names and descriptions are inline to ACM 0006 v14 and tools involved. **CL 06 Closed**.				

Table 2. CAR from this validation

CAR ID	01	Section no.		Date: 17/10/2016
Description of CAR				
PDD is using Version 6 of PDD form. The latest version should be used.				
Project participant response				**Date:** 01/08/2019
The updated PDD is submitted using the CDM PDD version 11.0				
Documentation provided by project participant				
PDD. Version 3.				
DOE assessment				**Date:** 13/08/2019
PDD version 3 has been up-dated to PDD form version 11. **CAR 01 is Closed**.				

CAR ID	02	Section no.	PDD several sections	Date: 27/08/2016
Description of CAR				
There are several inconsistencies in the PDD concerning the inclusion or exclusion of the biomass left to decay or uncontrolled burning from the Baseline Emissions: *PDD excludes this in:* *- B.3 page 13. Project boundary.* *- page 17. B1-B2-B3 excluded as a baseline.* *-page 36-37. B4 is the only baseline scenario identified* *- page 60. step 5.1 and 5.2 B1-B2-B3 excluded from the calculation of baseline.* *-and others* *PDD includes it in:*				

- page 28. B1 is considered baseline.
- page 38-39. step 1.1. Considering baseline B4 and B1.
-page 60. Determination of $PE_{BR,y.}$
-page 65. Leakage.
-B.6.2 parameters fixed ex-ante. page 73. EF_{BR} included.
-page 93. step 5.1 included.
-ERs spreadsheet. included.
-B7 Monitoring plan. page 105.
- and others

Project participant response | **Date:** 01/03/2019

The PP has made the corresponding corrections to the following request:

The following table summarizes the baseline case for biomass residues in the absence of the project activity defining which are applicable. Note that the following biomass categorization is according to ACM0006 (version 14.0).

Scenario	Scenario description	Feasibility in the context of the proposed project activity
B1:	The biomass residues are dumped or left to decay mainly under aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.	Yes.
B2:	The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields.	No. The biomass residues are normally used for heat and power generation in pulp mills. As a result, this baseline is not applicable in this case.
B3:	The biomass residues are burnt in an uncontrolled manner without utilizing them for energy purposes.	Yes.
B4:	The biomass residues are used for energy or non-energy applications, or the primary source of the biomass residues and/or their fate cannot be clearly identified.	Biomass used for energy: No. The generation of biofuels using forestry biomass residues (sawdust and bark) is not developed at an industrial scale in Chile (and in the world) to date. Biomass used for non-energy applications: No. The biomass residues used for energy generation purposes are not the same as the biomass residues used for feedstock for pulp and paper production. Primary source of biomass residues and/or their fate cannot be clearly identified: No. Though there is a market for biomass residues in the region, considerable surplus still remains which is not commercialized, but disposed in piles or burned in the open air. For this reason, this baseline is not really applicable for the biomass types considered under this project activity
B5:	The biomass residues are used for power or heat generation at the project site in new and/or existing plants.	Yes.

Documentation provided by project participant

PDD version 3.

DOE assessment | **Date:** 06/08/2019

PDD has been corrected. PDD version 3 states now correctly that biomass left to decay or uncontrolled burning is included as Baseline Emissions, and consistently the emissions from the combustion of biomass residues in the power boiler are included as a project emissions. **CAR02 is closed.**

CAR ID	03	**Section no.**	Several sections	**Date:** 27/08/2016

Description of CAR

Some of the versions of tools/methodology mentioned in the PDD are not valid at the time of the validation, or referenced in the methodology, or the title is not correct:

- *Name of the methodology stated is "Consolidated methodology for electricity and heat generation from biomass residues". It should be "Consolidated methodology for electricity and heat generation from biomass".*
- *"Tool to calculate the emission factor for an electricity system (Version 04.0.0)". Version 05.0.0 should be used.*
- *"Tool to determine the baseline efficiency of thermal or electric energy generation systems (Version 01)" is referenced in the PDDv2. Valid version is version 02, and the correct name is Tool "Determining the baseline efficiency of thermal or electric energy generation systems"*
- *"Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01)" is referenced in PDDv2. It is not used in the PDDv2 as it is not referenced in ACM0006 version 12.1.1*
- *"Assessment of the validity of the original/current baseline and **to** update the baseline at the renewal of a crediting period" is referenced in PDDv2. Should be "Assessment of the validity of the original/current baseline and update the baseline at the renewal of a crediting period".*

Project participant response **Date:** 01/05/2019

The name of the approved baseline methodology applied to the proposed project activity is:

ACM0006 (Version 14.0), "Consolidated methodology, electricity and heat generation from biomass".

The proposed project activity also relies on the application of the latest versions of the following methodological tools (referenced in the methodology ACM0006 (Version 14.0)).

"TOOL07: Tool to calculate the emission factor for an electricity system (Version 07.0)".

"TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 03.0)".

"TOOL09: Determining baseline efficiency of thermal or electric energy generation systems (Version 02.0)".

"TOOL05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation (Version 03.0)".

"TOOL16: Project and leakage emissions from biomass (Version 04.0)

Since this PDD is designed to revalidate the crediting period of the Trupan Biomass Power Plant in Chile project activity, the document also relies on the last versions of the following procedures/tools:

"Assessment of the validity of the original/current baseline and update the baseline at the renewal of a crediting period (Version 03.0.1)".

"TOOL12: Project and leakage emissions from transportation of freight (Version 01.1.0)".

Documentation provided by project participant

PDD updated.

DOE assessment **Date:** 13/08/2019

PDD version 3 included as all the last version of methodology ACM 0006 v14 and tools involved. Also ERs calculations.xls uses the last version of methodology and tools. **CAR 03 is Closed.**

CAR ID	04	**Section no.**		**Date:** 27/08/2016

Description of CAR

PDD v2 states as a Physical/Geographical location of the project: X Region. The project is actually located in XIV Region due to new political-administrative division created in 2007.
Project participant response **Date:** 01/06/2019
The PP has updated the project location according to the new political-administrative division.
Documentation provided by project participant
PDD updated for revalidation process.
DOE assessment **Date:** 13/08/2019
PDD version 3 has corrected the project location. **CAR 04 is closed.**

CAR ID	05	**Section no.**	B.6.2/B.7.1	**Date:** 27/08/2016
Description of CAR				
The following parameters were not included in B.6.2 Data and parameters fixed ex ante: *1) EF $_{CO2,f,}$, "Default CO2 emission factor for freight transportation activity f". From Methodological tool: Project and leakage emissions from transportation of freight (Version 01.1.0)* *2) $\rho_{i,y}$,"Weighted average density of fuel type i in year y". According to the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", measured or default values may be used . PP has not included the parameter either in the section B.6.2 or B.7.1 . This parameter is applicable when fossil fuel is measured in a volume unit.*			
Project participant response **Date:** 01/05/2019				
The PP has updated both parameters in the monitoring plan of the PDD in revalidation.				
Documentation provided by project participant				
PDD in revalidation.				
DOE assessment **Date:** 13/08/2019				
1) The revised PDD has been rechecked and $EF_{co2,f}$ "Default CO2 emission factor for freight transportation activity f", is now included in section B.6.2. in line to tool 12 version 01.1.0, 2) and ρi,y "*Weighted average density of fuel type i in year y" is included in section B.7.1. PP has used the Energetic Nacional Balance.xls BNE2012 (28)* *Data from both parameters has been reviewed and found correct. from the Energy Ministry.* ***CAR 05 is closed.***				

CAR ID	06	**Section no.**	B.6.2	**Date:** 27/08/2016
Description of CAR				
The following parameter defined as fixed ex-ante needs to be corrected: • *$EF_{CH4,BR,}$ "CH4 emission factor for the combustion of biomass residues in the project plant (tCH4/GJ)": According to the monitoring methodology of ACM0006 v12.1.1, default values may be used. Table 4 of the methodology is correctly applied, however, table 5 is not correctly applied: the conservative factor should be 1.37 for an assumed uncertainty of 300%.*				
Project participant response **Date:** 10/05/2019				
The PP decided to used default value for this parameter and so the conservative factor of 1.37 is used following table 5 of the meth.				
Documentation provided by project participant				
PDD for revalidation process.				
DOE assessment **Date:** 13/08/2019				
PDD and ERs Calculations xls has been corrected, and table 4 and 5 from ACM 0006 v14 are correctly applied. ***CAR 06 is Closed.***				

CAR ID	07	**Section no.**	B.7.1	**Date:** 27/08/2016
Description of CAR				
The following values need to be corrected or included in B.7.1 according to ACM 0006 or the tools involved: *1) "For biomass residues categories for which scenarios B1:, B2: or B3…": According to the monitoring methodology, this information should be available and reported at the validation stage for the biomass residues identifies ex-ante, however, this information is not included. Monitoring frequency: not defined for new biomass residues categories when included during the crediting period.*				

2) *$NCV_{BR,n,y}$: "Net calorific value of biomass residue of category n in year y (GJ/tonne on dry-basis)". No NCV monitoring plan is defined for sludge, biomass (saw and bark) (biomass type 4,5,6,7 and 8)*

3) *$D_{f,m}$: "Return trip distance between the origin and destination of freight transportation activity f in monitoring period m. Data informed corresponds to single trips (the return trip distances are correctly applied in the ER calculation).*

4) *$FC_{i,m,y}$, $FC_{i,k,y}$: "Amount of fossil fuel type i consumed by power plant/unit m and k in year y". Data applied for ex-ante calculation not informed in PDD.*

5) *EGm,y, EGk,y: "Net electricity generated by power plant/ unit m and k in year y.". Data applied for ex-ante calculation not informed in PDD.*

6) *Concerning "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion": parameters: FCi,j,y, NCVi,y, EFCO2,i,y should inform the same fossil fuel that is estimated to be used in the PA; the calculation includes natural gas, LPG, diesel, and foil fuel. These parameters are not informed consistently in the parameter tables.*

7) *$EF_{CO2,i,y}$, CO_2 emission factor of fossil fuel type i used in power unit m in year y.: Data reported in PDD incorrect for IFO 180 and coal. Butane and propane, not reported as fuel used in plant connected to grid (only LPG). Fuel oil 6 and IFO 380 were consumed as reported by the CDEC-SIC (grid), however these fuels are not reported in this table. Please also confirm (with supporting evidence) that coal used corresponds to sub-bituminous coal.*

Besides, the following parameters were not included in section B.7.1.:

8) *$H_{LOW,y}$ = Specific enthalpy of the heat carrier at the process heat demand side (GJ/tonnes) and $H_{HIGH,y}$ = Specific enthalpy of the heat carrier at the heat generator side (GJ/tonnes). As per ACM 0006*

9) *LOC, "Length of the operational campaign in year y (hour)", As per ACM 0006*

Project participant response	**Date:** 01/05/2019

The PP submitted the PDD with the corrections and updated data as per required.

Documentation provided by project participant

PDD updated.

DOE assessment	**Date:** 13/08/2019

1) Parameter 20. For biomass residues categories for which scenarios B1:, B2: or B3…". This result has been included in section B.6.1 section leakage emissions.

2) *$NCV_{BR,n,y}$: sludge, biomass (saw and bark). This has been included in the monitoring plan.*

3) *$D_{f,m}$: "Return trip distance between the origin and destination of freight transportation activity f in monitoring period m." This parameter is included in appendix 5 of the PDD, and correct value is presented there.*

4) *$FC_{i,m,y}$, $FC_{i,k,y}$: "Amount of fossil fuel type i consumed by power plant/ unit m and k in year y". PP has decided to apply EF_{OM} fixed ex-ante for the entire second crediting period.* ***This requirement is no longer applicable*** *as there are not to be included in B.7.1. This point is closed.*

5) *EGm,y, EGk,y: "Net electricity generated by power plant/ unit m and k in year y. PP has decided to apply EF_{OM} fixed ex-ante for the entire second crediting period.* ***This requirement is no longer applicable*** *as there are not to be included in B.7.1. This point is closed.*

6) *Concerning "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion": parameters: $FC_{i,j,y}$, $NCV_{i,y}$, $EF_{CO2,i,y}$. Up dated PDD is consistent to all fossil fuel applicable to the project*

activity. This point is closed.

7) *$EF_{CO2,i,y}$, CO_2 emission factor of fossil fuel type i used in power unit m in year y (tool7). EF calculation has been up-dated and found correct. This point is closed.*

Besides, the following parameters were not included in section B.7.1.:

8) *$H_{LOW,y}$,and $H_{HIGH,y}$ (GJ/tonnes). These parameters were correctly included in section B.7.1. The values applied were found correct. This point is closed.*

9) *LOC, "Length of the operational campaign in year y (hour)", As per ACM 0006. This parameter is now correctly included in section B.7.1. The value applied is found correct considering 354 days (subtracting the maintenance period) and 24hrs a day. This point is closed.*

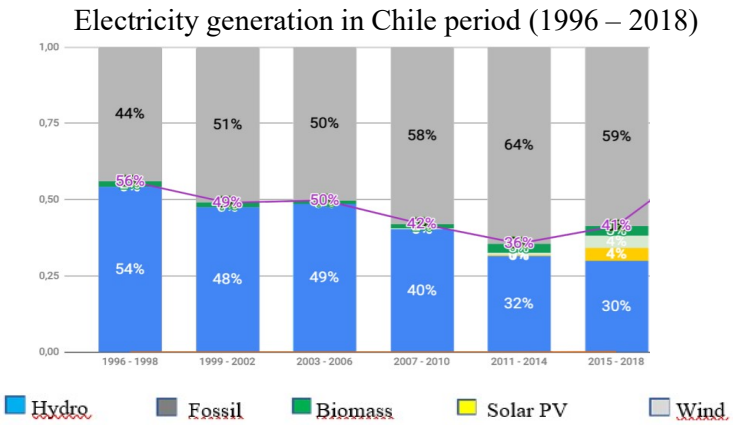
CAR 07 is closed.

CAR ID	08	**Section no.**	B.6.2, B.6.3, B.7.1	**Date:** 27/07/2016
Description of CAR				
EF cm,grid (0,656 tCO2/MWh) used for ex-ante calculations (and informed in the PDD) is different to EF cm,grid obtained using the tool "Tool to calculate the emission factor for an electricity system" (0,675 tCO2/MWh). EFom am EFbm are inconsistent also.				
Project participant response				**Date:** 01/05/2019
The grid emission factor calculation was submitted and results included in the PDD and emission reduction calculations.				
Documentation provided by project participant				
Emission reduction calculations spread sheet and PDD version 03 updated.				
DOE assessment				**Date:** DD/MM/YYYY
PP has up-dated the calculation of EFgrid, using 2015-2017 data, and using EFom and EFbm fixed for the second crediting period. After a full revision of the calculation, the EFcm is found correct. ***CAR 08 is closed.***				

CAR ID	09	**Section no.**	B.4 and B.5	**Date:** 27/08/2016
Description of CAR				
PP has re-assessed the baseline according to the methodology ACM 0006 (section B.4). This is to be performed only during the first crediting period. As mentioned in paragraph 112 of the methodology: for the second and third crediting period for a project activity, the continued validity of the baseline scenario (determined during the first crediting period) shall be assessed by applying the latest version of the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period". *Concerning step 1.2. of this tool, PP has not evaluated the impact of the latest changes in conditions:* *o whether the conditions used to determine the baseline emissions in previous crediting period are still valid.*				
Project participant response				**Date:** 01/05/2019
Step 1: Assess the validity of the current baseline for the next crediting period **Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies.** As can be seen from the baseline analysis previously presented, the current baseline for electricity (P5 and P7), heat (H5) and biomass use (B5 and B1) complies with all relevant mandatory national and/or sectorial policies which have come into effect after the submission of the Valdivia Biomass Power Plant for validation. **Step 1.2: Assess impact of circumstances** The current circumstances at the date of requesting crediting period renewal have changed to some extent to those that prevailed at the date of sending the proposed project activity to validation at the start of the first crediting period. The changes that the energy sector has experienced in recent years have been significant. At a general level, the integration of very low-cost renewable energies, such as solar and wind, has contributed to transform energy matrices in many countries. In Chile, solar and wind energy quickly became the most relevant sources among new projects, given their low costs, Chile 's natural conditions and a regulatory				

framework and favorable bidding. For example, the energy tender done in 2017 for 2,200 GWh/y was 100% renewable energy with an average awarded price of 32.5[3] USD/MWh. Two tenders were done previously. One in 2016 and the other in 2015. The tenders done in 2016 for 12,430 GWh/y, the average awarded average price was 47.6 MWh/y and the one done in 2015 for 1,200 GWh/y, the average awarded price was 79.3 USD/MW, which demonstrates the clear downward trend in the energy prices[3].

In recent years there has been a significant increase in installed capacity, especially solar and wind renewable projects of large generators, which contemplates large solar and wind megaprojects, displacing biomass and mini-hydroelectric projects.



Source: Data 1996 – 2017: Average data based on public information, CNE (National Commission of Energy)

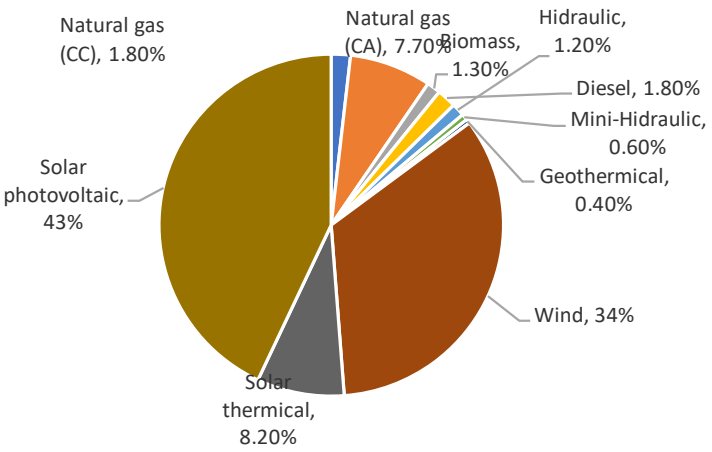
According to the graph, the share of biomass technologies has remained unchanged in recent years. This cab partly be explained to downward trend in the energy electric prices, and it should be noted that biomass generation technologies compete unfavorably with solar and wind generation technologies, which have no fuel and supply costs.

According to the CNE the distribution of the total investment according to technology, based on the information provided by the developers, and considering the projects under construction and under study is shown below:

Distribution of the total investment of projects under construction and

[3] See https://www.cne.cl/prensa/prensa-2017/11-noviembre-2017/valor-de-la-energia-mas-bajo-en-la-historia-de-las-licitaciones-en-chile/

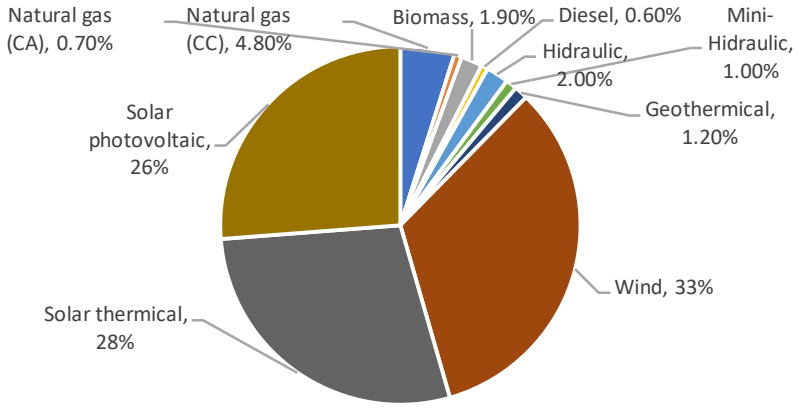
study per technology generation



Source, CNE (National Commission of Energy)

According to the CNE[4] the distribution of the total investment according to technology, based on the information provided by the developers, and considering the projects under construction and under study is shown below:

Distribution of the total capacity of projects under construction and study per technology generation.



Source, CNE (National Commission of Energy)

Based on investment and installed capacity informed above, the CNE (National Commission of energy) [5] determined the average unit cost of investment for a photovoltaic solar project is US $ 1,138 per KW installed, while for a wind one it is US $ 1,361. In contrast, the unit cost of biomass thermoelectric plants resulted to be US $ 2,056 per KW installed.

At sectorial level the internal and electric power generation for internal consumption is part of the BAU in the

[4] Refer to https://www.cne.cl/wp-content/uploads/2019/03/Res.-Ext.-N%C2%B0-207-Informe-costos-de-generaci%C3%B3n-2019.pdf page 32, Figure 1: Distribution of the total investment of projects under construction and study per technology generation.

[5] Please refer to, https://www.cne.cl/wp-content/uploads/2019/03/Res.-Ext.-N%C2%B0-207-Informe-costos-de-generaci%C3%B3n-2019.pdf, page 35, Table 8: Investment costs (USD/KW).

Pulp and Paper industry and therefore, conventional self-sufficient pulp mill, without surplus power generation capacity is the standard practice in the pulp mill industry in Chile and geographical area.

In conclusion, Chile´s natural conditions, downward trend in the energy prices and decrease in the investment cost for wind and solar technologies and regulatory framework have been promoting the increase in the installed capacity of solar and wind projects leaving the installed capacity of biomass technology without variations in recent years.

Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) is the most likely scenario for the crediting period for which renewal is requested.

This assessment is not applicable; since in the case of the proposed project activity the equipment that would have been used in the baseline scenario does not exist. This equipment did not exist at the date the project activity was started.

Step 1.4: Assessment of the validity of the data and parameters

All monitored parameters have been updated according to the new monitoring methodology of the ACM0006 (Version 14.0).

Documentation provided by project participant	
footnotes	
DOE assessment	**Date:** 13/08/2019

Step 1.2 of the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" is now properly explained in PDD section B.5.

It the following information was confirmed:

During 2003-2015 several laws and new energy policies have entered into force in Chile:

- *Law 20805. Improves the system of tendering of electricity supply for customers subject to price regulations (39) (https://www.leychile.cl/Navegar?idNorma=1074277).*
- *Resolución Exenta N°558, 2017. It complements and modifies Resolution No. 778, which establishes deadlines, requirements and conditions for setting average node prices (40) (https://www.leychile.cl/Navegar?idNorma=1108966).*

This new policy were implemented in order to encourage the installation of new power plants of "non-conventional renewable energy" (ERNC in Spanish), mainly solar and wind energy, reducing the initial obstacles that this kind of energy had to face in order to compete in the Chilean markets.

These new polices, and the decreasing construction costs of these kind of power plants (44), have had clear effects since 2014-2015, increasing the wind and solar participation in the Chilean electricity matrix (grossgeneration.xls, www.cne.cl) (12). This has meant that energy prices in new generation contracts have decreased from 110-150 USD/MWh in 2005 to 35 USD/MWh in 2017 (41) (42) (43).
Even if biomass is also considered "non-conventional renewable energy", it can be confirmed that no new biomass plant (except for biogas) has been commissioned since 2015 (installedcapacity.xls from www.cne.cl) (13), and solar and wind power has duplicated since 2016 (grossgeneration.xls, www.cne.cl) (12).

It should be noted that, in November 2017, the two most important grids in Chile were connected. Initially the Valdivia project was connected to SIC (central grid), where hydroelectric plants were an important source of energy. From November 2017 on, SIC were connected to SING (north grid), its energy mainly comes from fossil fuel sources. This means that EFcm from 2018 on is expected to increase for the effect of the SING in the project connected grid. Generating a drastic increment of the estimated emission reduction, followed for a gradual decreasing of the emission reduction due to new renewable energy plant connecting the grid (if ex-post calculation EFcm option were chosen). However, PP has chosen to keep EFbm and EFom fixed, therefore EFcm for Valdivia will not increase by the effect of the two grids being connected. This is conservative.

In conclusion:

- *Information supplied by the PP has been confirmed, also other references confirming the argument (12) (13) (41) (42) (43) (44).*

- *Even though the general situation in Chile has changed this does not impact the conditions used to determine the baseline emissions in the previous crediting period. PP has correctly evaluated this impact in the PDD section B.5.*
- *Baseline scenario (determined during the first crediting period) is still valid. Only data and parameters applicable have been correctly up-dated as per new monitoring methodology of the ACM0006 (Version 14.0).*

CAR 09 is closed.

Appendix 5. CDM Validation Protocol: Renewal of Crediting Period

1 Validation findings –PDD

1.1 Project Design Document (PDD)

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/CAR/ CL	Final OK/ NOT OK
5.1.1	Has the PP updated the sections of the PDD related to the baseline, estimated GHG emission reductions, and the monitoring plan?	PP has updated baseline, estimated GHG emission reductions and monitoring plan. Some findings where raised for these particular sections. CLs and CARs concerning GHG emission reduction and monitoring plan were duly closed as explained in section 3.3 and 4.1 of this report. The PDD of the 1st crediting period includes black-liquor, sawdust and bark as a biomass residue. The PDD for the 2nd crediting period includes these and sludge, methanol and CNCG. Those are on-site residues of the process and need to be burnt due to environmental legal requirements. These represent less than 3% of the total biomass burnt. However, in terms of thermal energy these represent less than 2% of the total thermal energy generated, and because of this were not included in the original registered PDD. This is not a change of the project, it is a change on the description of the project, due the new version of the methodology ACM0006 states to include separate information of each kind of biomass used, and previous methodologies accept to identify and monitor biomass as a mix. The PDD submitted for the renewal of the crediting period describes the use of methanol, CNCG and sludge. This does not affect the ER calculation as this biomass corresponds to B5 (used for heat generation in the baseline scenario). Because of that, this change is not significant. This does not represent an actual physical design change. This is providing a more detailed description in the PDD, hence a PRC is not considered necessary.	CLs CARs	OK
5.1.2	Is the updated PDD prepared in accordance with the latest forms and guidance required by the CDM EB? http://cdm.unfccc.int/Reference/PDDs_Forms/PDDs/index.html	Version 6 used. Version 8 of the PDD form should be used. CAR 1 is closed. Version 11 of the PDD form is used.	CAR 1	OK

1.2 Project Description

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
6.4.6	Is there a clear description of the baseline scenario in the revised PDD?	Description of the baseline scenario concerning is described: - Electricity generation in baseline case CL01 - Fossil fuel consumption in baseline case CL01 - Disposal of biomass residues CAR 02 Please refer CL01 and CAR 2 regarding baseline description. There is a clear description of the baseline scenario in section in B.4 up dated to ACM 0006 v14. All inconsistencies described in CL01 and CAR	CL01 is closed. CAR2 is closed.	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
		are closed. The baseline scenario corresponds to generation of heat and power for the pulp mill only, with no injection of energy to the grid. Biomass: black liquor, CNCG, methanol, sludge and part of industrial biomass would be burnt for generating this heat and power for internal use. Part of the industrial biomass (sawdust and bark) would have been left to decay generating methane.		

2 Validation findings –Methodology

2.1 Validity of selected methodology and methodological tools

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
6.1.1	Are the number, title and version of the approved methodology clearly and correctly stated? Is the latest version of the methodology valid at the time of submission of the revised PDD for the renewal of the crediting period used? Is the methodology within its period of validity?	CAR03. Name of the methodology stated in PDD is "Consolidated methodology for electricity and heat generation from biomass **residues**". It should be "Consolidated methodology for electricity and heat generation from biomass". The version of the methodology ACM0006 applied is valid, and within the period validity. CAR 03 closed. Number, title and version of the approved methodology are clearly and correctly stated.	CAR03	OK
	Are all the required tools applied and fully referenced in the PDD? Are the version numbers applicable at the time of validation?	CAR03 There are some tools with the incorrect version number and some tools not used in the PDD: "Tool to calculate the emission factor for an electricity system (Version 04.0.0)". Should be version 05.0 ""Tool to determine the baseline efficiency of thermal or electric energy generation systems (Version 01)". Valid version is version 02. Should be "Determining the baseline efficiency of thermal or electric energy generation systems" "Tool to calculate baseline, project and/or leakage emissions from electricity consumption (Version 01)". Valid version is version 2. It is not used in the PDD as it is not referenced in ACM0006 version 12.1.1 "Assessment of the validity of the original/current baseline and *to* update the baseline at the renewal of a crediting period" Should be ""Assessment of the validity of the original/current baseline and update the baseline at the renewal of a crediting period (Version 03.0.1)". The following tools are correctly referenced: "Tool to calculate projector leakage CO2 emissions from fossil fuel combustion (Version 02)". "Tool for project and leakage emissions from transportation of freight (Version 01.1.0)". CAR 03 closed. Number, title and version of the required tools are clearly and correctly stated.	CAR03	OK

2.2 Applicability of the selected methodology to the project activity

ERM CVS has assured the compliance of the project activity with each of the applicability conditions of the selected methodology and tools:

	Applicability Conditions in methodology and/or tools	Is this condition discussed in the PDD? (yes/no)	Does the project meet this condition? (Yes/No, or state that this condition is not relevant for the project)	Validation findings (including justification and substantiation of information, data and evidence).	Draft OK/ CAR/CL	Final OK/ Not OK
	Applicability Conditions for ACM0006 v14 (1) No biomass types other than biomass residues and/or biomass from dedicated plantations are used in the project plant;	Yes	Yes	Black liquor, sawdust, bark, sludge, methanol, and CNCG is used. All of them are residues of the onsite process, and off-site industrial process (sawdust and bark). This was validated during the site visit, confirming reception of off-site residues, onsite residues conveyer belt flow, storing and different type of recording.	OK	OK
	(2) Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired does not exceed 80% of the total fuel fired on an energy basis;	Yes	Yes	Fossil fuel is used in baseline and project scenario only for start-ups, and some occasions during the winter when biomass may be with a higher %moisture. This is confirmed through invoices and monitoring reports of the first crediting period, which confirmed that the amount of fossil fuel is rarely used.	OK	OK
	(3) For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project does not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process;	Yes	Yes	The Project does not result in an increase of the processing capacity. The project is currently working at 75% of its maximum capacity, since 550,000 (Adt/y) is the maximum production allowed in the environmental permits (the mill has up to 728,640 Adt/y of installed capacity) (ref11). This was also confirmed during the site visit, checking that the annual production is always slightly below 550,000(Adt/y) every year. The energy balance (baseline and project case) are developed considering the same energy demand for both cases. These energy balances are used to obtain ex ante ER calculations. Therefore there is no an increase of the processing capacity.	OK	OK
	(4) The biomass used by the project facility are not stored for more than one year;	Yes	Yes	The longest storage of the biomass corresponds to sawdust and bark and this is less than a week. This was confirmed during the site visit, considering records of biomass residues generation on site and biomass residues consumption. The amount of biomass generated on site is usually less that the biomass consumed in the power plant and recovery boiler. Because of this, biomass residues from off-site industries is required. Then the storage time is just a few days, considering that back-up biomass fuel is needed to guarantee the continues operation of power plant and recovery	OK	OK

	Applicability Conditions in methodology and/or tools	Is this condition discussed in the PDD? (yes/no)	Does the project meet this condition? (Yes/No, or state that this condition is not relevant for the project)	Validation findings (including justification and substantiation of information, data and evidence).	Draft OK/ CAR/CL	Final OK/ Not OK
				boiler. Sawdust, bark, sludge, black liquor, methanol and CNCG are burned as generated by the cellulose plant. Only a drying process is used to improve their quality as a fuel.		
	(5) The biomass used by the project facility are not obtained from chemically processed biomass (e.g. through esterification, fermentation, hydrolysis, pyrolysis, bio- or chemical- degradation, etc.) prior to combustion. Moreover, the preparation of biomass-derived fuel do not involve significant energy quantities, except from transportation or mechanical treatment so as not to cause significant GHG emissions;	Yes	Yes	No chemical process is used to treat any of the biomass residues types used in the project. This was confirmed during the site visit. Sawdust, bark, sludge, black liquor, methanol and CNCG are burned as generated by the cellulose plant. Only drying process is used to improve their quality as a fuel of the sawdust and bark.	OK	OK
	(6) In the case of fuel switch project activities, the use of biomass or the increase in the use of biomass as compared to the baseline scenario is technically not possible at the project site without a capital investment.	Yes	Yes	The project does not involve fuel switching	OK	OK
	(7) In the case that biogas is used in power and/or heat generation, this methodology is applicable under some conditions.	Yes	Yes	The project does not include biogas generation.	OK	OK
	(8) In the case of biomass from dedicated plantations: (a) The cultivated land can be clearly identified and used only for dedicated energy biomass plantations;	Yes	Yes	The project does not include dedicated plantations.	OK	OK

2.3 Project Boundary

Emission sources

The emissions sources included in or excluded from the project boundary, as set out in the applied methodology are as follows:

	Source	Gas	Is this source included within the project boundary in the PDD?	Is inclusion / exclusion from the project boundary justified in the PDD?	How has this been validated?
Baseline emissions	Electricity and heat generation	CO_2	Included	Yes	Main emission source. In line with ACM0006
		CH_4	Excluded	Yes	Excluded for simplification. In line with ACM0006
		N_2O	Excluded	Yes	Excluded for simplification. In line with ACM0006
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	Yes	In line with ACM0006
		CH_4	Included	Yes	CAR02. PP has explicitly and consistently included this parameter. CAR02 closed.
		N_2O	Excluded	Yes	Excluded for simplification. In line with ACM0006
Project emissions	On-site fossil fuel consumption.	CO_2	Included	Yes	There is some consumption of fossil fuel for start-up operations. In line with ACM0006
		CH_4	Included	Yes	Excluded for simplification. In line with ACM0006
		N_2O	Excluded	Yes	Excluded for simplification. In line with ACM0006
	Off-site transportation of biomass residues	CO_2	Included	Yes	In line with ACM0006
		CH_4	Excluded	Yes	Excluded for simplification. In line with ACM0006
		N_2O	Excluded	Yes	Excluded for simplification. In line with ACM0006
	Combustion of biomass for electricity and heat generation	CO_2	Excluded	Yes	Assumed no influence in LULUCF sector. In line with ACM0006
		CH_4	Included	Yes	In line with ACM0006. However pending CAR02. PP has explicitly and consistently included this parameter. CAR02 closed.
		N_2O	Excluded	Yes	Excluded for simplification. In line with ACM0006
	Waste water from treatment of biomass residues	CO_2	Excluded	Yes	Not applicable to the project. In line with ACM0006
		CH_4	Excluded	Yes	Not applicable to the project. In line with ACM0006
		N_2O	Excluded	Yes	Not applicable to the project. In line with ACM0006
	Cultivation of land to produce biomass feedstock.	CO_2	Excluded	Yes	Not applicable to the project. In line with ACM0006
		CH_4	Excluded	Yes	Not applicable to the project. In line with ACM0006
		N_2O	Excluded	Yes	Not applicable to the project. In line with ACM0006

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.3.1	Has the PDD justified the inclusion/exclusion of all potential sources of GHG emissions as set out in the applied baseline methodology	Yes. All inclusion and exclusion defined and justified in section B.3 and B.4 Except Related CAR 2. CAR 02: PP has explicitly and consistently included CH_4 from Uncontrolled burning or decay of surplus biomass residues and combustion of biomass for electricity and heat. CAR02 is closed.	CAR02	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.3.2	Does the PDD correctly describe the project boundary, including the physical delineation of the proposed CDM project activity included within the project boundary?	X Region of Los Lagos is stated in PDD v2, instead of XIV Region, according to new political division of Chilean Regions. CAR 04: PP has corrected this information in PDD version 3. CAR 04 in Closed.	CAR04	OK
	Were any emission sources identified that will be affected by the project activity and are not addressed by the selected approved methodology? If so, was clarification of, revision to or deviation from the methodology approved in accordance with required procedures.	All sources are identified in the methodology ACM 0006. No emission sources were identified that will be affected by the project activity and are not addressed by the methodology.	OK	OK

3 Validation findings – Baseline and emission reductions

3.1 Baseline identification

The baseline identification has been validated as follows:

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.1.1	Does the PDD identify the baseline, a scenario that represents the anthropogenic emissions by sources of GHG that would occur in the absence of the proposed CDM project activity?	Except CAR02. The rest of the baseline describes the anthropogenic emissions in line with the methodology ACM 0006. Section B.4 describes the baseline scenario and the GHG emissions in this case. CAR 02: There are several inconsistencies in the PDD concerning the inclusion or exclusion of the biomass left to decay or uncontrolled burning from the Baseline Emissions. In response, the PP explicitly and consistently included CH_4 from uncontrolled burning or decay of surplus biomass residues and combustion of biomass for electricity and heat. CAR02 is closed. Please see Appendix 4 for details.	CAR02	OK
	Does the identified baseline conform to an allowed baseline under the applied methodology?	CAR 02 was raised: There are several inconsistencies in the PDD concerning the inclusion or exclusion of the biomass left to decay or uncontrolled burning from the Baseline Emissions. CAR 02: PP explicitly and consistently included CH_4 from uncontrolled burning or decay of surplus biomass residues and combustion of biomass for electricity and heat. CAR02 is closed. Please see Appendix 4 for details.	CAR02	OK

3.2 Assessment of the validity of the original/current baseline

In accordance with the project standard, paragraph 290, Project Participants shall assess and incorporate the impact of national and/or sectoral policies and circumstances existing at the time of requesting renewal of the crediting period on the current baseline GHG emissions, without reassessing the baseline scenario. Where data and parameters used for determining GHG emission reductions that are determined ex ante (and not monitored during the crediting period) are no longer valid, project participants shall update such data and parameters. The validity of the baseline and the parameters determined ex-ante shall be assessed in accordance with the 'Tool to assess the validity of the original/current baseline and to update the baseline at the renewal of a crediting period'. Each step of the tool was validated as follows:

Step 1: Assess the validity of the current baseline for the next crediting period

The Procedures for the renewal of the crediting period of a registered CDM project activity approved by the CDM Executive Board require assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline. The validity of the current baseline is assessed using the following Sub-steps:

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.3.1	Have any new national and/or sectoral policies or regulations entered into force since the time of registration of the project activity that could have an impact on the baseline or GHG emission reductions?	Several changes have occurred in Chile concerning the power plant markets injecting to the grid. This situation has not been identified and analysed in the PDD, **CAR 09 is raised.** PP has updated the PDD. During 2003-2015 several laws and new energy policies have entered into	CAR 09	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
	Please list.	force. - *Law 20805. Improves the system of tendering of electricity supply for customers subject to price regulations (39) (https://www.leychile.cl/Navegar?idNorma=1074277).* - *Resolución Exenta N°558, 2017. It complements and modifies Resolution No. 778, which establishes deadlines, requirements and conditions for setting average node prices (40) (https://www.leychile.cl/Navegar?idNorma=1108966).* This new policy were implemented in order to encourage the installation of new power plants of "non-conventional renewable energy" (ERNC in Spanish), mainly solar and wind energy, reducing the initial obstacles that this kind of energy had to face in order to compete in the Chilean markets. These new polices and the decreasing construction costs of these kind of power plants (44), have had clear effects since 2014, increasing the wind and solar participation in the Chilean electricity matrix (**grossgeneration.xls, www.cne.cl) (12).** This has generated that energy prices in new generation contract has decreased from 110-150 USD/MWh in 2005 to 35 USD/MWh in 2017 (41) (42) (43). Even if biomass is also considered "non-conventional renewable energy", it can be confirmed that no new biomass plant (except for biogas) has been commissioned since 2015 (**installedcapacity.xls from www.cne.cl) (13**), and solar and wind power has duplicated since 2016 (**grossgeneration.xls, www.cne.cl) (12).** It should be noted that, in November 2017, the two most important grids in Chile were connected. Initially the Valdivia project was connected to SIC (central grid), where hydroelectric plants were an important source of energy. From November 2017 on, SIC were connected to SING (north grid), its energy mainly comes from fossil fuel sources. This means that EFcm from 2018 on is expected to increase for the effect of the SING in the project connected grid. Generating a drastic increment of the estimated emission reduction, followed for a gradual decreasing of the emission reduction due to new renewable energy plant connecting the grid (if ex-post calculation EFcm option were chosen). However, PP has chosen since the second crediting period to keep EFbm fixed, and for the 3rd crediting period the PP has chosen to keep the EFom fixed, therefore EFcm for Valdivia will not increase by the effect of the two grid connection. This is conservative. Considering all changes occurred in Chile, none of them would reduce any of the barriers for construction and commissioning of new biomass energy plant. PP has explained analysed this in section B.3 of PDD, step 1.2 of the Methodological Tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period" (Version 03.0.1). **CAR 09 is Closed**.		
	Does the current baseline (used in the registered PDD for the first crediting period) comply with all relevant mandatory national and/or sectoral policies applicable at the time of requesting renewal of the crediting period?	Yes - as analysed in previous paragraph and in CAR 09 (closed). Also because the baseline considers the 550,000 (Adt/y) restriction that corresponds to the production of pulp allowed in the environmental permits (11). The current baseline (used in the registered PDD) complies with the national mandatory requirement.	CAR 09	OK
	If the current baseline does *not* comply with relevant mandatory national and/or sectoral policies, have the PPs assessed, based on the examination of current practice in the country or region in which the policies	Not applicable, as the current baseline complies the mandatory requirement.	OK	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
	apply, whether those policies are systematically not enforced and that non-compliance with those requirements is widespread in the country or region? How was this validated?			
	If the current baseline is not in compliance with the relevant mandatory national and/or sectoral policies or if it cannot be shown that the policies are systematically not enforced and that non-compliance with those policies is widespread in the country or region, has the PP updated the baseline, as required by the tool?	Not applicable, as the current baseline complies the mandatory requirement.	OK	OK

Step 1.2: Assess the impact of circumstances

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.3.2	Have the PPs: • assessed the impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions (without reassessing the baseline scenario); • evaluated whether the conditions used to determine the baseline emissions in the previous crediting period are still valid • assessed the availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions	• PP has discussed in the PDD, the step 1.2 (B.5) assess the impact of circumstances. There are some changes in circumstances since the validation of the first crediting period, and this has not been evaluated in the PDD (step 1,2 of the tool 11). Please see CAR 09. • However, the PDD does not present information of an assessment of the availability of biomass (sawdust and barks) (B1/B3 baseline scenario), to demonstrate B1/B3 is a realistic scenario, demonstrating there is an abundant surplus of this type of biomass residue in the region. Also related with parameter "For biomass residues categories for which scenarios B1:, B2: or B3…": in section B.7.1, where all biomass identified as a B1/B3 that should be monitored at the validation stage. Please see CAR 07. • PP has re-assessed the baseline according ACM 0006 (section B.4). This is to be performed only during the first crediting period. As mentioned on paragraph 112: for the second and third crediting period for a project activity, the continued validity of the baseline scenario (determined during the first crediting period) shall be assessed by applying the latest version of the tool "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period". Concerning step 1.2. of the last tool, PP has not evaluated: o whether the conditions used to determine the baseline emissions in previous crediting period are still valid, and o the availability of new fuels and the impact of electricity fuel and price. Please see CAR 09. Following the closure of CAR 07 and CAR 09 (see Appendix 4), ERM CVS was able to confirm that: • The PPs have assessed the impact of circumstances existing at the	CAR 07 CAR 09	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
		time of requesting renewal of the crediting period on the current baseline emissions (without reassessing the baseline scenario). Changes in circumstances in Chile do not invalidate the chosen baseline scenario. • The PPs have evaluated whether the conditions used to determine the baseline emissions in the previous crediting period are still valid, and have re-evaluated the baseline scenario based on the latest available data at the time of crediting period renewal. • The PPs have assessed the availability of new fuels or raw materials and the impact of electricity or fuel prices in the identification of the current practice for the baseline emissions. The identified baseline scenario does not change as a result of the analysis.		
	If the baseline scenario identified in the registered PDD was the continuation of the current practice without any investment, have the PPs undertaken an assessment of the changes in market characteristics on the baseline?	Not Applicable, as the baseline scenario identified in the registered PDD is the construction of a conventional pulp mill without surplus electric power generation capacity (not the continuation of previous practices with no investment).	OK	
	If the new circumstances make a continued validity of the current baseline not plausible, then has the PP updated the baseline for the subsequent crediting period? How has this updated baseline been validated?	Please see CAR 07 and CAR 09. This does not involve a change in the baseline scenario, only and up-dating of data and parameters. This has been duly applied in section B.4, B.6.1, B.6.2, B.6.3, B.7.1.	CAR 07 and CAR 09	OK

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

This sub-step should only be applied if the baseline scenario identified at the validation of the project activity was the continuation of use of the current equipment(s) without any investment, and the project proponents or third party (or parties) would undertake an investment later due, for example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period or the availability of a new technology.

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.3.3	Is the baseline scenario in the registered PDD: • the continuation of use of the current equipment(s) without any investment; and • the project proponents or third party (or parties) would undertake an investment later due, for	The baseline scenario identified in the registered PDD is the construction of a conventional pulp mill without surplus electric power generation capacity (not the continuation of current equipment with no investment).	OK	

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
	example, to the end of the technical lifetime of the equipment(s) before the end of the crediting period, or the availability of a new technology? If not, then the rest of this step is not applicable.			
	Have the PPs assessed whether the remaining technical lifetime of the equipment that would have continued to be used in the absence of the project activity exceeds the crediting period for which renewal is requested? How was this validated?	Not applicable as noted above. According to C.1.2 of the registered PDD, the lifetime of the equipment is minimum of 30 years, considered from 14/05/2004.	NA	
	If the baseline scenario of the project activity is the continuation of use of the current equipment(s) without any investment and the projects proponents or third party(ies) will undertake an investment later, but before the end of a crediting period, then the current baseline needs to be updated for that crediting period or the crediting of emission reductions should be limited to the period before the baseline equipment would cease its operation. Has this been done in the case of the project?	Not applicable	NA	
	Have the PPs taken into consideration the market penetration of different technologies. Have the PPs evaluated the penetration rate of different technologies that are available in the market and evaluate how they could affect the baseline? How was this validated?	Not applicable.	NA	

Step 1.4: Assessment of the validity of the data and parameters

PPs are required to assess whether data and parameters that were only determined at the start of the crediting period and not monitored during the crediting period are still valid or whether they should be updated. Updates should be undertaken in the following cases:

• Where IPCC default values are used, the values should be updated if any new default values have been adopted and published by the IPCC, for example, in guidelines for national GHG inventories, IPCC assessment report or special reports by the IPCC;

• Where emission factors, values or emission benchmarks are used and determined only once for the crediting period, they should be updated, except if the emission factors, values or emission benchmarks are based on the historical situation at the site of the project activity prior to the implementation of the project and can not be updated because the historical situation does not exist anymore as a result of the CDM project activity.

The validity of the data and parameters is validated in section 7.4 below.

Step 2: Update the current baseline and the data and parameters

Step 2.1: Update the current baseline and Step 2.2: Update the data and parameters

The PP has updated the current baseline emissions for the subsequent crediting period, based on the latest approved version of the methodology. ERM CVS confirmed that the baseline emissions were updated in line with the context of the sectoral policies and circumstances that are applicable at the time of request for renewal of the crediting period.

If the application of Step 1.4 showed that the data and/or parameter(s) that were only determined at the start of the crediting period and not monitored during the crediting period are not valid anymore, project participants should update all applicable data and parameters, following the guidance in Step 1.4. Please see below for validation of the parameters set ex-ante which are used to calculate baseline emissions.

3.3 Data and Parameters set Ex-ante

Each parameter required by the methodology and tools for this project is listed and validated in detail as follows:

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
$BR_{n,h,x}$	Quantity of biomass residues of category n used in heat generator h in year x (tonnes on dry-basis)	-	-	-	-	in B.7.1. Monitored parameter.	-
$CAP_{HG,h}$	Baseline capacity of heat generator h (GJ/h)	yes	yes	yes	CL02 Closed	Recovery Boiler: For eucalyptus: 1,879 (GJ/h)=[422 MW * 3.6 (GJ/MW)/80.88%]. For Pine: 1,677 (GJ/h) =422 MW * 3.6 (GJ/MW)/90.59%]. 422 MW capacity of the recovery boiler, the value informed in the baseline energy/mass balance informed in this PDD.	CL02 Closed OK

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						80.88% (eucalyptus) and 90.59%(pine) correspond to $LFC_{HG,h}$ (baseline load factor of the recovery boiler) in section B.6.2 of PDD. CL02 is raised in order to justify 422MW of design maximum heat generation capacity of the recovery boiler. PP provided energy balances (16) used to determine the data needed for the ex-ante fixed parameters and ex-ante ER estimation. This Energy balance is performed by KSH (specialist in pulp industry) during 2016. This energy balances (16) are the same used during the first crediting period (PDD 1st period pages 8-11), updated using 85% of baseline efficiencies of heat generator and 83.5% of overall efficiency as per tool 09 v.2, and other monitored data as NCVs. The data validated during the validation of the first crediting period for the recovery boiler MCR (Maximum continuous rating) 399,3 MW (PDD first crediting period). Understanding the *Maximum continuous rating (MCR)* defined as the maximum output (MW) that a station is capable of producing continuously under normal conditions over a year. Under ideal conditions, the actual output could be higher than the MCR. MCR= 399,3 MW MCR ratio=0,946 422 MW as *design maximum heat generation capacity of the recovery boiler.* This is an estimation performed by the KSH Solutions that is considered	

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						suitable. CL02 closed. Power Boiler: 0(pine) (See CL02): because during pine campaign the quality of the black liquor would be enough to supply the energy needs in the recovery boiler in the baseline case. No need of sawdust and bark. CL02 Closed For Euca: 313 (GJ/h)= 76.9 MW * 3.6 (GJ/MW)/88.42% 80.42% (eucalyptus) and corresponds to $LFC_{HG,h}$ (baseline load factor of the recovery boiler) in section B.6.2 of PDD. 76.9MW capacity of the power boiler for baseline case. CL02 is raised in order to justify the value of 76.9MW. The value was validated based on third party documentation from KSH Solutions – see CL 02 for details. MCR=71,7 MW . This was validated during the validation of the first crediting period for the recovery boiler. MCR (Maximum continuous rating) (PDD first crediting period). Understanding the *Maximum continuous rating (MCR)* defined as the maximum output (MW) that a station is capable of producing continuously under normal conditions over a year. Under ideal conditions, the actual output could be higher than the MCR. MCR= 71.7 MW MCR ratio=0,933 76.9 MW as design	

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						maximum heat generation capacity of the recovery boiler validated during the first crediting period. The values are based on calculations provided by KSH Solutions (16,21) that are considered suitable. **CL02 closed.**	
$CAP_{EG,CG,i}$ $CAP_{EG,PO,j}$	CAPEG,Cg,I= Baseline electricity generation capacity of heat engine i (MW) CAPEG,PO,j= Baseline electricity generation capacity of heat engine i (MW)	yes	yes	yes	OK	$CAP_{EG,Cg,I}$ = Two backpressures units of 45MW (TG1) and 45MW (TG2). Validated in the original PDD for the first crediting period. $CAP_{EG,PO,j}$: = 0 (MW). In the baseline pulp mill there would be no power-only heat engines.	OK
$LFC_{HG,h}$	Baseline load factor of heat generator h (ratio)	yes	yes	yes	CL02 Closed. OK	In the case, the load factor is defined as the ratio 0.906 equivalent to 3,307 tDS/d /3,650.5 tDS/d under pine pulp production, and 0.809 equivalent to 2,952/3, tDS/d 3650.5 tDS/d under euca pulp production. The values 3,307 tDS/d and 2,952 tDS/d correspond to the average load (tons of dry solids per day) of black-liquor under pine and pulp production, respectively. CL02 is raised in order to clarify the source of these values. The value 3,650.5 tDS/d corresponds to the design load of black liquor of the recovery boiler CL02 is raised in order to clarify the source of this value. The PP provided the energy balance by KSH Solutions (16) and the KSH solutions memo (report) (21), where 3,650 tDS/d has been identified as the capacity of the recovery boiler, as there is not a real baseline recovery boiler (as	CL02 Closed OK

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						greenfield project) this was estimated through this energy/mass balance. Also this Memo identifies 3,307 tDS/d and 2,952 tDS/d as the average load of black-liquor under pine and pulp production as an estimation of the possible data in case of baseline scenario. CL02 is closed. Power boiler (heat generator): 0.895 (ratio) under euca pulp production. 483.68 (BDt/d) (average load) /540 (BDt/d) (capacity load) under euca pulp production . Note that for pine campaign the load factor would be zero as no biomass would be consumed in the power boiler. CL02 is raised to identify the sources of these data. PP has changed the calculation of this power boiler load factor. Considering now: Power boiler Euca: 106.1 /t/h) (average steam generation) /120 (t/h) (steam generation capacity) = 0,884 Load factor for the power boiler (euca). For those data PP provided the following references manufacturer's data (22) and the KSH Memo(21). Under pine campaign, the quantity/quality of the black liquor would be enough for generating the necessary steam to supply the energy needs in baseline case. Refer Energy mass balances (16). That is why $LFC_{HG,h}$ = 0 (power boiler, pine campaign) CL02 is closed.	

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
$HPR_{BL,i}$	Baseline heat-to-power ratio of the heat engine i (ratio)	yes	yes	yes	CL3 is closed	$HPR_{BL,TG1}$ =5.074 (under euca pulp production); 4.980 (under pine pulp production. $HPR_{BL,TG2}$= 4.303 (under euca pulp production); 4.290 (under pine pulp production). CL 03 is raised asking evidence for the results obtained. Values originally requested in CL 03 were up dated. PINE HPR $_{BL,TG1\ (pine):}$ [4.935 = 4,288,038(GJ/hr)/241,361(MWh/yr)/3.6 HPR $_{BL,TG2(pine):}$ [4.616 = 2,316,674(GJ/hr) /139,396(MWh/yr)/3,6 This is calculated in ERs Calculation Xls (3), sheet Electricity baseline pine, between files 190-240. Following step 1.5 of ACM0006 v14, Option 1. EUCA HPR $_{BL,TG1\ (euca):}$ [4.361 = 1,798,339(GJ/yr) /114,543 (MWh/h)]/3.6 HPR $_{BL,TG2\ (euca):}$ [6,358 = 517,458 (GJ/yr) / 22,608 /MWh/yr)] / 3.6 This is calculated in ERs Calculation Xls (3), sheet Electricity baseline Euca, between files 190-240. Following step 1.5 of ACM0006 v14, Option 1. This is also consistent to KSH solution report (21) page 6. CL03 is closed.	CL3 is closed
$LFC_{EG,CG,i}$ $LFC_{EG,CG,j}$	$LFC_{EG,CG,I}$ =Baseline load factor of heat engine i (ratio) $LFC_{EG,CG,j}$ =Baseline load factor of heat engine j (ratio)	yes	yes	yes	CL03 Closed	<u>Under pine pulp production:</u> $LFC_{EG,CG,TG1}$= 69.46% (31.257MW produced / 45MW installed) $LFC_{EG,CG,TG2}$= 76.73% (34.53MW produced / 45MW installed) <u>Under euca pulp production:</u> $LFC_{EG,CG,TG1}$= 46.84% (21.077MW produced /	CL03 Closed

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						45MW installed) $LFC_{EG,CG,TG2}$= 74.69% (33.609MW produced / 45MW installed) CL 03 is raised asking evidence for the results obtained. 45MW is the capacity of each turbogenerator as per PDD 1st crediting period. According the new mass – energy balance performed by KSH consulting (16) and (20), the MW expected in a baseline case are: Pine: TG1 40.58MW and TG2 23.44MW Euca: TG1 44.94MW and TG2 8.87MW Then values has been updated. Pine: $LFC_{EG,CG,TG1}$= 90.19%% (**40.58MW** produced / 45MW installed) $LFC_{EG,CG,TG2}$= 52.09% (**23.44MW** produced / 45MW installed) Euca: $LFC_{EG,CG,TG1}$= 99.87% (**44.94MW** produced / 45MW installed) $LFC_{EG,CG,TG2}$= 19.71% (**8.87MW** produced / 45MW installed). CL03 is closed.	
GWP_{CH4}	Global Warming Potential for CH_4.	yes	yes	yes	No	25 tCO2eq is the GWP according the last COP/MOP decision	Yes
	Additional electric power consumption of the project mill. Not included in meth/tool	yes	Parameter is not included in any meth or tool	yes	CL1 closed. OK	The factor "Additional electric power consumption of the project mill" is included in section B.6.2 (page 78 of PDDv2). Please explain also the reasons why this parameter (ELpj,aux,y) cannot be directly measured, and the	CL1 closed. OK

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						origin of this factor. (4,71%) According to methodology ACM0006, the parameter ELpj,aux,y should be measured using electricity meters. The PDD includes this parameter in section B.7.1 stating this parameter will be measured directly. However, this parameter would be calculated ELpj,aux,j= EL consumed by entire cellulose plant x Factor ex-ante. CL01 is raised. $EL_{,pj,aux.y}$: As the installed equipments for generating surplus energy are the same as in the baseline case, then PP is proposing to use a factor of the total power consumption of the pulp mill. This equation has been used since the first crediting period. This factor has been up dated, using the 30% pine and 70% euca as informed in spreadsheet "Additional electric power consumption" (20), this calculation also used information for the energy balance performed for the first crediting period for KSH solutions, HC Balance Valdivia.xls (16). The calculation of the factor 4.71% was reviewed and found correct (20). This value is more conservative than 4,59% used during the first crediting period. CL01 is closed.	
$EF_{BR,n,y}$	CH_4 emission factor for uncontrolled burning of the biomass residues category n during the year y.	yes	yes	yes	OK	According to monitoring methodology of ACM0006 v14 measured or default values may be used. PP measured this value and kept it fixed for the entire 2nd crediting period. Measurements were performed in March 2009 using the methodology developed by Hao et al. [1996] (29), Information results and uncertainty were verified and found correct. Table 3 of ACM 0006 v14 is correctly applied. Mix of sawdust and bark from industrial operations. =930 +/- 167 ($KgCH_4/TJ$) X	OK

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						0.94 (conservative factor)= 874.20 ($KgCH_4/TJ$) Mix of sawdust and bark from forest operations. = 114 +/- 114 ($KgCH_4/TJ$) X 0.82 (conservative factor)= 93.48 ($KgCH_4/TJ$)	
$EF_{CH4,BR}$	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH4/GJ)	yes	yes	yes	CAR 06 is closed OK	According to the monitoring methodology of ACM0006 v12.1.1. default values may be used. Table 4 of the methodology is correctly applied, however, table 5 is not correctly applied: the conservative factor should be 1.37 for an assumed uncertainty of 300%. CAR 06 is raised. PDDv3 and ERs Calculations xls has been corrected, then table 4 and 5 from ACM 0006 v14 are correctly applied. Adjusted CH_4 default factor. =41.1($KgCH_4/TJ$)= 30.0 CH_4 ($KgCH_4/TJ$) factor for biomass controlled burning x 1.37 conservativeness factor (%). CAR 06 is closed.	Yes
$EF_{CO2,f}$ From "Methodological tool: Project and leakage emissions from transportation of freight Version 01.1.0"	Default CO2 emission factor for freight transportation activity f	No CAR 05 closed. Yes	CAR 05 closed. Yes	CAR 05 closed. Yes	CAR 05 closed. OK	CAR05 is raised. This parameter has not been included in section B.6.2. PP has included this parameter in section B.6.2 as per required tool. Emission factor (g CO_2 / t km) Light vehicles 245 Heavy vehicles 129 CAR 05 closed.	CAR 05 closed. OK
$EF_{grid,CM,y}$	CO_2 emission factor for grid electricity during year y Not included in meth/tool	Yes	Yes	Yes	CAR 8 closed	Initially PP chose to monitor ex-post the $EF_{grid,CM,y.}$ (2016). Then this parameter were not included in section B.6.2. Now 2019, this parameter was correctly include in this section as the PP has chosen fixed EF_{bm} and EF_{om}. The initial CAR 08 was raised in 2016, then for 2019	CAR 08 Closed

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						the calculation was completely up-dated. Then CAR 08 is closed. Calculation of EF_{CM} was calculated using Wom=0,25 and Wbm=0,75 as per Tool 7 v7 paragraph 87 (b). $EF_{grid,CM,y}$:0.5125(tCO_2/MWh) =(BM)0.4278 x0.75 +(OM) 0.7665 x0.25 This is found correct.	OK
$EF_{grid,om,y}$	Simple adjusted operating margin CO2 emission factor in year y. Not included in meth/tool	yes	yes	yes	Yes	PP originally (2016) took the option of monitoring the EFom expost. During the period of closing of findings (2019), PP has changed the option taken for the EFom, choosing option (a) paragraph 42, of tool 7. Ex-ante EFom, using 3-year generation-weighted average, based on the most recent data available at the time of re- validation. In previous crediting period PP had chosen ex-post option. This change of option is allowed by AM_CLA_280 (30). Considering that : - the North and Central grid were connected in November 2017, in a new grid (SEN grid) - North grid was mainly based on fossil fuel, Then, the EFom of the grid connected to the project (Central Grid) will increase from 2018 on. The ex-ante option (2015-2017) is a conservative option. Calculation are in EF **Emission Factor 2015, 2016, 2017 xls (18)** were verified. PP has chosen Simple adjusted operating margin since the first crediting period. The results of this calculation is the same than Simple margin due to λ (lambda) =0 The grid emissions factor has been calculated ex-ante with information available at the time of PDD submission	OK

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						for renewal of crediting period (2015-2017). This is in line with step 5 of the tool to calculate the EF, paragraph 72 (a). Gross Electricity generation: this has been validated against the CNE records of Energy Supply (grossgeneration.xls https://www.cne.cl/estadisticas/electricidad/)**and grossgeneration.xls (12) and monthly electricity generation.xls (14)** 2015-2016-2017 Gross electricity generation were compared to raw data. No difference were found. Internal electricity consumption of each plant connected to the grid is obtained as a % of auxiliary consumption **Potencia sufiencia.xls. (15) Data obtained for** https://www2.coordinador.cl/informe-documento/mercados/potencia-de-suficiencia-2/ Several factor of internal consumption were compared to raw data for 2015, 2016 and 2017 and no difference were found. Lambda calculations: Data and calculation of lambda were checked. Hourly power generation data were compared to raw data (real dia.xls) (17) https://www2.coordinador.cl/sistema-informacion-publica/portal-de-operaciones/operacion-real/generacion-real-de-las-centrales/ (Cordinador Electrico Nacional , CEN) , and no difference were found. EFco2, fossil fuel (tCO2/GJ). It is used the lower limit EF: IPCC default values at the lower limit of the uncertainty at a 95 per cent confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG	

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						Inventories (31). This is in line to too7, v7, since values provided by the fuel supplier of the power plants and regional or national average default values are not available. Values used for natural gas, diesel, fuel oil, and coal were compared to IPCC and found correct. NCV: This is taken from the 2012 National Energy Balance. (28) Final result is EFom= 0.7665(tCO2/MWh Found Correct.	
$EF_{grid,BM,y}$	CO2 Build Margin emission factor of the grid. Not included in meth/tool	yes	yes	yes	Yes	The $EF_{grid,BM,y}$ originally provided in 2016 has been updated in 2019, using data until the end of 2017. Calculation of build margin has been checked. Calculation ref (18) 2017.xls The PP listed the power plant in the same order as they stared operation, including: -net electricity generation during 2017 -emission of each plant (considering fuel type, and amount of fossil fuel) (CDM project not considered) Then it was calculated (as per tool 7) the total generation of 2017,20% of the total electricity generated during 2017, and electricity generated of the 5 most recent plants. 20% of the total generation is chosen (as the highest value). Then the most recent plants generating the 20% of the total are included in the EFbm calculation. Calculation were revised and find correct. The power plants injecting to the grid and its starting operation dates were compared to installed capacity. Xls (13) public official document, and confirming this operation with grossgeneration.xls (12) when it can be confirmed when actually operation started the of each plant. Fuel consumption of plants suppling energy to SIC: This	OK

Parameter required as per meth / tools	**Description of parameter** (as per meth/ tools)	**Included in revised PDD?**	**Title & description in revised PDD in line with meth/ tools?**	**Data unit correctly expressed in revised PDD?**	**Value needs to be re-assessed ?**	**Value in revised PDD correct & provides for conservative estimate of Emission Reductions?** **How was this validated?**	**Measurement method correctly described in revised PDD** (if applicable)
						has been validated against the FF Consumption.xls (19), public information of the CNE. Nacional Energy Commission. This was found correct. Electricity generation (subtracting internal consumption): this has been validated against the grossgeneration.xls (12) public information from the CNE. Nacional Energy Commission NCV: This is taken from the 2012 National Energy Balance (28). Lower limit EF: this is taken from table 1.4 of the IPCC report (31) The grid emissions factor has been calculated ex-ante with information available at the time of PDD submission for renewal of crediting period (all information available until ending 2017). This is in line with step 5 of the tool to calculate the EF, paragraph 70. $EF_{grid,BM}$=0,4278 tCO_2/MWh Is found correct. It is to remain fixed during the second and third crediting period.	
$\rho_{i,y}$ from "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)	Weighted average density of fuel type *i* in year *y*	No CAR05 Closed	CAR05 Closed	CAR05 Closed	CAR05 Closed	Applicable where Option A is used and where *FCi.j.y* is measured in a volume unit. Not included in PDD v2. CAR05 is raised. PDD version 3 included this parameter in section B.7.1 . CAR 05 is closed	CAR05 Closed OK
	Fuel oil consumption per unit of combusted biomass in the Valdivia mill power boiler	yes	Parameter is not included in any meth or tool	yes	CL1 Closed	CL01 raised This was eliminated after CL 01. Not included in PDDv3. PP will not used this factor to calculate the fossil fuel combusted in baseline case. CL01 closed	CL1 Closed OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.4.1	Have the parameters required by the methodology / tools been correctly described in the PDD? Have the values been reassessed, where appropriate, and are the reassessed values valid and applicable?	No. Not all parameters required by the methodology/tools have been correctly described in the PDD. Please refer to CL1-02-03 and CAR 05-06,07. CL1-02-03 and CAR 05-06,09 were closed – please see appendix 4 for details. Following closure of the CARs and CLs, ERM CVS confirmed that the parameters required by the methodology / tools have been correctly described in the PDD. The values have been reassessed, where appropriate, and the reassessed values are valid and applicable.	CL1-02-03 and CAR 05-06,07. Closed	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
7.5.2	Has the PP correctly applied all relevant calculations as required by the methodology and associated tools? Does the PDD transparently explain how the procedures provided in the Methodology and applicable Tools are applied by the proposed project activity? *(i.e. are the required steps clearly followed?)*	Calculation has been verified. CLs and CAR concerning assumptions made and formula used were raised. CL1-02-03-04 and CAR 06-08 were raised. CL1-02-03-04 and CAR 06-08 were closed – please see appendix 4 for details. Following closure of the CARs and CLs, ERM CVS confirmed that the PP correctly applied all relevant calculations as required by the methodology and associated tools. The PDD transparently explains how the procedures provided in the Methodology and applicable Tools are applied by the proposed project activity.	CL1-02-03-04 and CAR 06-08. Closed OK	OK
	Where the methodology provides for selection between different options for equations; is every choice of options for calculating project emissions, baseline emissions and leakage offered by the methodology correctly justified in the context of the project activity and baseline scenario?	**Methodological choices from ACM0006 "Consolidated methodology for electricity and heat generation from biomass" have been further validated as follows:** Step 1.5: Determine the efficiencies of heat generators, and efficiencies and heat-to-power ratio of heat engines. Option 1 is taken: Option F in the latest approved version of the "Tool to determine the baseline efficiency of thermal or electric energy generation systems". The default value for the losses linked to the electricity generator group (i.e.turbine/engine, couplings and electricity generator), GGLdefault , is 5%. Option 2 and 3 are not applicable because they are only applicable to heat engines and heat generators that were operated at the project site prior to the implementation of the CDM project. Step 1.6: Determine the emission factor of on-site electricity generation with fossil fuels. This assessment is not applicable. There is no fossil fuel based power generation identified as part of the baseline scenario. **Methodological tool "Determining the baseline efficiency of thermal or electric energy generation systems"** Option F is used: Use a default value for the baseline efficiency of the New biomass fired boiler and the steam turbine connected to the grid. (recovery boiler an power plant)/ Same as Option 1 of step 1.5 (ACM0006) **Tool to calculate the emission factor for an electricity system .**	OK	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
		Step 3: Select a method to determine the operating margin (OM). PP should choose an option from paragraph 35 of the tool. PP took (b) Simple adjusted OM. According to paragraph 42 of the tool_ the simple adjusted OM is calculated the Ex-ante option to calculate the OM. This option was not taken during previous crediting period. This is permitted according to AM_CLA_0280 (30). Step 4: Calculate the operating margin emission factor according to the selected method Paragraph 47: Option B (calculating the OM from net electricity generation of all power plants serving the system, and the fuel types and total fuel consumption). This option can be taken if necessary data for Option A is not available (according to paragraph 45 of tool). Currently EF of each power unit is not available. Then Option B is correctly chosen. Determination of $EF_{EL,m,y}$. (6.4.1.1.1.) If for a power unit m data on fuel consumption and electricity generation is available, the emission factor (EFEL,m,y) should be determined using option A1. PP is using option A1. Step 5: Calculate the build margin (BM) emission factor Option 2 is used. $EF_{grid,BM,y}$ calculated ex-ante and remain fixed for the crediting period. For the first crediting period, PP calculated the build margin emission factor ex post (up-dated annually). For the second crediting period, the build margin emission factor is updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. Step 6. Calculate the combined margin emission factor. For calculation of $EF_{grid,CM,y}$. PP uses Option (a), weighted average CM method. **Methodological tool "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 03)** Option B: The CO_2 emission coefficient COEFi,y is calculated based on net calorific value and CO_2 emission factor of the fuel type i, as follows: COEFi,y = NCVi,y × EFCO2,i,y **Methodological tool: Project and leakage emissions from transportation of freight, Version 01.1.0** Option B: Using conservative default values for EF Emission factor (g CO_2/t km) ERM CVS was able to confirm that where the methodology provides for selection between different options for equations, every choice of options for calculating project emissions, baseline emissions and leakage offered by the methodology is correctly justified in the context of the project activity and baseline scenario.		
	Are the formulae required for the determination of project emissions, baseline emissions and leakage correctly presented in a complete and transparent manner, enabling	CL 01 was raised. Following closure of CL 01, ERM CVS was able to confirm that the formulae required for the determination of project emissions, baseline emissions and leakage have been correctly presented in a complete and transparent manner, enabling a complete identification of parameters to be used and / or	CL1 Closed	OK

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
	a complete identification of parameters to be used and / or monitored?	monitored.		
	Are detailed calculations provided in a traceable spreadsheet showing relevant information? Is the table of emission reductions in the PDD consistent with the calculations?	Table of emission reduction is consistent with the calculation spreadsheet given. However, it needs to be rechecked after changes concerning CLs and CARs. Following closure of the CARs and CLs, ERM CVS was able to confirm that detailed calculations have been provided in a traceable spreadsheet showing relevant information. The table of emission reductions in the PDD is consistent with the calculations.	Cls and CARs Closed	OK
	Can the calculation of emission reductions be replicated using the data and parameters supplied in the PDD?	Yes, However, it needs to be rechecked after changes concerning CLs and CARs. Following closure of the CARs and CLs, ERM CVS was able to confirm that the calculation of emission reductions can be replicated using the data and parameters supplied in the PDD.	Cls and CARs. OK	OK

4 Validation Findings - Monitoring Plan

4.1 Compliance of the monitoring plan with the approved methodology

Completeness of monitoring parameters

The monitoring parameter(s) required by the methodology and applicable tools for this type of project is/are:

<table>
<tr><th>Parameter Name</th><th>Parameter Description</th><th>Is the parameter appropriately included in the Monitoring Plan? (including justification and substantiation of information, data and evidence and explanation if any are excluded from the monitoring plan)</th></tr>
<tr><td colspan="3">ACM 0006 v14. “Consolidated methodology for electricity and heat generation from biomass”</td></tr>
<tr><td>Biomass categories and quantities used in the project activity.</td><td>Description not in line with the monitoring methodology in ACM 0006 v14.

CL07 is raised

CL07 closed. Description in line with ACM 0006.</td><td>CL04. According to description in the MP, the values used for ER ex-ante Calculation are obtained ex-post in accordance with past monitored period. However, during the past monitoring periods, not all monitoring devices were installed to monitor the biomass separately as presented in “values applied”. Please explain how those data were obtained.

PP has responded that biomass quantities used for ex-ante ERs calculation are obtained from energy mass balances (16) where the different types of biomass (most of them not monitored separately during de 1st crediting period). Calculations are available in ERs Calculation (3) sheet “biomass consumption”. This was found correct. CL04 closed.
<table>
<tr><th>Biomass category

n</th><th>Biomass type</th><th>Measurement method and procedures</th></tr>
<tr><td>1</td><td>Black liquor</td><td>Method: meters installed on line.
Frequency: continuously.
Accuracy defined.</td></tr>
<tr><td>2</td><td>Methanol</td><td>Method: meters installed on line.
Frequency: continuously.
Accuracy defined.</td></tr>
<tr><td>3</td><td>CNCG</td><td>Method: meters installed on line.
Frequency: continuously.
Accuracy defined.</td></tr>
<tr><td>4</td><td>Sludge from off-site industrial operations.</td><td>Method: meters installed on line.
Frequency: continuously (flow). For %moisture: monitoring procedure defined in “% moisture content”
For density and (%) solids: no defined a frequency: (meth ACM0006 does not require a determined frequency) CL 5 is raised.
Accuracy: not defined. CL 05 is raised.
CL05 closed. Frequency and accuracy defined.</td></tr>
<tr><td>5</td><td>Mix of sawdust and bark from on-site industrial operations. (B4)</td><td>5 and 6 would be measured together as they have the same origin. Then the quantity of biomass 5 and 6 is calculated using eq 14 of the methodology.</td></tr>
<tr><td>6</td><td>Mix of sawdust and bark from on-site industrial operations. (B1)</td><td>5 and 6 measured together. However, at the time of the validation, the meter for measuring biomass type 5 and 6 is not installed and still studying its technical feasibility. At the time of the site visit (2016) the biomass (mix: 5,6 and 7) is measured together before entering the power plant.

PP as a conservative approach, biomass type 5-6 will not be considered for ER, until a meter is installed.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Parameter Name</th><th>Parameter Description</th><th>Is the parameter appropriately included in the Monitoring Plan? (including justification and substantiation of information, data and evidence and explanation if any are excluded from the monitoring plan)</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td></td><td>Method: meters installed on line.
For %moisture monitoring procedures defined in parameter “%moisture content”
Frequency: continuously.
Accuracy: defined for meter.</td></tr>
<tr><td>7</td><td>Mix of sawdust and bark from off-site industrial operations.</td><td>Method: weight meter.
For %moisture monitoring procedures defined in parameter “%moisture content”

Frequency: continuously (each entrance).

Accuracy: defined.</td></tr>
<tr><td>8</td><td>Mix of sawdust and bark from forest operations.</td><td>Method: weight meter.
For %moisture monitoring procedures defined in parameter “%moisture content”

Frequency: continuously (each entrance).

Accuracy: not defined. CL 05 is raised. CL05 closed. Accuracy defined.</td></tr>
</table>
</td></tr>
<tr><td>For biomass residues categories for which scenarios B1:, B2: or B3: is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario</td><td>- Quantity of available biomass residues of type n in the region

- Quantity of biomass residues of type n that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region

- Availability of a surplus of biomass residues type n (which cannot be sold or utilized) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region</td><td>Included in MP.

According to the monitoring methodology, this information should be available and reported at the validation stage for the biomass residues identifies ex-ante, however, this information is not presented. CAR 07.

Monitoring frequency: not defined for new biomass residues categories when included during the crediting period. CL 05 is raised.

PDDv3 includes monitoring frequency and result for this evaluation in section B.6.1 Leakage emission section.

CL05 is closed.

PP performed a summary of the quantity of biomass residues available and the quantity of biomass residues are utilized in Valdivia region.

For industrial residues generation: public statistical information from INFOR is used (Instituto Nacional Forestal, Forestry National Institute). Some sampling was performed and no error were found.

-Anuario del aserrio 2018 (Sawmill Yearbook 2018) (35): (https://wef.infor.cl/publicaciones/publicaciones.php#P1) containing forestry production and residues generation information for 2017 and 2016. Some sampling was performed and no error were found.

The final results are:

Industrial Biomass residues supply / Industrial Biomass residues consumption

2016_: 1,7738

2017: 1,8226

For 2016-2017, it is demonstrated that the supply y more than 1.25 times the demands for industrial biomass.</td></tr>
<tr><td>$BR_{PJ,n,y}$</td><td>Quantity of biomass residues of category n used in the CDM project activity in year y</td><td>Same as described in parameter “Biomass categories and quantities used in the project activity”.</td></tr>
</table>

Parameter Name	Parameter Description	Is the parameter appropriately included in the Monitoring Plan? (including justification and substantiation of information, data and evidence and explanation if any are excluded from the monitoring plan)
	(tonnes on dry-basis). Description not in line with the monitoring methodology. CL6 is raised. CL06 closed.	CL 04 is raised in order to clarify how these data were obtained. These values are not taken from previous monitoring periods, due to previous methodology ACM 0006 v5 did not requested a separated biomass monitoring, then most of them were monitored as a mix. Thus, ex-ante estimation of biomass consumption (to be monitored ex-post), energy-mass balance performed by KSH consulting (16) were used. Using the consumption estimated by the mass balance, and estimating campaign 70% pine and 30%euca (as estimated and confirmed during the site visit). CI 04 closed.
$BR_{B1/B3,n,y}$	Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline scenario is B1or B3 (tonnes on dry-basis). Description not in line with the monitoring methodology. CL6 is raised. CL06 closed.	Same as described in parameter "Biomass categories and quantities used in the project activity" and $BR_{PJ,n,y}$
$BR_{B4,n,y}$	Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline scenario is B4 (tonnes on dry-basis).	Since ACM 0006 was updated form v12 to v14, PDD v3 is up-dated accordingly. The value of this parameter is 0 tons. B4 is not a possible baseline identified.
$BR_{B5,n,y}$	Quantity of biomass residues of category n used in the CDM project activity in year y for which the baseline scenario is B5 (tonnes on dry-basis)	Same as described in parameter "Biomass categories and quantities used in the project activity" and $BR_{PJ,n,y}$
$EF_{Br,n,y}$	CH_4 emission factor for uncontrolled burning of the biomass residues category n during the year y (tCH_4/GJ)	Required by the monitoring methodology, not included in B.7.1 however included in B.6.2. PP has conducted measurement prior to 2nd crediting period and the value remains fixed for the crediting period.
$EF_{FF,y,F}$	CO_2 emission factor for fossil fuel type f in year y (t CO2/GJ)	Not included in the MP as stated in ACM0006. It is included as stated in: • Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion. Upper limit of the IPCC is used. It can be found in as parameter $EF_{CO2,i,y}$ in the monitoring plan.
$EG_{CH4,BR}$	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH4/GJ)	Monitoring methodology allows the default values or measured data using. PP is using default values, and includes this parameter in B.6.2., not in B.7.1.
$EF_{CO2,LE}$	CO_2 emission factor of the most carbon intensive fossil fuel used in the country (t CO2/GJ)	Not applicable, as LE = 0
$HC_{BL,y}$	Baseline process heat generation in year y (GJ)	Correctly included in the MP. Frequency and accuracy level defined and in line with ACM 0006.

<table>
<tr><th>Parameter Name</th><th>Parameter Description</th><th>Is the parameter appropriately included in the Monitoring Plan? (including justification and substantiation of information, data and evidence and explanation if any are excluded from the monitoring plan)</th></tr>
<tr><td>$EL_{PJ,gross,y}$</td><td>Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year y (MWh).</td><td>Correctly included in the MP. Frequency and accuracy level defined and in line with ACM 0006.

694.485 MWh/y considering energy mas balances (16), 30% pine and 70% euca. Found correct. This is calculated taking the power generation estimated in the energy mass balance /16) for pine and euca case y project scenario. -</td></tr>
<tr><td>$EL_{PJ,imp,y}$</td><td>Project electricity imports from the grid in year y (MWh)</td><td>Correctly included in the MP. Frequency and accuracy level defined and in line with ACM 0006. Cl04 was raised in order to clarify the data used for ex-ante ERs Calculation (4,248(MWh/y).

2,812 (MWh/year is finally used. This value corresponds to the average 2016-2017 and 2018 of the actual import from the grid. It was compared to national data of electricity import (of power plant injecting to the grid). Data from the Electric National Coordinator. https://www.coordinador.cl/informe-documento/mercados/transferencias-de-energia/antecedentes-de-calculo/ (32), and also data monitored by the PP. Data is found correct. CL04 closed.</td></tr>
<tr><td>$EL_{PJ,aux,y}$</td><td>Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh)</td><td>Correctly included in the MP. Frequency and accuracy level defined and in line with ACM 0006.
MP states that this data will be monitored. The electricity consumption of the power plant is measured directly, this is not the electricity consumption in the project case, because the power plant and recovery boiler (with a different capacities) would be installed also in the baseline case.
The formula proposed is not described in the PDD.
ELpj,aux,y=4.59%* $EL_{pulp\ mill}$
4,59% factor defined ex-ante to be applied during the 2nd crediting period.
CL 01 is raised.

$EL_{,pj,aux.y}$: As the installed equipment for generating surplus of energy are the same (different capacities) than baseline case, then PP is proposing to use a factor of the total power consumption of the pulp mill. This equation has been used since the first crediting period. This factor has been up dated, using the 30% pine and 70% euca as informed in spreadsheet “Additional electric power consumption” (20), this calculation also used information for the energy balance performed for the first crediting period for KSH solutions, HC Balance Valdivia.xls (16). The calculation of the factor 4,71% was reviewed and found correct (20). This value is more conservative than 4,59% used during the first crediting period.
CL01 closed.
Value applied _ 25,403 (MWh/y) applying the 4,71% to $EL_{pulp\ mill.}$</td></tr>
<tr><td>$NCV_{BR,n,y}$</td><td>Net calorific value of biomass residue of category n in year y (GJ/tonne on dry-basis)</td><td>
<table>
<tr><th>Biomass category n</th><th>Biomass residues type</th><th>Net calorific value</th></tr>
<tr><td>1</td><td>Black liquor</td><td>The monitoring frequency will be every six months, with at least 3 samples being taken for each measurement. Measurements will be based on a dry basis. The monitoring is in line with the methodology.</td></tr>
<tr><td>2</td><td>Methanol</td><td>PP will use data for literature and will measure the mass content of Methanol (MeOH) continuously (reported as “moisture content of biomass residues”).</td></tr>
<tr><td>3</td><td>CNCG</td><td>The PP will use conservative values from industry. The NCV will be obtained from the gross calorific value and water vapour weight fraction ($W_{H2O,}$ reported as “moisture content of biomass residues”), and the latter will be monitored continuously.</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Parameter Name</th><th>Parameter Description</th><th>Is the parameter appropriately included in the Monitoring Plan? (including justification and substantiation of information, data and evidence and explanation if any are excluded from the monitoring plan)</th></tr>
<tr><td></td><td></td><td>
<table><tr><td></td><td></td><td></td></tr></table>
The methodology ACM 0006 includes this as a parameter not monitored and also as a parameter monitored, indicating this parameter may be measured or based on default values in a conservative manner. The monitoring methodology proposed by the PP is therefore considered to be suitable.

No NCV monitoring definition is stated for sludge, biomass (saw and bark) (biomass type 4,5,6,7 and 8) CAR 07 is raided.

PP has included in the MP the NCV of sludge and biomass (saw and bark).

Data used only for ex-ante calculation are:

<table>
<tr><td>Fuel</td><td>NCV</td><td>Remarks</td></tr>
<tr><td></td><td>GJ/BDt</td><td></td></tr>
<tr><td>Black liquor</td><td>Pine –11,377
Euca- 10,48867</td><td>KSH report (21)</td></tr>
<tr><td>MeOH</td><td>19,36</td><td>KSH report (21)</td></tr>
<tr><td>CNCG</td><td>6,89</td><td>KSH Report (21)</td></tr>
<tr><td>Bark own</td><td>16.93</td><td>2016 monitored data</td></tr>
<tr><td>Sludge</td><td>5,150</td><td>KSH report (21)</td></tr>
<tr><td colspan="3">CL04 is closed</td></tr>
</table>
</td></tr>
<tr><td>H_{low} and H_{high}</td><td>$H_{low,y}$ = Specific enthalpy of the heat carrier at the process heat demand side (GJ/tonnes)

$H_{high,y}$= Specific enthalpy of the heat carrier at the heat generator side (GJ/tonnes)</td><td>Used in step 3.2 (case 3.2.4) of ER calculations. Not included in section B.7. CAR 07 is raised.

PDD v3 includes this parameter in section B.7.1.

$H_{LOW,y}$ = 2.7661 (GJ/tonnes) for pine and 2,7754 (GJ/tonnes) for euca.
$H_{HIGH,y}$ = 3.3550 (GJ/tonnes).
Calculated in ERs Calculation.xls (3) according Step 3.2 of ACM 0006 v14.

CAR 07 Closed.</td></tr>
<tr><td>LOCy</td><td>Length of the operational campaign in year y (hour)</td><td>Used in equation (4) of methodology ACM 0006. Not included in section B.7.1 CAR 07 is raised. CAR 07 closed.

This parameter is duly included in the MP.

LOC_y=8,496 (hours). Considering 354 days of annual working days.</td></tr>
<tr><td colspan="3">Tool 16 . Project and leakage emissions from biomass (Version 04.0)</td></tr>
<tr><td>Moisture content of the biomass residues</td><td>% Water content in mass basis in wet biomass residues</td><td>
<table>
<tr><td>Biomass category n</td><td>Biomass residues type</td><td>Net calorific value</td></tr>
<tr><td>1</td><td>Black liquor</td><td>Continuously measured, accuracy level determined.</td></tr>
<tr><td>2</td><td>Methanol</td><td>Continuously measured, accuracy level determined.</td></tr>
<tr><td>3</td><td>CNCG</td><td>Measurement frequency not defined. (CL05) , accuracy level determined. CL05 closed. Continuous measurement defined.</td></tr>
<tr><td>4</td><td>Sludge from industrial operations.</td><td>Measurement frequency: each batch, however it is a continuous process (CL05), accuracy level determined. CL05 closed. Monthly monitoring defined</td></tr>
<tr><td>5</td><td>Mix of sawdust and bark from industrial operations. (internal) (B4)</td><td>Measurement frequency: each batch (CL05), however it is a continuous process, accuracy level determined. CL05 closed. Monthly monitoring defined.</td></tr>
<tr><td>6</td><td>Mix of sawdust and bark from</td><td>Measurement frequency: each batch, however it is a continuous process,</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Parameter Name</th><th>Parameter Description</th><th>Is the parameter appropriately included in the Monitoring Plan? (including justification and substantiation of information, data and evidence and explanation if any are excluded from the monitoring plan)</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td></td><td>industrial operations. (internal) B1</td><td>accuracy level determined.</td></tr>
<tr><td>7</td><td>Mix of sawdust and bark from industrial operations. (external)</td><td>Measurement frequency: each batch, however it is a continuous process (CL05), accuracy level determined.</td></tr>
<tr><td>8</td><td>Mix of sawdust and bark from forest operations.</td><td>Measurement frequency: each batch, however it is a continuous process (/CL05), accuracy level determined.</td></tr>
<tr><td colspan="3">Monitoring frequency finally defined as monthly.</td></tr>
</table>
</td></tr>
<tr><td colspan="3">Tool 12. Methodological tool: Project and leakage emissions from transportation of freight. Version 01.1.0</td></tr>
<tr><td>Df,m</td><td>Return trip distance between the origin and destination of freight transportation activity f in monitoring period m</td><td>Data informed is not the return trip (it is single trip), however the return trip distances are correctly applied in the ER calculation. CAR 07 is raised. Return trip needs to be informed in PDD. CAR07 Closed. This parameter is corrected included in appendix 5 of the PDD.

PP will monitor this through road maps. Methodological tool: Project and leakage emissions from transportation of freight, states once for each freight transportation activity f for a reference trip using the vehicle odometer or any other appropriate sources (e.g. on-line sources) (o be updated whenever the distance changes).</td></tr>
<tr><td>FRf,m</td><td>Total mass of freight transported in freight transportation activity f in monitoring period m</td><td>Data will measure in a weight scale each entrance by the PP.

Accuracy level not defined. CL5 is raised.

FRf,m is finaly defined as +-30Kg. Data corresponds to the parameters $BR_{PJ,n,y,}$ biomass 7 and 8, that corresponds to the external sources. CL 05 closed.</td></tr>
<tr><td colspan="3">Tool 3 “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion”, Version 03.</td></tr>
<tr><td>$FC_{i,j,y}$</td><td>Quantity of fuel type i combusted in process j during the year y</td><td>Monitoring procedures and frequency meets “Tool to calculate project or leakage CO2 emissions from fossil fuel combustion” requirements.

Accuracy level defined.

CL04 is raised in order to clarify and correct the different data used in PP and calculations.

The parameter FCi,j,y (Quantity of fuel type i combusted in process j during the year y) is considered the total amount of fossil fuel consumption of the boiler and power plant measured ex-post in project case according to up.dated methodology and Tool03. FCi,j,y from other internal processes as internal transportation is considered also in a separate manner as per MP. This situation differs from the last crediting period, when BEff were considered = 0 tCO2 and PEff were considered as emission from fossil fuel only attributable to the project (subtracting the theoretical baseline consumption) and not the total consumption.

For this reason, in order to determine the values applicable for FCi,j,y , PP used fossil fuel consumption of the two boilers as defined by the carbon footprintnig records (34) (reviewed and found correct), and reported data from previous period are not used.

Values of fossil fuel used for ex-ante ER estimation.xls(3) and PDD v3 (2) were reviewed and fount correct and consisted with this approach.

• 2,523(ton/yr) of Fuel oil will be burned in PB.
• 15,806 (ton/yr) of Fuel oil will be burned in RB.
• 88 (ton/ye) of diesel consumed due to on-site biomass transportation in the plant.
CL04 is closed.</td></tr>
</table>

Parameter Name	Parameter Description	Is the parameter appropriately included in the Monitoring Plan? (including justification and substantiation of information, data and evidence and explanation if any are excluded from the monitoring plan)
$\rho_{i,y}$	Weighted average density of fuel type i in year y	Not included. (B.6.2 nor B.7.1). CAR 05 Is raised. PPD v3 includes this parameter in section B.7.1. Data obtained from Energetic Nacional Balance.xls BNE2012 (28) from the Energy Ministry. CAR 05 is closed. 0.84(kg/lt) for Diesel. 0.95(kg/lt) for Fuel Oil 550 (kg/m3) for Natural Gas. Not expected to be used, however it is still possible. 0.65(kg/lt) for LPG. Not expected to be used, however it is still possible.
$NCV_{i,y}$	Weight average net calorific value of fuel type i in year y.	Included: Option d) IPCC default values at the upper limit will be used (31). Option a) is not available. 43.3(GJ/ton) for Diesel. 41.7(GJ/ton) for Fuel Oil 50.40 (GJ/ton) for Natural Gas. Not expected to be used, however it is still possible. 52.2(GJ/ton) for LPG. Not expected to be used, however it is still possible.
$EF_{CO2,i,y}$	Weighted average CO2 emission factor of fuel type i in year y	Option a) is not available; supplier does not provide the EF of the fuel. PP is taking option d). IPCC values will be used (31), and will be up-dated in case of changes. 0.0748 (tCO2/GJ) for Diesel. 0.0788 (tCO2/GJ) for Fuel Oil. 0.06560 (tCO2/GJ) for LPG. Not expected to be used, however it is still possible.

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
9.1.1	Are all required parameters (according to the methodology and tools) included in the monitoring plan?	No. Refer CI and CARS raised in previous section. CLs and CARs closed.	CLs and CARs Closed	OK

Compliance of monitoring

	Parameter Names

Monitored Parameters	Biomass residues categories and quantities used in the CDM project activity.	For biomass residues categories for which scenarios B1:, B2: or B3: is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario	$BR_{PJ,n,y}$	$BR_{B1/B3,n,y}$	$BR_{B4,n,y}$	$BR_{B5,n,y}$
Parameter Title correct?	CL06 Closed.	Yes	Yes	Yes	Yes	Yes
Description in line with methodology/tool?	CL06 Closed.	yes	Yes	Yes	Yes	CL06 closed.
Data unit correctly expressed?	Yes Tonnes in dry-dasis	yes	yes	Yes	Yes	yes
Source clearly referenced?	Yes	yes	yes	Yes	Yes	yes
Correct value provided for ex ante estimation?	CL04 closed	CAR 07 closed. B.6.1 under leakage emissions, of the PDD.	Defined in parameter; Biomass categories and quantities used in the project activity.	Defined in parameter; Biomass categories and quantities used in the project activity.	Yes	Defined in parameter; Biomass categories and quantities used in the project activity.
How has this value been verified?	CL04 Closed. Mass-energy balances (16)	CAR 07 Closed. Using public data (35, 36, 37) and calculating biomass residues consumption and generation.	Defined in parameter; Biomass categories and quantities used in the project activity.	Defined in parameter; Biomass categories and quantities used in the project activity.	Yes	Defined in parameter; Biomass categories and quantities used in the project activity.
Measurement method correctly described?	CL04 Closed.	CAR 07 Closed.	Defined in parameter; Biomass categories and quantities	Defined in parameter; Biomass categories and quantities	Yes	Defined in parameter; Biomass categories and quantities

Monitored Parameters	Parameter Names					
	Biomass residues categories and quantities used in the CDM project activity.	For biomass residues categories for which scenarios B1:, B2: or B3: is deemed a plausible baseline alternative, project participants shall demonstrate that this is a realistic and credible alternative scenario	$BR_{PJ,n,y}$	$BR_{B1/B3,n,y}$	$BR_{B4,n,y}$	$BR_{B5,n,y}$
			used in the project activity.	used in the project activity.		used in the project activity.
Measurement and recording frequency correctly described?	Details on frequency defined on measurement method. Data monitored continuously and aggregated as appropriated. CL05 closed.	No frequency defined. CAR 07 Closed.	Defined in parameter; Biomass categories and quantities used in the project activity.	Defined in parameter; Biomass categories and quantities used in the project activity.	Yes	Defined in parameter; Biomass categories and quantities used in the project activity.
Correct reference to standards?	Yes	NA	Defined in parameter; Biomass categories and quantities used in the project activity.	Defined in parameter; Biomass categories and quantities used in the project activity.	Yes	Defined in parameter; Biomass categories and quantities used in the project activity.
Indication of accuracy provided?	CL05 closed.	NA	Defined in parameter; Biomass categories and quantities used in the project activity.	Defined in parameter; Biomass categories and quantities used in the project activity.	Yes	Defined in parameter; Biomass categories and quantities used in the project activity.
QA/QC procedures described?	Yes	NA	yes	Yes	Yes	yes
QA/QC procedures appropriate/in line with methodology/tool?	Yes	NA	yes	Yes	Yes	Yes

Monitored Parameters	Parameter Names				
	$HC_{BL,y}$	$EL_{PJ,gross,y}$	$EL_{PJ,imp,y}$	$EL_{PJ,aux,y}$	$NCV_{BR,n,y}$
Parameter Title correct?	Yes	yes	yes	yes	Yes
Description in line with methodology/tool?	yes	yes	yes	Yes	yes
Data unit correctly expressed?	Yes	Yes	yes	yes	yes
Source clearly referenced?	Yes	Yes	yes	yes	CL04 Closed. CAR 07 Closed
Correct value provided for ex ante estimation?	CL2 and CL3 Closed OK	yes	CL04 Closed. Yes	CL01 Closed. Yes	CL04 Closed Yes
How has this value been verified?	CL2 and CL3 Closed OK	Data were compared to project case energy and mass balances with the environmental restriction(16)	CL04 closed. Data compared to 2016-2018 electricity import. Public record (32)	CL01 Closed. This value cannot be directly measured. A factor of the electricity consumptions is used (since first crediting period). This was checked and found correct.	CAR 07 Closed. Comparing to monitored data and bibliography references. Please refer section 4.1
Measurement method correctly described?	Yes	yes	yes	yes	yes
Measurement and recording frequency correctly described?	Yes	yes	yes	yes	CAR 07 Closed. Yes
Correct reference to standards?	NA	Na	na	na	NA
Indication of accuracy provided?	Yes	Yes	yes	yes	NA
QA/QC procedures described?	NA	Yes	yes	yes	Yes
QA/QC procedures appropriate/in line with methodology/tool?	NA	Yes	yes	yes	Yes

Monitored Parameters	Parameter Names					
	H_{low} H_{high}	LOCy	Moisture content of the biomass residues			
Parameter Title correct?	CAR 07 Closed. Yes.	CAR 07 Closed. Yes.	Yes			
Description in line with methodology/tool?	CAR 07 Closed. Yes	CAR 07 Closed. Yes	yes			
Data unit correctly expressed?	CAR 07 Closed. Yes	CAR 07 Closed. Yes	Yes			
Source clearly referenced?	CAR 07 Closed. Yes	CAR 07 Closed. Yes	Yes			
Correct value provided for ex ante estimation?	CAR 07 Closed. Yes	CAR 07 Closed. Yes	Yes			
How has this value been verified?	CAR 07 Closed. This is calculated following ACM 0006 using data defined in this monitoring plan.	CAR 07 Closed. 24hrsx354 annual workind days =8496 working hrs.	Moisture of forest biomass (sawdust and bark), compared with previous period and found correct. Rest of data compared with data monitored on site.			
Measurement method correctly described?	CAR 07 Closed. Yes	Yes	Yes			
Measurement and recording frequency correctly described?	CAR 07 Closed. Yes	CAR 07 closed.	Frequency defined for black liquor and methanol. (continuous) CL06 is raised for monitoring frequency of			

Monitored Parameters	Parameter Names					
	H_{low} H_{high}	LOCy	Moisture content of the biomass residues			
			sludge and sawdust and barks. CL06 closed.			
Correct reference to standards?	NA	NA	Yes			
Indication of accuracy provided?	Yes	NA	Yes			
QA/QC procedures described?	NA	NA	NA			
QA/QC procedures appropriate/in line with methodology/tool?	NA	NA	NA			

Tools

Monitored Parameters	Parameter Names					
	$D_{f,m}$	$FR_{f,m}$	$FC_{i,j,y}$	$p_{i,y}$	NCVi,y	$EF_{CO2,i,y}$
Parameter Title correct?	Yes	yes	yes	CAR 05 closed. Yes	Yes	yes
Description in line with methodology/tool?	Yes	Yes	yes	Yes	yes	yes
Data unit correctly expressed?	yes	Yes	yes	Yes	yes	yes
Source clearly referenced?	yes	Yes	yes	Yes	yes	yes
Correct value provided for ex ante estimation?	No, values only consider single trip, no round trip. In appendix 5 CAR 07 CLosed OK	CL 04 (biomass type 7) Closed.	CL04 Closed. yes	Yes	Yes	yes
How has this value been verified?	A sample was verified using google maps. OK	CL 04 (biomass type 7) Closed. As per biomass type 7.	Compared to last monitoring period the amount of Fossil fuel consumption was less than	Compared to National energy balance (28)	Compared with upper limit in IPCC v2 table 1.2 informed data are correct (31).	Compared with upper limit in IPCC v2 table 1.4 informed data are correct

Monitored Parameters	Parameter Names					
	$D_{f,m}$	$FR_{f,m}$	$FC_{i,j,y}$	$p_{i,y}$	NCVi,y	$EF_{CO2,i,y}$
			informed. Not the same data used in calculations CL04 Closed. CAR 07Closed.			(31).
Measurement method correctly described?	NO	Yes	Yes	Yes	Yes Data from provider each delivery not available	Yes Data from provider each delivery not available.
Measurement and recording frequency correctly described?	yes	Yes	Yes	yes	yes	yes
Correct reference to standards?	NA	Yes	Yes	yes	Yes	yes
Indication of accuracy provided?	NA	Yes	Yes	NA	NA	NA
QA/QC procedures described?	NA	Yes.	Yes	NA	NA	NA
QA/QC procedures appropriate/in line with methodology/tool?	NA	NA	Yes	NA	NA	NA

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not OK
9.1.2	Are all required parameters appropriately monitored in accordance with the methodology/tools?	No. Refer CI and CARS raised in previous section. CIs and CARs Closed. Yes all parameters required are appropriately included in Section B.7.1 of the PDD v3	CARs and CLs raised in previous section Closed	OK

4.2 Implementation of the monitoring plan

	Question	Validation findings (including justification and substantiation of information, data and evidence)	Draft OK/ CAR/CL	Final OK/ Not

				OK
9.2.1	Are the arrangements described in the plan feasible and practical within the project design? Please consider: (a) operational and management structure, including responsibilities (b) Plans for maintenance and calibration of equipment (c) Plans for QA/QC of equipment and data (d) Installation of monitoring equipment (whether in place, or planned)	a) operational and management structure is in place and in line with description made in the PDD and as seen on site. b) Plans for maintenance and calibration of equipment is part of the current practice of the project operator. c) plans for QA/QC are consistent with applicable methodology and tool. d) Not all monitoring equipment are currently in place or planned. PP is analysing how to measure some parameters: • Biomass type 5,6 (sawdust and bark from on-site). Biomass is currently measured as a mix (Types 4,5,6,and 7) and also biomass type 4, and 7 are monitored separated. CI05 closed. • % moisture is also currently measure for the mix of biomass (Types 4,5,6, and 7). And also for sludge (type 4). But % moistures is not currently implemented as a separate measuring of biomass type 5/6 and 7. CI05 closed	CL05 closed	OK

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Document information

Version	*Date*	*Description*
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM validation and verification standard for project activities" (CDM-EB93-A05-STAN) and version 02.0 of the "CDM project cycle procedure for project activities" (CDM-EB93-A06-PROC); • Make editorial improvements.
02.0	31 October 2017	Revision to align with the requirements of the "CDM validation and verification standard for project activities" (version 01.0).
01.0	23 March 2015	Initial publication.

Decision Class: Regulatory
Document Type: Form
Business Function: Renewal of crediting period
Keywords: crediting period, project activities, validation report