Draft consolidated baseline and monitoring methodology ACM00XX

"Consolidated methodology for electricity generation from biomass residues in power-only plants"

I. SOURCE AND APPLICABILITY

Sources

This consolidated baseline and methodology is based on elements from the following approved consolidated baseline and monitoring methodology:

- ACM0006 "Consolidated methodology for electricity generation from biomass residues".

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

- "Tool to calculate the emission factor for an electricity system";
- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site";
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";
- "Combined tool to identify the baseline scenario and demonstrate additionality";
- "Tool for the demonstration and assessment of additionality".

For more information regarding the proposals and the tools as well as their consideration by the Executive Board please refer to <http://cdm.unfccc.int/goto/MPappmeth>.

Selected approach from paragraph 48 of the CDM modalities and procedures

"Existing actual or historical emissions, as applicable"

and/or

"Emissions from a technology that represents an economically attractive course of action, taking into account barriers to investment".

Definitions

For the purpose of this methodology, the following definitions apply:

Biomass. Biomass is non-fossilized and biodegradable organic material originating from plants, animals and microorganisms. This shall include products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilized and biodegradable organic fractions of industrial and municipal wastes. Biomass also includes gases and liquids recovered from the decomposition of non-fossilized and biodegradable organic material.

Biomass residues. Biomass residues are defined 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 wastes that contain fossilized and/or non-biodegradable material (however, small fractions of inert inorganic material like soil or sands may be included).

Heat. Heat is defined as useful thermal energy that is generated in a heat generation facility (e.g. a boiler, a cogeneration plant, thermal solar panels, etc.) and transferred to a heat carrier (e.g. hot liquids, hot gases, steam, etc.) for utilization in thermal applications and processes, including power generation. For the purposes of this methodology, heat does not include waste heat, i.e. heat that is transferred to the environment without utilization, for example, heat in flue gas, heat transferred to cooling towers or any other heat losses. Note that heat refers to the *net* quantity of thermal energy that is transferred to a heat carrier at the heat generation facility. For example, in case of a boiler it refers to the difference of the enthalpy of the steam generated in the boiler and the enthalpy of the feed water and, if applicable, any condensate return.

Power. Power refers to electric power. Mechanical and other forms of power are not included under this methodology.

Power plant. A power plant is an installation that generates electric power through the conversion of heat to mechanical power using a heat engine. The heat is produced in a heat generator, through the combustion of fuels, and the electric power is generated in an electricity generator, coupled to the heat engine. The power plant includes all the equipment necessary to generate electric power, including, *inter alia*, heat generators, heat engines, electricity generators, gear boxes and speed reducers, instrumentation and control equipment, cooling equipment, pumps, fans, and also the systems required for the preparation, storage and transportation of fuels. A common example of power plant is a steam cycle plant, in which heat is produced in boilers through the combustion of fuels, transferred to steam which then drives steam turbines. The steam turbines are coupled, normally via speed reducers, to electricity generators which in turn finally generate the electric power. The steam leaving the turbines is directed to condensers, so that its residual heat content is transferred to the atmosphere via a cooling towers system. In the case of several heat generators providing heat to one heat header and/or several heat engines receiving heat from one heat header, all equipment connected to the heat header should be considered as part of the power plant.

Power-only plant. A power-only plant is a power plant to which the following conditions apply:

(a) All heat engines of the power plant produce only power and do not co-generate heat; and

(b) The thermal energy (e.g. steam) produced in equipment of the power plant (e.g. a boiler) is only used in heat engines (e.g. turbines or motors) and not for other processes (e.g. heating purposes or as feedstock in processes). For example, in the case of a power plant with a steam header, this means that *all* steam supplied to the steam header must be used in turbines.

Power and heat plant. A power and heat plant is a power plant which does not fulfill one or both conditions of a power-only plant.

Cogeneration. A cogeneration plant is a heat and power plant in which at least one heat engine simultaneously generates both heat and power.

Off-grid power plant. A power plant which is located at a site that has no connection to the electricity grid. The power plant provides electricity only to identified consumers through dedicated distribution line(s) which are only served by power plants from the project site. The consumers are not connected to the grid and do not receive electricity from power plants other than the plants included in the project boundary.

Net quantity of electricity generation. The *net quantity of electricity generation* is the electricity generated by the power plant unit after exclusion of parasitic and auxiliary loads, i.e. the electricity consumed by the auxiliary equipment of the power plant unit (e.g. pumps, vans, flue gas treatment, control equipment, etc) and equipment related to fuel handling and preparation.

Efficiency of electricity generation. The *efficiency of electricity generation* is defined as the net quantity of electricity generated per quantity of fuel fired in the relevant power plant (expressed in the same energy units). The *average* efficiency refers to the generation efficiency over a longer time period (e.g. one year) that includes different loads and operational modes, including start-ups.

Applicability

This methodology is applicable to project activities that generate electricity in biomass residue (co-)fired power-only plants. The project activity may include the following activities or, where applicable, combinations of these activities:

- The installation of new biomass residues (co-)fired power-only plants at a site where currently no power generation occurs (**greenfield power projects**);
- The installation of new biomass residues (co-)fired power-only plants, which replace or are operated next to existing power-only plants fired with fossil fuels and/or biomass residues (**power capacity expansion projects**);
- The improvement of energy efficiency of existing biomass residues (co-)fired power-only plants (energy **efficiency improvement projects**), which can also lead to a capacity expansion, e.g. by retrofitting the existing plant;
- The total or partial replacement of fossil fuels by biomass residues in an existing power-only plant or in a new power-only plant 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 biomass residues used in the project activity may be produced on-site (e.g. if the project activity is based on the operation of a power plant located in an (agro-)industrial plant generating the biomass residues), or they can be obtained off-site from the nearby area, specific suppliers or purchased from a market.

The methodology is applicable under the following conditions:

(1) No other biomass types than biomass residues, as defined above, are used in the project plant;[1]

(2) Fossil fuels may be co-fired in the project plant. However, the amount of fossil fuels co-fired shall not exceed 50% of the total fuel fired on an energy basis;

[1] Refuse Derived Fuel (RDF) may be used in the project plant but all carbon in the fuel, including carbon from biogenic sources, shall be considered as fossil fuel.

(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 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;

(4) The biomass residues used by the project facility should not be stored for more than one year;

(5) No significant energy quantities, except from transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. esterification of waste oils, gasification, etc.) are not eligible under this methodology;

(6) No power and heat plant operates at the project site during the crediting period;

(7) If any heat which is used for purposes other than power generation (e.g. heat which is produced in boilers or extracted from the header to feed thermal loads in the process) is generated during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the following conditions should apply:

(a) The implementation of the project activity does not influence directly or indirectly the operation of the heat generation equipment, i.e. the heat generation equipment would operate in the same manner in the absence of the project activity;

(b) The heat generation equipment does not influence directly or indirectly the operation of the project plant (e.g. no fuels are diverted from the heat generation equipment to the project plant); and

(c) The amount of fuel used in the heat generation equipment can be monitored and clearly differentiated from any fuel used in the project activity.

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

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

Finally, the methodology is only applicable if the most plausible baseline scenario, as identified per the “Procedure for the selection of the baseline scenario and demonstration of additionality” section hereunder, is:

- For power generation: Scenarios P2 to P7, or a combination of any of those scenarios;

- For biomass use: Scenarios B1 to B8, or a combination of any of those scenarios. However, note that for scenarios B5 to B8, leakage emissions should be accounted for as per the procedures of the methodology.

II. BASELINE METHODOLOGY

Project boundary

The spatial extent of the project boundary encompasses:

- The project activity power-only plant(s);
- All other on-site power-only plants, 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;
- If applicable, the means of transportation of biomass residues to the project site;
- If applicable, the site where the biomass residues would have been left for decay or dumped;
- If applicable, the wastewater treatment facilities used to treat the wastewater produced from the treatment of biomass residues.

Explain in the CDM-PDD the specific situation of the project activity. For this purpose, project participants should document in the CDM-PDD:

- For each power plant that has been operated at the project site during the most recent three years prior to the start of the project activity: the type and capacity of the power plant, the types and quantities of fuels which have been used in the power plant during the most recent three years prior to the start of the project activity, and whether the plant continues operation after the start of the project activity;
- For each boiler or other heat generation equipment that has been operated at the project site during the most recent three years prior to the start of the project activity: the type and capacity of the equipment, the types and quantities of fuels which have been used in the equipment during the most recent three years prior to the start of the project activity, and whether the equipment continues operation after the start of the project activity;
- For each power plant installed under the project activity: the type and capacity of the power plant, and the types and quantities of fuels which are planned to be used;
- For each power plant that would be installed in the absence of the project activity: the type and capacity of the power plant and the types and quantities of fuels which would be used.

Table 1 illustrates which emissions sources are included and which are excluded from the project boundary for determination of both baseline and project emissions.

Table 1: Overview on emissions sources included in or excluded from the project boundary

	Source	Gas		Justification / Explanation
Baseline	Electricity 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 by project participants	Project participants 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 residues	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.
	Combustion of biomass residues for electricity	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 must be included if CH_4 emissions from uncontrolled burning or decay of biomass residues in the baseline scenario are included.
		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.

Procedure for the selection of the baseline scenario and demonstration of additionality

The selection of the baseline scenario and demonstration of additionality should be conducted by applying the following steps:

Step 1: Identification of alternative scenarios

This step serves to identify all alternative scenarios to the proposed CDM project activity(s) that can be the baseline scenario through the following sub-steps:

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

Identify all alternative scenarios that are available to the project participants and that provide outputs or services with comparable quality, properties and application areas as the proposed CDM project activity.

In doing so, alternative scenarios should be separately determined regarding:

- How electric power would be generated in the absence of the CDM project activity; and
- What would happen to the biomass residues in the absence of the project activity.

The alternative scenarios for electric power should include, *inter alia*:

P1: The proposed project activity not undertaken as a CDM project activity;

P2: If applicable,[2] the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The existing power-only 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 project activity;

P3: If applicable[2], the continuation of power generation in existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The existing power-only plants would operate with different conditions from those observed in the most recent three years prior to the project activity;

P4: If applicable[2], the retrofitting of existing power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site. The retrofitting may or may not include a change in fuel mix;

P5: The generation of power in the grid;

P6: The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using the same amount or less biomass residues than under scenario P1:;

P7: The installation of new power-only plants fired with biomass residues, or fossil fuels, or a combination of both, at the project site, using more biomass residues than under scenario P1:.

[2] This alternative is only applicable if there are existing power plants operating at the project site.

When defining plausible and credible alternative scenarios for power generation, the guidance below should be strictly 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-PDD. The justification for existing plants should be based on the existing conditions of the 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 generation under the project scenario, at the project site, must be considered. Therefore, whenever the project activity involves an increase in installed power generation capacity, an increase in electricity generation, and/or a change in electricity demand as compared to the historical situation, the baseline scenario should be determined for the overall power generated under the project activity, possibly including a combination of the different scenarios described above. This is particularly relevant for cases in which existing power plants have operated at the project site prior to the implementation of the project activity;
- In cases where alternative scenarios include the installation of new power generation facilities 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 quantity), that are technologically available and that are in compliance with relevant regulations. The efficiency of the technology 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 power plants in the respective industry sector, in the country or region, excluding CDM registered projects;[3]
- If a power plant was already operated at the project site prior to the implementation of the project activity, it could be retired at the start of the project activity because it is replaced by the project plant, or it may initially be operated in parallel to the project plant and be retired at a future point in time (at the end of its lifetime). In such cases, the remaining technical 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 project activity. From that point of time, a different baseline shall apply. Project participants should determine the age and the average technical lifetime of any existing power plant, taking into account common practices in the sector and country. The average technical lifetime may be determined based on industry surveys, statistics, technical literature or the practices of the responsible company regarding replacement schedules, e.g. based on historical replacement records for similar equipment. The average technical lifetime should be chosen 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;

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

- If the project activity supplies electricity partially or fully to (a) captive consumer(s), then alternatives considered for power generation should only include alternatives that can be implemented at the project site (e.g. P1, P2, P3, P4, P6 or P7) or the purchase of electricity from the grid (P5) but not the generation of power in plants established by the project participants at other locations;
- If the project activity is the establishment of a greenfield power plant and supplies electricity only to the grid, then the alternatives considered for power generation should include only the scenarios P1 and P5. In this case, it can be considered that the electricity delivered by the project activity would have otherwise been generated by the operation of existing or new grid-connected power plants, established either by the project participants or by third parties.

For the <u>use of biomass residues</u>, the alternative scenarios for biomass residues should include, *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[4] 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 electricity generation in power-only plant configuration at the project site in new and/or existing power plants;
B5: The biomass residues are used for power and/or heat generation in other existing or new power plants at other sites;
B6: The biomass residues are used for other energy purposes, such as the generation of bio-fuels;
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: The primary source of the biomass residues and/or their fate in the absence of the project activity cannot be clearly identified.[5]

When defining plausible and credible alternative scenarios for the use of biomass residues, the guidance below should be strictly 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 project activity along the crediting period, and consistent with the alternative scenarios selected for power generation (Scenarios P 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 project activity (Scenarios B above);
- For example, consider a project activity which includes the installation of a new biomass-only power plant, and the retrofit of an existing co-fired biomass-fossil-fuel power plant, which has historically used rice husks, produced on-site. Suppose that the project activity will use two types of biomass residues, rice husks (historical use plus an additional amount) and diverse agricultural

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[4] Further work is undertaken to investigate to which extent and in which cases methane emissions may occur from stock-piling biomass residues. Subject to further insights on this issue, the methodology may be revised.

[5] For example, this scenario can be used if biomass residues are purchased from a market, or biomass residues retailers.

residues (as additional biomass residues compared to the historical situation). Further consider that the rice husks used in the project would come from two different sources, on-site production and off-site supply from an identified rice mill. Presumably, the rice husks produced on-site would have been partly used on-site for electricity generation and partly be dumped in the baseline. The rice husks procured off-site would have been dumped in the baseline. The diverse agricultural residues are purchased from a biomass retailer. For this example, four categories of biomass residues should be considered in the subsequent analysis, as illustrated in Table 2;

- Explain and document transparently in the CDM-PDD, using a table similar to Table 2, 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 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 emissions reductions 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.

Table 2: 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 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. Towards this end, for each biomass residues category, one of the following procedures should be applied:
  - (a) Demonstrate that there is an abundant surplus of the type of biomass residue in the region of the 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;
  - (b) 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 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 (a) or (b) are 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 of the type B1:, B2: or B3: are used in the project activity which were not listed at the validation stage, e.g. due to new sources of biomass residues, the baseline scenario for those types of biomass residues should be assessed using the procedures outlined in this guidance for each category of biomass residues.

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 application areas 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 definition of geographical area is 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. Provide relevant documentation to support the results of the analysis.

Identify realistic combinations of scenarios for electric power generation and use of biomass residues. The identified realistic combinations should be considered in the following steps.

Outcome of Step 1a: List of plausible alternative scenarios to the 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.[6] (This sub-step does not consider national and local policies that do not have legally-binding status).

If an alternative does not comply with all mandatory applicable legislation and regulations, then show that, based on an examination of current practice in the country or region in which the mandatory law or regulation applies, those applicable mandatory legal or regulatory requirements are systematically not enforced and that non-compliance with those requirements is widespread in the country. If this cannot be shown, then eliminate the alternative from further consideration.

If the proposed project activity is the only alternative amongst the ones considered by the project participants 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 project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Proceed to Step 2 (Barrier analysis).

Step 2: Barrier analysis

This step serves to identify barriers and to assess which alternatives are prevented by these barriers. Apply the following sub-steps:

Sub-step 2a: Identify barriers that would prevent the implementation of alternative scenarios

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 analyzed 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, as defined in Sub-step 1a above;

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

- No private capital is available from domestic or international capital markets due to real or perceived risks associated with investments in the country where the project activity is to be implemented, as demonstrated by the credit rating of the country or other country investment reports of reputed origin.

- Technological barriers, *inter alia*:
  - Skilled and/or properly trained labor to operate and maintain the technology 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 technology (e.g. natural gas can not be used because of the lack of a gas transmission and distribution network);
  - 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 project activity is not available in the relevant geographical area.
- Lack of prevailing practice:
  - The alternative is the "first of its kind".
- Other barriers, preferably specified in the underlying methodology as examples.

Outcome of Step 2a: List of barriers that may prevent one or more alternative scenarios to occur.

Sub-step 2b: Eliminate alternative scenarios which are prevented by the identified barriers

Identify which alternative scenarios are prevented by at least one of the barriers listed in Sub-step 2a, and eliminate those alternative scenarios from further consideration. All alternative scenarios shall be compared to the same set of barriers. The assessment of the significance of barriers should take into account the level of access to and availability of information, technologies and skilled labour in the specific context of the industry where the project type is located. For example, projects located in sectors with small and medium sized enterprises may not have the same means to overcome technological barriers as projects in a sector where typically large or international companies operate.

Outcome of Step 2b: List of alternative scenarios to the project activity that are not prevented by any barrier.

In applying Sub-steps 2a and 2b, provide transparent and documented evidence, and offer conservative interpretations of this evidence, as to how it demonstrates the existence and significance of the identified barriers and whether alternative scenarios are prevented by these barriers. The type of evidence to be provided should include at least one of the following:

(a) Relevant legislation, regulatory information or industry norms;
(b) Relevant (sectoral) studies or surveys (e.g. market surveys, technology studies, etc) undertaken by universities, research institutions, industry associations, companies, bilateral/multilateral institutions, etc;
(c) Relevant statistical data from national or international statistics;
(d) Documentation of relevant market data (e.g. market prices, tariffs, rules);
(e) Written documentation from the company or institution developing or implementing the CDM project activity or the CDM project developer, such as minutes from Board meetings, correspondence, feasibility studies, financial or budgetary information, etc;
(f) Documents prepared by the project developer, contractors or project partners in the context of the proposed project activity or similar previous project implementations;
(g) Written documentation of independent expert judgements from industry, educational institutions (e.g. universities, technical schools, training centres), industry associations and others.

Outcome of Step 2: If there is only one alternative scenario that is not prevented by any barrier, and if this alternative is the proposed project activity undertaken without being registered as a CDM project activity, then the project activity is not additional.

If there is only one alternative scenario that is not prevented by any barrier, and if this alternative is not the proposed project activity undertaken without being registered as a CDM project activity, then this alternative scenario is identified as the baseline scenario. Explain – using qualitative or quantitative arguments – 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. If the CDM alleviates the identified barriers that prevent the proposed project activity from occurring, proceed to Step 4, otherwise the project activity is not additional.

If there are still several alternative scenarios remaining, including the proposed project activity undertaken without being registered as a CDM project activity, proceed to Step 3 (investment analysis).

If there are still several alternative scenarios remaining, but which do not include the proposed project activity undertaken without being registered as a CDM project activity, explain – using qualitative or quantitative arguments – 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. If the CDM alleviates the identified barriers that prevent the proposed project activity from occurring, project participants may choose to either:

- Option 1: Go to Step 3 (investment analysis); or
- Option 2: Identify the alternative with the lowest emissions[7] (i.e., the most conservative) as the baseline scenario, and proceed to Step 4.

If the CDM does not alleviate the identified barriers that prevent the proposed project activity from occurring, then the project activity is not additional.

[7] The respective emissions should be determined in accordance with the procedures in this methodology.

Step 3: Investment analysis

The objective of Step 3 is to compare the economic or financial attractiveness of the alternative scenarios remaining after Step 2 by conducting an investment analysis. The analysis should include all alternative scenarios remaining after Step 2, including scenarios where the project participants do not undertake an investment (e.g. a combination of B1 and P5).

Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g., levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision-making context. If one of the alternative scenarios remaining after Step 2 corresponds to the situation where the project participants do not undertake any investment, then use either the NPV or the IRR as financial indicator in the analysis.

Calculate the suitable financial indicator for all alternative scenarios remaining after Step 2. Include all relevant costs (including, for example, the investment cost, the operations and maintenance costs), and revenues (including subsidies/fiscal incentives,[8] ODA, etc. where applicable), and, as appropriate, non-market costs and benefits in the case of public investors if this is standard practice for the selection of public investments in the host country.

For an alternatives which does not involve any investment by the project participants, use the following values for the financial indicator:

- If the financial indicator is the NPV: assume a value of NPV equal to zero;
- If the financial indicator is the IRR: use as the IRR the financial benchmark, as determined through the options (a) to (e) below.

The financial/economic analysis shall be based on parameters that are standard in the market, considering the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer. In the particular case where the project activity can only be implemented by the project participant, the specific financial/economic situation of the company undertaking the project activity can be considered.

The discount rate (in the case of the NPV) or the financial benchmark (in the case of the IRR) shall be derived from:

(a) Government bond rates, increased by a suitable risk premium to reflect private investment and/or the project type, as substantiated by an independent (financial) expert or documented by official publicly available financial data;

(b) Estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds' required return on comparable projects;

(c) A company internal financial benchmark (weighted average cost of capital of the company), only in the particular case that the project activity can only be implemented by the project participant. The project developers shall demonstrate that this financial benchmark has been consistently used in the past, i.e. that project activities under similar conditions developed by the same company used the same financial benchmark;

[8] Note that according to guidance by the EB (EB 22, Annex 3), subsidies and incentives may be excluded from consideration in certain cases.

(d) A government/officially approved financial benchmark where, it can be demonstrated that such financial benchmarks are used for investment decisions;

(e) Any other indicators, if the project participants can demonstrate that the above options are not applicable and their indicator is appropriately justified.

Present the investment analysis in a transparent manner and provide all the relevant assumptions, preferably in the CDM-PDD, or in separate annexes to the PDD, so that a reader can reproduce the analysis and obtain the same results. Refer to critical techno-economic parameters and assumptions (such as capital costs, fuel prices, lifetimes, and discount rate or cost of capital). Justify and/or cite assumptions in a manner that can be validated by the DOE. In calculating the financial indicator, the risks of the alternative scenarios can be included through the cash flow pattern, subject to project-specific expectations and assumptions (e.g., insurance premiums can be used in the calculation to reflect specific risk equivalents). Assumptions and input data for the investment analysis shall not differ across alternative scenarios, unless differences can be well substantiated.

Present in the CDM-PDD submitted for validation a clear comparison of the financial indicator for all alternative scenarios and rank the alternative scenarios according to the financial indicator.

Include a sensitivity analysis to assess whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions. The investment comparison analysis provides a valid argument in identifying the baseline scenario only if it consistently supports (for a realistic range of assumptions) the conclusion that one alternative is the most economically and/or financially attractive.

Outcome of Step 3: Ranking of the short list of alternative scenarios according to the most suitable financial indicator, taking into account the results of the sensitivity analysis.

If the investment analysis, supported by the sensitivity analysis, is not conclusive, then the alternative scenario to the project activity with least emissions[7] among the alternative scenarios is considered as baseline scenario. If the investment analysis, supported by the sensitivity analysis, is conclusive, then the most economically or financially attractive alternative scenario is considered as baseline scenario. If the alternative considered as baseline scenario is the "proposed project activity undertaken without being registered as a CDM project activity", then the project activity is not additional. Otherwise, proceed to Step 4.

Step 4: Common practice analysis

The previous steps shall be complemented with an analysis of the extent to which the proposed project type (e.g., technology or practice) has already diffused in the relevant sector and geographical area. This test is a **credibility check** to demonstrate additionality which complements the barrier analysis (Step 2) and, where applicable, the investment analysis (Step 3).

Provide an analysis to which extent similar activities to the proposed CDM project activity have been implemented previously or are currently underway. Similar activities are defined as activities (i.e., technologies or practices) that are of similar scale, take place in a comparable environment, *inter alia*, with respect to the regulatory framework and are undertaken in the relevant geographical area, as defined in Sub-step 1a above. Other registered CDM project activities are not to be included in this analysis. Provide documented evidence and, where relevant, quantitative information. On the basis of that analysis, describe whether and to which extent similar activities have already diffused in the relevant geographical area.

If similar activities to the proposed project activity are identified, then compare the proposed project activity to the other similar activities and assess whether there are essential distinctions between the proposed project activity and the similar activities. If this is the case, point out and explain the essential distinctions between the proposed project activity and the similar activities and explain why the similar activities enjoyed certain benefits that rendered them financially attractive (e.g., subsidies or other financial flows) and which the proposed project activity can not use or why the similar activities did not face barriers to which the proposed project activity is subject.

Essential distinctions may include a serious change in circumstances under which the proposed CDM project activity will be implemented when compared to circumstances under which similar projects were carried out. For example, new barriers may have arisen, or promotional policies may have ended, leading to a situation in which the proposed CDM project activity would not be implemented without the incentive provided by the CDM. The change must be fundamental and verifiable.

Outcome of Step 4: If Sub-step 4 is satisfied, i.e., (i) similar activities cannot be observed or (ii) similar activities are observed but essential distinctions between the proposed CDM project activity and similar activities can reasonably be explained, then the proposed project activity is additional.

If Sub-step 4 is not satisfied, i.e., similar activities can be observed and essential distinctions between the proposed CDM project activity and similar activities cannot reasonably be explained, then the proposed CDM project activity is not additional.

Emission Reductions

Emission reductions are calculated as follows:

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

Where:

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

Baseline Emissions

Baseline emissions may, where applicable, include the following emission sources:

- CO_2 emissions from fossil fuel power plants at the project site;
- CO_2 emissions from grid-connected fossil fuel power plants in the electricity system;
- CH_4 emissions from anaerobic decay of biomass residues and/or CH_4 emissions from uncontrolled burning of biomass residues without utilizing them for energy purposes.

Baseline emissions are calculated as follows:

$$BE_y = BE_{EL,y} + BE_{BR,y} \quad \textbf{(2)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2e)
$BE_{EL,y}$	=	Baseline emissions due to generation of electricity in year *y* (tCO_2)
$BE_{BR,y}$	=	Baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (tCO_2e)

Baseline emissions are determined through the following steps:

Step 1: Determination of $BE_{EL,y}$

Baseline emissions from electricity generation are calculated based on the net quantity of electricity generated at the project site under the project scenario ($EG_{PJ,y}$) and a baseline emission factor ($EF_{BL,EL,y}$) which expresses the weighted average CO_2 intensity of electricity generation in the baseline, as follows:

$$BE_{EL,y} = EG_{PJ,y} \cdot EF_{BL,EL,y} \quad \textbf{(3)}$$

Where:

$BE_{EL,y}$	=	Baseline emissions due to generation of electricity in year *y* (tCO_2)
$EG_{PJ,y}$	=	Net 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)
$EF_{BL,EL,y}$	=	Emission factor for electricity generation in the baseline in year *y* (tCO_2/MWh)

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 1.1: Determination of $EG_{PJ,y}$

The net quantity of electricity generated in all power plants which are located at the project site and included in the project boundary ($EG_{PJ,y}$) is determined as the difference between the gross electricity generation at the project site ($EG_{PJ,gross,y}$) and the auxiliary electricity consumption required for the operation of the power plants at the project site ($EG_{PJ,aux,y}$), as follows:

$$EG_{PJ,y} = EG_{PJ,gross,y} - EG_{PJ,aux,y} \quad \textbf{(4)}$$

Where:

$EG_{PJ,y}$	=	Net 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)
$EG_{PJ,gross,y}$	=	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)
$EG_{PJ,aux,y}$	=	Total auxiliary electricity consumption required for the operation of the power plants at the project site (MWh)

$EG_{PJ,aux,y}$ 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.).

Step 1.2: Determination of $EF_{BL,EL,y}$

The electricity generated under the project activity could be generated in the baseline in three different ways, depending on the baseline scenario and the particular situation of the project activity:

- **Use of biomass residues at the project site.** Electricity could be generated with biomass residues in power plants at the project site. This applies, for example, if

  (a) The project activity is a replacement of an existing biomass residues fired power plant;
  (b) The project activity is a capacity expansion of an existing biomass residues fired power plant by installing a new biomass residues fired power plant that is operated next to the existing 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;

AND/OR

- **Use of fossil fuels at the project site.** Electricity could be generated with fossil fuels in power plants at the project site. 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 power plant would continue to operate at the project site in parallel with a new biomass residues power plant;

  AND/OR

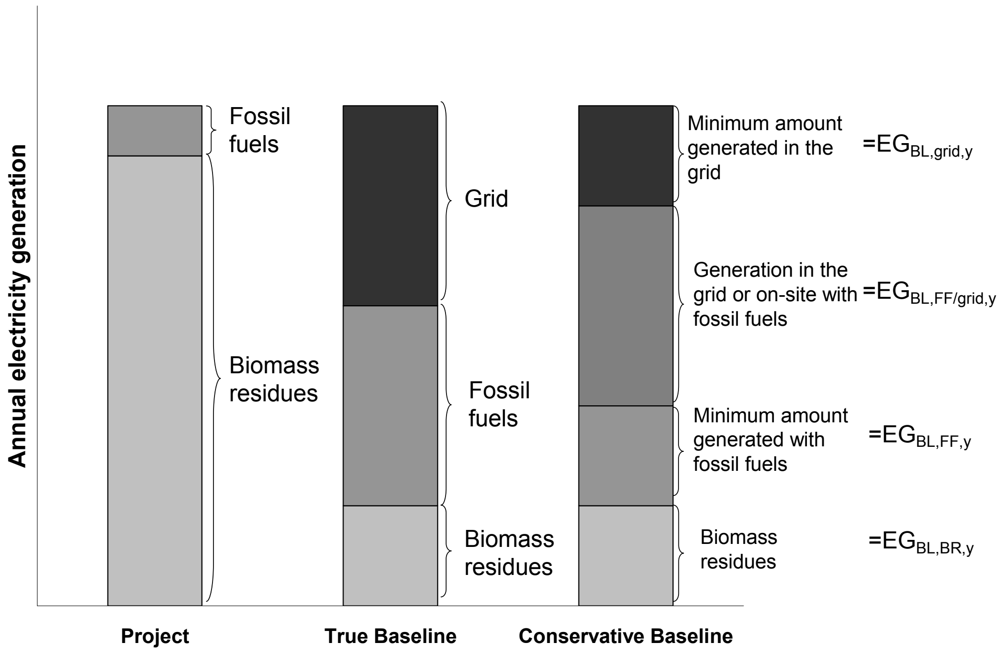
- **Power generation in the electricity grid.** Electricity could be generated by power plants in the electricity grid. This applies, for example, if

  (a) The project activity exports all 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 electricity produced by power plants included in the project boundary and this increased electricity is exported to the grid or would in the baseline be purchased from the grid.

For some project types, electricity would be generated in the baseline by a combination of these three ways. Therefore, $EF_{BL,EL,y}$ is a weighted average baseline emission factor: it is determined based on each of the three ways electricity could be generated (grid, biomass residues, fossil fuels), multiplied with its respective emission factor over the total amount of electricity produced in the baseline.

Figure 1 illustrates this general case. Under the project activity, electricity is generated with biomass residues and fossil fuels. This is illustrated in the bar labeled as “Project” in the figure. The bar labeled as “True Baseline” represents the scenario that would truly represent the mix of grid, biomass residues and fossil fuels based electricity that would be generated in the absence of the project activity.

Figure 1: Illustration of the determination of $EF_{BL,EL,y}$



In many situations it is difficult to clearly determine the precise mix of grid, biomass residues and fossil fuels based electricity that would be generated in the absence of the project activity. If electricity 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 defines four different electricity quantities to be used for the calculation of the weighted average baseline emission factor $EF_{BL,EL,y}$. This is illustrated in the bar labeled "Conservative Baseline" in Figure 1. These four different electricity quantities are $EG_{BL,BR,y}$, $EG_{BL,grid,y}$, $EG_{BL,FF,y}$ and $EG_{BL,FF/grid,y}$:

- $EG_{BL,BR,y}$ corresponds to the amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline;
- $EG_{BL,grid,y}$ corresponds to the amount of electricity for which it can be clearly identified that it would be generated in the electricity grid in the baseline. For example, the amount of electricity generated under the project activity that exceeds the amount that could be generated with the capacity of the baseline plants operated at the project site could only be generated in the grid in the baseline;
- $EG_{BL,FF,y}$ corresponds to the amount of electricity for which it can be clearly identified that it would be generated in the baseline with fossil fuels at the project site. For example, in the case of a co-fired boiler operated in the baseline, some fossil fuels may need to be fired for technical or operational reasons;

- $EG_{BL,FF/grid,y}$ corresponds to the amount of electricity that could be generated in the baseline either by power plants in the electricity grid or with fossil fuels at the site of the project activity. As it can not be clearly identified which of these two options would be used in the baseline, the lower CO_2 emission factor between the grid emission factor and the emission factor of fossil fuel power plants operated at the site of the project activity is used for this amount of electricity.

Based on this approach, $EF_{BL,EL,y}$ is calculated as follows:

$$EF_{BL,EL,y} = \frac{EG_{BL,FF,y} \cdot EF_{BL,FF,y} + EG_{BL,grid,y} \cdot EF_{grid,CM,y} + EG_{BL,FF/grid,y} \cdot MIN\left(EF_{BL,FF,y}; EF_{grid,CM,y}\right)}{EG_{BL,BR,y} + EG_{BL,FF,y} + EG_{BL,grid,y} + EG_{BL,FF/grid,y}} \quad \textbf{(5)}$$

Where:

$EF_{BL,EL,y}$	=	Emission factor for electricity generation in the baseline in year *y* (tCO_2/MWh).
$EG_{BL,BR,y}$	=	Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh)
$EG_{BL,FF,y}$	=	Minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh)
$EG_{BL,grid,y}$	=	Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh)
$EG_{BL,FF/grid,y}$	=	Amount of electricity that could be generated in the baseline either by power plants in the electricity grid or by power plants at the project site using fossil fuels in year *y* (MWh)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid-connected electricity generation in year *y* (tCO_2/MWh)
$EF_{BL,FF,y}$	=	CO_2 emission factor for electricity generation with fossil fuels in power plant(s) at the project site in the baseline in year *y* (tCO_2/MWh)

In the following, first the amounts of electricity generated from the various sources in the baseline ($EG_{BL,BR,y}$, $EG_{BL,grid,y}$, $EG_{BL,FF,y}$ and $EG_{BL,FF/grid,y}$) are determined, taking into account the project configuration and the baseline scenario. Therefore, different cases have to be considered. Then the emission factors ($EF_{grid,CM,y}$ and $EF_{BL,FF,y}$) are determined.

Step 1.3: Determination of $EG_{BL,BR,y}$

The amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline ($EG_{BL,BR,y}$) should, in accordance with the baseline scenario and the historical situation before project implementation, be determined as follows:

Case 1: **No power generation with biomass residues in the baseline.** If Scenario B4 does not apply to any biomass residue category (i.e. if no biomass residues would be used for electricity generation in power-only plants in the baseline), then: $EG_{BL,BR,y} = 0$.

Case 2: Power generation with biomass residues in the baseline. If Scenario B4 applies to all or parts of the biomass residues fired in the power plant(s) included in the project boundary (i.e. if all or parts of the biomass residues would be used in the baseline for electricity generation in power-only plants included in the baseline boundary), then $EG_{BL,BR,y}$ is calculated as follows:

$$EG_{BL,BR,y} = \frac{1}{3.6} \cdot \sum_{n} \sum_{p} \eta_{BL,BR,p} \cdot BR_{BL,n,p,y} \cdot NCV_{n,y} \quad \textbf{(6)}$$

Where:

$EG_{BL,BR,y}$	=	Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh)
$\eta_{BL,BR,p}$	=	Efficiency of electricity generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels (ratio)
$BR_{BL,n,p,y}$	=	Quantity of biomass residues of category *n* that would be fired in power-only plant *p* in the baseline in year *y* (tonnes on dry-basis)
$NCV_{n,y}$	=	Net calorific value of biomass residues of category *n* in year *y* (GJ/tonnes on dry-basis)
n	=	Biomass residues categories.
p	=	Power-only plants at the site of the project activity that would (partly) use biomass residues to generate electricity in the baseline

Determination of $BR_{BL,n,p,y}$

Where case 2 above applies, $BR_{BL,n,p,y}$ has to be determined. The determination of $BR_{BL,n,p,y}$ shall be based on the monitored amounts of biomass residues used in power plants included in the project boundary. The 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.). Note that $BR_{BL,n,p,y}$ only includes those biomass residues categories which would also be used in the baseline for electricity generation in power-only plants (i.e. for which B4 is the baseline scenario).

Where the *whole amount* of biomass residues of one particular type and from one particular source would be used in the baseline in *only one* clearly identifiable baseline power plant p, the monitored quantities of biomass residues used in the project ($BR_{PJ,n,y}$) can be directly allocated to their use in the baseline scenario ($BR_{BL,n,p,y}$). This allocation should be made consistently with Table 2 above, as provided for the project activity in the CDM-PDD.

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 power plants *p* (and not only in one power plant) or in different boilers of that power plant. In this case, the use of this biomass residue type from this source has to be allocated to the different baseline power plants p or different boilers should they have a different efficiency;
- 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 10 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) Electricity generation in power-only plants (B4); or
(b) Dumping, leaving to decay or burning (B1, B2 and/or B3); or
(c) Ss required for the purpose of calculating leakage effects: other fates (B5, B6, B7 and/or B8:).

Where one of these situations arises, the project participants should specify and justify in the CDM-PDD in a transparent manner how the relevant allocations should be made and how $BR_{BL,n,p,y}$ should be determined for the relevant biomass residue category *n* and each power plant *p* 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. In doing so, the following allocation rules should be adhered to:

- The sum of biomass residues used in the baseline in all power plants p shall correspond to the total amount of biomass residues which are used under the project activity and for which the baseline scenario is B4:

$$\sum_{n}\sum_{p} BR_{BL,n,p,y} = \sum_{n} BR_{PJ,n,y} \quad \textbf{(7)}$$

Where:

$BR_{BL,n,p,y}$ = Quantity of biomass residues of category *n* that would be fired in power-only plant *p* in the baseline in year *y* (tonnes on dry-basis)

$BR_{PJ,n,y}$ = Quantity of biomass residues of category *n* used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on a dry-basis)

n = Biomass residues categories for which B4 is the baseline scenario

p = Power-only plants at the site of the project activity that would (partly) use biomass residues to generate electricity in the baseline

- The allocation of biomass residue should be undertaken in a conservative manner. This means that in case of uncertainty an allocation rule should be favoured that tends to result in lower emission reductions;
- If several biomass residue plants p or several boilers supplying one power plant would operate in the baseline and if it is technically feasible to use a biomass residue type in different power plants p or boilers, one of the following two approaches should be applied:

  (a) Assume the most efficient operation mode which results in the greatest amount of electricity generation from biomass residues. For example, it should be assumed that first those biomass residues types, boilers and power plants p would be used that yield the highest efficiency of power generation, taking into account technical constraints, and that subsequently less efficient biomass residue types or equipment would be used;
  (b) Choose for the determination of $\eta_{BL,BR,p}$ below the same conservative default efficiency for all power plants p that would be operated in the baseline at the project. In this case, no allocation of biomass residues to different power plants is required.

- In the case a biomass residues type from one particular source has been used prior to the implementation of the project activity partly in power-only plants 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 allocated to scenario B4:

  (a) The highest annual historical use of that biomass residue type from that source in power-only plants operated at the project site observed in the most recent three calendar years prior to the implementation of the project activity; 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), calculated as follows:

$$BR_{PJ,n,B4,y} = P_y \cdot MAX\left\{\frac{BR_{n,power-only,x}}{P_x};\frac{BR_{n,power-only,x-1}}{P_{x-1}};\frac{BR_{n,power-only,x-2}}{P_{x-2}}\right\} \quad \textbf{(8)}$$

Where:

$BR_{PJ,n,B4,y}$	=	Quantity of biomass residues of category *n* used in year *y* in power-only plants which are located at the project site and included in the project boundary and for which B4 is the baseline scenario (tonnes on dry-basis)
$BR_{n,power-only,x}$	=	Quantity of biomass residues of category *n* used in year *x* in power-only plants which were used at the project site prior to the implementation of the project activity (tonnes on dry-basis)
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
x	=	Last calendar year prior to the start of the crediting period
n	=	Biomass residue type from one particular source for which the baseline scenario is partly B4 and partly B1/B2/B3 B1 is the baseline scenario

Determination of $\eta_{BL,BR,p}$

This methodology covers situations where a power plant *p* includes different heat generators which can use different fuel types and which operate in parallel, supplying heat to a common heat header, as well as several heat engines with different efficiencies that also operate in parallel and all use heat from the common heat header. Therefore, the definition of a single efficiency of electricity generation for a baseline power plant *p* is challenging, and a simplified and conservative approach (i.e. an approach that tends to overestimate $\eta_{BL,BR,p}$) is taken.

The parameter $\eta_{BL,BR,p}$ should be calculated using one of the following options for each power plant *p*:

Option 1: **Default values.** Use the following conservative default values:

(a) For existing plants operated at the project site prior to the implementation of the project activity: $\eta_{BL,BR,p} = 0.37$;
(b) For new plants that would be in the baseline scenario be constructed and operated at the project site: $\eta_{BL,BR,p} = 0.39$.

Option 2: **Manufacturer's data.** This option is only applicable to plants that were operated at the project site prior to the implementation of the project activity (and not new plants that would be constructed and operated at the project site in the baseline scenario). The overall efficiency of the plant is determined based on manufacturer's data of the efficiency of the main components under optimal operating conditions, as follows:

$$\eta_{BL,BR,p} = \eta_{BL,hg,p} \cdot \eta_{BL,mg,p} \cdot \eta_{BL,eg,p} \qquad \textbf{(9)}$$

Where:

$\eta_{BL,BR,p}$	=	Efficiency of electricity generation of baseline power plant p if fired only with biomass residues and not with fossil fuels (ratio)
$\eta_{BL,hg,p}$	=	Conservative efficiency of heat generation of baseline power plant p if fired only with biomass residues and not with fossil fuels (ratio)
$\eta_{BL,mg,p}$	=	Conservative efficiency of conversion from heat to mechanical shaft power of baseline power plant p (ratio)
$\eta_{BL,BR,p}$	=	Conservative efficiency of the electric generators of baseline power plant p (ratio)

For any of the parameters $\eta_{BL,hg,p}$, $\eta_{BL,mg,p}$ and $\eta_{BL,BR,p}$, if several heat generators, heat engines and electric generators would operate in the baseline and if it can not clearly defined which configuration would prevail in the baseline, the most conservative values for efficiencies should be assumed in determining $\eta_{BL,BR,p}$. For example, if several boilers, turbines, speed reducers and electric generators operate in the power plant *p*, it should be assumed that the most efficient boiler and the most efficient set of turbine-speed reducer-electric generator would be used. The efficiency of conversion from heat to mechanical shaft power should include the speed-reducers or gear boxes required to couple the mechanical shaft power generator to the electric generator.

Option 3: **Historical records.** This option is only applicable to plants that were operated at the project site for at least three calendar years prior to the implementation of the project activity. The overall efficiency of a plant p is determined based on the historical quantity of biomass residues used in the plant and electricity generation of the plant, as follows:

$$\eta_{BL,BR,p} = MAX\left\{\frac{EG_{BR,p,x}}{\sum_n BR_{n,p,x} \cdot NCV_{n,x}};\frac{EG_{BR,p,x-1}}{\sum_n BR_{n,p,x-1} \cdot NCV_{n,x-1}};\frac{EG_{BR,p,x-2}}{\sum_n BR_{n,p,x-2} \cdot NCV_{n,x-2}}\right\} \qquad \textbf{(10)}$$

Where:

$\eta_{BL,BR,p}$	=	Efficiency of electricity generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels (ratio)
$EG_{BR,p,x}$	=	Net quantity of electricity generated from using biomass residues in power plant *p* in year *x* (MWh / yr)
$BR_{n,p,x}$	=	Quantity of biomass residues of category *n* used in year *x* in power plant *p* (tonnes on dry-basis)
$NCV_{n,x}$	=	Net calorific value of biomass residue category *n* in year *x* (GJ/tons on a dry basis)
p	=	Power-only plant(s) operated at the project site prior to the implementation of the project activity
x		Last calendar year prior to the start of the crediting period
n	=	Biomass residue categories used for power generation at the project site in years *x*, *x*-1 and *x*-2

If only biomass residues and no fossil fuels were used for electricity generation in the power plant p prior to the implementation of the project activity, then $EG_{BR,p,x}$, $EG_{BR,p,x-1}$ and $EG_{BR,p,x-2}$ can be obtained directly from historical electricity generation records ($EG_{BR,p,x} = EG_{p,x}$; $EG_{BR,p,x-1} = EG_{p,x-1}$; $EG_{BR,p,-2x} = EG_{p,x-2}$).

If fossil fuels and biomass residues were used for electricity generation in power plant p prior to the implementation of the project activity, then $EG_{BR,p,x}$, $EG_{BR,p,x-1}$ and $EG_{BR,p,x-2}$ are determined as follows:

$$EG_{BR,p,x} = EG_{p,x} \cdot \frac{\sum_{n} BR_{n,p,x} \cdot NCV_{n,x}}{\sum_{n} BR_{n,p,x} \cdot NCV_{n,x} + \sum_{m} FF_{m,p,x} \cdot NCV_{m,x}} \quad \textbf{(11)}$$

Where:

$EG_{BR,p,x}$	=	Net quantity of electricity generated from using biomass residues in power plant *p* in year *x* (MWh / yr)
$EG_{p,x}$	=	Net quantity of electricity generated in power plant *p* in year *x* (MWh / yr)
$BR_{n,p,x}$	=	Quantity of biomass residues of category *n* used in year *x* in power plant *p* (tonnes on dry-basis)
$NCV_{n,x}$	=	Net calorific value of biomass residue category *n* in year *x* (GJ/tons on a dry basis)
$FF_{m,p,x}$	=	Quantity of fossil fuel type *m* fired in power plant *p* in year *x* (mass or volume unit/yr)
$NCV_{m,x}$	=	Net calorific value of fossil fuel type *m* in year *x* (GJ/mass or volume unit)
m	=	Fossil fuel types used in the power plants *p* in years *x*, *x*-1 and *x*-2
p	=	Power plants that are operated at the site of the project activity, included in the project boundary, and (partially) fired with fossil fuels in the years *x*, *x*-1 and *x*-2
x	=	Last calendar year prior to the start of the crediting period

Option 4: **Determination of a benchmark for the baseline efficiency.** Use the average efficiency of the top 20% performing biomass residue power-only plants in the relevant region among the plants that were built in the most recent five calendar years prior to the implementation of the project activity. The region should be defined in a manner that it includes at least ten plants.

Step 1.4: Determination of $EG_{BL,FF,y}$

The minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* ($EG_{BL,FF,y}$) should, in accordance with the baseline scenario and the historical situation before project implementation, be determined as follows:

Case 1: **No use of fossil fuels in the baseline.** This case applies if no fossil fuels would be used for electricity generation in the baseline scenario at the project site. In this case, $EG_{BL,FF,y} = 0$.

Case 2: **No connection to the electricity grid.** This case applies if all power plants included in the project boundary are off-grid power plants. In this case, the electricity generated by the project can only displace on-site electricity generation with fossil fuel and/or biomass residues ($EG_{PJ,y} = EG_{BL,FF,y} + EG_{BL,BR,y}$). Accordingly, $EG_{BL,FF,y}$ is calculated as follows:

$$EG_{BL,FF,y} = EG_{PJ,y} - EG_{BL,BR,y} \tag{12}$$

Where:

$EG_{BL,FF,y}$ = Minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh)

$EG_{PJ,y}$ = Electricity generated in power plants included in the project boundary in year *y* (MWh / yr)

$EG_{BL,BR,y}$ = Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh / yr)

Case 3: **Grid connection and historical use of fossil fuels.** This case applies if

(a) At least one power plant included in the project boundary is not an off-grid plant; and
(b) Fossil fuels were used for power generation at the project site at any point in time during the most recent three calendar years prior to the implementation of the project activity; and
(c) The baseline scenario is the continued use of fossil fuels for power generation at the project site either in existing or new (co-fired) power plant(s) at the project site which is/are (co-)fired with fossil fuels.

In this case, it is assumed that at least the lowest annual amount of fossil fuel use during the most recent three years would continue to be used for electricity generation in the baseline. $EG_{BL,FF,y}$ is then determined as the lowest annual amount of electricity generation with fossil fuels during the most recent three years prior to the implementation of the project activity, as follows:

$$EG_{BL,FF,y} = MIN\left(EG_{FF,x}; EG_{FF,x-1}; EG_{FF,x-2}\right) \tag{13}$$

Where:

$EG_{BL,FF,y}$	=	Minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh / yr)
$EG_{FF,x}$	=	Electricity generation with fossil fuels in power plant(s) operated in year *x* at the project site and included in the project boundary (MWh / yr)
$EG_{FF,x-1}$	=	Electricity generation with fossil fuels in power plant(s) operated in year *x*-1 at the project site and included in the project boundary (MWh / yr)
$EG_{FF,x-2}$	=	Electricity generation with fossil fuels in power plant(s) operated in year *x*-2 at the project site and included in the project boundary (MWh / yr)
x	=	Last calendar year prior to the start of the crediting period

If only fossil fuels and no biomass residues were used for electricity generation at the project site prior to the implementation of the project activity, then $EG_{FF,x}$, $EG_{FF,x-1}$ and $EG_{FF,x-2}$ can be obtained directly from historical electricity generation records.

If fossil fuels and biomass residues were used for electricity generation at the project site prior to the implementation of the project activity, then $EG_{FF,x}$, $EG_{FF,x-1}$ and $EG_{FF,x-2}$ are determined as follows:

$$EG_{FF,x} = \sum_{m}\sum_{p} \eta_{p,FF} \cdot \frac{1}{3.6} \cdot FF_{m,p,x} \cdot NCV_{m,x} \qquad \textbf{(14)}$$

Where:

$EG_{FF,x}$	=	Electricity generation with fossil fuels in power plant(s) operated in year *x* at the project site and included in the project boundary (MWh / yr)
$\eta_{p,FF}$	=	Efficiency of electricity generation of power plant p if fired only with fossil fuels and not with biomass residues
$FF_{m,p,x}$	=	Quantity of fossil fuel type m fired in power plant p in year x (mass or volume unit/yr)
$NCV_{m,x}$	=	Net calorific value of fossil fuel type m in year x (GJ/mass or volume unit)
m	=	Fossil fuel types used in the power plants p in years *x*, *x*-1 and *x*-2
p	=	Power plants that are operated at the site of the project activity, included in the project boundary, and (partially) fired with fossil fuels in the years *x*, *x*-1 and *x*-2
x	=	Last calendar year prior to the start of the crediting period

Case 4: **Grid connection, no historical use of fossil fuels, and construction of a new power plant (co-)fired with fossil fuels in the baseline scenario.**

This case applies if:

(a) At least one power plant included in the project boundary is not an off-grid plant; and
(b) No fossil fuels were used for power generation at the project site during the most recent three years prior to the implementation of the project activity; and
(c) The baseline scenario is the construction of new power plant(s) at the project site which is/are (co-)fired with fossil fuels.

In this case, it is difficult to establish a reasonable minimum amount of electricity that would be generated with fossil fuels at the project site. The project activity could displace electricity in both on-site fossil fuel fired power plants or in the grid. To what extent the on-site power plant(s) is/are dispatched and to what extent grid electricity is used could depend on several parameters, including the price of electricity, the price of the fossil fuels, the on-site demand for electricity and/or the reliability of the grid. However, all these parameters may change during the crediting period.

For this reason, the following conservative approach is taken:

- If the new power plant constructed in the baseline scenario would only use fossil fuels and not co-fire any biomass residues, then $EG_{BL,FF,y} = 0$. This implies that the amount of electricity that could displace on-site electricity generation with fossil fuels is allocated to $EG_{BL,FF/grid,y}$;
- If the new power plant constructed in the baseline scenario would co-fire fossil fuels and biomass residues, then $EG_{BL,FF,y}$ should correspond to the minimum amount of fossil fuels that must be used due to technical or operational constraints to operate the power plant. This quantity should be determined based on technical specifications obtained from manufacturers. The determination of this amount should be transparently documented and explained in the CDM-PDD. Otherwise, if there are no technical constraints, if these cannot be demonstrated or if the project participants do not wish to determine a minimum amount, it should be assumed that $EG_{BL,FF,y} = 0$.

Step 1.5: Determination of $EG_{BL,grid,y}$

The minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline ($EG_{BL,grid,y}$) should, in accordance with the baseline scenario, be determined as follows:

Case 1: No connection to the electricity grid. If all power plants included in the project boundary are off-grid power plants, then the project does not displace grid electricity and $EG_{BL,grid,y} = 0$.

Case 2: No electricity generation at the project site in the baseline. If no power plants would be operated at the project site in the baseline, then all electricity generated by the project displaces grid electricity and $EG_{BL,grid,y} = EG_{PJ,y}$.

Case 3: Use of only biomass residues for electricity generation at the project site in the baseline. If only biomass residues and no fossil fuels would be used for electricity generation at the project site in the baseline, then the electricity generated by the project displaces grid electricity and electricity generated with biomass residues ($EG_{PJ,y} = EG_{BL,grid,y} + EG_{BL,BR,y}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = EG_{PJ,y} - EG_{BL,BR,y} \quad \textbf{(15)}$$

Where:

$EG_{BL,grid,y}$	=	Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh/yr)
$EG_{PJ,y}$	=	Electricity generated in power plants included in the project boundary in year *y* (MWh/yr)
$EG_{BL,BR,y}$	=	Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh / yr)

Case 4: Use of only fossil fuels for electricity generation at the project site in the baseline. If only fossil fuel and no biomass residues would be used for electricity generation at the project site in the baseline, then the electricity generated by the project can displace grid electricity and electricity generated with fossil fuels at the project site.

$EG_{BL,grid,y}$ represents the amount of electricity that could not be generated in on-site power plant(s) using fossil fuels and would have to be supplied by the grid. This applies to the amount of electricity generated in the project activity that exceeds the maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline ($EG_{BL,MAX,FF}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,MAX,FF} & \text{if } EG_{PJ,y} > EG_{BL,MAX,FF} \\ 0 & \text{if } EG_{PJ,y} \leq EG_{BL,MAX,FF} \end{cases} \quad \textbf{(16)}$$

Where:

$EG_{BL,grid,y}$	=	Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh)
$EG_{PJ,y}$	=	Electricity generated in power plants included in the project boundary in year *y* (MWh)
$EG_{BL,MAX,FF}$	=	Maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline (MWh)

Case 5: Use of fossil fuels and biomass residues for electricity generation at the project site in the baseline. If biomass residues and fossil fuels would be used for electricity generation at the project site in the baseline, then the electricity generated by the project can displace grid electricity, electricity generated with fossil fuels at the project site and electricity generated with biomass residues at the project site. The following scenarios can occur:

(a) **Use of all biomass residues in co-fired heat generator(s).** All biomass residues that would be used in the baseline for electricity generation would be co-fired with fossil fuels. In this case, $EG_{BL,grid,y}$ corresponds to the amount of electricity generated in the project activity that exceeds the maximum amount of electricity generation that could be generated by co-firing fossil fuels and biomass residues in plants at the project site in the baseline ($EG_{BL,MAX,FF/BR}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,MAX,FF/BR,y} & \text{if } EG_{PJ,y} > EG_{BL,MAX,FF/BR,y} \\ 0 & \text{if } EG_{PJ,y} \leq EG_{BL,MAX,FF/BR,y} \end{cases} \quad \textbf{(17)}$$

Where:

$EG_{BL,grid,y}$ = Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh / yr)

$EG_{PJ,y}$ = Electricity generated in power plants included in the project boundary in year *y* (MWh / yr)

$EG_{BL,MAX,FF/BR,y}$ = Maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year *y* (MWh / yr)

(b) **Use of all biomass residues in biomass residues only heat generator(s).** All biomass residues that would be used in the baseline for electricity generation would be used in heat generator(s) that use only biomass residues and no fossil fuels. In this case, $EG_{BL,grid,y}$ is determined as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,BR,y} - EG_{BL,MAX,FF} & \text{if } EG_{PJ,y} > \left(EG_{BL,BR,y} + EG_{BL,MAX,FF}\right) \\ 0 & \text{if } EG_{PJ,y} \leq \left(EG_{BL,BR,y} + EG_{BL,MAX,FF}\right) \end{cases} \quad \textbf{(18)}$$

Where:

$EG_{BL,grid,y}$ = Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh / yr)

$EG_{PJ,y}$ = Electricity generated in power plants included in the project boundary in year *y* (MWh / yr)

$EG_{BL,BR,y}$ = Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh / yr)

$EG_{BL,MAX,FF}$ = Maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline (MWh / yr)

(c) **Use of biomass residues in both biomass residues only heat generator(s) and co-fired heat generator(s).** The biomass residues that would be used in the baseline for electricity generation would partially be co-fired in fossil fired heat generator(s) and partially be used in heat generator(s) that use only biomass residues. In this case, the project participants should document and justify in the CDM-PDD what quantities of which types of biomass residues would be used in each type of heat generator, ensuring that:

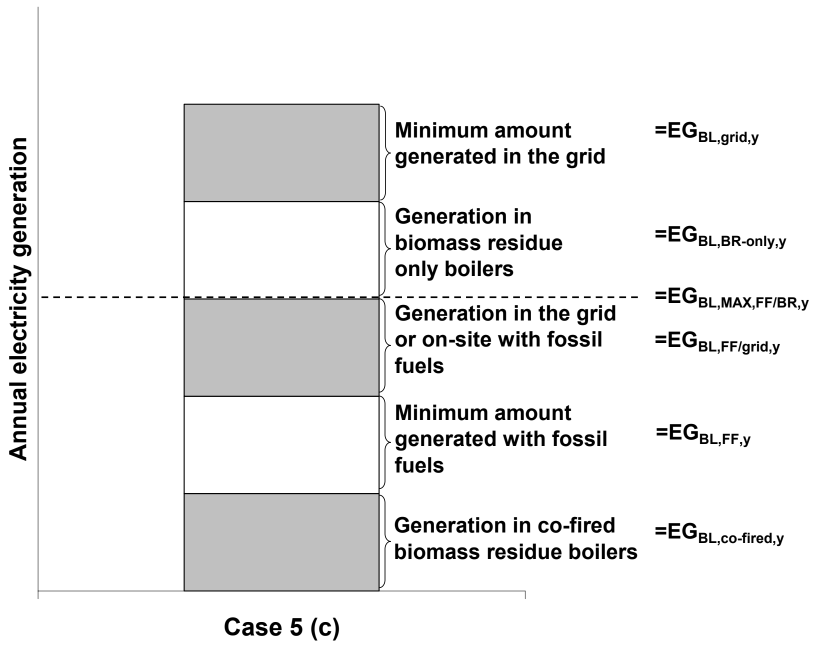
$$\sum_{n}\sum_{p} BR_{BL,n,p,y} = BR_{BL,BR-only,y} + BR_{BL,co-fired,y} \quad \textbf{(19)}$$

Where:

$BR_{BL,n,p,y}$	= Quantity of biomass residues of category *n* that would be fired in power-only plant *p* in the baseline in year *y* (tonnes on dry-basis)
$BR_{BL,BR\text{-}only,y}$	= Quantity of biomass residues that would be fired in biomass-residue-only heat generators (of power-only plants) in the baseline in year *y* (tonnes on dry-basis)
$BR_{BL,co\text{-}fired,y}$	= Quantity of biomass residues that would be fired in co-fired heat generators (of power-only plants) in the baseline in year *y* (tonnes on dry-basis)

This case is illustrated in Figure 2.

Figure 2: Determination of the baseline emission factor in case 5 (c)



In this case, $EG_{BL,grid,y}$ corresponds to the amount of electricity generated in the project activity that exceeds the maximum amount of electricity generation that could be generated by co-firing fossil fuels and biomass residues in plants at the project site in the baseline ($EG_{BL,MAX,FF/BR,y}$) and by firing biomass residues in biomass residues only heat generators ($EG_{BL,BR\text{-}only,y}$). Accordingly, $EG_{BL,grid,y}$ is calculated as follows:

$$EG_{BL,grid,y} = \begin{cases} EG_{PJ,y} - EG_{BL,BR\text{-}only,y} - EG_{BL,MAX,FF/BR,y} & \text{if } EG_{PJ,y} > \left(EG_{BL,BR\text{-}only,y} + EG_{BL,MAX,FF/BR,y}\right) \\ 0 & \text{if } EG_{PJ,y} \le \left(EG_{BL,BR\text{-}only,y} + EG_{BL,MAX,FF/BR,y}\right) \end{cases} \quad \textbf{(20)}$$

Where:

$EG_{BL,grid,y}$	= Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh / yr)
$EG_{PJ,y}$	= Electricity generated in power plants included in the project boundary in year *y* (MWh / yr)
$EG_{BL,BR\text{-}only,y}$	= Amount of electricity that would be generated with biomass-residue-only heat generators at the project site in the baseline in year *y* (MWh / yr)
$EG_{BL,MAX,FF/BR,y}$	= Maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year *y* (MWh / yr)

The parameter $EG_{BL,BR\text{-}only,y}$ should be estimated based on the parameter $BR_{BL,BR\text{-}only,y}$ and the corresponding efficiency of power generation.

Determination of $EG_{BL,MAX,FF,y}$

$EG_{BL,MAX,FF,y}$ corresponds to the maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline. This parameter needs to be determined if fossil fuels would be used for electricity generation at the project site in the baseline (cases 4 and 5 above).

$EG_{BL,MAX,FF,y}$ is determined as follows:

$$EG_{BL,MAX,FF,y} = \sum_{n} CAP_{FF,p} \cdot 0.9 \cdot 8{,}760 \cdot \text{hours / yr} \quad \textbf{(21)}$$

Where:

$EG_{BL,MAX,FF,y}$	= Maximum amount of electricity that could be generated with fossil fuels at the project site in the baseline in year *y* (MWh / yr)
$CAP_{FF,p}$	= Maximum electricity generation capacity of baseline power plant *p* if fired only with fossil fuels (MW)
p	= Power-only plants that would operate at the project site in the baseline scenario

Determination of $EG_{BL,MAX,FF/BR,y}$

$EG_{BL,MAX,FF/BR,y}$ corresponds to the maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year *y* (MWh / yr). This parameter needs to be determined if fossil fuels and biomass residues would be co-fired in heat generators of any power plant that would be used for electricity generation at the project site in the baseline (case 5 (c) above).

$EG_{BL,MAX,FF/BR,y}$ is determined as follows:

$$EG_{BL,MAX,FF/BR,y} = \sum_{n} CAP_{FF/BR,p,y} \cdot 0.9 \cdot 8{,}760 \cdot hours / yr \tag{22}$$

Where:

$EG_{BL,MAX,FF/BR,y}$	=	Maximum amount of electricity that could be generated with fossil fuels and any co-firing of biomass residues at the project site in the baseline in year *y* (MWh / yr)
$CAP_{FF/BR,p,y}$	=	Maximum electricity generation capacity of baseline power plant p in year *y* if fossil-fuel-only heat generators and co-fired heat generators are used (MW)
p	=	Power-only plants that would operate at the project site in the baseline scenario

$CAP_{FF/BR,p,y}$ should be based on the maximum heat quantity that can be generated for use in heat engines if fossil-fuel-only heat generators and co-fired heat generators are used (but no biomass-residue-only heat generators). Note that $CAP_{FF/BR,p,y}$ depends on the amount of biomass residues co-fired in heat generators of the power plant. It is therefore determined based on the monitored amounts of biomass residues that would be co-fired in heat generators in year *y* ($BR_{BL,co\text{-}fired,y}$). Project participants should document transparently and justify in the CDM-PDD how they determine $CAP_{FF/BR,p,y}$ as a function of $BR_{BL,co\text{-}fired,y}$ for each calendar year.

Alternatively, as a conservative approach, the following can be assumed: $EG_{BL,MAX,FF/BR,y} = EG_{BL,MAX,FF}$.

Step 1.6: Determination of $EG_{BL,FF/grid,y}$

$EG_{BL,FF/grid,y}$ represents the amount of electricity that could be generated in the baseline in the grid or at the project site using fossil fuels. $EG_{BL,FF/grid,y}$ corresponds to the remainder of electricity generation, i.e. the amount that exceeds the minimum amount of electricity that would be generated by power plants in the electricity grid ($EG_{BL,grid,y}$), the minimum amount of electricity that could be generated with fossil fuels at the project site ($EG_{BL,FF,y}$), and the amount of electricity that would be generated with biomass residues at the project site ($EG_{BL,BR,y}$). Accordingly, $EG_{BL,FF/grid,y}$ is calculated as follows:

$$EG_{BL,FF/grid,y} = EG_{PJ,y} - EG_{BL,BR,y} - EG_{BL,FF,y} - EG_{BL,grid,y} \tag{23}$$

Where:

$EG_{BL,FF/grid,y}$	=	Amount of electricity that could be generated in the baseline either by power plants in the electricity grid or by power plants at the project site using fossil fuels in year *y* (MWh)
$EG_{PJ,y}$	=	Electricity generated in power plants included in the project boundary in year *y* (MWh)
$EG_{BL,BR,y}$	=	Amount of electricity that would be generated with biomass residues in power-only plants operated at the project site in the baseline in year *y* (MWh)
$EG_{BL,FF,y}$	=	Minimum amount of electricity that would be generated with fossil fuels at the project site in the baseline in year *y* (MWh)
$EG_{BL,grid,y}$	=	Minimum amount of electricity that would be generated by power plants in the electricity grid in the baseline in year *y* (MWh)

Step 1.7: Determination of $EF_{BL,FF,y}$

$EF_{BL,FF,y}$ 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 to determine $EF_{BL,FF,y}$. For new power plants that would be constructed at the project site in the baseline scenario, Option B should be used.

Option A: Determine $EF_{BL,FF,y}$ 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 to the implementation of the project activity.

Option B: Determine a default emission factor for $EF_{BL,FF,y}$ 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:

$$EF_{BL,FF,y} = 3.6 \cdot \frac{EF_{BL,CO2,FF}}{\eta_{BL,FF}} \tag{24}$$

Where:

$EF_{BL,FF,y}$	=	CO_2 emission factor for electricity generation with fossil fuels in power plant(s) at the project site in the baseline in year *y* (t CO2 / 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 (t CO2 / GJ)
$\eta_{BL,FF}$	=	Efficiency of the fossil fuel power plant(s) at the project site in the baseline

Step 1.8: Determination of $EF_{grid,CM,y}$

$EF_{grid,CM,y}$ should be determined as the combined margin CO_2 emission factor for grid connected power generation in year *y*, calculated using the latest approved version of the "Tool to calculate the emission factor for an electricity system".

Step 2: Determination of baseline emissions due to uncontrolled burning or decay of biomass residues ($BE_{BR,y}$)

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, as summarized in Table 2. The guidance for the determination of $BR_{BL,n,p,y}$ 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:

$$BE_{BR,y} = BE_{BR,B1/B3,y} + BE_{BR,B2,y} \quad \textbf{(25)}$$

Where:

$BE_{BR,y}$	=	Baseline emissions due to uncontrolled burning or decay of biomass residues in year *y* (tCO_2)
$BE_{BR,B1/B3,y}$	=	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 2.1: Determination of $BE_{BR,B1/B3,y}$

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:

$$BE_{BR,B1/B3,y} = GWP_{CH4} \cdot \sum_{n} BR_{n,B1/B3,y} \cdot NCV_{n,y} \cdot EF_{BR,n,y} \quad \textbf{(26)}$$

Where:

$BE_{BR,B1/B3,y}$	=	Baseline emissions due to uncontrolled burning or anaerobic decay of biomass residues in year *y* (tCO_2)
GWP_{CH4}	=	Global Warming Potential of methane valid for the commitment period (tCO_2/tCH_4)
$BR_{n,B1/B3,y}$	=	Amount of biomass residues category n used in the project plant(s) included in the project boundary in year *y* for which B1 or B3 has been identified as the most plausible baseline scenario (tonnes on dry-basis)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category n in yeay y (GJ/tonnes 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	=	Categories of biomass residues

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 default value for the product of NCV_k and $EF_{burning,CH4,k,y}$.[9]

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

[9] 2006 IPCC Guidelines, Volume 4, Table 2.5, default value for agricultural residues.

uncertainty range of the estimate for the CH_4 emission factor. The appropriate conservativeness factor from Table 3 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 3: 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 2.2: Determination of $BE_{BR,B2,y}$

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.

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 ($BR_{PJ,n,y}$) 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 made consistently with Table 2 above, as provided for the project activity in the CDM-PDD. The allocation should be made in a conservative manner and consistent with the guidance provided before for $BR_{BL,n,p,y}$. The project participants should specify and justify in the CDM-PDD 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.

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 for auxiliary loads related to the generation of electric power;
- 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 electricity 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:

$$PE_y = PE_{FF,y} + PE_{TR,y} + PE_{BR,y} + PE_{WW,y} \tag{27}$$

Where:

PE_y	=	Project emissions during year *y* (tCO2e)
$PE_{FF,y}$	=	Emissions during the year *y* due to fossil fuel consumption at the project site (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)

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. This includes all fossil fuels used at the project site in heat generators (e.g. boilers) for the generation of electric power; and
- Emissions from on-site fossil fuel consumption of auxiliary equipment and systems related to the generation of electric power. This includes fossil fuels required for the operation of auxiliary equipment related to the power 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 $PE_{TR,y}$

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):

$$PE_{TR,y} = N_y \cdot AVD_y \cdot EF_{km,y} \tag{28}$$

or

$$PE_{TR,y} = \frac{BR_{TR,y}}{TL_y} \cdot AVD_y \cdot EF_{km,y} \tag{29}$$

Where:

$PE_{TR,y}$	=	CO_2 emissions during the year *y* due to transport of the biomass residues to the project plant (tCO_2)
N_y	=	Number of truck trips 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 (tonnes) during the year *y*

Option 2

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

$$PE_{TR,y} = \sum_i FC_{TR,i,y} \cdot NCV_{i,y} \cdot EF_{FF,i,y} \tag{30}$$

Where:

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

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:

$$PE_{BR,y} = GWP_{CH4} \cdot EF_{CH4,BR} \cdot \sum_{n} BR_{PJ,n,y} \cdot NCV_{n,y} \qquad \textbf{(31)}$$

Where:

$PE_{BR,y}$	=	Emissions from the combustion of biomass residues during the year *y* (tCO_2)
GWP_{CH4}	=	Global Warming Potential for methane valid for the relevant commitment period (tCO_2/tCH_4)
$EF_{CH4,BR}$	=	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 power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis/yr)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category *n* in year *y* (GJ/tonnes on dry-basis)

To determine the CH_4 emission factor, project participants may conduct measurements at the plant site or use IPCC default values, as provided in Table 4 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 5 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 4 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 4: Default CH_4 emission factors for combustion of biomass residues[10]

	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%

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

Table 5: 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 $PE_{WW,CH4,y}$

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:

$$PE_{WW,CH4,y} = GWP_{CH4} \cdot V_{WW,y} \cdot COD_{WW,y} \cdot B_{o,WW} \cdot MCF_{WW} \quad \textbf{(32)}$$

Where:

$PE_{WW,CH4,y}$	=	CH_4 emissions from wastewater generated from the treatment of biomass residues in year *y* (tCH_4)
GWP_{CH4}	=	Global Warming Potential for methane valid for the relevant 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)

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:

$$LE_y = EF_{CO2,LE} \cdot \sum_n BR_{PJ,n,y} \cdot NCV_{n,y} \quad \textbf{(33)}$$

Where:

LE_y	=	Leakage emissions in year *y* (tCO_2/yr)
$EF_{CO2,LE}$	=	CO_2 emission factor of the most carbon intensive fossil fuel used in the country (tCO_2/GJ)
$BR_{PJ,n,y}$	=	Quantity of biomass residues of category n used in power plants which are located at the project site and included in the project boundary in year *y* (tonnes on dry-basis/yr)
$NCV_{n,y}$	=	Net calorific value of the biomass residues category *n* in year *y* (GJ/ton of dry matter)
n	=	Categories of biomass residues for which B5:, B6:, B7: or B8: has been identified as the baseline scenario

The determination of $BR_{PJ,n,y}$ 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.

Data and parameters not monitored

In addition to the parameters and procedures described herein, all monitoring provisions contained in the tools referred to in this methodology also apply:

- "Tool to calculate the emission factor for an electricity system";
- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site";
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";
- "Combined tool to identify the baseline scenario and demonstrate additionality";
- "Tool for the demonstration and assessment of additionality".

Document and justify all selected values in the CDM-PDD.

The following are not monitored data and parameters:

Data / parameter:	GWP_{CH4}
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential for CH_4
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:	Amount of fuel used in the heat generation equipment, if any
Data unit:	GJ
Description:	If any heat which is used for purposes other than power generation (e.g. heat which is produced in boilers or extracted from the header to feed thermal loads in the process) is generated during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the amount of fuel used in the heat generation equipment should be monitored and clearly differentiated from any fuel used in the project activity. The following conditions should be checked using this data: • The implementation of the project activity does not influence directly or indirectly the operation of the heat generation equipment, i.e. the heat generation equipment would operate in the same manner in the absence of the project activity; and, • The heat generation equipment does not influence directly or indirectly the operation of the project plant, e.g. no fuels are diverted from the heat generation equipment to the project plant
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight or volume meters. The quantity shall be cross-checked with the quantity of electricity generated and any fuel purchase receipts (if available)
Any comment:	This parameter is related to an applicability condition

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, using a table similar to Table 2, 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 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
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

Data / parameter:	$BR_{n,power\text{-}only,x}$
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used in year *x* in power-only plants which were used at the project site prior to the implementation 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)
Any comment:	---

Data / parameter:	$BR_{n,p,x}$
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues of category *n* used in year *x* in power plant *p*
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:	---

Data / parameter:	$FF_{m,p,x}$
Data unit:	mass or volume unit/yr
Description:	Quantity of fossil fuel type *m* fired in power plant *p* in year *x*
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:	---

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, etc.) produced in year *x* from plants operated at the project site
Source of data:	On-site measurements
Measurement procedures (if any):	---
Any comment:	---

Data / parameter:	$EG_{p,x}$
Data unit:	MWh / yr
Description:	Net quantity of electricity generated in power plant *p* in year *x*
Source of data:	On-site measurements
Measurement procedures (if any):	Use calibrated electricity meters
Any comment:	---

Data / parameter:	$EG_{FF,x}$, $EG_{FF,x-1}$, $EG_{FF,x-2}$
Data unit:	MWh / yr
Description:	Electricity generation with fossil fuels in power plant(s) included in the project boundary, operated respectively in years *x*, *x*-1 and *x*-2 at the project site
Source of data:	On-site measurements
Measurement procedures (if any):	Use calibrated electricity meters
Any comment:	---

Data / parameter:	$NCV_{n,x}$
Data unit:	GJ/tons on a dry basis
Description:	Net calorific value of biomass residue 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:	---

Data / parameter:	$NCV_{m,x}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of fossil fuel type *m* 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:	---

Data / parameter:	$EF_{BL,CO2,FF,d}$
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
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

Data / parameter:	$\eta_{BL,BR,p}$
Data unit:	ratio
Description:	Efficiency of electricity generation of baseline power plant *p* if fired only with biomass residues and not with fossil fuels
Source of data:	Survey conducted by the project participants or third parties
Measurement procedures (if any):	Use the average efficiency of the top 20% performing biomass residue power-only plants in the relevant region among the plants that were built in the most recent five calendar years prior to the implementation of the project activity. The region should be defined in a manner that it includes at least ten plants
Any comment:	---

Data / parameter:	$\eta_{BL,hg,p}$, $\eta_{BL,mg,p}$, $\eta_{BL,BR,p}$
Data unit:	ratio
Description:	Respectively: conservative efficiency of heat generation of baseline power plant p if fired only with biomass residues and not with fossil fuels; conservative efficiency of conversion from heat to mechanical shaft power of baseline power plant p; and conservative efficiency of the electric generators of baseline power plant p
Source of data:	Manufacturer's data

Measurement procedures (if any):	---
Any comment:	If several heat generators, heat engines and electric generators would operate in the baseline and if it can not clearly defined which configuration would prevail in the baseline, the most conservative values for efficiencies should be assumed. For example, if several boilers, turbines, speed reducers and electric generators operate in the power plant p, it should be assumed that the most efficient boiler and the most efficient set of turbine-speed reducer-electric generator would be used. The efficiency of conversion from heat to mechanical shaft power should include the speed-reducers or gear boxes required to couple the mechanical shaft power generator to the electric generator

Data / parameter:	$\eta_{p,FF}$
Data unit:	ratio
Description:	Efficiency of electricity generation of power plant *p* if fired only with fossil fuels and not with biomass residues
Source of data:	Either use the higher value among (a) the measured efficiency and (b) manufacturer's information on the efficiency OR assume an efficiency of 100% as a conservative default value
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 estimation of the losses). Document measurement procedures and results and manufacturer's information transparently in the CDM-PDD
Any comment:	---

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 estimation of the losses). Document measurement procedures and results and manufacturer's information transparently in the CDM-PDD
Any comment:	---

Data / parameter:	$CAP_{FF,p}$
Data unit:	MW
Description:	Maximum electricity generation capacity of baseline power plant p if fired only with fossil fuels
Source of data:	On-site measurements or manufacturer's data
Measurement procedures (if any):	---
Any comment:	---

III. MONITORING METHODOLOGY

Monitoring procedures

Describe and specify in the CDM-PDD all monitoring procedures, including the type of measurement instrumentation used, the responsibilities for monitoring and QA/QC procedures that will be applied. Where the methodology provides different options (e.g. use of default values or on-site measurements), specify which option will be used. All meters and instruments should be calibrated regularly as per industry practices.

All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the last crediting period. 100% of the data should be monitored if not indicated differently in the comments in the tables below.

In addition to the parameters and procedures described herein, all monitoring provisions contained in the tools referred to in this methodology also apply:

- "Tool to calculate the emission factor for an electricity system";
- "Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site";
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion";
- "Tool to calculate baseline, project and/or leakage emissions from electricity consumption";
- "Combined tool to identify the baseline scenario and demonstrate additionality";
- "Tool for the demonstration and assessment of additionality".

Data and parameters monitored

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 calculte emissions reudctions
QA/QC procedures:	---
Any comment:	---

Data / parameter:	Amount of fuel used in the heat generation equipment, if any
Data unit:	GJ
Description:	If any heat which is used for purposes other than power generation (e.g. heat which is produced in boilers or extracted from the header to feed thermal loads in the process) is generated during the crediting period or was generated prior to the implementation of the project activity, by any on-site or off-site heat generation equipment connected to the project site, the amount of fuel used in the heat generation equipment should be monitored and clearly differentiated from any fuel used in the project activity. The following conditions should be checked using this data: • The implementation of the project activity does not influence directly or indirectly the operation of the heat generation equipment, i.e. the heat generation equipment would operate in the same manner in the absence of the project activity; and, • The heat generation equipment does not influence directly or indirectly the operation of the project plant, e.g. no fuels are diverted from the heat generation equipment to the project plant.
Source of data:	On-site measurements
Measurement procedures (if any):	Use weight or volume meters. The quantity shall be cross-checked with the quantity of electricity generated and any fuel purchase receipts (if available)
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculte emissions reductions
QA/QC procedures:	---
Any comment:	This parameter is related to an applicability condition

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 (scenario B); - Use in the project scenario (scenario P); - Quantity (tonnes on dry-basis)
Description:	Explain and document transparently in the CDM-PDD, using a table similar to **Table 2**, 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** 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 emissions reductions 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 type B1:, 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 calculte emissions reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	---

Data / parameter:	$BR_{PJ,n,y}$
Data unit:	tonnes on dry-basis
Description:	Quantity of biomass residues of category n used in power plants which are located at the project site and included in the project boundary in year *y*
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 calculte emissions reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	The 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.)

Data / parameter:	$BR_{n,B1/B3,y}$
Data unit:	tonnes on dry-basis
Description:	Amount of biomass residues category n used in the project plant(s) included in the project boundary in year *y* for which B1 or B3 has been identified as the most plausible baseline scenario
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 calculte emissions reductions
QA/QC procedures:	Crosscheck the measurements with an annual energy balance that is based on purchased quantities and stock changes
Any comment:	---

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 alternative 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:	---

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*
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:	---

Data / parameter:	$EG_{PJ,gross,y}$
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*
Source of data:	On-site measurements
Measurement procedures (if any):	Use calibrated electricity meters
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculte 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:	---

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

Data / parameter:	$NCV_{n,y}$
Data unit:	GJ/tonnes on dry-basis
Description:	Net calorific value of biomass residues of category n in year *y*
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:	---

Data / parameter:	$EF_{BR,n,y}$
Data unit:	tCH_4/GJ
Description:	CH_4 emission factor for uncontrolled burning of the biomass residues category *n* during the year *y*
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 default value for the product of NCV_k and $EF_{burning,CH4,k,y}$
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	---

Data / parameter:	Moisture content of the biomass residues
Data unit:	% Water content
Description:	Moisture content of each biomass residues type *k*
Source of data:	On-site measurements
Measurement procedures (if any):	
Monitoring frequency:	Continuously, mean values calculated at least annually
QA/QC procedures:	
Any comment:	In case of dry biomass, monitoring of this parameter is not necessary

Data / parameter:	$CAP_{FF/BR,p,y}$
Data unit:	MW
Description:	Maximum electricity generation capacity of baseline power plant p in year *y* if fossil-fuel-only heat generators and co-fired heat generators are used
Source of data:	On-site measurments
Measurement procedures (if any):	$CAP_{FF/BR,p,y}$ should be based on the maximum heat quantity that can be generated for use in heat engines if fossil-fuel-only heat generators and co-fired heat generators are used (but no biomass-residue-only heat generators). Note that $CAP_{FF/BR,p,y}$ depends on the amount of biomass residues co-fired in heat generators of the power plant. It is therefore determined based on the monitored amounts of biomass residues that would be co-fired in heat generators in year *y* ($BR_{BL,co\text{-}fired,y}$). Project participants should document transparently and justify in the CDM-PDD how they determine $CAP_{FF/BR,p,y}$ as a function of $BR_{BL,co\text{-}fired,y}$ for each calendar year

Monitoring frequency:	Yearly
QA/QC procedures:	---
Any comment:	---

Data / parameter:	N_y
Data unit:	---
Description:	Number of truck trips for the transportation of biomass
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. by the relation with previous years
Any comment:	---

Data / parameter:	AVD_y
Data unit:	km
Description:	Average round trip distance (from and to) between biomass fuel supply sites and the project site
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 emissions 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

Data / parameter:	$EF_{km,y}$
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for the trucks during the year *y*
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:	---

Data / parameter:	TL_y
Data unit:	tonnes
Description:	Average truck load of the trucks used for transportation of biomass
Source of data:	On-site measurements
Measurement procedures (if any):	Determined by averaging the weights of each truck carrying biomass to the project plant
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions reductions
QA/QC procedures:	---
Any comment:	---

Data / parameter:	$FC_{TR,i,y}$
Data unit:	Mass or volume unit
Description:	Fuel consumption of fuel type i in trucks for transportation of biomass residues during the year *y*
Source of data:	Fuel purchase receipts or fuel consumptions meters in the trucks
Measurement procedures (if any):	---
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculate emissions 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:	$EF_{FF,i,y}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type *i* in year *y*
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 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:	---

Data / parameter:	$NCV_{i,y}$
Data unit:	GJ/mass or volume unit
Description:	Net calorific value of the fossil fuel type *i* in year *y*
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:	

Data / parameter:	$EF_{CH4,BF}$
Data unit:	tCH_4/GJ
Description:	CH_4 emission factor for the combustion of biomass residues in the project plant
Source of data:	On-site measurements or default values, as provided in Table 4
Measurement procedures (if any):	The CH_4 emission factor may be determined based on a stack gas analysis using calibrated analyzers
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_4 emissions from biomass combustion are included in the project boundary. Note that a conservative factor shall be applied, as specified in the baseline methodology

Data / parameter:	$EF_{CO2,LE}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of the most carbon intensive fuel used in the country
Source of data:	Identify the most carbon intensive fuel type from the national communication, 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:	---

Data / parameter:	$V_{WW,y}$
Data unit:	m^3
Description:	Quantity of waste water generated in year *y*
Source of data:	On-site measurements
Measurement procedures (if any):	---
Monitoring frequency:	Data monitored continuously and aggregated as appropriate, to calculte emissions reductions
QA/QC procedures:	---
Any comment:	---

Data / parameter:	$COD_{WW,y}$
Data unit:	$tCOD/m^3$
Description:	Average chemical oxygen demand of the waste water in year *y*
Source of data:	On-site measurements
Measurement procedures (if any):	---
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	---

Data / parameter:	$B_{o,WW}$
Data unit:	$tCH_4/tCOD$
Description:	Methane generation potential of the wastewater
Source of data:	On-site measurements or reference default values
Measurement procedures (if any):	---
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	---

Data / parameter:	MCF_{WW}
Data unit:	ratio
Description:	Methane correction factor for the waste water
Source of data:	On-site measurements or reference default values
Measurement procedures (if any):	---
Monitoring frequency:	---
QA/QC procedures:	---
Any comment:	---

IV. REFERENCES AND ANY OTHER INFORMATION

Not applicable.

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History of the Document

Version	Date	Nature of Revision
01	EB 52, Annex # 12 February 2010	To be considered at EB 52.
Decision Class: Regulatory **Document Type**: Standard **Business Function**: Methodology		