CLEAN DEVELOPMENT MECHANISM
PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-PoA-DD) Version 01

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NOTE:

This form is for the submission of a CDM PoA whose CPAs apply a large scale approved methodology.

At the time of requesting registration this form must be accompanied by a CDM-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-CPA-DD (using a real case).

SECTION A. General description of programme of activities (PoA)

A.1 Title of the programme of activities:

Biomass Renewable Energy Programme of Activities
Version of PoA-DD: 03
Date: 16/12/2012

A.2. Description of the programme of activities:

1. General operating and implementing framework of PoA

The CDM Programme of Activities, "Biomass Renewable Energy Programme of Activities" (hereinafter referred to as PoA) involves installation of biomass residue power and/or heat plants across Chile (Biomass Residues hereinafter referred to as Biomass), to be connected to one of the Chilean grids and/or for internal use at the project site.

Fossil fuels may be co-fired in the project activity. However, the amount of fossil fuels co-fired would not exceed 80% of the total fuel fired on an energy basis according to the requirement of the applied methodology ACM0006, version 12.0.1.

The proposed project activities will reduce greenhouse gas (GHG) displacing fossil fuel utilization for thermal and/or electricity generation by the promotion of biomass cogeneration systems in Chile, which is a less intensive GHG emission fuel. The Project activities under the PoA will utilize biomass as an alternative fuel for generation of thermal and electricity energy.

The PoA is a voluntary action coordinated and managed by Bioenergías Forestales S.A. which is the 'Coordinating / Managing Entity' (hereinafter referred to as CME). The CME is a registered company and a subsidiary to CMPC, one of the most important Paper and Cardboard Manufacturing Companies[1] in Latin America.

This PoA will include; (i) the installation of new plants at a site where currently no power and heat generation occurs; (ii) the installation of new plants at a site where currently power or heat generation occurs; (iii) the improvement of energy efficiency of existing plants; (iv) the total or partial replacement of fossil fuels by biomass in existing plants or in new plants that would have been built in the absence of the project.

The equipment that is planned to be installed in the proposed project activities includes *inter alia*: a) steam boiler, b) heat engine, c) heat generator, d) electricity generator, e) piping system, f) instrumentation and control equipment, g) pumps/fans, h) cooling equipment, i) major earth/civil works.

The Designated National Authority of Chile has not defined specific criteria for sustainability in order to approve CDM projects or PoAs carried out under the Clean Development Mechanism of the Kyoto Protocol[2]. Renewable energy projects in Chile are subject to a legal framework and system for approval

[1] CMPC – Manufacturing Company www.cmpc.cl
[2] Official web site of the DNA; http://www.mma.gob.cl/1304/w3-propertyvalue-16236.html

for environmental impacts[3] that is regulates by Law 19,300, this law would be considered in the development of the PoA.

2. Policy/measure or stated goal of the PoA

The goal of the PoA is to displace fossil fuel utilization for thermal and/or electricity generation by the promotion of biomass cogeneration systems in Chile, thereby reducing GHG emissions. The Project activities under the PoA will utilize biomass as an alternative fuel for thermal and/or electricity generation and/or mechanical power generation. The proposed project activities will i) increase the supply of renewable energy to Chilean grids (for connected plants) from biomass sources on a commercially sustainable basis and/or ii) displace fossil fuel utilization from thermal and energy generation by biomass cogeneration systems at the project site for self consumption.

The PoA will provide a platform for biomass energy project developers (CPA Implementer) to overcome existing barriers through additional cash flow from carbon revenues. While providing such platform for potential CPAs, the CME will take care of the CDM cycle development of the project activity and receive a certain return from CERs generated from the CPAs for its provided efforts.

So far, the utilization of biomass for energy generation remains at an initial stage in the country; therefore, the proposed PoA will provide a key incentive to further enhance the development of biomass energy projects in Chile.

The Government of Chile has recognized climate change as a significant challenge. Biomass usage for generation of thermal and power energy can avoid a large amount of emissions from fossil fuel used for the same porpoise.

The PoA will contribute to sustainable development in the host country. The benefits of the proposed project activity regarding to the sustainable development are the following:

Social well being

The Project activities under this PoA would generate additional employment in rural areas, directly and indirectly through the following:

- Biomass processing and supply management
- Collection and transportation of biomass to Project sites
- Promoting owners of premises to supply the waste biomass
- Biomass fuel handling at Project sites

Thus the PoA would contribute to alleviating poverty and lead to improvement in the quality of life of rural people. The PoA offers employment opportunities to both genders thereby contributing towards removing social disparities, in addition to improving quality of life in rural areas.

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[3] Publicly available at:
http://www.leychile.cl/Consulta/Exportar?radioExportar=Normas&exportar_formato=pdf&nombrearchivo=LEY-19300_09-MAR-1994&exportar_con_notas_bcn=True&exportar_con_notas_originales=True&exportar_con_notas_al_pie=True&hddResultadoExportar=30667.2010-11-13.0.0%23

Economic well being

Activities under the PoA would provide opportunities for employment, which would lead to alleviating poverty. This programme, through the Project activities brings additional investments through plant and machinery, storage and transportation systems thus leading to improvement in the economy of the country..

Environmental well being

The programme is based on the use of renewable biomass, so the use of biomass replacing fossil fuels will reduce GHG emissions in the atmosphere. As the programme is based on the use of renewable biomass, it ensures eco-friendliness and the sustainability of resources.

Technological well being

Biomass based heat-and-power generation system is environmentally safe and sound technology. The Project activities would help in replication of clean energy technologies in the country

3. **Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.**

The PoA is a voluntary action being coordinated and managed by Bionergías Forestales S.A. There are no mandatory laws or regulations in Chile that require biomass energy generation plants to seek CDM services. Likewise, no mandatory laws or regulations exist requiring the coordinating/managing entity or any other party to develop a PoA for biomass energy plants in the country.

A.3. Coordinating/managing entity and participants of POA:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants(*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Chile	Bionergías Forestales S.A. (Private entity)	No
(*) In accordance with the CDM modalities and procedures, at the time of making the PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party (ies) involved is required.		

A.4. Technical description of the programme of activities:

A.4.1. Location of the programme of activities:

The Programme of Activities will be implemented within the geographical area of Chile

A.4.1.1. Host Party(ies):

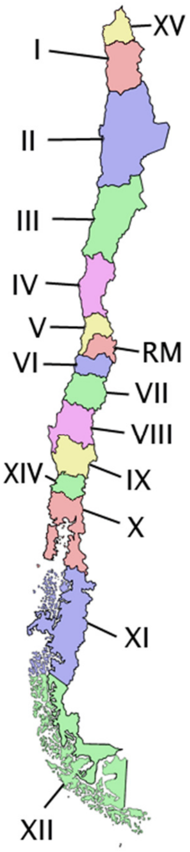
Republic of Chile

A.4.1.2. Physical/ Geographical boundary:

The boundary of a PoA is defined as the geographical area within which all the CPAs included in the PoA will be implemented. The geographical boundary of the PoA will cover all the regions of Chile. The consideration of all applicable national and/or sectoral policies and regulations of the host parties, within the boundary of this PoA will be considered

In the following figure is detailed the regions that comprise the geographical boundary of the host country.

Figure No. 1: Map of geographical boundary, Chile



I. Tarapaca Region
II. Antofagasta Region
III. Atacama Region
IV. Coquimbo Region
V. Valparaiso Region
VI. Libertador General Bernardo O'Higgins Region
VII. Maule Region
VIII. Bio Bio Region
IX. Araucanía Region
X. Los Lagos Region
XI. Aysen del General Carlos Ibáñez del Campo Region
XII. Magallanes y la Antartica Chilena Region
XIII. Metropolitan Region (MR)
XIV. Los Ríos Region
XV. Arica y Parinacota Region

Geographical coordinates of the boundary [4]

Position	Geographic coordinates
North (Arica and Parinacota Region)	17º 35' 41"S 69º 28'53" W
South (Magallanes y la Antartica Chilena Region)	56º32'12"S 68º42'50"W

[4] http://es.wikipedia.org/wiki/Anexo:Puntos_extremos_de_Chile

A.4.2. Description of a typical CDM programme activity (CPA):

A typical CDM Programme Activity (CPA) consists of the operation of biomass residues (co-) fired heat-and-power plants for; i) electricity delivery to one of the grids in the host country and/or ii) heat and electricity self-consumption at the project site.

The biomass used by the CDM-CPA-DD under this PoA will be in compliance with "Definition of Renewable Biomass - Annex 18 of EB 23" and "Glossary of CDM Terms - Version 06.0 - Annex 63 of EB 66".

A.4.2.1. Technology or measures to be employed by the CPA:

The project activity will apply ACM0006 "Consolidate methodology for electricity and heat generation from biomass residues", Version 12.0.1.

The type and scope of the Project are defined as follows:

Type I: Renewable energy projects .
Sectoral scope 01: Energy industries (renewable - / non-renewable sources).

The principle technology and purpose of this PoA is the installation of biomass based heat and/or electricity generation systems in Chile; i.e. cogeneration systems also known as combined heat and power (CHP), which would replace heat and/or electricity that otherwise would have been generated by fossil fuels and thus resulting into mitigation of GHG emissions.

Fossil fuels may be co-fired in the project activity. However, the amount of fossil fuels co-fired would not exceed 80% of the total fuel fired on an energy basis according to the requirement of the applied methodology.

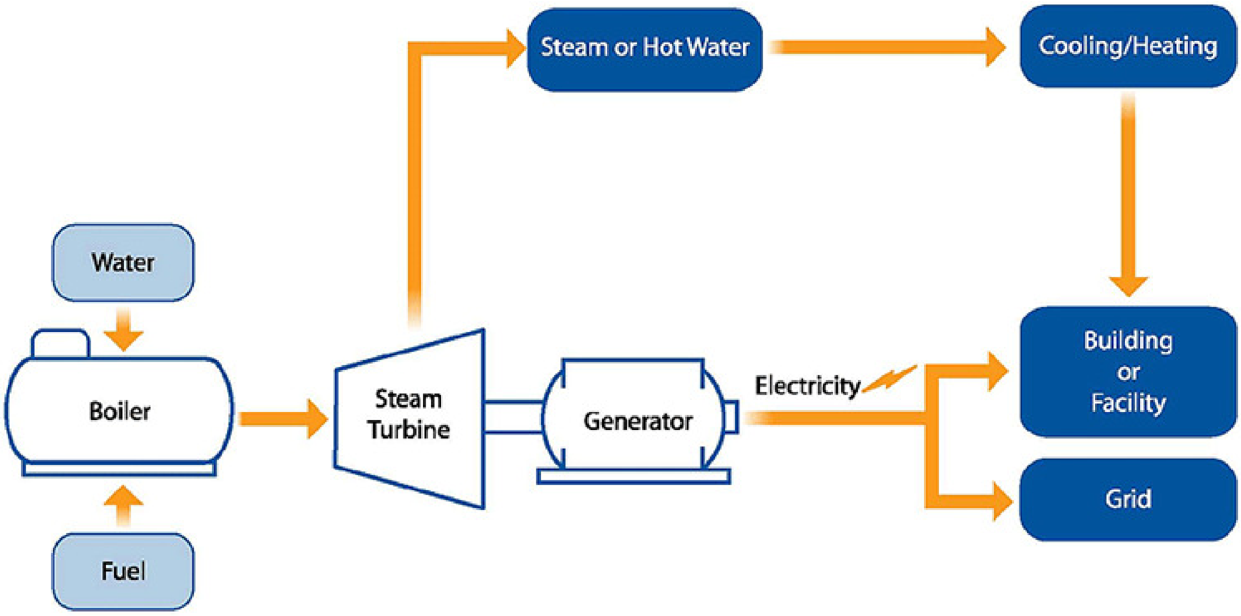
Two types of cogeneration system could be implemented by the CDM-CPA-DD under this PoA: "topping cycle" and "bottoming cycle." Topping cycle refers where fuel is first used to generate electricity or mechanical energy at the facility and a portion of the waste heat from power generation is then used to provide useful thermal energy. Bottoming cycle refers to type of cogeneration systems that first produce useful heat for a manufacturing process via fuel combustion and recover some portion of the exhaust heat to generate electricity.

The CPAs included under this CDM-PoA will use environmentally safe and sound technologies in compliance with national environmental regulations. In the Chilean energy matrix, the share of the technologies promoted by this proposed CDM-PoA is negligible or inexistent[5]; the SIC and the SING generate for the year 2011 58,257 GWh and Biomass source represent only the 1% of the total generation, therefore, the technologies promoted by this CDM-PoA will result in a significantly better performance than any commonly used technology in Chile. Even though this technology is not typically manufactured

[5] http://www.cne.cl/images/stories/estadisticas/raiz/antecedentes_matriz_energetica_010611.pdf

in Chile, it will not fall under any type of Technology Transfer from an Annex I party to Chile or to the CPA implementer.

Figure No. 2: Diagram of a cogeneration system "topping cycle" (Steam Boiler with Steam Turbine).



Source: http://www.c2es.org/technology/factsheet/CogenerationCHP

Main equipment's employed by the CDM-CPA-DD under this PoA, but not limited to:

a) Power energy generation from biomass fired boilers:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the water boiler, through the heat transfer surfaces of the heat exchangers / pressure parts, which is then converted to steam. This steam is used for electrical energy generation using steam turbines that involves three energy conversions, extracting thermal energy from the biomass and using it to raise steam, converting the thermal energy of the steam into kinetic energy in the turbine and using a rotary generator to convert the turbine's mechanical energy into electrical energy.

Components of the equipment:

The boiler consists mainly of the following parts:

1. Pressure parts – form heat transfer area, holds steam, water and various mountings.
2. Furnace fuel combustor – designed to burn efficiently a particular type of biomass fuel or any compatible biomass fuel.
3. Accessories – for various systems like water treatment, storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, flue gas discharge, ash

discharge & handling, electrical systems, equipment safety & controls.

A steam turbine consists of:

One or more rotors (rotating discs) mounted on a drive shaft, alternating with a series of stators (static discs) fixed to the turbine casing. The rotors have a propeller-like arrangement of blades at the outer edge. Steam acts upon these blades, producing rotary motion. The stator consists of a similar, but fixed, series of blades that serve to redirect the steam flow onto the next rotor stage. A steam turbine often exhausts into a surface condenser that provides a vacuum. The stages of a steam turbine are typically arranged to extract the maximum potential work from a specific velocity and pressure of steam, giving rise to a series of variably sized high and low pressure stages. An alternator/generator is set to produce electricity that later is used to drive an electric motor.

The key technical specifications of boiler, turbine, and generator will be determined case by case according to the requirement for each CPA.

b) Thermal energy generation from biomass fired boilers:

The thermal energy generated from biomass firing in the boiler furnace is transferred to the water boiler, through the heat transfer surfaces of the heat exchangers / pressure parts, which is then converted to steam. This steam acts as a medium of transfer of thermal energy in the process for heating.

The boiler consists of mainly the following parts:

1. Pressure parts – form heat transfer area, holds steam, water and various mountings.
2. Furnace fuel combustor – designed to burn efficiently a particular type of biomass fuel or any compatible biomass fuel.
3. Accessories – for various systems like water treatment, storage & feeding, fuel storage, fuel handling & feeding, steam piping, water & fuel piping, drain lines, fans & draught system, flue gas discharge, ash discharge & handling, electrical systems, equipment safety & controls.

The type of boilers and the capacity range vary according to the user's requirement and choice. Various types of boiler shall be considered under this activity like smoke tube / water tube type or combination of these types. These boilers can be packaged / field erected / site assembled with refractory lined or water walled type integral /external furnace.

The water/steam drum is mounted on the top of the water tube type boilers. In smoke tube type boiler shell is mounted side wise of the external refractory lined /water walled furnace or have integral furnace.
The boilers with Fluidized Bed combustors (FBC) have in bed heat exchanger/s inside the furnace & are connected externally, to the main heat exchangers / boiler shell/water-steam drum, with risers & down comer pipes. The boilers are designed with single or multi flue pass design, with furnaces having forced / Induced / balanced draught, as per the boiler model, capacity and by biomass fuel properties.

c) Thermal energy generation by biomass fired Heaters:

The biomass fired heaters consist of thermic fluid / thermal oil heaters, pressurized and non pressurized

hot water generators, which work on closed loop pipe line system, for transferring the thermal energy indirectly, to the process through a heat transfer medium like thermic fluids / thermal oil or pressurized / non pressurized water.

The biomass-fired heaters are similar to the boilers, as both pick up the heat from the biomass fuel combustion & transfer it to the process/heat utilities.

The heaters transfer the thermal energy in the form of heat to the user, which could be a process or heat utilities in a closed loop piping system. The heater consists mainly of the following parts:

1. Heat Exchangers – form the heat transfer surface of the heater,
2. Furnace fuel combustor – designed to burn efficiently a particular type of biomass fuel or any compatible biomass fuel,
3. Accessories - for various systems like fuel storage, fuel handling and feeding, heat transfer fluid/water pipe lines, fans and draught system, flue gas discharge, ash discharge and handling, electrical system, equipment safety and controls, de-aerator and expansion Tank, heat transfer fluid/treated water system and storage.

The heat generated by combustion of the fuels is picked up and carried by the heat transfer medium like thermal oil commonly called thermic fluid or as pressurized /non pressurized water which is forced circulated by a pump through the heat exchangers. The heat exchangers absorb the radiation & convective heat from the combustion of fuel and hot flue gases generated in the furnace and then pass it on to the heat transfer fluid being circulated. Thus, the heat transfer fluid gets heated and it is transferred to the process or utilities to transfer the heat indirectly and then returns to the circulating pump.

The colder heat transfer medium is returned to the circulating pump after passing through the utilities and then through a de-aerator. The de-aerator tank liberates and vents out the vapors trapped or generated in the closed system.

The expansion tank connected at the highest level in the pipe line system ensures that the system is full of the heat transfer medium and also takes care of the increased volume of the heat transfer medium due to its heating.
The heaters are designed with a single / two or multi flue pass design, with furnaces having forced / induced / balanced draught, as per model and capacity and biomass fuel properties.

The type of heater and the capacity and range vary according to the user's requirement and choice. The biomass fuels are burnt in the combustors or furnaces of the heaters. The furnaces are lined fully or partly with refractory material. The combustion system of the heaters is similar to the boilers.

A.4.2.2. Eligibility criteria for inclusion of a CPA in the PoA:

Here only a description of criteria for enrolling the CPA shall be described, the criteria for demonstrating additionality of CPA shall be described in section E.5

A CPA to be included in the proposed PoA shall have:

- Development of the project document according to approve methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass residues", Version 12.0.1, EB 66.
- A cooperation agreement with the CME to participate with this PoA.

CPAs under the PoA are required to fulfil a range of criteria with regards to environmental, regulatory, financial and program specific eligibility criteria considering the *"Standard for demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities" Version 01.0, EB 65, Annex 3.*

Table No. 1: Eligibility criteria to be accomplished by the CPAs participants

No	Criteria	Compliance Rationale	Evidence to be submitted
a	The geographical boundary of the CPA including any time-induced boundary consistent with the geographical boundary set in the PoA.	In each CPA-DD, it shall be demonstrated with GPS coordinates that the CPA does take place within the borders of Chile.	<u>*Requirement for the CME:*</u> An inclusion statement from the CME that it has checked the geographical coordinates of the CPA and they are within the geographical boundary of the PoA. <u>*Requirement for the CPA:*</u> Certificate issued by the CPA implementer and/or supporting documents that includes GPS coordinates of the proposed site, showing that the CPA project activity is inside the geographical boundary stated in the PoA. The supporting document(s) could be for example: copy of the environmental license, CPA topographic layout, copy of the engineering feasibility study, etc.
b	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);	In each CPA-DD, it shall be confirmed that the CPA is not already included in another PoA or developed as a stand-alone CDM registered project. Detailed procedure to avoid double-counting is formulated in A.4.4.1 of the PoA-DD.	<u>*Requirement for the CME:*</u> Documented evidence from the CME following the system/ procedure detailed in section A.4.4.1, including a list of PoAs, CPAs and PDDs reviewed in said CDM database, as well as the unique identification number of all included CPAs and a map showing all included CPAs.

			<u>*Requirement for the CPA:*</u> Certificate from the CPA implementer indicating that the project activity has not been and will not be registered as a single CDM project activity, CPA under another PoA or any voluntary scheme[6].
c	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications;	The CPA shall demonstrate that the technology to be installed is a biomass cogeneration plant for the production of heat/electricity and will meet the host country or international standard/requirements in terms of testing/certifications.	<u>*Requirement for the CME:*</u> An inclusion statement of the CME that it has been checked that the technology to be installed in the CPA project activity to be included in the PoA consist of a biomass cogeneration plant for the generation of steam/heat/electricity and will meet the host country or international standard/requirements in terms of testing/certifications. <u>*Requirement for the CPA:*</u> Certificate issued by the CPA implementer and supporting documents (if applicable) that includes evidence for the main equipment's to be installed, that could be for example: proposals, requests for quote, quotations, tender documents, FSR, project design diagram, engineering feasibility study or equivalent documents. The main project components include, inter alia: a) Seam Boiler and/or b) heat engine and/or c) heat generator and/or d) electricity generator and/or e) Piping system and/or f) instrumentation and control equipment and/or g) pumps/fans and/or h) cooling

[6] Without relinquishing the right of each CPA of voluntarily cancel their CERs (EB69, Annex 2).

			equipment and/or i) major earth/civil works.
d	Conditions to check the start date of the CPA through documentary evidence	The start date of the CPA is either the date when the first contract for a main component is awarded, or when the work for a main component has started, or the planned date for starting the work on the main component (in case an investment decision for a main component has been taken but no work has started) or a declaration to the effect that the project has not started; therefore, the so called "start date" has not happened yet. In any case, such start date cannot be before 25/04/2012, date of Global Stakeholder's Comments.	_Requirement for the CME:_ An inclusion statement of the CME that it has been checked that the documentary evidence provided by the CPA implementer for showing that the start date is after 25/04/2012. _Requirement for the CPA:_ Documented evidence of the date when the first contract for a main component is awarded by the CPA showing a start date after 25/04/2012. Main component could be part of any of the following activities: - Investment decision from the CPA operator related to main project component, boiler/heater/ turbine (including retrofitting or replacement) and also civil works relating to the project activity including the planned date for starting the implementation; - Signed contract documents related to main project component, viz., boiler/heater/turbine and also civil works relating to the project activity; - Evidence to the effect that a main project component, viz., boiler/ heater/turbine had commenced operation collected during the site visit by the CME; - Signed contract for a new dedicated biomass residues supply chain establishment for the purpose of the project); - Signed contract for equipment for preparation and feeding of biomass; - Declaration by the PP on total or partial replacement of fossil fuels by biomass;

			The main plant will include, besides, boiler, heater and turbine, a) interconnecting piping system, b) piping system, c) system for collecting biomass and d) civil works If the project implementation has not commenced, then a declaration to that effect should be issued by the CPA.
e	Conditions that ensure compliance with applicability and other requirements of single or multiple methodologies applied by CPAs;	Each CPA must meet the applicability criteria and conditions, and the most plausible baseline scenario as per methodology ACM0006, version 12.0.1 (as listed in section E.2 of the PoA DD) depending on the of the project activity.	*Requirement for the CME:* An inclusion statement to the effect that the CME has checked the documentary evidence provided by the CPA implementer as evidence that the project complies with applicability criteria, applicability conditions, and applicability of baseline scenario for the applied methodology. *Requirement for the CPA:* Certificate issued by the CPA implementer and evidences / documents required to substantiate the applicability criteria, applicability conditions, and the most plausible baseline scenario in Table 4. of section B.2 of the CPA-DD.
f	The conditions that ensure that CPAs meet the requirements pertaining to the demonstration of additionality as specified in Section A of EB 65 Annex 3;	Each CPA must demonstrate that the respective CPA would not occur in the absence of CDM. This is the case if the CPA is demonstrated to be additional according to the rules set forth in the methodology ACM0006, version 12.0.1, read with the methodological tool "Guidelines on Additionality of First of Its Kind Project activities" (version 2)	*Requirement for the CME:* CME shall issue a inclusion statement of additionality of the CPA project activity after checking Section B.3 of the respective CPA-DD and conclude that the respective CPA would not occur in the absence of CDM. *Requirement for the CPA:* Certificate issued by the CPA

		"Demonstration and assessment of additionality" (Version 06.0.0) and all ancillary tools or guidelines, as elaborated under Section E.1. (If it is applicable to the project activity) below and procedures included in Section E.5. of the respective PoA-DD. In case the CPA is not proven to be additional, it is not eligible for inclusion into the "Biomass Renewable Energy Programme of Activities" PoA_DD	implementer and evidences / documents required to substantiate additionality (details are given in section E.5.1. and E.5.2)
g	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;	- Local stakeholders must have been consulted. - The CPA must be compliant with the Host Country requirements in terms of environmental impact analysis.	<u>*Requirement for the CME:*</u> An inclusion statement of the CME that it confirms: - The Local stakeholders meeting has been carried out by the CPA implementer in line with the approved process of the POA-DD and that the evidence have been submitted to in a transparent and appropriate manner. - The CPA has positive environmental approval issued by the Environmental Evaluation System of the host country. <u>*Requirement for the CPA:*</u> The CPA will submit the following documentary evidence: *I. Local Stakeholder by meeting:* - Invitation letters and/or newspaper advertisement and/or public notice for the invitation of local stakeholders. - Photographs and/or video evidence of stakeholder

			consultation - Attendance list of attended stakeholders - Q&A or Minutes Meeting of stakeholder consultation *II. Local Stakeholder by public announcement:* - Evidence of at least 2 public announcements in a national newspaper, specialized magazine, radio, TV, inviting the community for made comments regarding the project activity. - Evidence of at least 2 public announcement in a local media where the project activity take place, such as; newspaper, specialized magazine, radio, TV, inviting the community for made comments regarding the project activity. - copies of the comments received during the process of public announcement. - Minutes of the responses to the comments received during the public announcement. - A compilation of the comments received from stakeholders and the response given The CPA implementer must submit the positive environmental approval issued by the Environmental Authority to prove that the CPA complies with the Host Country requirement in terms of environmental impact analysis.
h	Conditions to provide an affirmation that funding from Annex I parties, if any, does not result in a diversion of official development assistance;	In each CPA-DD, it shall be confirmed by the Annex 1 Project Participant that the CPA does not involve any public funding from Annex 1 parties or that in case public funding is used a confirmation	*Requirement for the CME:* An inclusión statement from the CME that it has checked the documentary evidence provided by the CPA implementer to prove that the Project is an:

		that official development assistance is not being diverted to the implementation of the PoA.	- Industrial processing and or manufacturing sectors. - Rural or urban - Grid connected or off grid *<u>Requirement for the CPA:</u>* - Certificate issued by the CPA implementer together with evidences / documents such as company license, business license, copy of electricity bills, , etc.
i	Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid-connected/off-grid) and distribution mechanisms (e.g. direct installation);	There is no particular target group for this PoA. This condition is not applicable for this PoA.	*<u>Not Applicable</u>*
j	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys.	The CME has chosen not to go for sampling for verification of the individual CPAs. Thus the DOE would verify every CPA and no sampling would be employed for verification of the PoA and CPAs.	*<u>Not applicable</u>*
k	Where applicable, the conditions that ensure that every CPA in aggregate meets the small-scale or microscale threshold criteria and remains within those thresholds throughout the crediting period of the CPA	Since the PoA is large scale hence this condition is not applicable.	*<u>Not Applicable</u>*
l	Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or microscale project categories.	Since the PoA is large scale hence this condition is not applicable.	*<u>Not Applicable</u>*
m	The consideration of all applicable national and/or sectoral policies and	The consideration of all applicable national and/or sectoral policies and	*<u>Requirement for the CME:</u>* Documented evidence from the

	regulations of each host parties, within the boundary of all host country.	regulations of each host parties, within the boundary of this PoA shall be carried out at CPA level.	CME detailing the latest available national and/or sectoral policies and regulations and detailing how they apply (or not) to the CPA. *Requirement for the CPA:* The CPA implementer must submit a copy of the environmental approval issued by the Environmental Authority to prove that they comply with the laws and regulations of the respective host country
n	The CPA proponent must enter into a contractual agreement with the CME to participate in the PoA.	The CPA implementer shall warrant to CME via a contractual agreement that he/she will at all times implement, operate and maintain the project in compliance with applicable law, regulations and usual and prudent standards in conformity with Chilean environmental law, appropriate health, building, safety protection and other applicable or mandatory requirements. Detailed procedure for a contractual agreement is formulated in A.4.4.1 of the PoA-DD.	*Requirement for the CME & CPA:* Both parties shall provide a copy of the contractual agreement signed containing, inter alia; CDM management services, CER cessation rights and the obligation to comply with the CME´s Code of Conduct and Health and Safety Regulations, as applicable.

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a CPA, below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

(i) The proposed PoA is a voluntary coordinated action

The proposed PoA is a voluntary coordinated action from Bionergías Forestales S.A. to promote the implementation of biomass residues (co-) fired fired heat-and-power plants.[7]
As explained in section A.2, the proposed PoA will facilitate access to carbon revenues to biomass based CHP plant developers. These developments will encourage renewable energy based heat and/or power

[7] Please refer to the declaration by CME "Certificate wilffullnes_CME.pdf" which has been submitted to DOE.

generation in the host country. There are no mandatory laws or regulations in the host country stipulating to implement a Renewable Energy Plant or development of a PoA. Likewise, no obligation exists for private entities to utilize or develop renewable energy projects. The proposed PoA can be, therefore, regarded as a voluntary coordinated action

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

As discussed in Section A.2. point 1 "General operating and implementing framework of PoA" this PoA is a voluntary coordinated action from Bionergías Forestales S.A. as CME.

In the absence of the proposed PoA, the voluntary coordinated actions outlined above would not be likely to be implemented. Virtually no change would take place with regard to the utilization of the biomass based renewable resources in Chile. As mentioned in the introductory section, the biomass utilization for energy generation in Chile is at initial stages only. Moreover, the majority of generating capacity in the existing Grids as well as the capacity expected to come online over the next several years will be primarily fossil-fuel plants.
Considering the participation of renewable sources in the total energy generation and the potential of the renewable resources in Chile, it can be concluded that in the absence of the capacity development and streamlined CDM services to be provided under the proposed PoA the financial incentives like CDM revenues will remain at insufficient levels to undertake the investments needed to establish new renewable plants. Consequently, the current dependence on fossil based thermal generation will remain.

By providing capacity building and carbon finance platforms to small renewable energy plants, the proposed PoA will support the sector in overcoming these barriers. The PoA is thus deemed additional.

The additionality of each CPA would be demonstrated in each CPA-DD following the relevant methodology and tools requirements and as per the inclusion criterion of the CPAs set out in A.4.2.2 above. Only the CPAs that have demonstrated to be additional will be included in the PoA, thus it can be concluded that none of the CPA's under the PoA would occur in the absence of CDM; therefore the entire programme would not be implemented in the absence of CDM.

The program has been developed by the CME specifically for CDM: carbon credits generated by the CPAs to be included in the programme are the only expected revenue that will go to the CME. Indeed it is unlikely that this voluntary coordinated action be implemented by the CME in the absence of the CDM.

The demonstration of additionality for a typical CPA is detailed under Section E.5 of the PoA-DD.

(iii) If the PoA is implementing a mandatory policy/regulation, this would/ is not enforced;

Not applicable as the proposed PoA is not implementing mandatory policies / regulations in the selected geographical boundary.

(iv) If mandatory policy/regulation are enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Not applicable as the proposed PoA is not implementing mandatory policies / regulations in the selected geographical boundary.

A.4.4. Operational, management and monitoring plan for the programme of activities:

A.4.4.1. Operational and management plan:

The operational and management arrangements established by the coordinating/managing entity for the implementation of the PoA are as per EB 65 Annex 3 Para 17. CME has prepared a CME quality manual (version 1, dated 15/12/12) which details out the operational and management plan of the PoA and defines roles and responsibilities at the CME level. The operational and management arrangements for the PoA are discussed below.

(a) A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;

The role of the CME (Bioenergías Forestales S.A.) is to assess and review potential CPAs and work with the implementing entity to perform eligibility assessment, prepare the CPA-DD and submit a CPA inclusion request to the DOE.

The CME will undertake the process of inclusion of CPAs as follows:

- The CPA status will be checked by a project manager qualified for CDM processes as per the procedure to avoid double accounting described in the Point (d) below.
- The CPA eligibility will be checked by a project manager qualified for CDM process and PoA guidelines and the CME will issue a statement of conformity of the CPA with the eligibility criteria.
- The General Manager or a director of the CME will sign a contractual agreement with the CPA implementer.
- The CME may appoint in-house staff or any relevant third party with CDM expertise (e.g. CDM consultant) to launch the inclusion process, including contracting a DOE, gathering the CPA information and preparing the relevant documentation.
- If the inclusion is carried out by a third party, the CME will be informed on a regular basis of the progress of the inclusion.
- A technical review of Operational and management plan will be conducted as described in Point (c) below.

The proposed PoA involves a range of operational activities in order to implement and manage each CPA by the managing entity Bioenergías Forestales S.A. and CPA operator within the PoA.

Table No. 2: Entity role, responsibilities and competency of personnel.

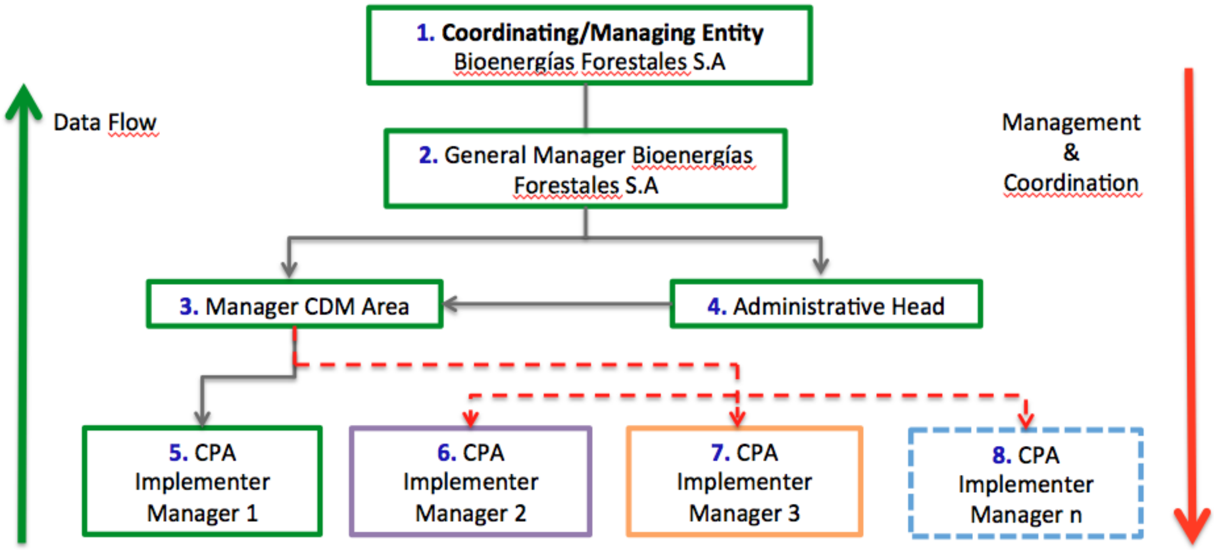
Entity	Personnel	Role and Responsibilities	Competency Requirements
Bioenergías Forestales S.A.	Project manager	- Check the CPA status - Check the eligibility of the CPA	Proven knowledge in climate change sector, including a minimum of 3 month experience

			in CDM
	General Manager	- Technical Review and final decision to include the CPA - Appoint a consultant or in-house staff to proceed with the inclusion	Proven knowledge in climate change sector, including a minimum of 1 year experience in CDM
	Third Party: CDM consultant	CDM inclusion process	Track record in registration and issuance of CDM projects, including Programmatic CDM
CPA implementer	CPA Implementer Manager	- Correct implementation of the CPA project activity, procedures and processes as well as maintaining a close relationship with the CME. - Compile all the monitoring information and making it available for the CME. - Adhering to the monitoring plan defined in the CPA-DD	Engineer with expertise and knowledge in the processes of the plant, and familiar with the record keeping system.

The competency requirements of the personnel involved in the inclusion process will be verified through CV (including contact details of at least two reliable personal references, which may be checked by the CME) and/or information publicly available.

In the figure below a representative diagram shows the management and operational scheme chart between the CME and the CPA Implementer.

Figure No. 3: Management and operational scheme of the proposed PoA



(b) Records of arrangements for training and capacity development for personnel;

- Personnel will be trained on both operational and CDM aspects of the project.
- Training will be carried out internally and/or externally, either on site or remotely.
- Training will be provided in their respective field whenever a new member is inducted at CME or at CPA implementer level.
- The CME will provide guidance to the CPA implementing entity on how the monitoring should be conducted and data should be collected with regards to emission reduction calculations.

The training will take place at the time of commissioning and will consist of:

- Training on operational aspects to personnel involved in the operation of the plant. The training will be carried out by qualified personnel from the equipment manufacturer or from the CPA implementer, as relevant
- Training on CDM aspects to the CPA implementer and the personnel on site. The training will be carried out either by the CME or by a CDM consultant. The trainees will be informed on the implications and obligations due to a CDM status: for instance in terms of data handling, metering, calibration, certification etc.

(c) Procedures for technical review of inclusion of CPAs;

In order to be included in the PoA, the CME will assess the eligibility of each CPA to see if its characteristics fit the criteria set in section A.4.2.2 of the PoA-DD. The procedures for inclusion of a CPA in the PoA are the following:
1) Initial screening by the CME (Bioenergías Forestales S.A.).
2) Preparation of the CPA-DD by third party (CDM consultant) or the CME for CDM inclusion process.
3) Eligibility checks verified through documentation provided by CPA implementer (technical review by CME).

4) Official submission to DOE for inclusion.

(d) A procedure to avoid double counting (e.g. to avoid the case of including a new CPA that has already been registered either as a CDM project activity or as a CPA of another PoA):

Prior to including a new CPA under the proposed PoA, the CME will check the CPA on PoA databases in the UNFCCC website to ensure that a similar CPA has not been registered already.
Existing registered projects will be verified at the following links:

a) http://cdm.unfccc.int/Projects/registered.html
b) http://cdm.unfccc.int/ProgrammeOfActivities/registered.html
c) http://www.cdmpipeline.org/

or any other link available at the time of inclusion.

Each CPA included in this PoA will be provided with a unique identification number, that shall includes:

- Name of the PoA: Biomass Renewable Energy Programme of Activities -
- Number of the CPA in the following format; CPA00X
- Name of the CPA implementer between brackets: “XXXXX”

And the format must be the following:
Biomass Renewable Energy Programme of Activities - CPA00X “XXXXX”

To avoid double counting, each included CPA with its reference number will be linked with the geographic coordinates for each facility’s specific site location and a specific map of the region showing the satellite location of each CPA.

(e) Records and documentation control process for each CPA under the PoA;

Operation, monitoring and management of the projects will be at the CPA level: All relevant parameters included in the monitoring plan shall be monitored and recorded in each CPA by maintaining a record keeping system supervised by the CME.

Each CPA will follow the record keeping and monitoring requirements stipulated in ACM0006 “Consolidated methodology for electricity and heat generation from biomass residues”, Version 12.0.1, EB 66.

As mentioned above in point (d), in order to unambiguously identify each energy facility participating in the PoA, a serial numbering system will be implemented that uniquely identify each facility through numbers for the CPA and the energy facility. This serial numbering system will be used to record baseline and monitoring data on a continuous basis using a MS Excel database. In this way, the PoA coordinating entity will be able to track the emission reduction of each energy facility over the full duration of the crediting period.

In summary, Bionergías Forestales S.A. will record and document CPA detail information as follows:

- Name of the CPA and its project capacity

- The name, address, and project owner details of each participating CPA
- The geographical coordinates of each CPA (GPS coordinates of each energy facility)
- The record of technical specification of each plant participating in the CPA

Bionergías Forestales S.A. will be responsible for the management of records and data associated with each CPA. The MS Excel database will be updated with the on-line data supplied by the participating energy facilities. It will form the basis for the verification of CPAs and be available for inspection by the DOE at any point in time.

The CME will ensure that each CPA will maintain standard records and will be responsible for centralizing and archiving the monitored data.
The monitored data will be kept for the full crediting period, plus two years after the end of the crediting period or the last issuance of CERs for this CPA (whichever occurs later).

(f) Measures for continuous improvements of the PoA management system;

The PoA management will seek for continuous improvements such as:
- Allowing flexibility on the development of the PoA
- Ensuring a continuous update of the most recent UNFCCC guidelines
- Appointing CDM experts for inclusions of CPAs and/or training of personnel

The PoA management process will be assessed annually with comments invited from all team members and participating CPA implementing entities to help identify any areas of improvement.
The annual assessment will take the form of a questionnaire that will be sent out electronically to all CME team members and on paper and/or electronically to participating CPA implementing entities / Operators.
Further a bi-annual audit would be conducted by the director of the CME to ascertain the smooth functioning of the process and any possible deviation from the approach as planned in the PoA-DD.

g) The provisions to ensure that those operating the CPA are aware and have agreed that their activity is being subscribed to the PoA;

In order to avoid double accounting and to ensure that the operators of the CPA are aware of and have agreed that their activity is being subscribed to the PoA the implementing entity of a CPA shall enter into a contractual arrangement with the coordinating entity including the respective provisions that:

- The CPA has not been and will not be registered as a single CDM project activity nor as a CPA under another PoA.
- The implementing entity is aware that the CPA will be subscribed to the present PoA.
- The implementing entity cedes its rights to claim and own emission reductions under the Clean Development Mechanism of the UNFCCC or any voluntary scheme to the managing entity of the present PoA.
- The implementing entity certifies that the CPA is not registered under the Clean Development Mechanism of the UNFCCC or any voluntary scheme

Using the unique identification for each participating energy facility, the PoA coordinating entity will confirm that a facility has not already been registered or entered validation as a CDM project activity or

as a CPA of another PoA. Should such a case occur then the coordinating entity will not proceed with the inclusion of the corresponding CPA in the PoA.

A.4.4.2. Monitoring plan:

(i) Description of the proposed statistically sound sampling method/procedure to be used by DOEs for the verification of the amounts of reductions of anthropogenic emissions by sources or removals by sinks? of greenhouse gases achieved by CPAs under the PoA.

The CME is not opting for any sampling method/procedure for verifying CPAs. The DOE would verify all the CPAs individually and completely without any sampling.

(ii) In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA;

For complying with point (ii), the coordinating entity will submit CPAs for verification by the DOE pursuant to the sequence described below:

1. The coordinating entity will continuously update a list of all CPAs
2. The coordinating entity collects the monitoring information for all CPAs that will be verified and prepares one monitoring report for each CPA.
3. Desk review and on-site assessment of the CPAs
4. The DOE computes total verified emission reductions by the PoA

1. Maintenance of a list of verification procedures to be applied to each CPA

The coordinating entity will develop and continuously update a list of CPAs that clearly and uniquely identifies each CPA and lists further important information to build the basis in order to compile a monitoring report, such as the crediting period and start date of each CPA.

The database described above will be used to perform a double accounting check. Every new CPA will be compared to the already existing database and to the list of project activities that are under validation or registered at the UNFCCC, as described in section A.4.4.1. above.

2. Collection of monitored parameters and elaboration of the monitoring plan

Each monitoring report will compile all required monitoring information for a CPA that will be verified by the DOE. This report will unambiguously set out the data relating to the emission reductions generated by each specific CPA during the monitoring period consistent with the requirements of this PoA-DD and the corresponding CPA-DD.

The monitoring plan for parameters included in section E.7.1 will be implemented for each CPA with assistance from the coordinating entity as follows:

- CPA Implementer will implement each CPA individually and monitor and record all parameters included in section E.7.1.
- The coordinating entity will provide guidance to CPA Implementer on how monitoring should be conducted and data should be collected in regards to emission reductions calculation.
- The CPA Implementer will provide data on monitored parameters included in section E.7.1 to the coordinating entity.
- The coordinating entity will document and store all parameters included in section E.7.1 provided by CPA Implementer in an electronic database, while CPA Implementer will store primary data.
- The coordinating entity reviews relevant monitoring documents, prepares the monitoring reports of the CPAs, and provides the latter to the DOE.

3. Desk review and on-site assessment of the CPAs

The DOE performs a desk review of the monitoring information of all CPAs and performs on-site assessments if deemed necessary as per procedures determined by the CDM Validation and Verification Manual.

At the end of the desk review and the on-site assessments, the coordinating entity shall provide an updated monitoring report elaborated in light of the DOE findings.

4. The DOE computes total verified emission reductions by the PoA

The DOE assesses the final monitoring report provided by the coordinating entity and certifies that ERs are estimated as described in the PoA-DD and the respective CPA-DD and are not miscalculated.

A.4.5. Public funding of the programme of activities:

Neither the PoA nor the CPAs participating in the programme will receive public funding that constitutes a diversion of official development assistances. The CME has not received and will not receive public funding of any type for the purpose of developing and/or implementing this PoA.

In case public funding is received for a CPA, an affirmation will be provided that such funding does not result in a diversion of ODA.

SECTION B. Duration of the programme of activities

B.1. Starting date of the programme of activities:

The starting date of the PoA-DD is 25/02/2013 or effective date of registration of the PoA which ever is later.

B.2. Length of the programme of activities:

28 years, 0 months.

SECTION C. Environmental Analysis

C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

1. Environmental Analysis is done at PoA level ☐
2. Environmental Analysis is done at CPA level ✔☐

Due to the highly localized and site-specific environmental impacts of each biomass power plant project in particular, the geographical location, capacity and construction plan among others, each CPA will have a separate environmental assessment. The environmental analysis for each CPA will be conducted in line with applicable national environmental policies that will be identified at the time of the inclusion of each CPA.

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

Not applicable. Environmental Analysis is done at CPA level.

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA),:

Environmental impact assessments will be carried out at CPA level according to the applicable laws and regulations of the host country (Chile) before the inclusion of the CDM-CPA in the CDM-PoA. The law applicable to a typical CPA under this PoA is as follows:

- Law 19,300[8] "Ley Sobre Bases Generales del Medio Ambiente" Article 10 (Project that should be subject to the System of Environmental Impact Assessment) and Article 11 (projects that must submit an Environmental Impact Study).

The owner of the CPA must submit either an Environmental Impact Statement or Environmental Impact Study. An Environmental Impact Statement (DIA) for a project is shorter than an Environmental Impact Study (EIA) as it is expected that the environmental impact is lower.

Stakeholders consultation at CPA level of projects which must analyze their environmental impacts

8 http://www.sinia.cl/1292/articles-26087_ley_bases.pdf

through an **Environmental Impact Study (EIA)**, a formal stakeholder consultation needs to be included as part of the assessment process by the environmental authority. This stakeholder consultation is defined in articles 49 to 53 of Law N° 19,300. The Environmental Authority is in charge of the coordination of the process, which defined specific mechanisms to ensure an informed participation of the community based on the characteristics of the project. The project developer must publish a summary of the project in the Official Gazette and in a local or national newspaper; any person affected by the project can submit comments to the Environmental Authority during the following 60 days. These observations are to be weighted by the Environmental Authority and taken into account in the environmental approval process.

Stakeholders consultation at CPA level which assess their environmental impacts through an **Environmental Impact Statement** (**DIA**) and those which don't need to go through the Environmental Impact Assessment System (EIA), the stakeholder consultation process before mentioned is not required. In these cases, the CPA implementer, taking into account the CPA's local circumstances, will define the invitation and compilation of comments by local stakeholders. The invitation for comments by local stakeholders shall be made in an open and transparent manner, in a way that it facilitates comments to be received from local stakeholders.

SECTION D. Stakeholders' comments

D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

1. Local stakeholder consultation is done at PoA level ✔ ☐
2. Local stakeholder consultation is done at CPA level ✔ ☐

Stakeholder consultation has been done at PoA level, and also it will be done specific for each CPA so as to ensure that a wider group of stakeholders is reached. At PoA level the consultation was carried out to ensure wider participation of national level stakeholders. However, the individual CPA are expected to have localized impacts due to nature of installation and hence, stakeholder consultation would also be carried out at CPA level.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

1. Stakeholder consultation at PoA level

A voluntary stakeholder consultation for the PoA has carried out. In this case, it was done a focused public consultation, surveying the neighbors in the national area of direct possible influence of the project and leaders or organized local groups in those same possible areas.

Therefore the project developer performed the following independent Public Consultation Process activities:

a) 6 public announcements were performed in a national newspaper, three times in a week, for two consecutive weeks[9]:

- Publication N°1: 21/12/2011 in the "El Mercurio"
- Publication N°2: 22/12/2011 in the "El Mercurio"
- Publication N°3: 23/12/2011 in the "El Mercurio"
- Publication N°4: 28/12/2011 in the "El Mercurio"
- Publication N°5: 29/12/2011 in the "El Mercurio"
- Publication N°6: 30/12/2011 in the "El Mercurio"

b) 64 letters to all the public authorities and neighbors was sent explaining the project[10].

2. Stakeholder consultation at CPA level

If the CPA does not require an Environmental Impact Study (EIA) then there must be a separate and voluntary Public Consultation Process (PCP) for the CDM application. Stakeholder consultation at CPA level must involve the following:

1. At least drafting an article on the project. This article must make mention of the environmental impacts of the project and the fact that the project is applying for carbon credits under the CDM. The article must invite comments from the public on the project. Contact details must be included in the article so that people can leave comments. This should include at least a PO BOX for contact.

2. The article must be published at least in one local newspaper with the local language.

3. The article must be placed in the town hall or municipal office nearest to the project site.

4. All comments must be recorded when received and all contact details of the person giving comments must be recorded.

5. All comments must be responded to and addressed. The person giving comments must be contacted with the response.

D.3. Summary of the comments received:

In general, the perception of the project is positive and related benefits regarding the use of Clean Development Mechanisms for generate renewable energy are well recognized by local stakeholder and authorities. Other concerns about the local permits and operation are seen as solvable and not as key within their general concerns about the PoA initiative itself.

1. One question where received because of the announcements in the national newspaper[11].

[9] Documentation will be available at Validation.
[10] Documentation will be available at Validation.
[11] Documentation will be available at Validation.

Comment No. 1:

Date of receipt letter:	06/01/2012
Name:	Felipe Mancini Merino
Position:	Mastermind of the conceptual engineering project management of forest biomass.
Institution:	Particular consultant
Summary of the comment:	The interested party has commented about the good initiative of taking advantage of residual biomass in power and/or thermal plants and exposes about a project that he has been developing for the management of forest biomass and it's positive effects.

2. Three questions where received because of the letters to public authorities and neighbors[12].

Comment No. 2:

Date of receipt letter:	08/02/2012
Name:	Patricio Esparza González
Position:	Chief of Planning and Regional Development Division
Institution:	Regional Government of the Araucanía
Summary of the comment:	The Regional Government of Araucanía supports the intention to developing projects in the region generating renewable energy from forest biomass. They claim that such initiatives are fully consistent with the guidelines of the Regional Development Strategy 2010-2022 and the plan of Government. They request further details on installation due dates, location and estimated employment generation.

Comment No. 3:

Date of receipt letter:	20/01/2012
Name:	Gloria Vilicic Peña
Position:	Chairman of the province of Magallanes
Institution:	Provincial Government of Magallanes
Summary of the comment:	More information about the Programmatic Renewable Energy Generation from Forest Biomass and about Clean Development Mechanism is requested, in order to have more background of this initiative that will be related to the Province of Magallanes.

Comment No. 4:

Date of receipt letter:	17/02/2012
Name:	Hernán Brucher Valenzuela

[12] Documentation will be available at Validation.

Position:	MRS
Institution:	Ministerial Regional Secretariat for the Environment of Valparaíso
Summary of the comment:	From letter to public bodies, an invitation was made by Ministerial Regional Secretariat of Environment to apply as representative for the Regional Advisory Council for Environment of Valparaíso, providing detailed information about the requirements of the position.

D.4. Report on how due account was taken of any comments received:

All comments received mentioned above were answered to the address that the letter stated, as follows[13]:

Response to Comment No. 1:

Response date:	16/10/2012
Directed to:	Felipe Mancini Merino
Summery of response:	Regarding the project that the stakeholder was developing, Bioenergías Forestales S.A. stated that they would contact him when the development plan has carried out to discuss about the possible joint development activities in the field of interest.

Response to Comment No. 2:

Response date:	03/05/2012
Directed to:	Patricio Esparza González
Summery of response:	Bioenergías Forestales S.A appreciates the favorable predisposition to the initiative. Requests a copy of the mentioned Regional Development Strategy 2010-2022, as well as, the Government Plan Araucanía 7. Finally, it has been stated they will contact again as the development plan has progressed.

Response to Comment No. 3:

Response date:	03/05/2012
Directed to:	Gloria Vilicic Peña
Summery of response:	Regarding the request for more information about the project, Bioenergías Forestales S.A. invited to visit the UNFCCC site (cdm.unfccc.int). They give notice that in in the short term, are not planned power/heat generation activities in the Region of Magallanes. Which, if carried out, will be duly informed according to the channel established by law.

Response to Comment No. 4:

Response date:	03/05/2012
Directed to:	Hernán Brucher Valenzuela

[13] Responses will be available for validation.

Summery of response:	Regarding the invitation to postulate as representative of the Regional Advisory Council for Environment of Valparaíso, they decline to participate because according to what is specified in the letter, the organization does not meet the requirements for the position.

SECTION E. Application of a baseline and monitoring methodology

E.1. Title and reference of the approved baseline and monitoring methodology applied to each CPA included in the PoA:

The following approved baseline and monitoring methodology can apply to a CPA included in the PoA:

ACM0006 "Consolidated methodology for electricity and heat generation from biomass residues", Version 12.0.1, EB 66.

This methodology also refers to the latest approved versions of the following tools:

- "Tool for the demonstration and assessment of additionality" Version 06.0.0, EB 65, Annex 21.
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" Version 02, EB 41, Annex 11.
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", Version 01, EB 39, Annex 7
- "Tool to calculate the emission factor for an electricity system" Version 02.2.1, EB 63, Annex 19
- "Tool to determine the baseline efficiency of thermal or electric energy generation systems" Version 01, EB 48, Annex 12.
- "Tool to determine the remaining lifetime of equipment" Version 01, EB 50, Annex 15
- "Assessment of the validity of the original/current baseline and update of the baseline at the renewable of the crediting period" Version 3.0.1, EB 66.
- "Project and leakage emissions from road transportation of freight" Version 01, EB 63, Annex 10.

E.2. Justification of the choice of the methodology and why it is applicable to each CPA:

ACM0006 Version 12.0.1 is applied in this PoA as the programme involves project activities that operate biomass-residue (co-)fired power-and-heat plants. The project activity may include the following activities or, where applicable, combinations of these activities. Detailed description of the justification of choice of the methodology is given in the following Table.

Table No. 3: Applicability analysis for ACM0006Version 12.0.1

The project activity may include the following activities or, where applicable, combinations of these activities:		
Sr. Nº	**Applicability Criteria**	**CPA**
1	The installation of new plants at a site where currently no	The CPAs could consist of new

	power and heat generation occurs (Greenfield projects)	plants installed where no power and heat generation plants were functioning. The CME will check at CPA level if the project activity applies to these criteria of the meth or not
2	The installation of new plants at a site where currently power or heat generation occurs. The new plant replaces or is operated next to existing plants (capacity expansion projects)	The CPA projects could consist of new plants built in facilities where power or heat generation currently occurs. The CME will check at CPA level if the project activity applies to these criteria of the meth or not
3	The improvement of energy efficiency of existing plants (energy efficiency improvement projects), which can also lead to a capacity expansion, e.g. by retrofitting the existing plant	CPAs could consist of projects that improve the actual energy efficiency in already existing plants, through retrofitting or implementation of new equipment. The CME will check at CPA level if the project activity applies to these criteria of the meth or not.
4	The total or partial replacement of fossil fuels by biomass residues in existing plants or in new plants that would have been built in the absence of the project (fuel switch projects), e.g. by increasing the share of biomass residues use as compared to the baseline, by retrofitting an existing plant to use biomass residues, etc	The CPA projects could consist of power plants based on biomass which displaces the heat and electric generation from fossil fuels from existing plants or that normally would have been implemented in the absence of the project. The CME will check at CPA level if the project activity applies to these criteria of the meth or not
The methodology is applicable under the following conditions;		
Sr. Nº	**Applicability Conditions**	**CPA**
1	No biomass types other than biomass residues are used in the project plant.	The CPAs shall utilize biomass residues for energy generation, understood as biomass that is a by-product, residue or waste stream from agriculture, forestry and related industries. This shall not include municipal waste or other waste that contain fossilized and/or non-

		biodegradable material (however, small fractions of inert inorganic material like soil or sands may be included). The biomass used by the CDM-CPA-DD under this PoA will be in compliance with "Definition of Renewable Biomass - Annex 18 of EB 23" and "Glossary of CDM Terms - Version 06.0 - Annex 63 of EB 66". The CME will check at CPA level that the activity project fulfils with this criteria.
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.	Fossil fuel co-fired in the project plant shall not exceed 80% of the total fuel fired on an energy basis. The CME will check at CPA level that the project activity fulfils with this criteria.
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.	Biomass residues from a production process use in CPAs shall 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. The CME will check at CPA level that the project activity fulfils with this criteria.
4	The biomass residues used by the project facility are not stored for more than one year.	The biomass residues used in individual CPAs shall not be stored for more than a year. The CME will check at CPA level that the project activity fulfils with this criteria.
5	The biomass residues 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 preparations of biomass-derived fuel do not involve significant energy quantities, except from transportation or mechanical treatment so as not to cause significant GHG emissions.	The biomass residues used by the individual CPAs shall not come from chemically processed biomass. Also the preparation of biomass-derived fuel would not involve significant energy quantities, except from transportation or mechanical treatment.

		The CME will check at CPA level that the project activity fulfils with this criteria.
6	In the case of fuel switch project activities, the use of biomass residues or the increase in the use of biomass residues as compared to the baseline scenario is technically not possible at the project site without a capital investment in: • The retrofit or replacement of existing heat generators/boilers; or • The installation of new heat generators/boilers; • A new dedicated biomass residues supply chain established for the purpose of the project (e.g. collecting and cleaning contaminated new sources of biomass residues that could otherwise not be used for energy purposes); or • Equipment for preparation and feeding of biomass residues.	The CME will check if CPAs projects activities of fuel switch, the use of biomass residues or the increase of the utilization of biomass residues in comparison with the baseline scenario, is not technically possible without a capital investment in: - Retrofit or replacement of existing generators / boilers; or - Installation of new heat generators/boilers; or - New biomass residues supply chain; or - Equipment for preparation and feeding of biomass residues.
7	In the case that biogas is used in power and/or heat generation, this methodology is applicable under the following conditions: • The biogas is generated by anaerobic digestion of waste water (to be) registered as a CDM project activity and the details of the registered CDM project activity must be included in the PDD. Any CERs from biogas energy generation should be claimed under the proposed project activity registered under this methodology; The biogas is generated by anaerobic digestion of wastewater that is not (and will not) being registered as a CDM project activity. The amount of biogas does not exceed 50% of the total fuel fired on an energy basis.	Project Activities in future CPAs does not include the use of biogas for power and/or heat generation. So this condition is not applicable to the PoA.
The methodology is only applicable if the most plausible baseline scenario, as identified per the "Selection of the baseline scenario and demonstration of additionality" section hereunder, is:		
Sr. Nº	**Baseline scenario Condition**	**CPA**
1	For power generation: Scenarios P2: to P7:, or a combination of any of those scenarios.	Future CPAs most plausible baseline scenario for power generation could be scenarios P2: to P7:, or a combination of any of those.
2	For heat generation: Scenarios H2: to H7:,or a combination of any of those scenarios	Future CPAs most plausible baseline scenario for heat generation could be scenarios H2: to H7:, or a

		combination of any of those.
3	If some of the heat generated by the project activity is converted to mechanical power through steam turbines, for mechanical power generation: Scenarios M2: to M5: • In the case of M2 and M3, if the steam turbine(s) are used for methancial power in the project, the turbine(s) used in the baseline shall be at least as efficient as the steam turbine(s) used for methancial power in the project; • In the case of M4 and M5, steam turbine(s) for methancial power are not allowed for the same purpose in the project.	Future CPAs most plausible baseline scenario for convert the heat generated by the project activity to mechanical power through steam turbines, for mechanical power generation could be scenarios M2: to M5:, or a combination of any of those.
4	For biomass residue use: Scenarios B1: to B8:, or any combination of those scenarios. For scenarios B5: to B8:, leakage emissions should be accounted for as per the procedures of the methodology.	For scenarios B5: to B8:, leakage emissions would be accounted for as per the procedures of the methodology. The CME will check at CPA level that in case this scenarios applies, leakage emissions are accounted as per the procedures of the methodology.

E.3. Description of the sources and gases included in the CPA boundary

ACM0006 Version 12.0.1 applied in this PoA encompasses the following spatial extent of the project boundary:

- All plants generating power and/or heat located at the project site, whether fired with biomass residues, fossil fuels or a combination of both;
- All power plants connected physically to the electricity system (grid) that the project plant is connected to;
- Where possible, all off-site heat sources that supply heat to the site where the project activity is located (either directly or via a district heating system);
- The means of transportation of biomass residues to the project site;
- The site where the biomass residues would have been left for decay or dumped;
- The wastewater treatment facilities used to treat the wastewater produced from the treatment of biomass residues;

The specific situation of the project activity shall be detailed in the CDM Programme Activity Design Document (CDM-CPA-DD), documenting the following:

- For each plant generating power and/or heat that has been operated at the project site within the most recent three years prior to the start of the project activity: the type and capacity of the heat

generators, the types and quantities of fuels which have been used in the heat generators, the type and capacity of heat engines, and whether the equipment continues operation after the start of the project activity;

- For each plant generating power and/or heat installed under the project activity: the type and capacity of the heat generators, the types and quantities of fuels used in the heat generators, the type and capacity of heat engines and direct heat extractions;
- For each plant generating power and/or heat that would be installed in the absence of the project activity: the type and capacity of the plant, including the type and capacity of the heat generators, heat engines and electric power generators used and the types and quantities of fuels which would be used in each heat generator;
- The average amounts of electricity and heat import from off-site sources that would happen in the absence of the project activity on an yearly basis and the forecast for the project scenario. A schematic diagram of the project activity and the baseline scenario. The specific configuration of the project activity should be clearly described in the CDM-PDD using a similar picture of the presented in the methodology.

The following tables illustrate which emissions sources are included and which are excluded from the project boundary according to ACM0006 Version 12.0.1 for determination of both baseline and project emissions. The following table will be updated accordingly in each CPA-DD.

Table No. 4: **Emissions sources included in or excluded from the project baseline and Project activity**

	Source	Gas		Justification / Explanation
Baseline	Electricity and heat generation	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Uncontrolled burning or decay of surplus biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	To be decided for each CPA	CPA operator may decide to include this emission source, where case B1, B2 or B3 has been identified as the most likely baseline scenario
		N_2O	Excluded	Excluded for simplification. This is conservative. Note also that emissions from natural decay of biomass are not included in GHG inventories as anthropogenic sources
Project Activity	On-site fossil fuel consumption	CO_2	Included	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Off-site transportation of biomass	CO_2	Included	May be an important emission source
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small

	residues	N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small
	Combustion of biomass residues for electricity and heat	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Included or Excluded	This emission source will be included if project CPA operator decide to include CH_4 emissions from uncontrolled burning or decay of the biomass residues in the baseline scenario
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small
	Storage of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Excluded	Excluded for simplification. Since biomass residues are stored for not longer than one year, this emission source is assumed to be small
		N_2O	Excluded	Excluded for simplification. This emissions source is assumed to be very small
	Wastewater from the treatment of biomass residues	CO_2	Excluded	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector
		CH_4	Included	This emission source shall be included in cases where the waste water is treated (partly) under anaerobic conditions
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be small

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

The selection of the most plausible baseline scenarios will be identified at CPA level as per the "Selection of the baseline scenario and demonstration of additionality" defined in the applied methodology ACM0006 Version 12.0.1 as follows:

- For power generation: Scenarios P2 to P7, or a combination of any of those scenarios;
- For heat generation: Scenarios H2 to H7, or a combination of any of those scenarios;
- If some of the heat generated by the CDM project activity is converted to mechanical power through steam turbines, for mechanical power generation: Scenarios M2 to M5:
    - In the case of M2 and M3, if the steam turbine(s) are used for methancial power in the project, the turbine(s) used in the baseline shall be at least as efficient as the steam turbine(s) used for methancial power in the project;
    - In the case of M4 and M5, steam turbine(s) for methancial power are not allowed for the same purpose in the project.
- For biomass residue use: Scenarios B1 to B8, or any combination of those scenarios. For scenarios B5 to B8, leakage emissions should be accounted for as per the procedures of the methodology.

- For Biogas, scenario BG1 to BG3 or a combination of these. In case BG4 is selected, the methodology is not applicable.
- For the land use of the plantation area: Scenario L1 is the baseline.

The baseline scenario to be identified in each CPA shall be in compliance with all mandatory laws and regulations taking into account the legal framework in Chile and EB decisions. As per the eligibility conditions (Section A.4.2.2.), all CPAs under this PoA must comply with the local laws and regulations.

Applicability of local law and regulations:

Each CPA should meet the requirements of Law 19,300[14] "Ley Sobre Bases Generales del Medio Ambiente" which is the Environmental Laws of Chile. In line with the requirements under Article 10 of this law (Project that should be subject to the System of Environmental Impact Assessment) and Article 11 (projects that must submit an Environmental Impact Study), the CPA should obtain appropriate approvals under the law. The approval under the law would prove the adherence of the CPA to local laws and regulations.

Different Baseline scenarios feasible for different CPAs
Technically there could be huge number of combinations that are feasible and could occur in one of the future CPAs depending on different combinations of power, heat, biomass scenarios in the baseline. Moreover, the extent and nature of future CPAs, which would be added over the course of PoA-lifetime, is not known at the present. Hence, it is not feasible to discuss all the feasible and technically possible baseline scenarios and alternatives.

However, following procedure would be adopted for identification of baseline scenarios:

Selection of the baseline scenario and demonstration of additionality
The selection of the baseline scenario and demonstration of additionality would be conducted under each CPA-DD by applying the following steps:

Step 1: Identification of alternative scenarios
This step serves to identify alternative scenarios to the proposed CPA(s) that can be the baseline scenario through the following sub-steps:

Step 1a: Definition of alternative scenarios to the proposed CPA
Identify realistic alternative scenarios that are available to the project participants under the CPA and that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity.
The alternative scenarios should specify:

- How electric power would be generated in the absence of the CPA;
- How heat would be generated in the absence of the CPA;
- If the CPA generates mechanical power through steam turbine(s): how the mechanical power would be generated in the absence of the CPA;
- If the CPA uses biomass residues, what would happen to the biomass residues in the absence of the CPA; and

[14] http://www.sinia.cl/1292/articles-26087_ley_bases.pdf

- If the CPA is based on dedicated plantation, what would happen to the land where dedicated plantation is established in the absence of the CPA.

The alternative scenarios for electric power should include, but not be limited to, inter alia:

P1: The proposed project activity not undertaken as a CDM project activity;
P2: If applicable,[15] the continuation of power generation in existing power plants at the project site. The existing plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the starting date of the CPA;
P3: If applicable, the continuation of power generation in existing power plants at the project site. The existing plants would operate with different conditions from those observed in the most recent three years prior to the starting date of the CPA;
P4: If applicable, the retrofitting of existing power plants at the project site. The retrofitting may or may not include a change in fuel mix;
P5: The installation of new power plants at the project site different from those installed under the CPA;
P6: The generation of power in specific off-site plants, excluding the power grid;
P7: The generation of power in the power grid.

So as an outcome here, one or more baseline power generation scenarios would be shortlisted for each CPA

The alternative scenarios for heat should include, but not be limited to, inter alia:
H1: The proposed project activity not undertaken as a CDM project activity;
H2: If applicable, the continuation of heat generation in existing plants at the project site. The existing plants would operate at the same conditions (e.g. installed capacities, average load factors, or average energy efficiencies, fuel mixes, and equipment configuration) as those observed in the most recent three years prior to the CPA;
H3: If applicable, the continuation of heat generation in existing plants at the project site. The existing plants would operate with different conditions from those observed in the most recent three years prior to the CPA;
H4: If applicable, the retrofitting of existing plants at the project site. The retrofitting may or may not include a change in fuel mix;
H5: The installation of new plants at the project site different from those installed under the CDM project activity;
H6: The generation of heat in specific off-site plants;
H7: The production of heat from district heating.

So as an outcome here, one or more baseline heat generation scenarios would be shortlisted.

The alternative scenarios for mechanical power should include, but not be limited to, inter alia:
M1: The proposed project activity not undertaken as a CDM project activity;

15 This alternative is only applicable if there are existing plants operating at the project site.

M2: If applicable, the continuation of mechanical power generation from the same steam turbines in existing plants at the project site;
M3: The installation of new steam turbines at the project site;
M4: If applicable, the continuation of mechanical power generation from electrical motors in existing plants at the project site;
M5: The installation of new electrical motors at the project site.

So as an outcome here, one or more baseline mechanical power generation scenarios would be shortlisted.

When defining plausible and credible alternative scenarios for power and heat generation, the guidance below should be followed:

- For any of the alternative scenarios described above, all assumptions with respect to installed capacities, load factors, energy efficiencies, fuel mixes, and equipment configuration, should be clearly described and justified in the CDM-CPA-DD. The justification for existing plants should be based on the conditions of the existing plants and the justification for new plants, or changes to existing plants, should be based on design parameters selected considering realistic and credible alternative design options;
- The whole electricity and heat generation under the project scenario must be considered in the selection of the baseline scenario. Therefore, the capacities of heat and electricity generation, including the grid if applicable, considered in the baseline scenario should be able to deliver the same level of process heat and power generation as that of the project scenario;
- If the CPA involves an increase in installed capacity, an increase in generation, and/or a change in demand of electricity or heat as compared to the historical situation, the baseline scenario should be determined for the overall generation under the CPA, possibly including a combination of the different scenarios described above. This is particularly relevant for cases in which existing plants have operated at the project site prior to the implementation of the CPA;
- In cases where alternative scenarios include the installation of new power or heat generation capacity at the project site other than the proposed project activity, the economically most attractive technology and fuel mix should be identified among those which provide the same service (i.e. the same power and, if applicable, heat quantity), that are technologically available and that are in compliance with relevant regulations. The type of technology, the efficiency of the plants and the fuel type should be selected in a conservative manner, i.e. where several technologies and/or fuel types could be used and are similarly economically attractive, the least carbon intensive fuel type/the most efficient technology should be considered. Ensure that the selected technology represents at least the common practice for new plants in the respective industry sector, in the country or region, excluding CDM registered projects;[16]
- If existing plants operated at the project site prior to the implementation of the CDM project activity, they could be retired at the start of the project CDM activity because they are replaced by the project plant, or they may initially be operated in parallel to the project plant and be retired at a future point in time (at the end of their lifetime). In such cases, the remaining lifetime of the existing equipment has to be determined and a baseline based on historical performance only applies until the existing power plant would have been replaced or retrofitted in the absence of the CDM project activity. From that point of time, a different baseline shall apply. For the purpose of determining the remaining lifetime of equipment, use the latest version of the "Tool to determine

[16] In case all similar plants are registered as CDM project activities, this assessment of common practice is not required.

the remaining lifetime of equipment". The remaining lifetime should be selected in conservative manner, i.e. the earliest point in time should be chosen in cases where only a time frame can be estimated, and should be documented and justified in the CDM-PDD.

For the use of biomass feedstock we consider: biomass residues, biomass from dedicated plantations, and biogas. Each is considered below.

When using biomass residues, the alternative scenarios should include, but not be limited to, inter alia:

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;

B2: The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to landfills, which are deeper than 5 meters. This does not apply to biomass residues that are stock-piled or left to decay on fields;

B3: The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes;

B4: The biomass residues are used for power or heat generation at the project site in new and/or existing plants;

B5: The biomass residues are used for power or heat generation at other sites in new and/or existing plants;

B6: The biomass residues are used for other energy purposes, such as the generation of biofuels;

B7: The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry);

B8: Biomass residues are purchased from a market, or biomass residues retailers, or the primary source of the biomass residues and/or their fate in the absence of the CDM project activity cannot be clearly identified.

When defining plausible and credible alternative scenarios for the use of biomass residues, the guidance below should be followed:

- The baseline scenario for the use of biomass residues should be separately identified for different categories of biomass residues, covering the whole amount of biomass residues supposed to be used in the CDM project activity during the crediting period, and consistent with the alternative scenarios selected for power and heat generation (scenarios P and H above);
- A category of biomass residues is defined by three attributes: (1) its type (i.e. bagasse, rice husks, empty fruit bunches, etc.); (2) its source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc.); and (3) its fate in the absence of the CDM project activity (Scenarios B above);
- Explain and document transparently in the CDM-CPA-PDD, using a table similar to Table-S below, which quantities of which biomass residues categories are used in which installation(s) under the CDM project activity and what is their baseline scenario. The last column of Table-S corresponds to the quantity of each category of biomass residues (tonnes). For the selection of the baseline scenario and demonstration of additionality, at the validation stage, an ex ante estimation of these quantities should be provided. These quantities should be updated every year of the crediting period as part of the monitoring plan so as to reflect the actual use of biomass residues in the project scenario. These updated values should be used for the calculations of the emission reductions. Along the crediting period, new categories of biomass residues (i.e. new types, new sources, with different fate) can be used in the CDM project activity. In this case, a new line should be added to the table.

Table S: Example of a table for biomass residues categories

Biomass residues category (*k*)	Biomass residues type	Biomass residues source	Biomass residues fate in the absence of the CDM project activity	Biomass residues use in project scenario	Biomass residues quantity (tonnes)
1	Rice husks	On-site production	Electricity generation on-site (B4:)	Electricity generation on-site (biomass-only boiler)	See comments above
2	Rice husks	On-site production	Dumped (B1:)	Electricity generation on-site (biomass-only boiler)	See comments above
3	Rice husks	Off-site from an identified rice mill	Dumped (B1:)	Electricity generation on-site (biomass-only boiler)	See comments above
4	Agricultural residues	Off-site from a biomass residues retailer	Unidentified (B8:)	Electricity generation on-site (co-fired boiler)	See comments above

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. Project participants may choose one among of the following procedures to demonstrate this:

- o Demonstrate that there is an abundant surplus of the type of biomass residue in the region of the CDM project activity, which is not utilized. For this purpose, demonstrate that the quantity of that type of biomass residues available in the region is at least 25% larger than the quantity of biomass residues of that type which is utilized in the region (e.g. for energy generation or as feedstock), including the project plant demand;
- o Demonstrate for the sites from where biomass residues are sourced that the biomass residues have not been collected or utilized (e.g. as fuel, fertilizer or feedstock) but have been dumped and left to decay, land-filled or burnt without energy generation (e.g. field burning) prior to their use under the CDM project activity. This approach is only applicable to biomass residues categories for which project participants can clearly identify the site from where the biomass residues are sourced;
  - The scenarios B1:, B2: or B3: can only be regarded as a plausible baseline scenario for a certain category of biomass residues, if the project participants can demonstrate that at least one of the two approaches above is fulfilled. Otherwise, the baseline scenario for this particular biomass residues category should be considered as B8:, and a leakage penalty will be applied when calculating leakage emissions;

- If during the crediting period, new categories of biomass residues are used in the CDM project activity which were not listed at the validation stage, e.g. due to new sources of biomass residues being used, those biomass residues should be clearly identified and included in an updated version of Table 2, without prejudice to the registration of the CDM project activity. Additionally, for new categories of biomass residues of the type B1:, B2: or B3: the baseline scenario should be assessed using the procedures outlined above.

When using biomass from dedicated plantations, for the land use where the dedicated plantations are established (L), the baseline scenario should be determined as follows:
CPA implementer would at least consider the following alternatives with respect to the baseline scenario for the use of the land where the dedicated plantations are established:
L1: Continuation of current land use, i.e. continued absence of agricultural and forestry activities on degraded or degrading lands;
L2: Conversion to plantations of biomass as fuel feedstock without CDM;
L3: Conversion to another plantation (annual or perennial).

The proposed PoA does not include the CPA that envisages the use of biogas; hence discussion regarding Biogas alternatives has not been undertaken here.

For the purpose of identifying relevant alternative scenarios, provide an overview of *other* technologies or practices that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity and that have been implemented previously or are currently underway in the relevant geographical area. The relevant geographical area should in principle be the host country of the proposed CDM project activity. A region within the country could be the relevant geographical area if the framework conditions vary significantly within the country. However, the relevant geographical area should include preferably ten facilities (or projects) that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity. If less than ten facilities (or projects) that provide outputs or services with comparable quality, properties and applications as the proposed CDM project activity are found in the region/host country, the geographical area may be expanded to an area that covers if possible, ten such facilities (or projects). In cases where the above-described requirements for geographical area are not suitable, the project proponents should provide an alternative definition of geographical area. Other registered CDM project activities are not to be included in this analysis.

Outcome of Step 1a: List of plausible alternative scenarios to the CDM project activity

Sub-step 1b: Consistency with mandatory applicable laws and regulations
The alternative(s) shall be in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g. to mitigate local air pollution.[17] This sub-step does not consider national and local policies that do not have legally binding status.
If an alternative chosen under the CPA does not comply with all mandatory legislation and regulations applicable in the geographical area, it would be demonstrated based on an examination of current practice in the geographical area, that those applicable mandatory legal or regulatory requirements are

[17] For example, an alternative would be non-complying in a country where this scenario would imply violations of safety or environmental regulations.

systematically not enforced and that non-compliance with those requirements is widespread. If this cannot be shown, then CPA would eliminate the alternative from further consideration.

If the proposed CDM project activity is the only alternative that is in compliance with all mandatory regulations with which there is general compliance, then the proposed CDM project activity is not additional.

Outcome of Step 1b: List of alternative scenarios to the CDM project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country. Proceed to Step 2 (Barrier analysis) or to Step 3 (Investment analysis)

Step 2 (Barrier analysis) and Step 3 (Investment analysis) are described in more detail in section E.5.2 below. These would be applied by each CPA as per the guidance provided in section E.5 below.

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the CPA being included as registered PoA (assessment and demonstration of additionality of CPA):>>

E.5.1. Assessment and demonstration of additionality for a typical CPA:

Prior consideration of the CDM

CPAs to be included under the CDM-PoA-DD shall be after the Global Stakeholder Consultation date of 25/04/2012. Each CDM-CPA-DD must provide either investment decision or the start date from the CPA implementer, related to a main project component, including the planned date for starting the work or signed contract documents related to a main project component or a declaration to the effect that the project has not started; therefore, the so-called "start date" has not happened yet, as per Eligibility Criteria No 4 under Section A.4.2.2.

As per Clarifications regarding the "Procedures for Registration of a Programme of Activities as a Single CDM Project Activity and Issuance of Certified Emission Reductions for a Programme Of Activities", EB 60 Annex 26, Para 3, CPAs with start date after the publication of the global stakeholder consultation of the CDM-PoA-DD do not have to follow the "Guidelines for the Demonstration and Assessment of Prior Consideration of the CDM", version 04, Annex 13, EB 62. However the start date shall be clearly defined as per CDM Glossary of Terms.

Additionality

The project is a large scale project activity. As such, the provisions of the approved methodology ACM0006 "Consolidated methodology for electricity and heat generation from biomass residues", Version 12.0.1. and "Tool for demonstration and assessment of additionality" (EB70, Annex 08, version 07.0.0) read with "Guidelines On Additionality of First-of-its-Kind Project Activities" (EB 69, Annex 7, version 02) will apply to all CPAs to be included in this PoA-DD. Methodology ACM 0006 has established the steps to be followed for the selection of the baseline scenarios and demonstration of additionality, wherein the methodology had given the option to demonstrate additionality according to barrier analysis as per "*Guidelines for objective demonstration and assessment of barriers*" (EB50,

Annex 13, version 01) including first-of-its-kind barrier, or investment analysis as per *"Guidelines on the assessment of investment analysis"* (EB62, Annex 05, version 05.0), to be complemented with the common practice analysis, for which the CPAs shall follow *"Guidelines on common practice"* (EB69, Annex 08, version 02.0)

E.5.2. Key criteria and data for assessing additionality of a CPA:

Where the project is demonstrated to be 'first-of-its-kind' in conformity with latest version of the "Guidelines on additionality of first-of-its-kind project activities" (Annex 7, EB 69), the additionality of the project will be deemed to have been demonstrated. A project will be considered first-of-its-kind if the

a) project is the first to apply the technology, which is different from technologies used by any other project and deliver the same output and have started commercial operation before the project design document (rCPA-DD) is submitted for validation or before the start date of the proposed project activity, whichever is earlier, in the applicable geographical area;
b) project implements one or more of the measures listed in the "Guidelines on additionality of first-of-its-kind project activities"; and
c) project participant has selected fixed crediting period for the project activity.

In all other cases, CPA implementers must demonstrate additionality based on the analysis contained in the previous section and should meet the requirement of the methodology ACM0006, version 12.0.1, which establish that the list of alternatives scenarios to the CPA-DD that are in compliance with mandatory regulations, could proceed to Step 2 "Barrier Analysis" (Approach 1) or Step 3 "Investment Analysis" (Approach 2).

Step 2: Barrier Analysis

In case CPAs choose Approach 1 for demonstrate additionality, a barrier analysis shall take place, they have to establish a complete list of realistic and credible barriers that may prevent alternative scenarios to occur.

Such realistic and credible barriers may include:

- Investment barriers, other than insufficient financial returns as analysed in Step 3, inter alia:
  - For alternatives undertaken and operated by private entities: Similar activities have only been implemented with grants or other non-commercial finance terms. Similar activities are defined as activities that rely on a broadly similar technology or practices, are of a similar scale, take place in a comparable environment with respect to regulatory framework and are undertaken in the relevant geographical area.
- No private capital is available from domestic or international capital markets due to real or perceived risks associated with investments in the country and/or sector and/or technology where

the CDM project activity is to be implemented, as demonstrated by the credit rating of the country and/or sector and/or technology or other country and/or sector and/or technology investment reports of reputed origin. Technological barriers, inter alia:

- Skilled and/or properly trained labor to operate and maintain the equipment is not available in the relevant geographical area, which leads to an unacceptably high risk of equipment disrepair, malfunctioning or other underperformance;
- Lack of infrastructure for implementation and logistics for maintenance of the equipment.
- Risk of technological failure: the process/technology failure risk in the local circumstances is significantly greater than for other technologies that provide services or outputs comparable to those of the proposed CDM project activity, as demonstrated by relevant scientific literature or technology manufacturer information;
- The particular technology used in the proposed CDM project activity is not available in the relevant geographical area.

CPAs will demonstrate, through qualitative and/or quantitative means, how the technological barriers prevent the implementation of the project activity and not atleast one alternative scenario or if they affect the project activity and other alternative/s, then how barriers affect other alternative/s less strongly than they affect the proposed CDM project activity and also demonstrate as how the registration of the CDM project activity will *alleviate* the barriers that prevent the proposed project activity from occurring in the absence of the CDM. In demonstrating the technological barriers, CPAs shall use the "Guidelines for objective demonstration and assessment of barriers" (EB50, Annex 13, version 01) for support this approach.

Step 3: "Investment Analysis"

In case CPAs choose Approach 2 for demonstrate additionality, an investment analysis shall take place, the analysis should include all alternatives scenarios (in case approach 1 is conducted, the remaining alternative scenarios after step 2), including scenarios where the project participant do not undertake an investment.

This approach should be implemented following the guidance provide in Step 2 of the "Tool for demonstration and assessment of additionality" (EB65, Annex 21, version 06.0.0), for each CPA-DD using simple cost analysis, investment comparison analysis or benchmark analysis. If the proposed project activity generates no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, investment comparison analysis (Option II) or the benchmark analysis (Option III) will be applied.

Sub-step 2a: Determine appropriate analysis method

Three analysis methods have been suggested by tool for the demonstration and assessment of additionality. Since the proposed project could earn revenues from not only the CDM but also the electricity output and heat supply, the simple cost analysis method is not considered as one of the approaches for demonstrates additionality. Investment comparison analysis method is applicable in cases where alternative scenarios are compared to the proposed project. As per the methodology ACM 0006 (ver 12.0.1), project developer is required to *compare* the economic or financial attractiveness of the alternative scenarios by conducting an investment analysis. Hence, , this investment analysis is possible for future CPAs,. Benchmark analysis is applicable in case the proposed project received other benefits

than CDM related incomes; though the CPAs will receive benefits from the project (either savings or income), since the methodology requires using only investment comparison analysis, this approach is not included as possible analysis for demonstrating additionality.

Sub-step 2b: Option II. Apply investment comparison analysis

This approach for demonstrates additionality would be used by CPA's as the methodology ACM 0006 (vr 12.0.1) requires the project developer to compare the economic or financial attractiveness of the alternative scenarios..

The purpose of the investment analysis is to determine whether the project is less financially attractive than at least one alternative in which the project participants could have invested.
Currency to be applied in the Investment Analysis will be in CLP or USD unless specifically stated. For equipment that is quoted in foreign currency, the conversion rate to USD /CLP (or vice versa) will be based on reliable sources or reference such as Central Bank of Chile[18], etc.

Financial Indicator:

CPAs will use project NPV or project IRR as financial indicator for the investment analysis. However, in cases, where the project is green field project generating only steam[19], CPAs may use levelized unit cost (LUC) of heat generation as financial indicator.

Sub-step 2b: Option III. Apply benchmark analysis

Since the methodology ACM 0006 (ver 12.0.1) requires the project developer to use investment comparison analysis and does not mandate the use of benchmark analysis for additionality demonstration, this approach will not be by CPA's

Selection of discount rate:

Discount rate will be in conformity with Additionality Tool. In general commercial lending rate or the default rate of return on equity (converted into nominal rate as per the methodology recommended by EB in the Appendix to Annex 5, EB 62) will be used as the discount rate. The interest rate will be sourced from credible publication, like World Bank, Banco Central de Chile, large commercial banks, term sheet from bank (if available at the time of decision making) or any credible source. Since investment comparison analysis is used by the CPAs for additionality demonstration, the discount rate will not impact the additionality as the same rate will be applied to all the alternatives and the project activity.

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18 http://www.bcentral.cl/index.asp

19 This is because in the case of green field project generating only steam, savings cannot be estimated as there will be no historical records of fossil fuel used and hence savings in fuel cost cannot be computed. However, if the CPA generates only electricity, then the opportunity cost of electricity in case the generated power is used for captive consumption or electricity tariff in case the power is exported to grid can be ascertained and therefore in such cases, NPV /IRR can be used as financial indicator.

LUC and NPV calculations, will be based on a list of financial parameters and assumptions provided by the CPA implementer that are available at the time of making the investment decision. This list of parameters includes (but not limited to):

Table No. 5: Parameters and assumptions for calculations

Sr No	Description	Documents to be submitted
1	Installed capacity - Boiler - Turbine	Each CPA must submit the following evidence in support of the installed capacity - FSR - Proposals / quotations / tender documents - Purchase order - EIA Approval
2	Budgeted CAPEX: - Boiler - Heat generator - Electricity generator - Piping system - Cabling, transformer cost for grid export if applicable - Instrumentation and control equipment - Consultancy cost if applicable - Others type of CAPEX if applicable	Each CPA must submit the following evidence for support the calculations of CAPEX, such as (inter alia): - Proposals / quotations / tender documents - Award letter / Acceptance Letter - Purchased order, if order has been placed - Feasibility studies
3	Financing pattern - Loans from banks/institutions - Equity capital - Others (like subsidies0	Each CPA must submit the following evidence in support of the financing pattern: - FSR - Board Note/Board resolution - Loan sanction letter, if any - Documentary evidence for other sources assumed
4	Terms of loan - Rate of Interest - Initial grace period (qrtrs/mths) - Repayment period (qrtrs/mths) - Repayment instalment	Each CPA must submit the following evidence in support of the terms of loan: - FSR - Term sheet from bank/financial institutions - Any credible document providing terms - Loan sanction letter, if any
5	Project technical life time for financial indicator calculation	Each CPA must submit the evidence on technical life of the project in conformity with Annex 15, EB 50. The evidence will be - FSR, - manufacturer specification / expert's opinion / third party study - default life time as per Annex 15, EB 50
6	Plant Load Factor / Capacity utilisation	Each CPA must submit the evidence for the PLF (in the case of electricity generation) in conformity with *ex-ante* definition of the plant load factors as per

		Para 3a and 3b of Annex 11 (version 01), EB48 Annex 11. In the case of steam generation, the Capacity Utilization of boiler will be evidenced by - FSR, - manufacturer specification / expert's opinion / third party study [CPA operator must submit evidence to the effect that the steam generated by project is equal to or less than the steam consumed internally in the last one year]
7	Gross electricity generation	Each CPA must submit evidence for the gross electricity generation. The evidence will be: - Feasibility study - Offer letter from supplier - any other credible document - purchase order for turbine If issued
8	Auxiliary consumption	Each CPA must submit evidence for the auxiliary consumption of power. The evidence will be: Feasibility study - offer letter from supplier - compuation based on power rating of auxiliary machines and expected working hours - any other credible document - purchase orders if issued
9	Electricity export to grid, if applicable	Each CPA must submit evidence for the electricity envisaged to be exported to grid. The evidence will be - Board Note/resolution, - FSR, - declaration by the CPA developer duly certified by CME
10	Electricity consumed internally	Each CPA must submit evidence for the electricity envisaged to be consumed internally. The evidence will be: - Board Note/resolution, - FSR, - declaration by the CPA developer duly certified by CME [CPA operator must submit evidence to the effect that the electricity consumption of the project is equal to or more than the electricity envisaged to be consumed internally, where the electricity is envisaged to be consumed internally]

11	Tariff for electricity exported to grid	Each CPA must submit evidence for the tariff for electricity exported to grid. The evidence will be: - FSR, - price forecast study or published information, if any, on the price at which the grid purchases electricity from the generators. The tariff will be subjected to escalation using consumer price index or any other published information pertaining to electricity tariff
12	Tariff for electricity used for captive consumption, if applicable	Each CPA must submit evidence on the auxiliary consumption of power. The evidence will be average price extracted from the previous 1 year electricity bills. [this rate will be used for estimating both power cost, in case the project does not generate electricity and imports the same for operation and savings in power cost, in cases where the project generates electricity and the power is consumed internally either partially of totally] The tariff will be subjected to escalation using consumer price index or any other published information pertaining to electricity tariff
13	Fossil fuel replaced	Each CPA must submit evidence on the auxiliary consumption of power. The evidence will be in the form of detailed calculations on the fossil fuel that would be replaced by the biomass. The calculations will form part of the worksheet
14	Fossil fuel cost	Each CPA must submit evidence on the auxiliary consumption of power. The evidence will be - FSR, - quotation from the supplier, - average price paid in the previous 1 year as evidenced by fossil fuel bills Fossil fuel price will be subjected to escalation using consumer price index or any other published information pertaining to fossil fuel price
15	Price of Biomass	Each CPA must submit evidence for the cost of each of the biomass envisaged to be used. The evidence will be - FSR, - quotation, - public market place information, - benchmark price indication

		Cost of biomass will be subjected to escalation using the consumer price index or other published information pertaining to biomass
16	Annual Operational & maintenance costs	Each CPA must submit the following evidence for support O&M costs, such as (inter alia): - quotation / costs by technology supplier(s) - similar project implemented by PP - references from journal for the technologies used. - rational benchmarking and assumptions. O&M will be indexed using the consumer price index
17	Manpower cost	Each CPA must submit evidence for the manpower cost. Documented evidence from the CPA operator duly certified by the CME, such as (inter alia): - Organizational structure giving the employee strength required for the project activity - covering letter issued by PP with ruling wage/salary structure of the company - Or market rate of the manpower envisaged to be appointed in the host country Will be submitted
18	Salary increment rate	Each CPA must submit evidence for the manpower cost. The evidence will include - FSR - Annual increment given by the company as evidenced by the declaration by the Managing Director or CFO of the company - Market survey - Information available in public domain
19	Inflation Rate / Consumer Price Index	Information published by Government agencies / reports from the central bank or equivalent
20	Other parameters that are deemed necessary	To be substantiated by CPA operator, certified by CME and confirmed by DOE duly supported by appropriate and credible documentary evidence
21	Depreciation of equipment (yrs./%)	Refer to annual tax booklet / inforamation available in the host country.
22	Residual value / fair value (%)	10% of the cost of tangible assets in line with best international practice.
23	Corporate tax (%)	Based on the Host Country tax law

The aforementioned information will be given for the project activity and each of the alternatives chosen. All the documentary evidence furnished will conform to guidance 6 of Annex 5, EB 62, i.e., available at the time of decision making. Where the FSR forms the basis, CPA operators will demonstrate that the time gap between the finalisation of FSR and the decision making is short enough that the input

parameters would not have changed. The above information will be consolidated in a worksheet where all the input parameters will be aggregated in the Assumption sheet which will be linked to the financial indicator calculation worksheet conforming to accepted accounting principles. Since the input parameters will be linked to the financial indicator calculation worksheet, the worksheet will ensure adherence to accounting principles and arithmetical accuracy.

Sensitivity analysis

A sensitivity analysis will be conducted to test the robustness of the conclusions drawn. All input parameters, which account for 20% of project cost/revenue wil be subjected to sensitivity analysis. Depending on the CPAs, input parameters, which account for less than 20% of the project cost/revenue may also be subjected to sensitivity analysis. In general, CAPEX, biomass cost, fossil fuel cost, electricity costs and price, and O&M cost will be subjected to sensitivity analysis.

All input parameters will be subjected to a variation of ± 10% unless a variation at higher/lower percent is considered necessary in the project context. s. The results of sensitivity analysis will be summarized in a table as given below (applicable case by case):

Table No. 6: Sensitive analysis

FACTORS			
	-10%	0%	+10%
CAPEX			
PLF/capacity utilisation			
Biomass Cost			
Electricity Price			
Electricity Cost			
Fossil fuel cost			
O&M cost			
Baseline			

Worksheet will contain a facility to check the sensitivity analysis results. If the financial indicator Iexceeds the baseline in one or more of the scenarios considered for the sensitivity analysis, the CPA operator/CME shall provide evidences as to why this is unlikely to happen. If no sufficient proof is provided, the CPA will be considered as non-additional.

Common practice analysis:

As a credibility check, CPA operators will complement the additionality demonstration with a common practice analysis, which will demonstrate the extent to which the proposed project type has already diffused in the relevant sector and geographical area in conformity with Step 4 of Additionality Tool. CPA operators will furnish details of the extent of similar activities and based on the analysis of such data explain the extent to which similar activities have percolated in the relevant geographical area. In case similar activities are identified, then the CPA operators will explain how the proposed project activity differs from other projects by bringing out the essential distinctions between the proposed project activity and the similar activities. The demonstration of common practice analysis will be conforming to the latest version of Additionality Tool.

E.6. Estimation of Emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical CPA:

The total volume of GHG emissions reductions to be achieved by this proposed PoA is unknown at the time of its registration. The emissions reductions are calculated and monitored for each CPA based on ACM0006 Version 12.0.1. The methodology provides several choices for determination of baseline, project emissions and leakage emissions depending largely on the type of baseline alternative selected through the series of steps defined in section E.4 above. However, the generic methodological choices are explained below for each of the Baseline emissions, project emissions and leakage.

Baseline emissions:

Baseline emissions are calculated based on the most plausible baseline scenario identified in the section "Selection of the baseline scenario and demonstration of additionality" of the approved methodological ACM0006 Version 12.0.1, taking into account how power and heat would be generated, and how the biomass residues would be used, in the absence of the project activity. The calculation procedure is shown in E.6.2.

Note that in the baseline scenario biomass residues could be (i) dumped, left to decay or burnt without being used or (ii) used for other applications. Related baselines emissions are only calculated in the first case, according to Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues.

In the baseline scenario power and heat could be generated in three different ways:

- **Use of biomass residues at the project site.** Power and heat could be generated with biomass residues at the project site. This applies, for example, (but not limited to) if:

  (a) The project activity is a replacement of an existing biomass residues fired plant;

  (b) The project activity is a capacity expansion of an existing biomass residues fired plant;

  (c) The project activity is a fuel switch project activity where some biomass residues have already been used prior to the implementation of the project activity;

  (d) The project activity is a retrofit of an existing biomass residues fired plant.

  AND/OR

- **Use of fossil fuels at the project site.** Power and heat could be generated with fossil fuels. This applies, for example, if:

  (a) The project activity is a fuel switch from fossil fuels to biomass residues;

  (b) In the baseline, a fossil fuel fired plant would continue to operate at the project site in parallel with a new biomass residues fired plant;

  AND/OR

- **Power generation in the electricity grid.** Power could be generated by power plants in the electricity grid. This applies, for example, if:

  (a) The project activity exports electricity to the grid and no electricity would be produced at the project site in the baseline;

  (b) The project activity results in an increase of the quantity of power produced by plants included in the project boundary and this increased power is exported to the grid or would in the baseline be purchased from the grid;

  (c) No electricity would be produced at the project site in the baseline and power produced by plants included in the project boundary would in the baseline be purchased from the grid.

In many cases, power and heat would be generated in the baseline by a combination of these three ways and it may be difficult to clearly determine the precise mix of power generation in the grid and power or heat generation with biomass residues or fossil fuels that would have occurred in the absence of the project activity. If power can be generated in an on-site fossil fuel power plant or can be purchased from the grid, it is particularly challenging to determine how electricity would be generated in the baseline. For example, to what extent an existing coal power plant is dispatched and to what extent electricity is purchased from the grid can depend on the prices for electricity and coal, which change over time.

For this reason, this methodology adopts a conservative approach and assumes that biomass residues, if available, would be used in the baseline as a priority for the generation of power and heat. Furthermore, it is assumed that the heat provided by heat generators is used first in heat engines which operate in cogeneration mode, then in thermal applications to satisfy the heat demand, and after that in heat engines which operate for the generation of power only.

The algorithm used to determine the baseline emissions can be summarized as follows:

- Step 1: Determine biomass availability, generation and capacity constraints, efficiencies and power emission factors;
- Step 2: Determine the minimum baseline electricity generation in the grid;
- Step 3: Determine the baseline biomass-based heat and power generation;
- Step 4: Determine the baseline demand for fossil fuels to meet the balance of process heat and the corresponding electricity generation;
- Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues;
- Step 6: Calculate baseline emissions.

Details of equations used for each step are defined in the section E.6.2 below.

Project emissions

For the purpose of determining GHG emissions of the CPA under the PoA, the following emissions will be included:

- Emissions from fossil fuel consumption at the project site for the generation of electric power and heat and for auxiliary loads related to the generation of electric power and heat;
- CO_2 emissions from grid-connected fossil fuel power plants in the electricity system for any electricity that is imported from the grid to the project site;
- If either $EL_{balance,PO,y} < EL_{BL,BR,PO,y}$ (Case 3.3.2) or $EL_{balance,FF,y} < EL_{BL,FF,y}$ (Case 4.2.2), CO_2 emissions from grid-connected fossil fuel power plants in the electricity system due to reduction in electricity generation at the project site as compared to the baseline scenario;
- CO_2 emissions from off-site transportation of biomass residues that are combusted in the project plant;
- If applicable, CH_4 emissions from combustion of biomass residues for electric power and heat generation at the project site;
- If applicable, emissions from anaerobic treatment of wastewater originating from the treatment of the biomass residues prior to their combustion.

Details of equations used for each step are defined in the section E.6.2 below.

Leakage

The main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the project activity. Changes in carbon stocks in the LULUCF sector are expected to be insignificant since this methodology is limited to biomass residues, as defined in the applicability conditions above. The baseline scenarios for biomass residues for which this potential leakage is relevant are, B5;, B6:, B7: and B8:.

The actual leakage emissions in each of these cases may differ significantly and depend on the specific situation of each project activity. For that reason, a simplified approach is used in this methodology: it is assumed that an equivalent amount of fossil fuels, on energy basis, would be used if biomass residues are diverted from other users, no matter what the use of biomass residues would be in the baseline scenario.

Details of equations used for each step are defined in the section E.6.2 below.

Determining Grid Emission Factor

In Chile there are 4 interconnection systems of electric power[20], the Grand North Interconnected System (SING; Sistema Interconectado del Norte Grande), the Central Interconnected System (SIC; Sistema

[20] http://www.cne.cl/energias/electricidad/sistemas-electricos

Interconectado Central); Aysen System and Magallanes System, each of these interconnected systems operate in isolation from the others.

The Grand North Interconnected System covers the area with a 24.06% of the installed capacity in the country, it consists of a set of power plants and transmission lines that supply interconnected electricity consumption located between the cities of Arica and Antofagasta, currently the first and second region of the country. Approximately 90% of the SING consumption is composed by large customers such as mining and industrial) the remaining consumption is concentrated in the distribution companies that supply smaller clients. The SING has an installed a capacity of 3,963.8 MW as of December 2011[21].

The Central Interconnected System is the main electrical system of the country, with 75.05% of the installed capacity, it extends between the northern town Taltal (third region) and the Grand Island of Chiloé (tenth region) in the south. Unlike the SING, the SIC supplies mainly small home clients (60% of the total). The SIC has an installed capacity of 12,365.1 MW as of December 2011[2].

The Aysen System operates in the Aysen Region (eleventh region) with 0.28% of the country's capacity; its installed capacity as of December 2011 amounted to 46.69 MW[2].

The Magellanes System consists of four electrical subsystems: Systems of Punta Arenas, Puerto Natales, Puerto Porvenir and Puerto Williams, all in the twelfth Region, with 0.60% of the installed capacity in the country. The installed capacity of this system to December of 2011 is 99.6 MW[2].

The $EF_{EG,GR,y}$ for the Central Interconnected System (SIC) will be calculated ex-ante as it the largest GRID having 75% of the Country's installed capacity of power generation under itself. In case CPA is located in another electricity system within the geographical boundary, calculation will be ex-post.

The parameter $EF_{EG,GR,y}$ should be determined as the combined margin CO_2 emission factor for grid to which the project activity is connected in year *y*, calculated using the latest approved version of the "Tool to calculate the emission factor for an electricity system".

For the ex-ante calculation, "**Tool to calculate the emission factor for an electricity system", Version 02.2.1** has been followed and following steps have been utilized:

STEP 1. Identify the relevant electricity systems.
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional).
STEP 3. Select a method to determine the operating margin (OM).
STEP 4. Calculate the operating margin emission factor according to the selected method.
STEP 5. Identify the group of power units to be included in the build margin (BM).
STEP 6. Calculate the build margin emission factor.
STEP 7. Calculate the combined margin (CM) emissions factor.

Detailed calculation approach and calculations for emission factor of SIC Grid has been explained in section E.6.2 below.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission

[21] Installed capacity of the National Electricity System 2011: http://www.cne.cl/estadisticas/energia/electricidad

reductions of a CPA:

The emission reduction will be calculated depending of the selected baseline and project activity scenario of each particular CPA. Therefore the following equation could be used.

Emission Reductions

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \textbf{(1)}$$

Where:

ER_y	=	Emissions reductions in year *y* (tCO_2)
BE_y	=	Baseline emissions in year *y* (tCO_2)
PE_y	=	Project emissions in year *y* (tCO_2)
LE_y	=	Leakage emissions in year *y* (tCO_2)

Baseline Emissions

According to the most plausible baseline scenario identified based on the approved methodology ACM0006 version 12.0.1, baseline emission are calculated on a CPA by CPA basis as follows:

$$BE_y = EL_{BL,GR,y} \cdot EF_{EG,GR,y} + \sum_f FF_{BL,HG,y,f} \cdot EF_{FF,y,f} + EL_{BL,FF/GR,y} \cdot \min(EF_{EG,GR,y}, EF_{EG,FF,y}) + BE_{BR,y} \quad \textbf{(2)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
$EL_{BL,GR,y}$	=	Baseline minimum electricity generation in the grid in year *y* (MWh)
$EF_{EG,GR,y}$	=	Grid emission factor in year *y* (tCO_2/MWh)
$FF_{BL,HG,y,f}$	=	Baseline fossil fuel demand for process heat in year *y* (GJ)
EFFF,y,f	=	CO2 emission factor for fossil fuel type f in year y (tCO2/GJ)
ELBL,FF/GR,y	=	Baseline uncertain electricity generation in the grid or on-site in year y (MWh)
EFEG,FF,y	=	CO2 emission factor for electricity generation with fossil fuels at the project site in the baseline in year y (tCO2/MWh)
BEBR,y	=	Baseline emissions due to disposal of biomass residues in year y (tCO2e)
y	=	Year of the crediting period
f	=	Fossil fuel type

The algorithm used to determine the data above can be summarized as follows:

- Step 1: Determine biomass availability, generation and capacity constraints, efficiencies and power emission factors;
- Step 2: Determine the minimum baseline electricity generation in the grid;
- Step 3: Determine the baseline biomass-based heat and power generation;
- Step 4: Determine the baseline demand for fossil fuels to meet the balance of process heat and the corresponding electricity generation;
- Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues;
- Step 6: Calculate baseline emissions.

Step 1: Determine biomass availability, generation and capacity constraints, efficiencies and power emission factors in the baseline

Step 1.1: Determine total baseline process heat generation

The amount of process heat that would be generated in the baseline in year *y* ($HC_{BL,y}$) is determined as the difference of the enthalpy of the process heat (steam or hot water) supplied to process heat loads in the project activity minus the enthalpy of the feed-water, the boiler blow-down and any condensate return to the heat generators. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure. The process heat should be calculated net of any parasitic heat used for drying of biomass.

This methodology assumes for the sake of simplicity that the proposed project activity consumes steam from the same quality as in baseline process transported through one steam header. Project activities in which the baseline includes multiple steam headers with different enthalpies may apply this procedure as if their process included only one steam header as this leads to a conservative outcome of the baseline emission estimation.

However, there may be cases where the baseline situations involve steam headers with different steam enthalpies and applying the algorithm as if there is one steam header may be difficult or may result in a very different baseline emission situation. For example, a baseline scenario could consist of biomass boilers generating low enthalpy steam for direct use as process heat while fossil fuel boilers would generate steam with a higher enthalpy for use in a backpressure turbine. In such cases the project participant may consider the existence of multiple steam headers as a technical constraint in the application of the algorithm (as specified in Steps 3 and 4).

Step 1.2: Determine total baseline electricity generation

The amount of electricity that would be generated in the baseline in year *y* is calculated as follows:

$$EL_{BL,y} = EL_{PJ,gross,y} + EL_{PJ,imp,y} - EL_{PJ,aux,y} \quad \textbf{(3)}$$

Where:

$EL_{BL,y}$ = Baseline electricity generation in year *y* (MWh)

$EL_{PJ,gross,y}$ = Gross quantity of electricity generated in all power plants which are located at the project site and included in the project boundary in year *y* (MWh)

$EL_{PJ,imp,y}$ = Project electricity imports from the grid in year *y* (MWh)

$EL_{PJ,aux,y}$ = Total auxiliary electricity consumption required for the operation of the power plants at the project site in year *y* (MWh)

y = Year of the crediting period

$EL_{PJ,aux,y}$ shall include all electricity required for the operation of equipment related to the preparation, storage and transport of biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, etc.) and electricity required for the operation of all power or heat generating plants which are located at the project site and included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.).

For this methodology, it is assumed that transmission and distribution losses in the electricity grid are not influenced significantly by the project activity and are therefore not accounted for.

Step 1.3: Determine baseline capacity of electricity generation

The total capacity of electricity generation available in the baseline should be calculated using the equation below. The heat engines *i* and *j* should be obtained from the baseline scenario identified using the "Selection of the baseline scenario and demonstration of additionality" and the load factors should take into account seasonal operational constraints as well as other technical constraints in the system (e.g. availability of heat to drive heat engines).

$$CAP_{EG,total,y} = LOC_y \cdot \left[\sum_i \left(CAP_{EG,CG,i} \cdot LFC_{EG,CG,i} \right) + \sum_j \left(CAP_{EG,PO,j} \cdot LFC_{EG,PO,j} \right) \right] \quad \textbf{(4)}$$

Where:

$CAP_{EG,total,y}$ = Baseline electricity generation capacity in year *y* (MWh)

$CAP_{EG,CG,i}$ = Baseline electricity generation capacity of heat engine *i* (MW)

$CAP_{EG,PO,j}$ = Baseline electricity generation capacity of heat engine *j* (MW)

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

$LFC_{EG,PO,j}$ = Baseline load factor of heat engine *j* (ratio)

LOC_y = Length of the operational campaign in year *y* (hour)

i = Cogeneration-type heat engine in the baseline scenario

j = Power-only-type heat engine in the baseline scenario

y = Year of the crediting period

Step 1.4: Determine the baseline availability of biomass residues

Where the baseline scenario includes the use of biomass residues for the generation of power and/or heat, the amount of biomass residues of category *n* that would be available in the baseline in year *y* ($BR_{B4,n,y}$) has to be determined.

The determination of this parameter shall be based on the monitored amounts of biomass residues used for power and/or heat generation in the project boundary for which B4: or BG3 has been identified as the most plausible baseline scenario in the CPA-DD. The biomass residues quantities used should be monitored separately for (a) each type of biomass residue (e.g. sugarcane bagasse, rice husks, empty fruit bunches, etc.) and each source (e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc.).

Where the whole amount of biomass residues of one particular type and from one particular source would be used in the baseline in clearly identifiable baseline heat generators, the monitored quantities of biomass residues used in the project can be directly allocated to those heat generators in the baseline scenario. However, the following situations require particular attention:

- One biomass residue type from one particular source could be used in the baseline in two or more heat generators. In this case, the use of this biomass residue type from this source has to be allocated to the different heat generators should they have different efficiencies;
- One biomass residue type from one particular source could have two different fates in the baseline scenario. The biomass categories 1 and 2 in Table 2 on page 13 illustrate this situation: the rice husks are obtained from one source but would in the baseline partly be dumped (B1:) and partly be used for power generation (B4:). This can apply, for example, if parts of one biomass residue type were already collected prior to the implementation of the project activity while another part was not needed and thus dumped, left to decay or burnt. In this case, it is necessary to allocate the biomass residue quantity used under the project to the following fates in the baseline scenario:

  (a) Power or heat generation (B4:), or

  (b) Dumping, leaving to decay or burning (B1:, B2: and/or B3:), or

  (c) Scenarios required for the purpose of calculating leakage effects: other fates (B5: - B8:).

Where one of these situations arises, the project participants should specify and justify in the CPA-DD in a transparent manner how the relevant allocations should be made. The approaches used should be consistent with the identified baseline scenario and reflect the particular situation of the underlying project activity. In doing so, the following allocation rules should be adhered to:

- The sum of biomass residues used in the baseline for power or heat generation in all heat generators shall be equal to the total amount of biomass residues which are used under the project activity and for which the baseline scenario is B4;
- The allocation of biomass residues should be undertaken in a conservative manner. This means that in case of uncertainty an allocation rule should be applied that tends to result in lower emission reductions.
- In the case a biomass residues type from one particular source has been used prior to the implementation of the project activity partly in heat generators operated at the project site (scenario B4:) and partly has been dumped, left to decay or burnt (scenarios B1:, B2:, B3:) and if

this situation would continue in the baseline scenario, then use, as a conservative approach to address the uncertainty associated with such an allocation, the maximum value among the following two approaches for the quantity of biomass residue of category n allocated to scenario B4:

(a) The quantity of biomass residue of category *n* is the highest annual historical use of that biomass residue type from that source for power and/or heat generation at the project site observed in the most recent three calendar years prior the date of submission of the PDD for validation of the project activity for which data is already available; and

(b) In the case of projects that use biomass residues from a on-site production process (e.g. production of sugar cane or rice), the quantity of biomass residues of category *n* is calculated as follows:

$$BR_{B4,n,y} = P_y \cdot MAX\left\{\frac{BR_{HIST,n,x}}{P_x}; \frac{BR_{HIST,n,x-1}}{P_{x-1}}; \frac{BR_{HIST,n,x-2}}{P_{x-2}}\right\} \quad \textbf{(5)}$$

Where:

$BR_{B4,n,y}$	=	Quantity of biomass residues of category n used in the project activity in year *y* for which the baseline scenario is B4: (tonne on dry-basis)
$BR_{HIST,n,x}$	=	Quantity of biomass residues of category n used for power or heat generation at the project site in year x prior the date of submission of the PDD for validation of the project activity (tonnes on dry-basis) prior the date of submission of the PDD for validation of the project activity
P_y	=	Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year *y* from plants operated at the project site
P_x	=	Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year *x* from plants operated at the project site
y	=	Year of the crediting period
x	=	Last calendar year prior to the start of the crediting period for which data is already available at the date of submission of the PDD for validation
n	=	Biomass residue category

Step 1.5: Determine the efficiencies of heat generators, and efficiencies and heat-to-power ratio of heat engines

The efficiencies of heat generators and heat engines should be calculated using one of the following options:

Option 1: Default values. Use 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), $GGL_{default}$, is 5%.

Option 2: Manufacturer's data. This option is only applicable to heat engines and heat generators that were operated at the project site prior to the implementation of the project activity (and not new equipment that would be constructed and operated at the project site in the baseline scenario). The efficiency of the heat generator or heat engine is determined based on manufacturer's data of the efficiency under optimal operating conditions and take into account the actual conditions of the fuel used (including moisture content of biomass residues).

Option 3: This option is only applicable to heat generators and heat engines that were operated at the project site for at least three calendar years prior the date of submission of the CPA-DD to the PoA. The efficiencies of heat generators and heat engines are determined based on the historical records, as follows:

Efficiency for heat generators

The efficiency for heat generators should be calculated using the following equation:

$$\eta_{BL,HG,BR,h} = MAX\left\{\frac{HG_{BR,h,x}}{\sum_n BR_{n,h,x} \cdot NCV_{BR,n,x}};\frac{HG_{BR,h,x-1}}{\sum_n BR_{n,h,x-1} \cdot NCV_{BR,n,x-1}};\frac{HG_{BR,h,x-2}}{\sum_n BR_{n,h,x-2} \cdot NCV_{BR,n,x-2}}\right\} \quad \textbf{(6)}$$

$$\eta_{BL,HG,FF,h} = MAX\left\{\frac{HG_{FF,h,x}}{\sum_n FF_{f,h,x} \cdot NCV_{FF,f,x}};\frac{HG_{FF,h,x-1}}{\sum_n FF_{f,h,x-1} \cdot NCV_{FF,f,x-1}};\frac{HG_{FF,h,x-2}}{\sum_n FF_{f,h,x-2} \cdot NCV_{FF,f,x-2}}\right\} \quad \textbf{(7)}$$

Where:

$\eta_{BL,HG,BR,h}$	=	Baseline biomass-based heat generation efficiency of heat generator *h* (ratio)
$\eta_{BL,HG,FF,h}$	=	Baseline fossil-based heat generation efficiency of heat generator *h* (ratio)
$HG_{BR,h,x}$	=	Net quantity of heat generated from using biomass residues in heat generator *h* in year *x* (GJ/yr)
$HG_{FF,h,x}$	=	Net quantity of heat generated from using fossil fuels in heat generator *h* in year *x* (GJ/yr)
$BR_{n,h,x}$	=	Quantity of biomass residues of category n used in heat generator *h* in year *x* (tonnes on dry-basis)
$FF_{f,h,x}$	=	Quantity of fossil fuel type f fired in heat generator *h* in year *x* (mass or volume unit/yr)
$NCV_{BR,n,x}$	=	Net calorific value of biomass residues of category *n* in year *x* (GJ/tonnes on dry-basis)

$NCV_{FF,f,x}$ = Net calorific value of fossil fuel type *f* in year *x* (GJ/mass or volume unit)

x = Last calendar year prior to the start of the crediting period

n = Biomass residue category

f = Fossil fuel type

h = Heat generator in the baseline scenario

If fossil fuels and biomass residues were used for heat generation in the heat generator h prior to the implementation of the project activity, then $HG_{BR,h,x}$, $HG_{BR,h,x-1}$ and $HG_{BR,h,x-2}$, as well as $HG_{FF,h,x}$, $HG_{FF,h,x-1}$ and $HG_{FF,h,x-2}$, are determined as follows:

$$HG_{BR,h,x} = HG_{h,x} \cdot \frac{\sum_{n} BR_{n,h,x} \cdot NCV_{BR,n,x}}{\sum_{n} BR_{n,h,x} \cdot NCV_{BR,n,x} + \sum_{f} FF_{f,h,x} \cdot NCV_{FF,f,x}} \quad \textbf{(8)}$$

$$HG_{FF,h,x} = HG_{h,x} \cdot \frac{\sum_{n} FF_{f,h,x} \cdot NCV_{FF,f,x}}{\sum_{n} BR_{n,h,x} \cdot NCV_{BR,n,x} + \sum_{f} FF_{f,h,x} \cdot NCV_{FF,f,x}} \quad \textbf{(9)}$$

Where:

$HG_{BR,h,x}$ = Net quantity of heat generated from using biomass residues in heat generator *h* in year *x* (GJ/yr)

$HG_{FF,h,x}$ = Net quantity of heat generated from using fossil fuels in heat generator *h* in year *x* (GJ/yr)

$HG_{h,x}$ = Net quantity of heat generated in heat generator *h* in year x (GJ/yr)

$BR_{n,h,x}$ = Quantity of biomass residues of category *n* used in heat generator *h* in year *x* (tonnes on dry-basis)

$FF_{f,h,x}$ = Quantity of fossil fuel type *f* fired in heat generator *h* in year *x* (mass or volume unit/yr)

$NCV_{BR,n,x}$ = Net calorific value of biomass residues of category *n* in year *x* (GJ/tonnes on dry-basis)

$NCV_{FF,f,x}$ = Net calorific value of fossil fuel type *f* in year *x* (GJ/mass or volume unit)

Efficiency for heat engines

The efficiency for heat engines should be calculated using the following equation:

$$\eta_{BL,EG,PO,i/j} = MAX\left\{\frac{EL_{BR,PO,x,i/j}}{HG_{BR,PO,x,i/j}};\frac{EL_{BR,PO,x-1,i/j}}{HG_{BR,PO,x-1,i/j}};\frac{EL_{BR,PO,x-2,i/j}}{HG_{BR,PO,x-2,i/j}}\right\} \quad \textbf{(10)}$$

Where:

$\eta_{BL,EG,CG,i}$	=	Baseline electricity generation efficiency of heat engine *i* (MWh/GJ)
$\eta_{BL,EG,PO,j}$	=	Average electric power generation efficiency of heat engine *j* (MWh/GJ)
$EL_{BR,CG/PO,x,i/j}$	=	Quantity of electricity generated in heat engine *i/j* in year *x* (MWh)
$HG_{BR,CG/PO,x,i/j}$	=	Quantity of heat used in heat engine *i/j* in year *x* (GJ)
x	=	Last calendar year prior to the start of the crediting period
i	=	Cogeneration-type heat engine in the baseline scenario
j	=	Power-only-type heat engine in the baseline scenario

The heat-to-power ratio of cogeneration-type heat engines (e.g. backpressure and heat-extraction steam turbines) should be calculated as follows.

Case 1: For existing heat engines with a minimum three-year operational history prior to the project activity:

$$HPR_{BL,EG,CG/PO,i/j} = \frac{1}{3.6} \cdot MAX\left\{\frac{HC_{BR,CG/PO,x,i/j}}{EL_{BR,CG/PO,x,i/j}};\frac{HC_{BR,CG/PO,x-1,i/j}}{EL_{BR,CG/PO,x-1,i/j}};\frac{HC_{BR,CG/PO,x-2,i/j}}{EL_{BR,CG/PO,x-2,i/j}}\right\} \quad \textbf{(11)}$$

Where:

$HPR_{BL,i}$	=	Baseline heat-to-power ratio of the heat engine *i* (ratio)
$HC_{BR,CG/PO,x,i/j}$	=	Quantity of process heat extracted from the heat engine *i/j* in year *x* (GJ)
$EL_{BR,CG/PO,x,i/j}$	=	Quantity of electricity generated in heat engine *i/j* in year *x* (MWh)
x	=	Last calendar year prior to the start of the crediting period
i	=	Cogeneration-type heat engine in the baseline scenario
j	=	Power-only-type heat engine in the baseline scenario

Case 2: For heat engines without a minimum three-year operational history prior to the project activity the heat-to-power ratio should be determined as per the design conditions of the plant, for the configuration identified as baseline scenario in the “Selection of the baseline scenario and demonstration of additionality”.

Step 1.6: Determination of the emission factor of on-site electricity generation with fossil fuels

If no fossil fuel based power generation was identified as part of the baseline scenario, or if fossil fuel based power generation was identified as part of the baseline scenario, but all capacity of power generation based on fossil fuels is used in the cogeneration mode (i.e. up to step 4.2) , then make $EF_{EG,FF,y} = EF_{EG,GR,y}$.

Otherwise, i.e. fossil fuel based power generation was identified as part of the baseline scenario and after conducting the steps up to 4.2 some power generation capacity based on fossil fuels is left, $EF_{EG,FF,y}$ should be determined using Option A or Option B below. If fossil fuel power plants were operated at the project site prior to the implementation of the project activity, either Option A or Option B can be used. For new power plants that would be constructed at the project site in the baseline scenario, Option B should be used.

Option A: Determine $EF_{EG,FF,y}$ as per the procedure described under "Scenario B: Electricity consumption from an off-grid captive power plant" in the latest approved version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption", using data from the three calendar years prior the date of submission of the CPA-DD to the PoA.

Option B: Determine a default emission factor for $EF_{EG,FF}$ based on a default efficiency of the power plant that would be operated at the project site in the baseline and a default CO_2 emission factor for the fossil fuel types that would be used, as follows:

$$EF_{EG,FF} = 3.6 \cdot \frac{EF_{BL,CO2,FF}}{\eta_{BL,FF}} \quad \textbf{(12)}$$

Where:

$EF_{EG,FF,y}$	=	CO_2 emission factor for electricity generation with fossil fuels at the project site in the baseline in year y (tCO_2/MWh)
$EF_{BL,CO2,FF}$	=	CO_2 emission factor of the fossil fuel type that would be used for power generation at the project site in the baseline (tCO_2/GJ)
$\eta_{BL,FF}$	=	Efficiency of the fossil fuel power plant(s) at the project site in the baseline (ratio)

Step 1.7: Determination of the emission factor of grid electricity generation

The parameter $EF_{EG,GR,y}$ should be determined as the combined margin CO_2 emission factor for grid to which the project activity is connected in year *y*, calculated using the latest approved version of the "Tool to calculate the emission factor for an electricity system".

The $EF_{EG,GR,y}$ for the Central Interconnected System (SIC) will be calculated ex-ante. In case CPA is located in another electricity system within the geographical boundary, calculation will be ex-post.

For the ex-ante calculation, "**Tool to calculate the emission factor for an electricity system", Version 02.2.1** has been followed:

STEP 1: Identify the relevant electricity systems.

The electricity system is the Central Interconnected System (Sistema Interconectado Central, SIC).

The electricity system is not connected to any other electricity grid; therefore, not exports/imports related emissions are accounted.

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Only the power plants connected to the SIC was considered.

No off grid power plants were included in the emission factor calculations.

STEP 3: Select a method to determine the operating margin (OM)

The selection of the OM is in this case limited by the fact that more than 50% of the grid's electricity comes from low-cost must-run sources, see table below, (average in the last 5 years 59%).

Table No. 7: Participation of the power plants "Low cost/must run" in five years

GWh	2006	2007	2008	2009	2010	Average	%
Low cost/must run	28,526	22,887	24,473	25,583	22,436	24,781	59%
No low cost/must run	11,813	19,157	17,401	16,207	20,797	17,075	41%
Total	40,340	42,043	41,874	41,790	43,233	41,856	100%

The method selected from the "Tool to calculate the emission factor for an electricity system", is option (b) Simple Adjusted OM. The emission factor is calculated ex-ante for the entire crediting period. The latest data available from official sources was used.

STEP 4: Calculate the operating margin emission factor according to the selected method

The simple adjusted operating margin emission factor ($EF_{grid,OM-,adj,y}$ in tCO_2/MWh) is a variation on the simple operating margin, where the power sources (including imports) are separated in low-cost/must-run power sources (k) and other power sources (m). It is calculated based on the net electricity generation of each power unit and an emission factor for each power unit. The $EF_{grid,OM-adj,y}$ was calculated in an ex ante basis. The Simple Adjusted Operation Margin emission factor was be calculated using Equation 7 of the Emission Factor Tool.

$$EF_{grid,OM-adj,y} = (1-\lambda_y) \times \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} + \lambda_y \times \frac{\sum_k EG_{k,y} \times EF_{EL,k,y}}{\sum_k EG_{k,y}} \quad (7)$$

Where:

$EF_{grid,OM-adj,y}$ = Simple adjusted operating margin CO_2 emission factor in year y (tCO_2/MWh)
λ_y = Factor expressing the percentage of time when low-cost/must-run power units are on the margin in year y
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EG_{k,y}$ = Net quantity of electricity generated and delivered to the grid by power unit k in year y (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)
$EF_{EL,k,y}$ = CO_2 emission factor of power unit k in year y (tCO_2/MWh)

m = All grid power units serving the grid in year y except low-cost/must-run power units
k = All low-cost/must run grid power units serving the grid in year y
y = The relevant year as per the data vintage chosen in Step 3

As the SIC is not connected to other grids there is no net electricity imports to be considered.

Determination of $EF_{EL,m,y}$

If for a power unit *m* data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) was determined using Option A.1 (equation 2 of the Emission Factor Tool):

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}} \quad (2)$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$ = Amount of fossil fuel type *i* consumed by power unit m in year *y* (Mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m = All power units serving the grid in year *y* except low-cost / must-run power units
i = All fossil fuel types combusted in power unit *m* in year *y*
y = The relevant year as per the data vintage chosen in Step 3

If for a power unit *m* only data on electricity generation and the fuel types used is available, the emission factor was determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit (Option A.2), as follows (equation 3 of the Emission Factor Tool):

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}} \quad (3)$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type *i* used in power unit m in year *y* (tCO_2/GJ)
$\eta_{m,y}$ = Average net energy conversion efficiency of power unit m in year y (ratio)
m = All power units serving the grid in year y except low-cost/must-run power units
y = The relevant year as per the data vintage chosen in Step 3

Where several fuel types are used in a power unit, the fuel type with the lowest CO_2 emission factor for $EF_{CO2,m,i,y}$. was used.

If for a power unit m only data on electricity generation is available, an emission factor of 0 tCO_2/MWh was assumed as a simple and conservative approach (Option A3).

Determination of λ_y

The parameter λ_y is defined as follows (equation 8 of the Emission Factor Tool):

$$\lambda_y(\%) = \frac{\text{Number of hours low-cost / must-run sources are on the margin in year y}}{\text{8760 hours per year}} \quad (8)$$

And it was calculated as per the following steps:

Step (i) Plot a load duration curve. Collect chronological load data (typically in MW) for each hour of the year y, and sort the load data from the highest to the lowest MW level. Plot MW against 8,760 hours in the year, in descending order.

Step (ii) Collect power generation data from each power plant/unit. Calculate the total annual generation (in MWh) from low-cost/must-run power plants/units (i.e. $\Sigma_k EG_{k,y}$).

Step (iii) Fill the load duration curve. Plot a horizontal line across the load duration curve such that the area under the curve (MW times hours) equals the total generation (in MWh) from low-cost/must-run power plants/units (i.e. $\Sigma_k EG_{k,y}$).

Step (iv) Determine the "Number of hours for which low-cost/must-run sources are on the margin in year y". First, locate the intersection of the horizontal line plotted in Step (iii) and the load duration curve plotted in Step (i). The number of hours (out of the total of 8760 hours) to the right of the intersection is the number of hours for which low-cost/must-run sources are on the margin. If the lines do not intersect, then one may conclude that low-cost/must-run sources do not appear on the margin and λ_y is equal to zero.

The following are the results for the parameters used for calculating the operating margin:

Table No. 8: Parameters for Emissions Factor OM 2008 2009 2010

Parameter	Year		
	2008	2009	2010
λ	0.0000	0.0001	0.0065
1 - λ	1.0000	0.9999	0.9935

$\sum_m EG_{m,y} \times EF_{EL,m,y}$ (tCO2)	13,506,896	12,976,266	12,401,363
$\sum_m EG_{m,y}$ (MWh)	17,400,648	16,206,724	20,797,007
$\sum_k EG_{k,y} \times EF_{EL,k,y}$ (tCO2)	0	0	0
$\sum_k EG_{k,y}$ (MWh)	24,473,304	25,582,990	22,435,769
Annual generation	41,873,952	41,789,714	43,232,776
%(2008-2010)	33.00%	32.93%	34.07%

According to the values in the table above:

OM_{2008} = (1.0000 * (13,506,896 tCO_2) / 17,400,648 MWh) + (0.0000 * (0tCO_2) / 24,473,304 MWh)

OM_{2008} = 0.7762 tCO_2/MWh

OM_{2009} = (0.9999 * (12,976,266 tCO_2) / 16,206,724 MWh) + (0.0001 * (0 tCO_2) / 25,582,990 MWh) =

OM_{2009} =0.8006 tCO_2/MWh

OM_{2010} = (0.9935 * (12,401,363 tCO_2) / 20,797,007 MWh) + (0.0065 * (0 tCO_2) / 22,435,769MWh) =

OM_{2010} = 0.5924 tCO_2/MWh

$OM_{2008-2010}$ = 0.7762 tCO_2/MWh * 0.3300 + 0.8006 tCO_2/MWh * 0.3293 + 0.5924 tCO_2/MWh * 0.3407

$OM_{2008-2010}$ = 0.7216 tCO_2/MWh

Step 5: Calculate the build margin (BM) emission factor

In defining the group of power units *m* that comprises the larger annual generation, the results (for 2010) are:

a) *Identify the set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-}units}$) and determine their annual electricity generation ($AEG_{SET\text{-}5\text{-}units}$, in MWh):*

Table No. 9: Group $SET_{5\text{-units}}$

SET5-units
CBB-Centro (4,190.3 MWh)
Punta Colorada (7,882.5 MWh)
San Clemente (7,349.1 MWh))
Juncalito (1,263.3 MWh)
El Salvador (297.0 MWh)

AEG $_{SET\ 5\text{-}units}$ ***: 20,982 MWh***

(b) Determine the annual electricity generation of the project electricity system, excluding power units registered as CDM project activities (AEG_{total}, in MWh).

Total SIC generation = 43,232,776 MWh

CDM projects generation = 1,848,569 MWh

Then:

AEG_{total} = 43,232,776 MWh - 1,848,569 MWh

AEG_{total} = 41,384,207 MWh

Identify the set of power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} and determine their annual electricity generation ($AEG_{SET\text{-}\geq 20\%,}$ in MWh).

The list of power plants and their generation is presented in the spreadsheet for Grid Emission Factor calculation.

$AEG_{SET\text{-}\geq 20\%,}$ = 8,407,934 MWh

(c) From $SET_{5\text{-}units}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}). As shown in steps (a) and (b) the larger annual electricity generation. $SET_{\geq 20\%}$ is larger than $SET_{5\text{-}units}$, then:

$SET_{sample} = SET_{\geq 20\%}$

As none of the power units in SET_{sample} started to supply electricity to the grid more than 10 years ago the sample group of power units m corresponds to SET_{sample}. The following are the results obtained for the build margin. For further details se spreadsheet for Grid Emission Factor calculation.

$$\sum_m EG_{m,y} \times EF_{EL,m,y} = 4{,}780{,}079 \text{ t } CO_2$$

$$\sum_m EG_{m,y} = 8{,}407{,}934 \text{ MWh}$$

Then:

$EF_{grid,BM}$ = 4,780,079 t CO_2 / 8,407,934 MWh.

$EF_{grid,BM}$ = 0.5685 t CO_2/MWh.

Step 6: Calculate the combined margin (CM) emissions factor $EF_{grid,CM,y}$.

The calculation of the combined margin (CM) emission factor (*EFgrid,CM,y*) is based on one of the following methods:

a) Weighted average CM; or
b) Simplified CM.

The weighted average CM method (option a) was used.

(a) Weighted average CM

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad \textbf{(13)}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{grid,OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM} = Weighting of operating margin emissions factor (%)
w_{BM} = Weighting of build margin emissions factor (%)

Following the guidance of the methodological tool, the values for the weighting factors are 0.5 each, considering that the proposed project activity is a hydro project. As the OM and BM are calculated ex-ante, the CM will not be updated during the first crediting period.
$w_{OM} = 0.5$
$w_{BM} = 0.5$

$EF_{grid,CM,y.}$ = 0.7216 tCO_2/MWh *0.5 + 0.5685 t CO_2/MWh. * 0.5

$EF_{grid,CM,y.}$ = 0.6451

Step 2: Determine the minimum baseline electricity generation in the grid

The calculation of the minimum amount of electricity that would be generated in the grid in the baseline is based on the assumption that the amount of electricity generated on-site in the baseline cannot be higher than the installed capacity of power generation available in the baseline scenario. Therefore, the following equation should be used:

$$EL_{BL,GR,y} = \max\left(0, EL_{BL,y} - CAP_{EG,total,y}\right) \quad \textbf{(13)}$$

Where:

$EL_{BL,GR,y}$	=	Baseline minimum electricity generation in the grid in year *y* (MWh)
$EL_{BL,y}$	=	Baseline electricity generation in year *y* (MWh)
$CAP_{EG,total,y}$	=	Baseline electricity generation capacity in year *y* (MWh)
y	=	Year of the crediting period

For baseline alternatives not connected to the grid or otherwise technically or legally impossible to export power to the grid $EL_{BL,GR,y} = 0$.

Step 3: Determine the baseline biomass-based heat and power generation

Step 3.1: Determine the baseline biomass-based heat generation

It is assumed that the use of biomass residues for which scenario B4 has been identified as the baseline scenario ($BR_{B4,n,y}$) would be prioritized over the use of any fossil fuels in the baseline. From that assumption, the equivalent amount of heat that would be generated with biomass residues ($HG_{BL,BR,y}$) should be determined.

Considering that the several heat generators and different categories of biomass residues might be identified as part of the baseline scenario, the prioritization of heat generators use and the allocation of biomass residues to different heat generators may be challenging and much dependent on specific site conditions. For that reason, the methodology proposes general principles that should be adhered to in order to determine the prioritization and allocation, which still leave room for technical constraints to be reflected given specific site conditions.

In order to do that follow the procedure below:

- Prepare a list of all heat generators that would use biomass residues in the baseline scenario. The list should include both biomass-based and co-fired heat generators;
- Allocate the biomass types and quantities for which B4 has been identified as the baseline scenario ($BR_{B4,n,y}$) to the different heat generators ($BR_{B4,n,h,y}$). In doing so, the following principles should be adhered to:
  - Where a biomass residue type can technically be used in more than one heat generator, it should be assumed that it is allocated from the most efficient to the less efficient heat generators to the maximum extent possible, taking into account any technical and operational constraints;
  - Where a biomass residue type can technically be used in both heat generators, which do not require co-firing fossil fuels, and heat generators, which require co-firing fossil fuels, it should be assumed that it is to the maximum extent possible used in the heat generator, which does not require co-firing fossil fuels, taking into account any technical and operational constraints. Any remaining biomass residue quantities are then allocated to the subsequent heat generators which require co-firing fossil fuels;
  - In both cases, if different types of biomass residues result in different levels of heat generation efficiency, the allocation of biomass residues should be guided by the principle

that the biomass residues would be allocated so as to maximize the heat generation efficiency of the set of heat generators;

- In the case of a district heating system or off site heat supply where the individual heat sources can be identified, the biomass boilers in the district heating system shall be included in this list. In case of a district heating system where no individual heat sources can be identified, see step 4 for further guidance how to deal with this case;
- One particular case of technical constraint is that of heat generators that require that a minimum amount of fossil fuels be (co-)fired for heat generation. In that case the project participant may wish to: (i) clearly identify the fossil fuel type and quantity required due to this technical constraint; (ii) add the identified quantity to the parameter $FF_{BL,HG,y,f}$; (iii) determine the heat generation from this quantity of fossil fuel based on the efficiency of the heat generator; and (iv) add the calculated heat generation to the parameter $HG_{BL,BR,y}$;

Document and justify in the CPA-DD in a transparent manner how the allocation of biomass residue types and quantities to heat generators will be performed during monitoring.

- Calculate the amount of heat generated with biomass residues based on the allocation rules established in the CDM-PDD using the following equations:

$$HG_{BL,BR,y} = \sum_h \sum_n \left(BR_{B4,n,h,y} \cdot NCV_{BR,n,y} \cdot \eta_{BL,HG,BR,h} \right) \quad \textbf{(14)}$$

Subject to,

$\sum_h \sum_n BR_{B4,n,h,y} = \sum_n BR_{B4,n,y}$, i.e. the biomass residues used in each heat generator should not exceed the total amount of biomass residues available. **(15)**

$\sum_n \left(BR_{B4,n,h,y} \cdot NCV_{BR,n,y} \cdot \eta_{BL,HG,BR,h} \right) \le LOC_y \cdot CAP_{HG,h} \cdot LFC_{HG,h}$, i.e. the heat generation in each heat generator should not exceed the total capacity of the heat generator; **(16)**

Where:

$HG_{BL,BR,y}$	=	Baseline biomass-based heat generation in year *y* (GJ)
$BR_{B4,n,h,y}$	=	Quantity of biomass residues of category n used in heat generator h in year *y* with baseline scenario B4 (tonne on dry-basis)
$NCV_{BR,n,y}$	=	Net calorific value of biomass residue of category n in year *y* (GJ/tonne on dry-basis)
$\eta_{BL,HG,BR,h}$	=	Baseline biomass-based heat generation efficiency of heat generator *h* (ratio)
$BR_{B4,n,y}$	=	Quantity of biomass residues of category n used in the project activity in

		year *y* for which the baseline scenario is B4: (tonne on dry-basis)
LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{HG,h}$	=	Baseline capacity of heat generator *h* (GJ/h)
$LFC_{HG,h}$	=	Baseline load factor of heat generator *h* (ratio)
y	=	Year of the crediting period
h	=	Heat generator in the baseline scenario

Step 3.2: Determine the baseline biomass-based cogeneration of process heat and electricity and heat extraction

It is assumed that cogeneration of process heat and power using biomass-based heat ($HG_{BL,BR,y}$) would be prioritized over the use of fossil fuels for the generation of process heat and power on-site. From that assumption the equivalent amount of electricity ($EL_{BL,BR,CG,y}$) and process heat ($HC_{BL,BR,CG,y}$) that would be generated are determined.

Considering that the several heat engines of different types might be identified as part of the baseline scenario, the prioritization of heat engines use may be challenging and much dependent on specific site conditions. For that reason, the methodology proposes general principles that should be adhered to in order to determine the prioritization of use, which still leave room for technical constraints to be reflected given specific site conditions.

In order to do that follow the procedure below:

- Prepare a list containing the heat engines identified in the baseline scenario for which heat and power can be cogenerated. The list should contain, in case of steam cycles, only back-pressure and heat-extraction steam turbines. Condensing steam turbines should not be considered at this stage;
- Allocate the total biomass-based heat ($HG_{BL,BR,y}$) to the different heat engines ($HG_{BL,BR,CG,y,i}$). In doing so, the following principles should be adhered to:
    - o Where heat can technically be used in more than one heat engine type, it should be assumed that it is allocated so as to maximize the cogeneration of process heat. For instance, in case of steam cycles, if both back-pressure and heat-extraction steam turbines are identified in the baseline, heat should be first allocated to back-pressure turbines and then to heat-extraction turbines to the maximum extent possible, taking into account any technical and operational constraints;
    - o Subject to the allocation rule above, it should be assumed that heat is allocated from the most efficient to the less efficient heat engines to the maximum extent possible, taking into account any technical and operational constraints;

    Document and justify in the CPA-DD in a transparent manner how the allocation of biomass-based heat to heat engines will be performed during monitoring.
- Calculate the amount of electricity and process heat generation based on the allocation above using the following equations:

$$EL_{BL,BR,CG,y} = \frac{1}{3.6} \cdot \sum_i \left(\frac{1}{(HPR_{BL,i} + 1 + GGL_{default})} \cdot HG_{BL,BR,CG,y,i} \right) \quad \textbf{(17)}$$

$$HC_{BL,BR,CG,y} = \sum_i \left(\frac{HPR_{BL,i}}{(HPR_{BL,i} + 1 + GGL_{default})} \cdot HG_{BL,BR,CG,y,i} \right) \quad \textbf{(18)}$$

Subject to,

$\sum_i HG_{BL,BR,CG,y,i} \leq HG_{BL,BR,y}$, i.e. the biomass-based heat used in cogeneration mode should not exceed the total biomass-based heat generated; **(19)**

$HC_{BL,BR,CG,y} \leq HC_{BL,y}$, i.e. the process heat cogenerated should not exceed the total process heat demand; **(20)**

$(\eta_{BL,EG,CG,i} \cdot HG_{BL,BR,CG,y,i}) \leq LOC_y \cdot CAP_{EG,CG,i} \cdot LFC_{EG,CG,i}$, i.e. the electricity generation in each heat engine should not exceed the total capacity of the heat engine. **(21)**

Where:

$EL_{BL,BR,CG,y}$	=	Baseline biomass-based cogenerated electricity in year *y* (MWh)
$\eta_{BL,EG,CG,i}$	=	Baseline electricity generation efficiency of heat engine *i* (MWh/GJ)
$HG_{BL,BR,CG,y,i}$	=	Baseline biomass-based heat used in heat engine *i* in year *y* (GJ)
$HC_{BL,BR,CG,y}$	=	Baseline biomass-based process heat cogenerated in year *y* (GJ)
$HPR_{BL,i}$	=	Baseline heat-to-power ratio of the heat engine *i* (ratio)
$GGL_{default}$	=	The default value for the losses linked to the electricity generator group (turbine, couplings and electricity generator. Set at 0.05) (ratio)
$HG_{BL,BR,y}$	=	Baseline biomass-based heat generation in year *y* (GJ)
$HC_{BL,y}$	=	Baseline process heat generation in year *y* (GJ)
LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{EG,CG,i}$	=	Baseline electricity generation capacity of heat engine *i* (MW)
$LFC_{EG,CG,i}$	=	Baseline load factor of heat engine *i* (ratio)
i	=	Cogeneration-type heat engine in the baseline scenario
y	=	Year of the crediting period

The next step to be followed depends on the outcomes of the calculations above. Four cases are possible:

Case 3.2.1: If $\mathrm{HG_{BL,BR,y}} = \sum_{i} \mathrm{HG_{BL,BR,CG,y,i}}$ and $HC_{BL,y} = HC_{BL,BR,CG,y}$, then all the heat that would be generated using biomass residues in the baseline would be used in cogeneration-type heat engines and would suffice to serve all process heat demand. It is assumed then that the use of fossil fuels on-site in the baseline scenario would be uncertain (except for the amount required due to technical constraints) because it would depend on a number of factors that are not taken into account in this methodology, particularly on the relative prices of on-site electricity generation using fossil fuels and the electricity price in the grid. In order to estimate the baseline parameters that result project participants should:

- Define $\mathrm{EL_{BL,FF/GR,y}} = \mathrm{EL_{BL,y}} - \mathrm{EL_{BL,GR,y}} - \mathrm{EL_{BL,BR,CG,y}}$, $\mathrm{EL_{PJ,offset,y}} = 0$, $\mathrm{FF_{BL,HG,y,f}} = 0$, and,
- Proceed to Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues.

Case 3.2.2: If $\mathrm{HG_{BL,BR,y}} = \sum_{i} \mathrm{HG_{BL,BR,CG,y,i}}$ and $HC_{BL,y} > HC_{BL,BR,CG,y}$, then all the heat that would be generated using biomass residues in the baseline would be used in cogeneration-type heat engines but still some process heat demand would remain to be met. It is assumed then that the process heat balance that remains to be met would be met by using fossil fuels. In order to estimate the baseline parameters that result, project participants should:

- Define $HC_{balance,FF,y} = HC_{BL,y} - HC_{BL,BR,CG,y}$, $\mathrm{EL_{balance,FF,y}} = \mathrm{EL_{BL,y}} - \mathrm{EL_{BL,GR,y}} - \mathrm{EL_{BL,BR,CG,y}}$, and,
- Proceed to Step 4: Determine the baseline demand for fossil fuels to meet the balance of process heat and the corresponding electricity generation

Case 3.2.3: If $\mathrm{HG_{BL,BR,y}} > \sum_{i} \mathrm{HG_{BL,BR,CG,y,i}}$ and $HC_{BL,y} = HC_{BL,BR,CG,y}$, then all process heat demand would be met with biomass-based heat in the baseline and still there would be some biomass-based heat to be used. It is assumed then that this heat would be used for generation of power in power-only mode, i.e. without cogeneration of process heat. In order to estimate the baseline parameters that result project participants should:

- Define $\mathrm{HG_{balance,BR,PO,y}} = \mathrm{HG_{BL,BR,y}} - \sum_{i} \mathrm{HG_{BL,BR,CG,y,i}}$, $\mathrm{EL_{balance,PO,y}} = \mathrm{EL_{BL,y}} - \mathrm{EL_{BL,GR,y}} - \mathrm{EL_{BL,BR,CG,y}}$, and,
- Proceed to Step 3.3: Determine the baseline biomass-based electricity generated in power-only mode.

Case 3.2.4: If $\mathrm{HG_{BL,BR,y}} > \sum_{i} \mathrm{HG_{BL,BR,CG,y,i}}$ and $HC_{BL,y} > HC_{BL,BR,CG,y}$, then there would be biomass-based heat in the baseline that could still be used and process heat demand to be met. It is assumed then that this balance of biomass-based heat would be extracted from the heat header and used to meet the process heat demand without cogeneration of power. Three cases should thus be considered (refer to the monitoring tables for a definitions of $h_{LOW,y}$ and $h_{HIGH,y}$ used in the equations below):

Case 3.2.4.1: If $HC_{BL,y} - HC_{BL,BR,CG,y} = \frac{h_{LOW,y}}{h_{HIGH,y}} \cdot \left(HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i} \right)$, i.e. the balance of biomass-based heat (right-hand side of the equation) equals the remaining demand for process heat (left-hand side of the equation). Then there is no more biomass-based heat available and the demand for process heat has been met. It is assumed then that the use of fossil fuels on-site would be uncertain in the baseline scenario (except for the amount required due to technical constraints) because it would depend on a number of factors that are not taken into account in this methodology, particularly on the relative prices of on-site electricity generation using fossil fuels and the electricity price in the grid. In order to estimate the baseline parameters that result project participants should:

- Define $EL_{BL,FF/GR,y} = EL_{BL,y} - EL_{BL,GR,y} - EL_{BL,BR,CG,y}$, $EL_{PJ,offset,y} = 0$, $FF_{BL,HG,y,f} = 0$, and,
- Proceed to Step 5 Determine the baseline emissions due to uncontrolled burning or decay of biomass residues.

Case 3.2.4.2: If $HC_{BL,y} - HC_{BL,BR,CG,y} > \frac{h_{LOW,y}}{h_{HIGH,y}} \cdot \left(HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i} \right)$, i.e. the balance of biomass-based heat (right-hand side of the equation) is less than the remaining demand for process heat (left-hand side of the equation). Then all biomass-based heat was used and there still remains process heat demand to be met. It is assumed then that this process heat demand would be met by using fossil fuels in the baseline. In order to estimate the baseline parameters that result project participants should:

- Define $HC_{balance,FF,y} = \left(HC_{BL,y} - HC_{BL,BR,CG,y} \right) - \frac{h_{LOW}}{h_{HIGH}} \cdot \left(HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i} \right)$,
  $EL_{balance,FF,y} = EL_{BL,y} - EL_{BL,GR,y} - EL_{BL,BR,CG,y}$, and,

Proceed to Step 4: Determine the baseline demand for fossil fuels to meet the balance of process heat and the corresponding electricity generation

Case 3.2.4.3: If $HC_{BL,y} - HC_{BL,BR,CG,y} < \frac{h_{LOW}}{h_{HIGH}} \cdot \left(HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i} \right)$, i.e. the balance of biomass-based heat (right-hand side of the equation) is greater than the remaining demand for process heat (left-hand side of the equation). Then the balance of heat produced with biomass residues is greater than the balance of process heat demand, meaning that there remains some biomass-based heat to be used after the demand for process heat was met. It is assumed then that this heat would be used to generate electricity in power-only mode, i.e. without cogeneration of process heat. In order to estimate the baseline parameters that result project participants should:

- Define $HG_{balance,BR,PO,y} = \left(HG_{BL,BR,y} - \sum_i HG_{BL,BR,CG,y,i} \right) - \frac{h_{HIGH}}{h_{LOW}} \cdot \left(HC_{BL,y} - HC_{BL,BR,CG,y} \right)$,
  $EL_{balance,PO,y} = EL_{BL,y} - EL_{BL,GR,y} - EL_{BL,BR,CG,y}$, and,

- Proceed to Step 3.3: Determine the baseline biomass-based electricity generated in power-only mode.

Step 3.3: Determine the baseline biomass-based electricity generated in power-only mode

If power-only-type heat engines, i.e. heat engines that produce only electricity without cogeneration of process heat, have been identified in the baseline scenario, it is assumed that the balance of heat produced using biomass residues, if any, would be used in power-only mode.

Considering that the several heat engines of different types might be identified as part of the baseline scenario, the prioritization of heat engines use may be challenging and much dependent on specific site conditions. For that reason, the methodology proposes general principles that should be adhered to in order to determine the prioritization of use, which still leave room for technical constraints to be reflected given specific site conditions.

In order to do that follow the procedure below:

- Prepare a list containing the power-only-type heat engines (i.e. heat engines that do not cogenerate any process heat) identified in the baseline scenario. The list should contain, in case of steam cycles, only condensing steam turbines. Back-pressure and heat-extraction steam turbines should not be considered here;
- Allocate the balance of biomass-based heat ($HG_{balance,BR,PO,y}$) to the different heat engines ($HG_{BL,BR,PO,y,j}$). In doing so, the following principles should be adhered to:
  - o Where heat can technically be used in more than one heat engine, it should be assumed that heat is allocated from the most efficient to the less efficient heat engines to the maximum extent possible, taking into account any technical and operational constraints;
  - o Document and justify in the CPA-DD in a transparent manner how the allocation of heat to heat engines will be performed during monitoring.
    - o Calculate the amount of electricity generated based on the allocation above using the following equations:

$$EL_{BL,BR,PO,y} = \sum_{i} \left(HG_{BL,BR,PO,y,j} \cdot \eta_{BL,EG,PO,j} \right) \quad \textbf{(22)}$$

Subject to,

$\sum_{i} HG_{BL,BR,PO,y,j} \leq HG_{balance,BR,PO,y}$, i.e. the biomass-based heat used in the heat engines should not exceed the biomass-based heat balance; **(23)**

$\left(HG_{BL,BR,PO,y,j} \cdot \eta_{BL,EG,PO,j} \right) \leq LOC_{y} \cdot CAP_{EG,PO,j} \cdot LFC_{EG,PO,j}$, i.e. the electricity generation in each heat engine should not exceed the total capacity of the heat engine. **(24)**

Where:

$EL_{BL,BR,PO,y}$	=	Baseline biomass-based electricity (power-only) in year *y* (MWh)
$HG_{BL,BR,PO,y,j}$	=	Baseline biomass-based heat used in heat engine *j* in year *y* (GJ)
$\eta_{BL,EG,PO,j}$	=	Average electric power generation efficiency of heat engine *j* (MWh/GJ)
$HG_{balance,BR,PO,y}$	=	Baseline biomass-based heat balance after cogeneration in year *y* (GJ)
LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{EG,PO,j}$	=	Baseline electricity generation capacity of heat engine *j* (MW)
$LFC_{EG,PO,j}$	=	Baseline load factor of heat engine *j* (ratio)

Case 3.3.1: If $EL_{balance,PO,y} \geq EL_{BL,BR,PO,y}$, the amount of electricity generated on-site in the baseline is either equal to or less than the amount of electricity generated in the project scenario. In that case:

- Define $EL_{BL,FF/GR,y} = EL_{balance,PO,y} - EL_{BL,BR,PO,y}$, $EL_{PJ,offset,y} = 0$, $FF_{BL,HG,y,f} = 0$, and,
- Proceed to Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues.

Case 3.3.2: If $EL_{balance,PO,y} < EL_{BL,BR,PO,y}$, the amount of electricity generated on-site in the baseline exceeds the amount of electricity generated in the project scenario. If grid-export was available in the baseline, this result indicates that the project activity results in a decrease of power output which is likely to be supplied by the grid. As a consequence, project emissions in the form of generation of electricity in the grid should be accounted for via the parameter $EL_{PJ,offset,y}$.. In order to continue project participants should:

- Define $EL_{BL,FF/GR,y} = 0$, $EL_{PJ,offset,y} = EL_{balance,PO,y} - EL_{BL,BR,PO,y}$, $FF_{BL,HG,y,f} = 0$, and,
- Proceed to Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues.

Step 4: Determine the baseline demand for fossil fuels to meet the balance of process heat and the corresponding electricity generation

Step 4.1: Determine the baseline fossil fuel based cogeneration of process heat and electricity and the remaining process heat demand

In many cases the amount of biomass residues available is not enough to generate the heat required to meet the process heat demand. In such cases, and if fossil-fuel-based heat generators have been identified in the baseline scenario, it is assumed that the balance of process heat is met using fossil fuels, resulting in related fossil fuel baseline emissions. Where cogeneration capacity is still available it is assumed that the

remaining process heat demand will first be supplied by cogeneration and then by direct use of heat supplied by heat generators.

Considering that several cogeneration heat engines of different types might be identified as part of the baseline scenario, the prioritization of cogeneration heat engines use may be challenging and much dependent on specific site conditions. For that reason, the methodology proposes general principles that should be adhered to in order to determine the prioritization and allocation, which still leave room for technical constraints to be reflected given specific site conditions.

In order to determine the amount of heat and electricity that would be cogenerated using fossil fuels, the procedure below should be followed:

- Prepare a list containing the cogeneration heat engines identified in the baseline scenario for which heat and power can be cogenerated. The list should contain, in case of steam cycles, only backpressure and heat-extraction steam turbines. Condensing steam turbines should not be considered;
- Allocate the process heat balance ($HC_{balance,FF,y}$) to the different cogeneration heat engines that still have capacity to cogenerate heat and power, up to the level required for meeting the balance of process heat demand. In doing so, the following principles should be adhered to:
  - Where heat can technically be used in more than one cogeneration heat engine type, it should be assumed that it is allocated so as to maximize the cogeneration of process heat. For instance, in case of steam cycles, if both back-pressure and heat-extraction steam turbines are identified in the baseline, the process heat balance should be first allocated to back-pressure turbines and then to heat-extraction turbines to the maximum extent possible, taking into account any technical and operational constraints, including partial use of the heat engine in previous steps;
  - Subject to the allocation rule above, it should be assumed that the process heat is allocated from the most efficient to the less efficient heat engines to the maximum extent possible, taking into account any technical and operational constraints;
- Document and justify in the CPA-DD in a transparent manner how the allocation of heat to heat engines will be performed during monitoring.

Calculate for each cogeneration heat engine *i* the amount of cogenerated electricity and the amount of heat that would need to be generated by fossil fuels in heat generators in order to supply the cogeneration heat engine, as follows:

$$\mathrm{HG}_{\mathrm{BL,FF,CG,y,i}} = \frac{(HPR_{BL,i} + 1 + GGL_{default})}{HPR_{BL,i}} \cdot HC_{\mathrm{BL,FF,CG,y,i}}$$

, i.e the amount of fossil fuel based heat required to supply the cogeneration heat engine i **(25)**

$$\mathrm{EL}_{\mathrm{BL,FF,y}} = \sum_{\mathrm{i}} \frac{\mathrm{HC}_{\mathrm{BL,FF,CG,y,i}}}{\mathrm{HPR}_{\mathrm{BL,i}}}$$

, i.e the amount of fossil fuel based electricity cogenerated by cogeneration heat engine i **(26)**

$$\mathrm{HG}_{\mathrm{BL,FF,CG,y}} = \sum_{\mathrm{i}} \mathrm{HG}_{\mathrm{BL,FF,CG,y,i}} \quad \textbf{(27)}$$

Subject to,

$\sum_{i} HC_{BL,FF,CG,y,i} \leq HC_{balance,FF,y}$, i.e. the fossil fuel based cogenerated process heat should not exceed the balance of process heat demand, **(28)**

$$\frac{1}{3.6} \cdot \left((HG_{BL,FF,CG,y,i} + HG_{BL,BR,CG,y,i}) \cdot \frac{1}{(HPR_{BL,i} + 1 + GGL_{default})} \right) \leq LOC_y \cdot CAP_{EG,CG,i} \cdot LFC_{EG,CG,i} \qquad \textbf{(29)}$$

Where:

$HG_{BL,FF,y,i}$	=	Baseline fossil-based heat used in heat engine *i* in year *y* (GJ)
$HC_{BL,BR,CG,y}$	=	Baseline biomass-based process heat cogenerated in year *y* (GJ)
$GGL_{default}$	=	The default value for the losses linked to the electricity generator group (turbine, couplings and electricity generator. Set at 0.05) (ratio)
$HPR_{BL,i}$	=	Baseline Heat Power Ratio of heat engine *i* (ratio)
$EL_{BL,FF,y}$	=	Baseline fossil-based electricity generation in year *y* (MWh)
$HG_{BL,FF,y,h}$	=	Baseline fossil-based heat generation in heat generator h in year *y* (GJ)
$HC_{balance,FF,y}$	=	Balance of process heat demand after cogeneration in year *y* (GJ)
$HG_{BL,FF,CG,y,i}$	=	Baseline fossil-fuel-based heat used in heat engine *i* in year *y* (GJ)
$HG_{BL,BR,CG,y,i}$	=	Baseline biomass-based heat used in heat engine *i* in year *y* (GJ)
LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{EG,CG,i}$	=	Baseline electricity generation capacity of heat engine *i* (MW)
$LFC_{EG,CG,i}$	=	Baseline load factor of heat engine *i* (ratio)
f	=	Fossil fuel type
y	=	Year of the crediting period
i	=	Cogeneration-type heat engine in the baseline scenario

In case after step 4.1 $HC_{balance,FF,y} > HC_{BL,FF,CG,y}$, then there would still be process heat demand to be met. It is assumed then that this balance of process heat would be generated with fossil fuels and extracted from the heat header and used to meet the process heat demand without cogeneration of power until all baseline process heat is met.

$$HG_{BL,FF,DHE,y} = (HC_{balance,FF,y} - HC_{BL,FF,CG,y}) \cdot \frac{h_{HIGH,y}}{h_{LOW,y}} \quad \textbf{(30)}$$

$$HG_{BL,FF,y} = HG_{BL,FF,CG,y} + HG_{BL,FF,DHE,y} \quad \textbf{(31)}$$

Where:

$HC_{balance,FF,y}$	=	Balance of process heat demand after cogeneration in year *y* (GJ)
$HC_{BL,FF,CG,y}$	=	Baseline fossil-fuel-based process heat cogenerated in year *y* (GJ)
$h_{LOW,y}$	=	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)
$HG_{BL,FF,y}$	=	Baseline fossil-based heat generation in year *y* (GJ)
$HG_{BL,FF,DHE,y}$	=	Baseline fossil-based heat used to meet baseline process heat demand via direct heat extraction in year y (GJ)
$HG_{BL,FF,CG,y}$	=	Baseline fossil-based heat cogeneration in year y (GJ)

The following cases are possible depending on the results of the calculations above:

Case 4.1.1: If $EL_{balance,FF,y} \geq EL_{BL,FF,y}$, the amount of electricity generated on-site in the baseline is either equal to or less than the amount of electricity generated in the project scenario. In order to determine the resulting baseline emissions project participants should:

- Define $EL_{BL,FF/GR,y} = EL_{balance,FF,y} - EL_{BL,FF,y}$, $EL_{PJ,offset,y}$ = 0, and,
- Proceed to Step 4.2 .

Case 4.1.2: If $EL_{balance,FF,y} < EL_{BL,FF,y}$, the amount of electricity generated on-site in the baseline exceeds the amount of electricity generated in the project scenario. If grid-export was available in the baseline, this result indicates that the project activity results in a decrease of power output which is likely to be supplied by the grid. As a consequence, project emissions in the form of generation of electricity in the grid should be accounted for via the parameter $EL_{PJ,offset,y}$. In order to determine the resulting baseline emissions project participants should:

- Define $EL_{BL,FF/GR,y} = 0$, $EL_{PJ,offset,y} = EL_{balance,FF,y} - EL_{BL,FF,y}$, and,
- Proceed to Step 4.2.

Step 4.2: Determine the baseline heat generation to meet the fossil-based cogeneration of heat and power and the heat to meet the balance of process heat

Considering that several heat generators might be identified as part of the baseline scenario, the prioritization of heat generators use may be challenging and much dependent on specific site conditions. For that reason, the methodology proposes general principles that should be adhered to in order to determine the prioritization and allocation, which still leave room for technical constraints to be reflected given specific site conditions.

In order to determine the amount of fossil fuels that would be required, the procedure below should be followed:

- Prepare a list of all heat generators that would use fossil fuels in the baseline scenario. In the case where the reference baseline plant would have been connected to a district heating system list all heat sources that supply heat to the district heating system. In case the heat sources to the district heating cannot be individually identified or no data is available the district heating system itself shall be identified as a heat source.
- Allocate the total heat generation required from fossil fuels ($HG_{BL,FF,y}$) to the different heat generators ($HG_{BL,FF,y,h}$), subject to the difference in heat content in the different heat carriers, up to the level required for meeting the balance of process heat demand. In doing so, the following principles should be adhered to:
  - Where heat can technically be generated in more than one heat generator, it should be assumed that it is generated starting from the most efficient to the less efficient heat generators to the maximum extent possible, taking into account any technical and operational constraints, including co-firing and the partial use of the heat generator in the previous steps;
  - If different types of fossil fuels can technically be used in the heat generators, the type of fossil fuel used should be guided by the principle that fossil fuels would be used so as to maximize the heat generation efficiency of the set of heat generators;
  - In case of connection to a district heating system or off site heat supply where the heat is generated in a cogeneration system rather than in a heat-only boiler, the emission factor for this fuel source shall be conservatively set at 0;
  - In case of connection to a district heating system or off site heat supply from which the individual sources cannot be identified, the district heating system shall be considered the most efficient heat source. The capacity of the district heating system shall be considered unlimited unless it can be justified (based on historical consumption data or heat purchase contracts) that the amount of heat to be consumed from/ or delivered to the district heat system was limited. The emission factor of the district heating system shall be considered 0.
- Document and justify in the CDM-PDD in a transparent manner how the allocation of fossil fuel types and quantities to different heat generators will be performed during monitoring.

Estimate the total amount of fossil fuels required to generate the heat required for the cogeneration in Step 4.1 and the balance of process heat based on the allocation principles above using the following equations:

$$\sum_h HG_{BL,FF,y,h} = HG_{BL,FF,DHE,y} + HG_{BL,FF,CG,y} \quad \textbf{(32)}$$

$$FF_{BL,HG,y,f} = \sum_h \left(\frac{HG_{BL,FF,y,h}}{\eta_{BL,HG,FF,h}} \right) \quad \textbf{(33)}$$

Subject to:

$HG_{BL,FF,y,h} \leq LOC_y \cdot CAP_{HG,h} \cdot LFC_{HG,h}$, i.e. the heat generation in each heat generator should not exceed the total capacity of the heat generator; **(34)**

Where:

$FF_{BL,HG,y,f}$	=	Baseline fossil fuel demand for process heat in year *y* (GJ)
$HG_{BL,FF,y,h}$	=	Baseline fossil-based heat generation in heat generator *h* in year *y* (GJ)
$\eta_{BL,HG,FF,h}$	=	Baseline fossil-based heat generation efficiency of heat generator *h* (ratio)
LOC_y	=	Length of the operational campaign in year *y* (hour)
$CAP_{HG,h}$	=	Baseline capacity of heat generator *h* (GJ/h)
$LFC_{HG,h}$	=	Baseline load factor of heat generator *h* (ratio)
$HG_{BL,FF,DHE,y}$	=	Baseline fossil-based heat used to meet baseline process heat demand via direct heat extraction in year y (GJ)
$HG_{BL,FF,CG,y}$	=	Baseline fossil-based heat cogeneration in year y (GJ)

Proceed to Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues

Step 5: Determine the baseline emissions due to uncontrolled burning or decay of biomass residues

The calculation of baseline emissions due to uncontrolled burning or decay of biomass residues is optional and project participants can decide whether to include these emission sources or not. If project participants wish to include these emission sources, the procedure below should be followed, and emissions from combustion of biomass residues under the project activity should be also be determined. Otherwise, this section does not need to be applied and project emissions do not need to include emissions from the combustion of biomass residues under the project activity.

Baseline emissions due to uncontrolled burning or decay of biomass residues are only determined for those categories of biomass residues for which B1, B2 or B3 has been identified as the most plausible

baseline scenario. The guidance provided before for the determination of the baseline scenario for biomass residues and allocation of biomass residues in the baseline should be considered in determining the quantities of biomass residues for each biomass residue category.

The emissions are determined separately for biomass residues categories for which scenarios B1 and B3 (aerobic decay or uncontrolled burning) apply, and for biomass residues categories for which scenario B2 (anaerobic decay) apply:

$$BE_{BR,y} = BE_{BR,B1/B3,y} + BE_{BR,B2,y} \quad \textbf{(35)}$$

Where:

$BE_{BR,y}$	=	Baseline emissions due to disposal of biomass residues in year *y* (tCO_2e)
$BE_{BR,B1/B3,y}$	=	Baseline emissions due to aerobic decay or uncontrolled burning of biomass residues in year *y* (tCO_2)
$BE_{BR,B2,y}$	=	Baseline emissions due to anearobic decay of biomass residues in year *y* (tCO_2)

Step 5.1: Determine $BE_{BR,B1/B3,y}$

For the biomass residues categories, as described in the biomass residues categories table, for which the most likely baseline scenario is either that the biomass residues would be dumped or left to decay under mainly aerobic conditions (B1), or burnt in an uncontrolled manner without utilizing them for energy purposes (B3), baseline emissions are calculated assuming, for both scenarios (aerobic decay and uncontrolled burning), that the biomass residues would be burnt in an uncontrolled manner.

Baseline emissions are calculated by multiplying the quantity of biomass residues with the net calorific value and an appropriate emission factor, as follows:

$$BE_{BR,B1/B3,y} = GWP_{CH4} \cdot \sum_{n} BR_{B1/B3,n,y} \cdot NCV_{BR,n,y} \cdot EF_{BR,n,y} \quad \textbf{(36)}$$

Where:

$BE_{BR,B1/B3,y}$	=	Baseline emissions due to aerobic decay or uncontrolled burning of biomass residues in year *y* (tCO2)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2/tCH4)
$BR_{B1/B3,n,y}$	=	Quantity of biomass residues of category *n* used in the project activity in year *y* for which the baseline scenario is B1: or B3: (tonnes on dry-basis)
$NCV_{BR,n,y}$	=	Net calorific value of biomass residue of category *n* in year *y* (GJ/tonne on dry-basis)
$EF_{BR,n,y}$	=	CH_4 emission factor for uncontrolled burning of the biomass residues category *n* during the year *y* (tCH_4/GJ)
n	=	Biomass residue category

To determine the CH_4 emission factor ($EF_{BR,n,y}$), project participants may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 t CH_4 per ton of biomass as default value for the product of $NCV_{BR,n,y}$ and $EF_{BR,n,y}$.

The uncertainty of the CH_4 emission factor ($EF_{BR,n,y}$) is in many cases relatively high. In order to reflect this and for the purpose of providing conservative estimates of emission reductions, a conservativeness factor must be applied to the CH_4 emission factor. The level of the conservativeness factor depends on the uncertainty range of the estimate for the CH_4 emission factor. The appropriate conservativeness factor from Table 10 below shall be chosen and multiplied with the estimate for the CH_4 emission factor. For example, if the default CH_4 emission factor of 0.0027 t CH_4/t biomass is used, the uncertainty can be deemed to be greater than 100%, resulting in a conservativeness factor of 0.73. Thus, in this case an emission factor of 0.001971 t CH_4/t biomass should be used.

Table No. 10: Conservativeness factors

Estimated uncertainty range (%)	Assigned uncertainty band (%)	Conservativeness factor where lower values are more conservative
Less than or equal to 10	7	0.98
Greater than 10 and less than or equal to 30	20	0.94
Greater than 30 and less than or equal to 50	40	0.89
Greater than 50 and less than or equal to 100	75	0.82
Greater than 100	150	0.73

Step 5.2: Determine $BE_{BR,B2,y}$

For the biomass residues categories, as described in the biomass residues categories table, for which the most likely baseline scenario is that the biomass residues would decay under clearly anaerobic conditions (case B2), project participants shall calculate baseline emissions using the latest approved version of the “Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site”. The variable $BE_{CH4,SWDS,y}$ calculated by the tool corresponds to $BE_{BR,B2,y}$ in this methodology. The project participants shall use as waste quantities prevented from disposal ($W_{j,x}$) in the tool, those quantities of biomass residues ($BR_{n,B2,y}$) for which B2 has been identified as the most plausible baseline scenario, as summarized in the example in Table 2 of the methodology

The determination of $BR_{n,B2,y}$ shall be based on the monitored amounts of biomass residues used in power plants included in the project boundary. Where all biomass residues with the baseline scenario B2 come from one particular source, the monitored quantities of biomass residues used from that source in the project plant can be directly used. Where only parts of the biomass residues from one source would be dumped under clearly anaerobic conditions (B2), an allocation should be made consistently with Table 2 of the methodology, as provided for the project activity in the CPA-DD. The allocation should be made in a conservative manner and consistent with the guidance provided before for $BR_{B4,n,y}$. The project participants should specify and justify in the CPA-DD in a transparent manner how the relevant allocations should be made and how $BR_{n,B2,y}$ should be determined for the relevant biomass residue category *n* based on the monitored quantities. The approaches used should be consistent with the identified baseline scenario and reflect the particular situation of the underlying project activity.

Step 6: Calculate baseline emissions

Calculate baseline emissions using equation 2 above.

Project emissions

For the purpose of determining GHG emissions of the project activity, project participants shall include the following emissions sources:

- Emissions from fossil fuel consumption at the project site for the generation of electric power and heat and for auxiliary loads related to the generation of electric power and heat;
- CO_2 emissions from grid-connected fossil fuel power plants in the electricity system for any electricity that is imported from the grid to the project site;
- If either $EL_{balance,PO,y} < EL_{BL,BR,PO,y}$ (Case 3.3.2) or $EL_{balance,FF,y} < EL_{BL,FF,y}$ (Case 4.2.2), CO_2 emissions from grid-connected fossil fuel power plants in the electricity system due to reduction in electricity generation at the project site as compared to the baseline scenario;
- CO_2 emissions from off-site transportation of biomass residues that are combusted in the project plant;
- If applicable, CH_4 emissions from combustion of biomass residues for electric power and heat generation at the project site;
- If applicable, emissions from anaerobic treatment of wastewater originating from the treatment of the biomass residues prior to their combustion.

Project emissions are calculated as follows:

$$PE_y = PE_{FF,y} + PE_{GR1,y} + PE_{GR2,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y} + PE_{BG2,y} \quad \textbf{(37)}$$

Where:

PE_y	=	Project emissions in year *y* (tCO_2)
$PE_{FF,y}$	=	Emissions during the year y due to fossil fuel consumption at the project site (tCO_2)
$PE_{GR1,y}$	=	Emissions during the year y due to grid electricity imports to the project site (tCO_2)
$PE_{GR2,y}$	=	Emissions due to a reduction in electricity generation at the project site as compared to the baseline scenario in year *y* (tCO_2)
$PE_{TR,y}$	=	Emissions during the year y due to transport of the biomass residues to the project plant (tCO_2)
$PE_{BR,y}$	=	Emissions from the combustion of biomass residues during the year *y* (tCO_2e)
$PE_{WW,y}$	=	Emissions from wastewater generated from the treatment of biomass residues in year *y* (tCO_2e)
$PE_{BG2,y}$	=	Emissions from the production of biogas in year *y* (tCO_2e)

Determination of PE_{FFy}

The following emission sources should be included in determining $PE_{FF,y}$:

- Emissions from on-site fossil fuel consumption for the generation of electric power and heat. This includes all fossil fuels used at the project site in heat generators (e.g. boilers) for the generation of electric power and heat; and
- Emissions from on-site fossil fuel consumption of auxiliary equipment and systems related to the generation of electric power and heat. This includes fossil fuels required for the operation of auxiliary equipment related to the power and heat plants (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.) which are not accounted in the first bullet, and fossil fuels required for the operation of equipment related to the preparation, storage and transportation of fuels (e.g. for mechanical treatment of the biomass, conveyor belts, driers, etc.).

The latest approved version of the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" should be used to calculate $PE_{FF,y}$. All combustion processes *j* as described in the two bullets above should be included.

Determination of $PE_{GR1,y}$

If electricity is imported from the grid to the project site during year *y*, corresponding emissions should be accounted for as project emissions, as follows:

$$PE_{GR1,y} = EF_{EG,GR,y} \cdot EL_{PJ,imp,y} \qquad \textbf{(38)}$$

Where:

$PE_{GR1,y}$	=	Emissions during the year *y* due to grid electricity imports to the project site (tCO_2)
$EL_{PJ,imp,y}$	=	Project electricity imports from the grid in year *y* (MWh)
$EF_{EG,GR,y}$	=	Grid emission factor in year *y* (tCO_2/MWh)

Determination of $PE_{GR2,y}$

If $EL_{balance,PO,y} < EL_{BL,BR,PO,y}$ (Case 3.3.2) or $EL_{balance,FF,y} < EL_{BL,FF,y}$ (Case 4.2.2), the amount of electricity generated on-site in the baseline exceeds the amount of electricity generated in the project scenario. In such cases it is assumed that an equivalent amount of electricity is generated during year *y* in order to offset this reduction in electricity generation at the project site. Corresponding emissions should be accounted as project emissions as follows:

$$PE_{GR2,y} = EF_{EG,GR,y} \cdot EL_{PJ,offset,y} \qquad \textbf{(39)}$$

Where:

$PE_{GR2,y}$	=	Emissions due to a reduction in electricity generation at the project site as compared to the baseline scenario in year *y* (tCO_2)
$EF_{EG,GR,y}$	=	Grid emission factor in year *y* (tCO_2/MWh)
$EL_{PJ,offset,y}$	=	Electricity that would be generated in the baseline that exceeds the generation of electricity during year *y* (MWh)

Determination of $PE_{TR,y}$

In cases where the biomass residues are not generated directly at the project site, project participants shall determine CO_2 emissions resulting from transportation of the biomass residues to the project plant. In many cases transportation is undertaken by vehicles. Project participants may choose between two different approaches to determine emissions: an approach based on distance and vehicle type (Option 1) or on fuel consumption (Option 2).

Option 1

Emissions are calculated on the basis of distance and the number of trips (or the average truck load):

$$PE_{TR,y} = N_y \cdot AVD_y \cdot EF_{km,y} \quad \textbf{(40)}$$

or

$$PE_{TR,y} = \frac{BR_{TR,y}}{TL_y} \cdot AVD_y \cdot EF_{km,y} \quad \textbf{(41)}$$

Where:

$PE_{TR,y}$	=	Emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2)
N_y	=	Number of truck trips for the transportation of biomass during the year *y*
AVD_y	=	Average round trip distance (from and to) between the biomass residues fuel supply sites and the site of the project plant during the year *y* (km)
$EF_{km,y}$	=	Average CO_2 emission factor for the trucks measured during the year *y* (tCO_2/km)
$BR_{TR,y}$	=	Quantity of biomass residues that has been transported to the project site during the year *y* (tonnes of dry matter)
TL_y	=	Average truck load of the trucks used during the year *y* (tonnes of dry matter)

Option 2

Emissions are calculated based on the actual quantity of fossil fuels consumed for transportation.

$$PE_{TR,y} = \sum_f FC_{TR,f,y} \cdot NCV_{FF,f,y} \cdot EF_{FF,f,y} \quad \textbf{(42)}$$

Where:

$PE_{TR,y}$	=	Emissions during the year y due to transport of the biomass residues to the project plant (tCO2)
$FC_{TR,f,y}$	=	Fuel consumption of fuel type f in trucks for transportation of biomass residues during the year *y* (mass or volume unit)
$EF_{FF,y,f}$	=	CO_2 emission factor for fossil fuel type f in year *y* (tCO_2/GJ)
$NCV_{FF,f,y}$	=	Net calorific value of fossil fuel type f in year *y* (GJ/mass or volume unit)
f	=	Fossil fuel type
y	=	Year of the crediting period

Determination of $PE_{BR,y}$

If project proponents chose to include emissions due to uncontrolled burning or decay of biomass residues ($BE_{BR,y}$) in the calculation of baseline emissions, then emissions from the combustion of biomass residues have also to be included in the project scenario. Otherwise, this emission source need not be included. Corresponding emissions are calculated as follows:

$$PE_{BR,y} = GWP_{CH4} \cdot EF_{CH4,BR} \cdot \sum_n BR_{PJ,n,y} \cdot NCV_{BR,n,y} \quad \textbf{(43)}$$

Where:

$PE_{BR,y}$	=	Emissions from the combustion of biomass residues during the year *y* (tCO_2e)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2/tCH4)
$EF_{CH4,BR}$	=	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH_4/GJ)
$BR_{PJ,n,y}$	=	Quantity of biomass residues of category n used in the project activity in year *y* (tonnes on dry-basis)
$NCV_{BR,n,y}$	=	Net calorific value of biomass residue of category n in year *y* (GJ/tonne on dry-basis)

To determine the CH_4 emission factor ($EF_{CH4,BR}$), project participants may conduct measurements at the plant site or use IPCC default values, as provided in Table 11 below. The uncertainty of the CH_4 emission factor is in many cases relatively high. In order to reflect this and for the purpose of providing conservative estimates of emission reductions, a conservativeness factor must be applied to the CH_4 emission factor. The level of the conservativeness factor depends on the uncertainty range of the estimate for the CH_4 emission factor. Project participants shall select the appropriate conservativeness factor from Table 12 below and shall multiply the estimate for the CH_4 emission factor with the conservativeness factor.

For example, where the default CH_4 emission factor of 30 kg/TJ from Table 11 is used, the uncertainty is estimated to be 300%, resulting in a conservativeness factor of 1.37. Thus, in this case a CH_4 emission factor of 41.1 kg/TJ should be used.

Table No. 11: Default CH_4 emission factors for combustion of biomass residues[22]

	Default emission factor (kg CH_4 / TJ)	Assumed uncertainty
Wood waste	30	300%
Sulphite lyes (Black Liquor)	3	300%
Other solid biomass residues	30	300%
Liquid biomass residues	3	300%

Table No. 12: Conservativeness factors

Estimated uncertainty range (%)	Assigned uncertainty band (%)	Conservativeness factor where higher values are more conservative
Less than or equal to 10	7	1.02
Greater than 10 and less than or equal to 30	20	1.06
Greater than 30 and less than or equal to 50	40	1.12
Greater than 50 and less than or equal to 100	75	1.21
Greater than 100	150	1.37

Determination of $PE_{WW,y}$

This emission source should be estimated in cases where wastewater originating from the treatment of the biomass is (partly) treated under anaerobic conditions and where methane from the waste water is not captured and flared or combusted. Project emissions from waste water are estimated as follows:

[22] Values are based on the 2006 IPCC Guidelines, Volume 2, Chapter 2, Tables 2.2 to 2.6.

$$PE_{WW,y} = GWP_{CH4} \cdot V_{WW,y} \cdot COD_{WW,y} \cdot B_{o,WW} \cdot MCF_{WW} \quad \textbf{(44)}$$

Where:

$PE_{WW,y}$	=	Emissions from wastewater generated from the treatment of biomass residues in year *y* (tCO_2e)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2/tCH_4)
$V_{WW,y}$	=	Quantity of waste water generated in year *y* (m^3)
$COD_{WW,y}$	=	Average chemical oxygen demand of the waste water in year *y* ($tCOD/m^3$)
$B_{o,WW}$	=	Methane generation potential of the waste water ($tCH_4/tCOD$)
MCF_{WW}	=	Methane correction factor for the waste water (ratio)

Determination of $PE_{BG2,y}$

No biogas production is considered in this PoA.

Leakage

The main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the project activity. Changes in carbon stocks in the LULUCF sector are expected to be insignificant since this methodology is limited to biomass residues, as defined in the applicability conditions above. The baseline scenarios for biomass residues for which this potential leakage is relevant are B5:, B6:, B7: and B8:.

The actual leakage emissions in each of these cases may differ significantly and depend on the specific situation of each project activity. For that reason, a simplified approach is used in this methodology: it is assumed that an equivalent amount of fossil fuels, on energy basis, would be used if biomass residues are diverted from other users, no matter what the use of biomass residues would be in the baseline scenario.

Therefore, for the categories of biomass residues whose baseline scenario has been identified as B5:, B6:, B7: or B8:, project participants shall calculate leakage emissions as follows:

$$LE_y = EF_{CO2,LE} \cdot \sum_n BR_{B5/B8,n,y} \cdot NCV_{BR,n,y} \quad \textbf{(45)}$$

Where:

LE_y	=	Leakage emissions in year *y* (tCO_2)
$EF_{CO2,LE}$	=	CO_2 emission factor of the most carbon intensive fossil fuel used in the country (tCO_2/GJ)
$BR_{B5/B8,n,y}$	=	Quantity of biomass residues of category n used in the project activity in year *y*, for which the baseline scenario is B5:, B6:, B7: or B8: (tonnes on dry-basis)
$NCV_{BR,n,y}$	=	Net calorific value of biomass residue of category *n* in year *y* (GJ/tonne on dry-basis)
n	=	Biomass residue category
y	=	Year of the crediting period

The determination of $BR_{B5/B8,n,y}$ shall be based on the monitored amounts of biomass residues used in power plants included in the project boundary.

In the case that negative overall emission reductions arise in a year through application of the leakage emissions, CERs are not issued to project participants for the year concerned and in subsequent years, until emission reductions from subsequent years have compensated the quantity of negative emission reductions from the year concerned. For example, if negative emission reductions of 30 tCO_2e occur in the year t and positive emission reductions of 100 tCO_2e occur in the year t+1, only 70 CERs are issued for the year t+1.

E.6.3. Data and parameters that are to be reported in CDM-CPA-DD form:

The following are not monitored data and parameters:

Data / Parameter:	**Biomass residues categories and quantities used for the selection of the baseline scenario selection and assessment of additionality**
Data unit:	- Type (i.e. bagasse, rice husks, empty fruit bunches, etc.); - Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc.); - Fate in the absence of the project activity (scenarios B); - Use in the project scenario (scenarios P); - Quantity (tonnes on dry-basis)
Description:	Explain and document transparently in the CDM-PDD, which quantities of which biomass residues categories are used in which installation(s) under the project activity and what is their baseline scenario. For the selection of the baseline scenario and demonstration of additionality, at the validation stage, an ex ante estimation of these quantities should be provided
Source of data:	On-site assessment of biomass residues categories and quantities
Measurement procedures (if any):	---
Any comment:	This parameter is related to the procedure for the selection of the baseline scenario selection and assessment of additionality. To be determined individually in each CPA if applicable.

Data / Parameter:	$\mathbf{BR_{HIST,n,x}}$
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used for power or heat generation at the project site in year *x* prior the date of submission of the PDD for validation of the project activity (tonnes on dry-basis) prior the time of submission of the PDD for validation of the project activity
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available). In case of volume meters use the fuel density to convert the measurement to mass basis
Any comment:	To be determined individually in each CPA applicable.

Data / Parameter:	$\mathbf{BR_{n,h,x}}$
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues of category n used in heat generator *h* in year *x* (tonnes on dry-basis)
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available)

Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$FF_{f,h,x}$**
Data unit:	mass or volume unit/yr
Description:	Quantity of fossil fuel type f fired in heat generator h in year x (mass or volume unit/yr)
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight or volume meters. Adjust for the moisture content in order to determine the quantity of dry biomass. The quantity shall be cross-checked with the quantity of heat generated and any fuel purchase receipts (if available). In case of volume meters use the fuel density to convert the measurement to mass basis
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$HG_{h,x}$**
Data unit:	GJ
Description:	Net quantity of heat generated in heat generator h in year x (GJ/yr)
Source of data:	On-site measurements
Measurement procedures (if any):	This parameter should be determined as the difference of the enthalpy of the heat (steam or hot water) generated by the heat generators(s) [in the project activity, monitored during year *y*,] minus the enthalpy of the feed-water, the boiler blow-down and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure
Any comment:	In absence of temperature and pressure records, use the default values from the equipment as reference. To be determined individually in each CPA if applicable.

Data / Parameter:	**$HG_{BR,CG/PO,x,i,j}$**
Data unit:	GJ
Description:	Quantity of heat used in heat engine i/j in year x (GJ)
Source of data:	On-site measurements
Measurement procedures (if any):	This parameter should be determined as the difference of the enthalpy of the process heat (steam or hot water) generated by the heat generators(s) [in the project activity, monitored during year *y*,] minus the enthalpy of the feed-water, the boiler blow-down and any condensate return. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$HC_{BR,CG/PO,x,i/j}$**
Data unit:	GJ
Description:	Quantity of process heat extracted from the heat engine i/j in year x (GJ)
Source of data:	On-site measurements
Measurement procedures (if any):	This parameter should be determined as the difference of the enthalpy of the process heat (steam or hot water) supplied to process heat loads in the project activity minus the enthalpy of the feed-water, the boiler blow-down and any condensate return to the heat generators. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$EL_{BR,CG/PO,x,i/j}$**
Data unit:	MWh
Description:	Quantity of electricity generated in heat engine *i/j* in year *x* (MWh)
Source of data:	On-site measurements
Measurement procedures (if any):	Electricity meters
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**P_x**
Data unit:	Use suitable units, as appropriate
Description:	Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year x from plants operated at the project site
Source of data:	On-site measurements
Measurement procedures (if any):	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$CAP_{HG,h}$**
Data unit:	GJ/h
Description:	Baseline capacity of heat generator h (GJ/h)
Source of data:	On-site measurements or reference plant design parameters
Measurement procedures (if any):	This parameter should reflect the design maximum heat generation capacity (in GJ/h) of the baseline heat generator *h*. It should be based on the installed capacity of the heat generator. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$CAP_{EG,CG,i}$** **$CAP_{EG,PO,j}$**
Data unit:	MW
Description:	$CAP_{EG,CG,i}$ = Baseline electricity generation capacity of heat engine i (MW) $CAP_{EG,PO,j}$= Baseline electricity generation capacity of heat engine j (MW)

Source of data:	On-site measurements or reference plant design parameters
Measurement procedures (if any):	This parameter should reflect the design maximum electricity generation capacity (in MW) of the baseline heat engines *i* and *j*. It should be based on the installed capacity of the heat engines. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	$\mathbf{LFC_{HG,h}}$
Data unit:	Ratio
Description:	Baseline load factor of heat generator h (ratio)
Source of data:	On-site measurements or reference plant design parameters
Measurement procedures (if any):	This parameter should reflect the maximum load factor (i.e. the ratio between the 'actual heat generation' of the heat generator and its 'design maximum heat generation' along one year of operation) of the baseline heat generator *h*, taking into account downtime due to maintenance, seasonal operational patterns, and any other technical constraints. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined (e.g. using historical records)
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	$\mathbf{HPR_{BL,i}}$
Data unit:	Ratio
Description:	Baseline heat-to-power ratio of the heat engine *i* (ratio)
Source of data:	On-site measurements or reference plant design parameters
Measurement procedures (if any):	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	$\mathbf{LFC_{EG,CG,i}}$ $\mathbf{LFC_{EG,CG,j}}$
Data unit:	Ratio
Description:	$LFC_{EG,CG,i}$ = Baseline load factor of heat engine i (ratio) $LFC_{EG,PO,j}$ = Baseline load factor of heat engine j (ratio)
Source of data:	On-site measurements or reference plant design parameters
Measurement procedures (if any):	This parameter should reflect the maximum load factor (i.e. the ratio between the 'actual electricity generation' of the heat engine and its 'design maximum electricity generation' along one year of operation) of the baseline heat engine *i* or *j*. The actual electricity generation of the heat engine should be determined taking into account downtime due to maintenance, seasonal operational patterns, and any other technical constraints. Project participants should document transparently and justify in the CDM-PDD how this parameter was determined
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	$\mathbf{EF_{BL,CO2,FF}}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of the fossil fuel type that would be used for power

	generation at the project site in the baseline (tCO2/GJ)
Source of data:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default emission factors (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the value in a conservative manner and justify the choice
Measurement procedures (if any):	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Any comment:	In case of plants existing before project implementation, the lowest CO_2 emission factor should be used in case of multi fuel plants. To be determined individually in each CPA if applicable.

Data / Parameter:	$\eta_{BL,FF}$
Data unit:	ratio
Description:	Efficiency of the fossil fuel power plant(s) at the project site in the baseline
Source of data:	Either use the higher value among (a) the measured efficiency and (b) manufacturer's information on the efficiency; OR use default values as provided in Annex 1 of the "Tool to calculate the emission factor for an electricity system"; OR assume an efficiency of 100%
Measurement procedures (if any):	If measurements are conducted, use recognized standards for the measurement of the heat generator efficiency, such as the "*British Standard Methods for Assessing the thermal performance of boilers for steam, hot water and high temperature heat transfer fluids*" (BS845). Where possible, use preferably the direct method (dividing the net heat generation by the energy content of the fuels fired during a representative time period), as it is better able to reflect average efficiencies during a representative time period compared to the indirect method (determination of fuel supply or heat generation and an estimation of losses). Document measurement procedures and results and manufacturer's information transparently in the CDM-PDD
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	$NCV_{BR,n,x}$
Data unit:	GJ/tonnes on dry-basis
Description:	Net calorific value of biomass residues of category n in year x
Source of data:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Measurement procedures (if any):	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Any comment:	The NCV is to be calculated for wet biomass as used in the heat generator (i.e. deducting the energy used for the evaporation of the water contained in the biomass residues). To be determined individually in each CPA if applicable.

Data / Parameter:	**$NCV_{FF,f,x}$**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of fossil fuel type f in year x (GJ/mass or volume unit)
Source of data:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Measurement procedures (if any):	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e/tCH_4
Description:	Global Warming Potential of methane valid for the commitment period (tCO2/tCH4)
Source of data:	IPCC
Measurement procedures (if any):	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions
Any comment:	-

Data / Parameter:	$EF_{grid,CM,y.}$
Data unit:	tCO_2/MWh
Description:	Combined Margin CO_2 emission factor
Source of data used:	Calculated bases on official data: • Latest IPCC Guidelines • CDEC-SIC • CNE official reports.
Value applied:	0.6451
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated following the procedures of ACM0006 Version 12.0.1. and the "Tool to calculate the emission factor for an electricity system" - Version 02.2.1.
Any comment:	Calculation based on official data.

Data / Parameter:	$EG_{m,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power units no low cost-must run in year y
Source of data used:	Files "Operacion Real Anual" (Real Annual Operation) for 2010, 2009 and 2008, available at CDEC-SIC website: ***https://www.cdec-sic.cl/est_opera_privada.php***

Value applied:	Data used is presented in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Is official data provided by the dispatch center.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of CER´s for this project activity, whatever occurs later.

Data / Parameter:	$EG_{k,y}$
Data unit:	MWh
Description:	Net quantity of electricity generated and delivered to the grid by power unit low cost-must run in year y
Source of data used:	Files “Operacion Real Anual” (Real Annual Operation) for 2010, 2009 and 2008, available at CDEC-SIC website: ***https://www.cdec-sic.cl/est_opera_privada.php***
Value applied:	Data used is presented in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Is official data provided by the dispatch center.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of CER´s for this project activity, whatever occurs later.

Data / Parameter:	$FC_{i,m,y}$
Data unit:	T
Description:	Amount of fossil fuel type i consumed by power units no low cost-must run in year y
Source of data used:	CDEC-SIC’s yearbook: "Estadísticas de Operación 2001-2010", page 68-71, available at https://www.cdec-sic.cl/datos/anuario2011.pdf
Value applied:	Data used is presented in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	"Estadísticas de Operación 2001-2010" is the most recent version available (at the time of submission of the CDM-PoA-DD) of the dispatch center’s official publication.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of CER´s for this project activity, whichever occurs later.

Data / Parameter:	$NCV_{i,y}$
Data unit:	GJ / t
Description:	Net calorific value (energy content) of fossil fuel type i in year y.
Source of data used:	"Balance Nacional de Energía 2008", Comisión Nacional de Energía (National

	Energy Balance 2008, National Energy Commission), sheet "CuadroA2"[23] and 2006 Guidelines for National Greenhouse, chapter 1, Table 1.2
Value applied:	Data used is presented in the spreadsheet for Grid Emission Factor calculation. Fuel Oil = 41.74 Diesel = 43.33 Coal = 27.82 Petcoke = 27.82 Natural Gas = 35.17 LNG = 40.90
Justification of the choice of data or description of measurement methods and procedures actually applied :	Values from the fuel supplier of the power plants are not available for the project participant. "Balance Nacional de Energia 2008" is the most recent version available (at the time of submission of the PoA) of the national energy balance. Fuel Oil, Diesel, Coal, Petcoke and Natural Gas are sourced from National Energy Balance 2008. These values are original expressed in KCal/Kg so they have been adjusted considering a conversion factor of 4.184. For LNG default IPCC values were used, as there is no information in National Energy Balance.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of CER´s for this project activity, whatever occurs later.

Data / Parameter:	$EF_{CO2,m,i,y}$
Data unit:	t CO_2/GJ
Description:	CO_2 emission factor of fossil fuel type i used in power units no low cost-must run in year y.
Source of data used:	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value applied:	Fuel Oil = 0.0755 Diesel = 0.0726 Coal = 0.0895 Petcoke = 0.0829 Natural Gas = 0.0543 LNG = 0.0583
Justification of the choice of data or description of measurement methods and procedures actually applied :	Values from the fuel supplier of the power plants (in invoices) are not available for the project participant. There are no regional or national average default values in the energy statistics/energy balance.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of CER´s for this project activity, whatever occurs later.

[23] http://www.cne.cl/estadisticas/balances-energeticos

Data / Parameter:	λ_y
Data unit:	% (dimensionless)
Description:	The amount of hours in the year *y* for which the low-cost/must-run sources in the electricity grid are on the margin, divided by the hours of the year (typically 8760)
Source of data used:	The factor was calculated using data obtained directly from the TSO
Value applied:	Data used is presented in the spreadsheet for Grid Emission Factor calculation.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data used for the calculation of λ_y is a public and official source published by the Transmission System Operator (TSO), information is provided to the DOE during validation. Calculated according to the "Tool to calculate the emission factor for an electricity system" - Version 02.2.1.
Any comment:	

Data / Parameter:	$\eta_{m,y}$
Data unit:	-
Description:	Average net energy conversion efficiency of power unit no low cost-must run in year k.
Source of data used:	Default values provided in Annex 1 of "Tool to calculate the emission factor for an electricity system" version 02.2.1.
Value applied:	Default efficiency factors for power plants Oil (Open cycle, new) 39,5% Coal (subcritical, new) 39,0% Natural Gas (Open Cycle, new) 39,5% Coal (subcritical, old) 37,0% CFBS (old) 36,5%
Justification of the choice of data or description of measurement methods and procedures actually applied :	The diesel power plants for which only data on electricity generation and fuel type is available started operation after 2000. The only plant with CFBS system for which only data on electricity generation and fuel type is available was constructed before 2000. The only natural gas fired power plant for which only data on electricity generation and fuel type is available was constructed after 2000.
Any comment:	Data will be kept for two years after the end of the crediting period or the last issuance of CER´s for this project activity, whatever occurs later.

E.7. Application of the monitoring methodology and description of the monitoring plan:

E.7.1 Data and parameters to be monitored by each CPA:

The following are monitored data and parameters:

Data / Parameter:	**Biomass residues, categories, and quantities used in the project activity**
Data unit:	- Type (i.e. bagasse, rice husks, empty fruit bunches, etc.); - Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc.); - Fate in the absence of the project activity (scenarios B); - Use in the project scenario (scenarios P and H); - Quantity (tonnes on dry-basis)
Description:	Explain and document transparently in the CDM-PDD, using a table similar to Table 2 of the methodology, which quantities of which biomass residues categories are used in which installation(s) under the project activity and what is their baseline scenario. The last column of Table 2 of the methodology corresponds to the quantity of each category of biomass residues (tonnes on dry-basis). These quantities should be updated every year of the crediting period as part of the monitoring plan so as to reflect the actual use of biomass residues in the project scenario. These updated values should be used for emission reduction calculations. Along the crediting period, new categories of biomass residues (i.e. new types, new sources, with different fate) can be used in the project activity. In this case, a new line should be added to the table. If those new categories are of the typeB1:, B2: or B3:, the baseline scenario for those types of biomass residues should be assessed using the procedures outlined in the guidance provided in the procedure for the selection of the baseline scenario and demonstration of additionality.
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**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 alternate scenario**
Data unit:	Tonnes
Description:	- 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 can not be sold or utilized) at the ultimate supplier to the project and a representative sample of other suppliers in the defined geographical region
Source of data:	Surveys or statistics
Measurement procedures (if any):	---
Monitoring frequency:	At the validation stage for biomass residues categories identified *ex-ante*, and

	always that new biomass residues categories are included during the crediting period
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$BR_{PJ,n,y}$**
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used in the project activity in year *y* (tonnes on dry-basis)
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	Biomass residue quantities used should be monitored separately for (a) each type of biomass residue (e.g.) and each source (e.g. produced on-site, obtained from biomass residues suppliers, obtained from a biomass residues market, obtained from an identified biomass residues producer, etc.). Biogas should be included as appropriate if applicable (in which case convenient units such as m^3 should be used) To be determined individually in each CPA if applicable.

Data / Parameter:	**$BR_{B4,n,y}$**
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used in the project activity in year y for which the baseline scenario is B4: (tonne on dry-basis)
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	The procedures in Step 1.4 on page 61 should also be followed. To be determined individually in each CPA if applicable.

Data / Parameter:	**$BR_{B1/B3,n,y}$**
Data unit:	tonnes on dry-basis

Description:	Quantity of biomass residues of category n used in the project activity in year y for which the baseline scenario is B1: or B3: (tonnes on dry-basis)
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	Biogas should be included as appropriate if applicable (in which case convenient units such as m^3 should be used) To be determined individually in each CPA if applicable.

Data / Parameter:	**$BR_{B5/B8,n,y}$**
Data unit:	tonnes of dry matter
Description:	Quantity of biomass residues of category n used in the project activity in year *y*, for which the baseline scenario is B5:, B6:, B7: or B8: (tonnes on dry-basis)
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight meters. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$BR_{TR,y}$**
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues that has been transported to the project site during the year y (tonnes of dry matter)
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight or volume meters. If volume meters are used convert to mass units using the density of each category of biomass residues. Adjust for the moisture content in order to determine the quantity of dry biomass
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	To be determined individually in each CPA if applicable.

Data / parameter:	**$FC_{TR,f,y}$**

Data unit:	Mass or volume unit
Description:	$FC_{TR,f,y}$ = Fuel consumption of fuel type f in trucks for transportation of biomass residues during the year y (mass or volume unit)
Source of data:	Fuel purchase receipts or fuel consumption meters in the trucks
Measurement procedures (if any):	---
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	Cross-checked the resulting CO_2 emissions for plausibility with a simple calculation based on the distance approach (option 1).
Any comment:	Applicable if option 2 is chosen to estimate CO_2 emissions from transportation

Data / Parameter:	**$EF_{km,y}$**
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for the trucks measured during the year *y* (tCO2/km)
Source of data:	Conduct sample measurements of the fuel type, fuel consumption and distance traveled for all truck types. Calculate CO_2 emissions from fuel consumption by multiplying with appropriate net calorific values and CO_2 emission factors. For net calorific values and CO_2 emission factors, use reliable national default values or, if not available, (country-specific) IPCC default values. Alternatively, choose emission factors applicable for the truck types used from the literature in a conservative manner (i.e. the higher end within a plausible range)
Measurement procedures (if any):	---
Monitoring frequency:	At least annually
QA/QC procedures:	Cross-check measurement results with emission factors referred to in the literature
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$EF_{BR,n,y}$**
Data unit:	tCH_4/GJ
Description:	$EF_{BR,n,y}$ = CH_4 emission factor for uncontrolled burning of the biomass residues category *n* during the year *y* (tCH4/GJ)
Source of data:	Conduct measurements or use reference default values
Measurement procedures (if any):	To determine the CH_4 emission factor, project participants may undertake measurements or use referenced default values. In the absence of more accurate information, it is recommended to use 0.0027 t CH_4 per ton of biomass as a default value for the product of NCV_k and $EF_{burning,CH4,k,y}$
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$EF_{FF,y,f}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type *f* in year *y* (tCO2/GJ)
Source of data:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default emission factors (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the value in a conservative manner and justify the choice
Measurement procedures (if any):	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Monitoring frequency:	In case of measurements: At least every six months, taking at least three samples for each measurement In case of other data sources: Review the appropriateness of the data annually
QA/QC procedures:	Check the consistency of measurements and local/national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$EF_{CH4,BR}$**
Data unit:	tCH_4/GJ
Description:	CH_4 emission factor for the combustion of biomass residues in the project plant (tCH4/GJ)
Source of data:	On-site measurements or default values.
Measurement procedures (if any):	The CH_4 emission factor may be determined based on a stack gas analysis using calibrated analysers
Monitoring frequency:	At least quarterly, taking at least three samples per measurement
QA/QC procedures:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements
Any comment:	Monitoring of this parameter for project emissions is only required if CH_4emissions from biomass combustion are included in the project boundary. Note that a conservative factor shall be applied, as specified in the baseline methodology To be determined individually in each CPA if applicable.

Data / Parameter:	**$EF_{CO2,LE}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of the most carbon intensive fossil fuel used in the country (tCO2/GJ)
Source of data:	Identify the most carbon intensive fuel type from national communication sources, and other literature sources (e.g. IEA). Possibly consult with the national agency responsible for the national communication / GHG inventory. If available, use national default values for the CO_2 emission factor. Otherwise, IPCC default values may be used
Measurement procedures (if any):	---
Monitoring frequency:	Annually
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$HC_{BL,y}$**
Data unit:	GJ
Description:	Baseline process heat generation in year y (GJ)
Source of data:	On-site measurements
Measurement procedures (if any):	This parameter should be determined as the difference of the enthalpy of the process heat (steam or hot water) supplied to process heat loads in the project activity minus the enthalpy of the feed-water, the boiler blow-down and any condensate return to the heat generators. The respective enthalpies should be determined based on the mass (or volume) flows, the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate

	thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure
Monitoring frequency:	Calculated based on continuously monitored data and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$EL_{PJ,gross,y}$**
Data unit:	MWh
Description:	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)
Source of data:	On-site measurements
Measurement procedures (if any):	Use calibrated electricity meters
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	The consistency of metered electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years)
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$EL_{PJ,imp,y}$**
Data unit:	MWh
Description:	Project electricity imports from the grid in year *y* (MWh)
Source of data:	On-site measurements
Measurement procedures (if any):	Use calibrated electricity meters
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	The consistency of metered electricity generation should be cross-checked with receipts from electricity purchases
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$EL_{PJ,aux,y}$**
Data unit:	MWh
Description:	Total auxiliary electricity consumption required for the operation of the power plants at the project site in year y (MWh)
Source of data:	On-site measurements
Measurement procedures (if any):	Use calibrated electricity meters
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions

QA/QC procedures:	The consistency of metered electricity generation should be cross-checked with receipts from electricity sales (if available) and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years).
Any comment:	$EG_{PJ,aux,y}$ shall include all electricity required for the operation of equipment related to the preparation, storage and transport of biomass residues (e.g. for mechanical treatment of the biomass, conveyor belts, driers, etc.) and electricity required for the operation of all power plants which are located at the project site and included in the project boundary (e.g. for pumps, fans, cooling towers, instrumentation and control, etc.). In case steam turbines are used for mechanical power in the baseline situation and electric motors for the same purpose in the project situation, the electricity used to run these electric motors shall be included in $EL_{PJ,aux,y}$ To be determined individually in each CPA if applicable.

Data / Parameter:	**$NCV_{BR,n,y}$**
Data unit:	GJ/tonnes of dry matter
Description:	Net calorific value of biomass residue of category n in year y (GJ/tonne on dry-basis)
Source of data:	On-site measurements
Measurement procedures (if any):	Measurements shall be carried out at reputed laboratories and according to relevant international standards. Measure the NCV on dry-basis
Monitoring frequency:	At least every six months, taking at least three samples for each measurement.
QA/QC procedures:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurement results differ significantly from previous measurements or other relevant data sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$NCV_{FF,f,y}$**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of fossil fuel type *f* in year *y* (GJ/mass or volume unit)
Source of data:	Either conduct measurements or use accurate and reliable local or national data where available. Where such data is not available, use IPCC default net calorific values (country-specific, if available) if they are deemed to reasonably represent local circumstances. Choose the values in a conservative manner and justify the choice
Measurement procedures (if any):	Measurements shall be carried out at reputed laboratories and according to relevant international standards
Monitoring frequency:	In case of measurements: At least every six months, taking at least three samples for each measurement In case of other data sources: Review the appropriateness of the data annually

QA/QC procedures:	Check consistency of measurements and local/national data with default values by the IPCC. If the values differ significantly from IPCC default values, possibly collect additional information or conduct measurements
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$h_{LOW,y}$** **$h_{HIGH,y}$**
Data unit:	GJ/tonnes
Description:	$h_{LOW,y}$ = 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)
Source of data:	On-site measurements
Measurement procedures (if any):	The specific enthalpies should be determined based on the temperatures and, in case of superheated steam, the pressure. Steam tables or appropriate thermodynamic equations may be used to calculate the enthalpy as a function of temperature and pressure.
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures:	---
Any comment:	The process heat demand side refers to where heat is finally used for heating purposes by end-users and the heat generator side refers to where heat is generated To be determined individually in each CPA if applicable.

Data / Parameter:	**Moisture content of the biomass residues**
Data unit:	% Water content in mass basis in wet biomass residues
Description:	Moisture content of each biomass residues type *k*
Source of data:	On-site measurements
Measurement procedures (if any):	---
Monitoring frequency:	The moisture content should be monitored for each batch of biomass of homogeneous quality. The weighted average should be calculated for each monitoring period and used in the calculations
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**P_y**
Data unit:	Use suitable units, as appropriate
Description:	Quantity of the main product of the production process (e.g. sugar cane, rice) produced in year *y* from plants operated at the project site
Source of data:	On-site measurements
Measurement procedures (if any):	---

Monitoring frequency:	Data aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**N_y**
Data unit:	---
Description:	Number of truck trips for the transportation of biomass during the year *y*
Source of data:	On-site measurements
Measurement procedures (if any):	---
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures:	Check consistency of the number of truck trips with the quantity of biomass combusted, e.g. in relation with previous years
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**AVD_y**
Data unit:	Km
Description:	Average round trip distance (from and to) between the biomass residues fuel supply sites and the site of the project plant during the year *y* (km)
Source of data:	Records by project participants on the origin of the biomass
Measurement procedures (if any):	---
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	Check consistency of distance records provided by the truckers by comparing recorded distances with other information from other sources (e.g. maps).
Any comment:	Applicable if option 1 is chosen to estimate CO_2 emissions from transportation. If biomass is supplied from different sites, this parameter should correspond to the mean value of km traveled by trucks that supply the biomass plant. To be determined individually in each CPA if applicable.

Data / Parameter:	**TL_y**
Data unit:	tonnes of dry matter
Description:	Average truck load of the trucks used during the year *y*
Source of data:	On-site measurements
Measurement procedures (if any):	Determined by averaging the weights of each truck carrying the biomass to the project plant
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$V_{WW,y}$**
Data unit:	m³
Description:	Quantity of waste water generated in year *y* (m³)
Source of data:	On-site measurements
Measurement procedures (if any):	---
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emission reductions
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$COD_{WW,y}$**
Data unit:	tCOD/m³
Description:	Average chemical oxygen demand of the waste water in year *y* (tCOD/m³)
Source of data:	On-site measurements
Measurement procedures (if any):	---
Monitoring frequency:	In case of measurements: At least every six months, taking at least three samples for each measurement
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**$B_{o,WW}$**
Data unit:	$tCH_4/tCOD$
Description:	$B_{o,WW}$ = Methane generation potential of the waste water (tCH4/tCOD)
Source of data:	Reference default values (IPCC)
Measurement procedures (if any):	---
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**MCF_{WW}**
Data unit:	ratio
Description:	Methane correction factor for the waste water (ratio)
Source of data:	Reference default values (IPCC)
Measurement procedures (if any):	---
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

Data / Parameter:	**LOC_y**
Data unit:	Hour
Description:	Length of the operational campaign in year y (hour)

Source of data:	On-site measurements
Measurement procedures (if any):	Record and add the hours of operation of the project activity facilities during year *y*.
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	To be determined individually in each CPA if applicable.

E.7.2. Description of the monitoring plan for a CPA:

A monitoring plan will be implemented to ensure that the approved monitoring methodology is correctly implemented to enable the accurate and transparent determination of avoided emissions following the requirements of EB 65, Annex 3 paragraph 17. The Monitoring Plan shall be in accordance with all relevant rules and regulations of the CDM in way to determine baseline emission and project emission as described in section B.7.1.

The CME is responsible for the development and implementation of a management and operational system for a CPA that will meet the requirements of the MP.

The monitoring plan details the necessary actions to monitor and record all the data parameters required by the applied methodology for each CPA.
It will describe the management systems and procedures to be implemented by CME upon implementation of each CPA. Monitoring will be carried out by the site operators (or any third party, as relevant) at each individual site. CME will ensure consistency in monitoring, processing and reporting of data required for the calculation of emission reductions achieved by each CPA. The CME will act as overall supervisor of CPA implementers and will carry out data checking of the monitored data by CPA implementers, analyzing and preparing a monitoring report. Details of the CPA monitoring plans will be described in each CPA-DD.

The CME will be in charge of communication with DOE during the verification. The CME may appoint a CDM consultant or any third party, as relevant, to perform the verification. CPA implementers will be responsible for implementing appropriate operation and maintenance procedures to ensure the monitoring equipment meet the CDM requirements and to submit a periodic report on the monitored parameters to CME. Clear roles and responsibilities of the key persons involved in the CPA will be defined in each SSC-CPA-DD.

Monitoring Parameters

The MP will identify the various data parameters to be monitored in order to calculate the emission reductions. Data parameters, which need to be monitored, will be recorded in each MP of the particular CPA.

The variables to be monitored are listed and described in Section E.7.1.The parameters monitored in each CPA will be described in section B.6.1 of the CPA-DD.

The biomass based steam/heat generation system parameters will be monitored using Field instruments, Hardware and Software installed at every project site and/or Manual data recording in the log book (if necessary). Main parameters and measuring instruments will be:

Monitoring Boiler:

Parameters	**Description**	**Measuring Instruments**
Steam Flow	To determine enthalpy for the energy balance	Flow meter
Steam Temperature	To determine enthalpy for the energy balance	Directly measured by separate temperature measuring instrument or field instrument integral to steam flow meter.
Steam Pressure	To determine enthalpy for the energy balance	Directly measured by separate pressure measuring instrument or field
Feed water temperature	To determine enthalpy for the energy balance	Temperature Measuring Instruments
Electrical energy consumption	To determine project emissions	Data obtained from invoices received for the purchase of electricity from the grid.
Electrical energy generation	Gross quantity of electricity generated in the power plant	Calibrated energy meters.
Fuel weighing	In case of use of fossil fuel consumption in the project activity, quantity will be monitored.	Weight or volume meter. Quantity will be cross-checked with the quantity of heat generated and any fuel purchase receipt.

Monitoring biomass:

Parameters	**Description**	**Measurement instrument**
Biomass residues categories	- Type of biomass (e.g. bagasse, rice, husks, forest biomass, sludge, etc) - Source (e.g. produced on-site, obtained from an identified biomass residues producer, obtained from a biomass residues market, etc.) - Fate in the absence of the project activity - Use in the project scenario	Information obtained should be documented transparently.
Biomass residues quantities	- Quantity (tonnes on dry-basis)	Weight meters adjusted for the moisture content in order to

		determine the quantity of dry biomass calibrated regularly as per industry practices or at least once in three years.
Net calorific value of biomass residue	Comparison of measurement results with relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC.	Measurements carried out by reputed laboratories and according to relevant international standards (on the basis of dry biomass)
Moisture content of each biomass residue	% water content in mass basis in wet biomass residues	Moisture content measured according to international standards and practices
Quantity of product processed	Quantity of the main product of the production process	Internal data of the company

Data logging, transmission and storage

Monitored parameters will be recorded at the appropriate frequency during the crediting period in each CPA-DD. CPA implementer will record and store the primary data while CME will process the primary data and store the processed data in an electronic central database. The CME will be responsible for managing the collection, storage and archiving of all pertinent CDM data and records.

Detailed description of the data collection and recording measures to be implemented for each CPA:

- The data measured by the instruments will be collected and stored in a data logging system at each site. The data will be retrieved remotely by modem or directly on site by CPA implementer and/or CME.
- If automatic data logging failed, the data will be recorded manually, if possible.
- If data cannot be retrieved from site, and no back up is available, no emissions reductions will be claimed for the period of data failure.
- The data collected will be stored in a central database by CME. Access to production data will be restricted.
- All such data will be archived electronically and regularly backed-up.
- Copies of the files will be stored up to two years after the end of the crediting period or the last issuance of CERs for this project activity whichever occurs later.

Calibration and maintenance procedures, malfunction of equipment

Maintenance includes all preventive and corrective actions necessary for the good functioning of the equipment, such as:

- Visual control of the equipment state and real-time check of displayed parameters,
- Cleaning up the equipment and the sensors,
- Adding lubricant,
- Replacement and change of defective parts.

Calibration of equipment consists in verifying, by comparison with a standard, the accuracy of a measuring instrument. Measuring instruments will be periodically and appropriately calibrated according

to the procedures, timing and methods recommended by the manufacturer or national/international standards, as available.

General malfunction of equipment:
Spare units and spare parts of certain monitoring instruments will be kept at each site. If the equipment fails, site operator will attempt to repair and fix the faulty equipment. If the equipment cannot be repair, then the supplier will be notified and repairs will be carried out. If the damaged equipment cannot be repaired, it will be replaced at the earliest by the same or an equivalent unit. In some cases, portable tools will be used in order to carry out daily monitoring of the missing parameter(s). This data will be recorded manually.

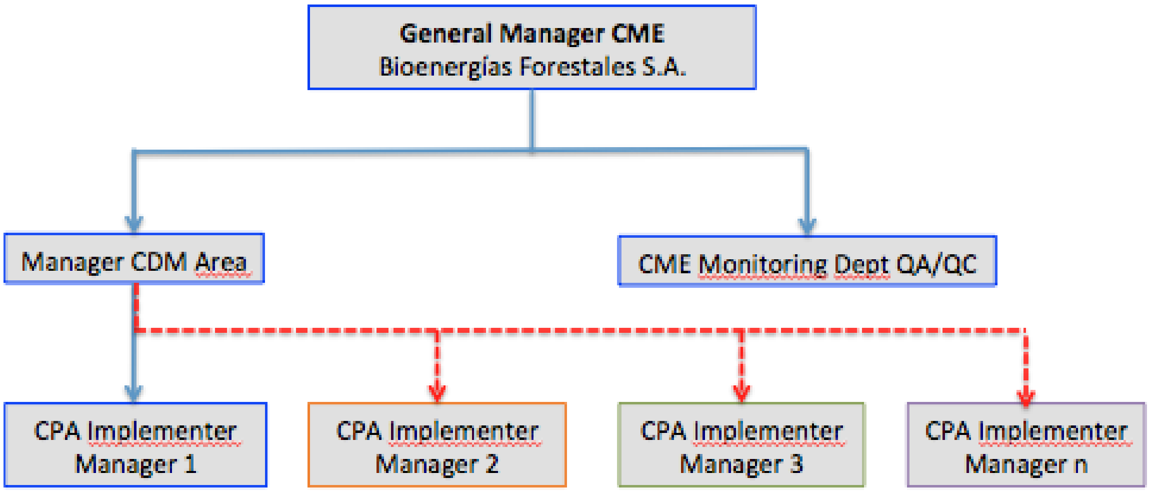
Discrepancies:
Discrepancies between projected data in the DDs and actual data (e.g. due to deferred starting date, malfunction of equipment) will be analyzed, in particular cross-checks between internal meter readings and external sources (e.g. electricity invoices) will be carried out. Any source of inconsistencies will be clarified.

Managerial Responsibilities

The CME will be responsible for the CDM aspects of the project. The CME may outsource some CDM tasks.

The CPA implementer will be responsible for the operation of the project.
See more details in section A.4.4.1 and A.4.4.2 above.

Figure No. 4: Organization structure



Quality Assurance and Quality Control

- The Monitoring Department will be responsible for the monitoring report. As such, it will be empowered to control consistency of monitored data by any means, such as on-site audit, visual control of data on the server, cross-checking of data on the server with data provided by the field technician and/or the maintenance director and/or the monitoring director.
- The monitoring director will keep proper management processes and systems records. The auditors can require copies of such records to judge compliance with the required management processes.
- Procedures to discount conservatively the emissions reductions from the CPA will be defined, in the event either the project implementer or the CME detects any distortion or malfunction of the monitoring equipment.

Emergency

For the case of emergency (earthquakes, explosions, fires etc.), the emergency plan of each plant will be applied. All employees involved in the CDM project on-site will be trained in the code of conduct and required actions at time of commissioning of the plant.

Training of Monitoring Personnel

Employees involved in the monitoring will be trained internally and/or externally. Training will include:
a) Review of equipment and sensors
b) Calibration / maintenance requirement
c) Configuration of monitoring equipment

E.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The application of the baseline and monitoring methodology of the project was completed in 20/04/2012.

The responsible person is:
Mr. Juan José Irarrázaval from the CME staff.
e-mail: jirarrazaval@celulosa.cmpc.cl
This person is not a Project Participant

Annex 1

CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The "Biomass PoA" has not received any type of public funding or public financial help.

Annex 3

BASELINE INFORMATION

Baseline information is presented in section E.4 of this PoA-DD

Annex 4

MONITORING INFORMATION

Monitoring information is presented in section E.7.1 and E.7.2 of this PoA-DD